REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL VALLEY REGION

Amendment To the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins

To Establish a Drinking Water Policy for Surface Waters of the Sacramento-San Joaquin Delta and Upstream Tributaries

Staff Report

July 2013

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 an amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basin (Resolution No. R5-201x-xxxx). Mention of specific products does not represent endorsement of those products by the Regional Board.

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To the
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ACKNOWLEDGEMENTS:

Disclosure: Funding for this project has been provided in part through an Agreement between the State Water Resources Control Board and the California Urban Water Agencies, starting in 2003. This Agreement provided resources from the California Urban Water Agencies and Sacramento Regional County Sanitation District to fund Central Valley Water Board staff to work on development of the Drinking Water Policy.

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 for the Sacramento River and San Joaquin River Basins (Basin Plan) to add a Drinking Water Policy for surface waters of the Sacramento-San Joaquin Delta (Delta) and upstream tributaries below their first major dams. The project area is bounded by Shasta Dam on the Sacramento River, Millerton Dam on the San Joaquin River, and Folsom Dam on the American River. The Policy includes a narrative water quality objective for *Cryptosporidium* and *Giardia* and implementation provisions for the objective. The Drinking Water Policy is proposed to protect the municipal and domestic supply (MUN) beneficial use; the narrative water quality objective for *Cryptosporidium* and *Giardia* is proposed to specifically protect the public water system component of the MUN beneficial use.

The Sacramento River and San Joaquin River watersheds and the Delta provide drinking water for over two thirds of the people in California. Most of Southern California, a major portion of the San Francisco Bay Area, parts of the Central Coast, and many Central Valley communities rely on these watersheds for their drinking water. The Cascade and Sierra tributaries to the Sacramento and San Joaquin rivers are high quality sources of drinking water. As the water flows out of the foothills and into the valley, pollutants from a variety of urban, industrial, agricultural and natural sources affect the quality of the water. The Central Valley Water Board has designated the MUN beneficial use for many waterways in the Central Valley. The Basin Plan includes existing provisions including beneficial use designations, water quality objectives, and implementation measures to protect drinking water uses. The proposed Basin Plan amendment would add a Drinking Water Policy and a narrative water quality objective for *Cryptosporidium* and *Giardia*.

The proposed Drinking Water Policy would compile the elements of the Basin Plan that apply to the protection of the MUN beneficial use as well as clarify that the existing narrative water quality objective for chemical constituents includes drinking water chemical constituents of concern, such as organic carbon. The Drinking Water Policy would recognize the importance of a multi-barrier approach that includes source water protection, drinking water treatment, and protection of water quality in the drinking water distribution system and for drinking water systems to provide monitoring and public information for its customers. The Drinking Water Policy would acknowledge that, according to source evaluation studies conducted in 2011 that examined publically owned treatment works, urban runoff, and irrigated agriculture, concentrations of organic carbon at public water system intakes are not expected to increase over time.

USEPA required monitoring of *Cryptosporidium* from 2006 to 2011 has not resulted in additional treatment requirements for most public water systems treating water from the Delta and its tributaries. To address adverse health impacts from potential increased *Cryptosporidium* and *Giardia* levels, a proposed narrative objective has been developed to maintain existing conditions for public water systems as defined in the Health and Safety Code section 116275, subdivision (h). The proposed Drinking Water Policy includes an implementation element to specifically address the interpretation of and compliance with the proposed narrative objective for *Cryptosporidiu*m and *Giardia*. To interpret the narrative objective and to evaluate compliance with the proposed objective, numeric triggers tied to USEPA's drinking water requirements based on *Cryptosporidium* concentrations will be used.

However, exceedances of the triggers would not be violations of the proposed narrative objective nor are the triggers to be used for numeric effluent limits. The implementation element will include the numeric triggers and a process for addressing exceedance of the triggers.

This Staff Report presents policy options including alternatives to the proposed narrative objective, evaluates these alternatives, identifies staff's recommended action, evaluates the proposed action's consistency with other laws, plans and policies, and assesses environmental impacts associated with implementing the proposed Basin Plan amendment.

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LIST OF ACRONYMS

AGR	Agricultural Supply
BIOL	Preservation of Biological Habitats of Special Significance
CCR	California Code of Regulations
CEC	Constituents of Emerging Concern
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
COMM	Commercial and Sport Fishing
COLD	Cold Freshwater Habitat
CTR	California Toxics Rule
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CWA	Clean Water Act
Delta	Sacramento-San Joaquin Delta
DBP	Disinfection Byproduct
DPH	California Department of Public Health
IND	Industrial Service Supply
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule
MGD	Million Gallons per Day
MUN	Municipal and Domestic Supply Beneficial Use
NAV	Navigation
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OEHHA	Office of Environmental Health Hazard Assessment
POTW	Publicly Own Treatment Works
PRC	Public Resources Code
PRO	Industrial Process Supply
PHG	Public Health Goal
RAA	Running Annual Average
REC-1	Water Contact Recreation
REC-2	Non-contact Water Recreation
SHELL	Shellfish Harvesting
SPWN	Spawning, Reproduction, and/or Early Development
SWTR	Surface Water Treatment Rule
ROD	Record of Decision
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WARM	Warm Freshwater Habitat
Wat. Code	California Water Code
WILD	Wildlife Habitat
Workgroup	Central Valley Drinking Water Policy Workgroup
WTP	Water Treatment Plant

1 INTRODUCTION AND EXISTING CONDITIONS

The purpose of this Staff Report is to provide the rationale and supporting documentation for the proposed amendment to the *Water Quality Control Plan for the Sacramento and San Joaquin River Basin* (Basin Plan). The amendment will add a Drinking Water Policy and a narrative water quality objective for *Cryptosporidium* and *Giardia* to the Basin Plan and provide clarity for the chemical constituents narrative water quality objective with regard to drinking water chemical constituents of concern, such as organic carbon. The Drinking Water Policy is proposed to protect the municipal and domestic supply (MUN) beneficial use; the narrative water quality objective for *Cryptosporidium* and *Giardia* is proposed to protect the public water system[1] component of the MUN beneficial use. The objective includes a prescribed geographic scope and compliance points for the evaluation of ambient waters at public water system intakes.

1.1 REGULATORY AUTHORITY AND MANDATES FOR BASIN PLAN AMENDMENTS

In the Porter-Cologne Water Quality Control Act, the Legislature found and declared that activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible.

The State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Water Boards) are the state agencies with primary responsibility for coordination and control of water quality. (Wat. Code, §13000.) Each Regional Water Board is required to adopt a water quality control plan, or Basin Plan, which provides the basis for regulatory actions to protect water quality. (Wat. Code, §13240 et seq.) Basin plans designate beneficial uses of water, water quality objectives to protect the uses, and a program of implementation to achieve the objectives. (Wat. Code, §13050, subd.(j).) Basin plans, once adopted, must be periodically reviewed and may be revised. (Wat. Code, §13240.)

Under the federal Clean Water Act (CWA), 33 USC section 1251 et seq., the states are required to adopt water quality standards for surface waters. (CWA §303(c)) Water quality standards consist of: 1) designated uses; 2) water quality criteria necessary to protect designated uses; and 3) an antidegradation policy. (CWA 303(c)(2)(A) and (d)(4)(B); Title 40 Code of Federal Regulations (CFR) §131.6) In California, water quality standards are found in the basin plans, statewide water quality control plans adopted by the State Water Board, and the federal California Toxics Rule (CTR). Under the Clean Water Act, the states must review water quality standards at least every three years.

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)

[1] Public water system as defined in Health and Safety Code, section 116275, subdivision (h)

§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; California Code of Regulations (CCR), title 14, §15251, subd. (g).) Instead, State Water Board regulations on its exempt regulatory programs require the Regional Water Boards to prepare a written report and an accompanying CEQA Environmental Checklist and Determination with respect to Significant Environmental Impacts (CEQA Checklist) (CCR, title 23, §3775 et seq.)

Basin Plan amendments are not effective until they are approved by the State Water Board and the regulatory provisions are approved by the State Office of Administrative Law. The United States Environmental Protection Agency (USEPA) also must review and approve amendments that add or modify water quality standards for waters of the United States.

1.2 Background and Need for Proposed Basin Plan Amendment

The Sacramento River and San Joaquin River watersheds and the Sacramento-San Joaquin Delta provide drinking water for over two thirds of the people in California. Most of Southern California, a major portion of the San Francisco Bay Area, parts of the Central Coast, and many Central Valley communities rely on these watersheds for their drinking water. The Sierra and Cascade tributaries to the Sacramento and San Joaquin rivers are high quality sources of drinking water. As the water flows out of the foothills and into the valley, pollutants and other constituents from a variety of urban, industrial, agricultural and natural sources affect the quality of the water. The California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) has designated the municipal and domestic supply (MUN) Beneficial Use for many waterways in the Central Valley. Water quality objectives are used as a regulatory tool to protect designated beneficial uses. The Basin Plan establishes both numeric and narrative water quality objectives to protect beneficial uses such as MUN for both surface water and groundwater. This proposed amendment is limited only to surface water.

In August 2000, CALFED issued a Record of Decision (ROD) requiring the California Bay-Delta Authority, with the assistance of Department of Public Health (DPH), to coordinate a comprehensive source water protection program. One element of this source water protection program is to establish a Drinking Water Policy for the Delta and upstream tributaries. In a May 2002 Implementation Memorandum of Understanding for the CALFED Drinking Water Quality Program, the Central Valley Water Board, in consultation with DPH, State Water Board and USEPA, was given primary responsibility for development of a Drinking Water Policy for the Delta and its tributaries.

The Central Valley Drinking Water Policy Workgroup (Workgroup) was formed to provide a stakeholder-based platform for development of the policy. The Workgroup is comprised of federal and state agencies, public water systems, and wastewater, municipal storm water and agricultural interests. Drinking water constituents of concern were identified as organic carbon, salt, nutrients, *Cryptosporidium,* and *Giardia* by the Workgroup. However, numeric water quality objectives are not in place for organic carbon, some nutrients, *Cryptosporidium,* and *Giardia*. There is also a lack of clarity regarding the applicability of the chemical constituents narrative water quality objective to drinking water chemical constituents of concern, such as organic carbon. In 2003, California Urban Water Agencies and Sacramento Regional County Sanitation District began reimbursing Central Valley Water Board staff costs for one half of a

staff person per year to lead the Workgroup in the development of the policy. This reimbursement continues into the current fiscal year.

In July 2004, the Central Valley Water Board adopted Resolution No. R5-2004-0091 which formally recognized that it would not meet the completion date specified in the CALFED ROD, but communicated the Board's continued support for development of a Drinking Water Policy. In July 2010, the Central Valley Water Board adopted Resolution No. R5-2010-0079 titled *Establishment of a Drinking Water Policy for the Sacramento-San Joaquin Delta and Upstream Tributaries*. This Resolution was adopted as a means of documenting progress to date and to set deadlines for completion of future work needed in the development of the policy. Resolution No. R5-2010-0079 directs staff to bring a Drinking Water Policy to the Board for action no later than July 2013.

1.3 WATER CODE SECTION 106.3

In compliance with Water Code section 106.3, it is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This Basin Plan amendment promotes that policy by establishing a drinking water policy to protect the MUN beneficial use.

2 DRINKING WATER POLICY ELEMENTS

2.1 MUN BENEFICIAL USE AND SOURCE OF DRINKING WATER IN DELTA AND TRIBUTARIES

The proposed Drinking Water Policy recognizes the importance of protecting the Delta and its tributaries as a source of drinking water. As stated above, the Sacramento River and San Joaquin River watersheds and the Sacramento-San Joaquin Delta provide drinking water for over two thirds of the people in California. Most of Southern California, a major portion of the San Francisco Bay Area, parts of the Central Coast, and many Central Valley communities rely on these watersheds for their drinking water.

2.2 BASIN PLAN ELEMENTS ADDRESSING DRINKING WATER PROTECTION

The Basin Plan currently includes a number of elements that address drinking water protection. The elements include water quality objectives and policies.

2.2.1 Water Quality Objectives

Surface water quality objectives in the Basin Plan are developed to protect all applicable beneficial uses, including the MUN beneficial use unless otherwise stated. The Basin Plan includes a number of water quality objectives that address drinking water protection. There are narrative objectives for chemical constituents, taste and odor, sediment, suspended material, and toxicity, and numeric objectives for chemical constituents and salinity. The Basin Plan incorporates by reference the maximum contaminant levels specified in Title 22 of the California Code of Regulations for waters designated MUN.

2.2.2 Implementation Chapter Policies Relevant to Drinking Water Protection

There are a number of existing policies in the Implementation Chapter of the Basin Plan that are relevant to drinking water protection. The following contains a list of the policies and brief summaries.

- Resolution No. 68-16, Policy with Respect to Maintaining High Quality of Water in California (IV – 8.00)

  Commonly known as the State's Antidegradation Policy, the goal of this Policy is to maintain high quality waters. Changes in water quality are allowed only if the change is consistent with maximum benefit to the people of the State; does not unreasonably affect present and anticipated beneficial uses; and does not result in water quality less than that prescribed in water quality control plans or policies. Resolution No. 68-16 also incorporates the federal antidegradation policy.

- Resolution No. 88-63, Sources of Drinking Water Policy (IV – 9.00)

  State Water Board Resolution No. 88-63, commonly known as the Sources of Drinking Water Policy, establishes the state policy that all waters are considered suitable or potentially suitable to support the MUN beneficial use, with certain exceptions.

  The Basin Plan implements State Water Board Resolution 88-63 ("Sources of Drinking Water Policy") by assigning MUN to all surface water bodies not listed in Table II-1. The following exceptions to the MUN designation are allowed for surface and ground waters with a Basin Plan Amendment: 1) with total dissolved solids exceeding 3,000 mg/L, 2) with contamination that cannot reasonably be treated for domestic use, 3) where there is

insufficient water supply for a single well to provide an average, sustained yield of 200 gallons per day, 4) in systems designed for wastewater collection or conveying or holding agricultural drainage, or 5) regulated as a geothermal energy producing source. Resolution 88-63 addresses only designation of water as drinking water sources; it does not establish objectives for constituents that are protective of the designated MUN use.

- Antidegradation Implementation Policy (IV – 15.01)

  The antidegradation directives of Section 13000 of the Water Code and State Water Board Resolution No. 68-16 ("Statement of Policy with Respect to Maintaining High Quality Waters in California") require that high quality waters of the State shall be maintained "consistent with the maximum benefit to the people of the State." The Regional Water Board applies these directives when issuing a permit that would result in a change in water quality in the receiving water, or in an equivalent process, regarding any discharge of waste which may affect the quality of surface or ground waters in the region. Implementation of this policy to prevent or minimize water degradation is a high priority for the Central Valley Water Board.

- Policy for Application of Water Quality Objectives (IV – 16.00)

  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.
  >
  > The numerical and narrative water quality objectives define the least stringent standards that the Regional Water Boards will apply to regional waters in order to protect beneficial uses… However, the water quality objectives do not require improvement over naturally occurring background concentrations….
  >
  > To evaluate compliance with the narrative water quality objectives, the Regional Water Board considers, on a case-by-case basis, direct evidence of beneficial use impacts, all material and relevant information submitted by the discharger and other interested parties, and relevant numerical criteria and guidelines developed and/or published by other agencies and organizations (e.g., State Water Board, California Department of Health Services, California Office of Environmental Health Hazard Assessment, California Department of Toxic Substances Control, University of California Cooperative Extension, California Department of Fish and Game, USEPA, U.S. Food and Drug Administration, National Academy of Sciences, U.S. Fish and Wildlife Service, Food and Agricultural Organization of the United Nations). In considering such criteria, the Board evaluates whether the specific numeric criteria, which are available through these sources and through other information supplied to the Board, are relevant and appropriate to the situation at hand…"

- Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California; a.k.a. State Implementation Plan or SIP (IV-26.02)

  In March 2000, the State Water Board adopted the SIP in Resolution No. 2000-015. This Policy establishes:

(1) Implementation provisions for priority pollutant criteria promulgated by the USEPA through the National Toxics Rule (40 CFR 131.36) (promulgated on 22 December 1992 and amended on 4 May 1995) and through the California Toxics Rule (40 CFR 131.38) (promulgated on 18 May 2000 and amended on 13 February 2001), and for priority pollutant objectives established by Regional Water Boards in their basin plans; and

(2) Monitoring requirements for 2,3,7,8-TCDD equivalents; and

(3) Chronic toxicity control provisions.

The National Toxics Rule and California Toxics Rule include criteria to protect human health; however, they do not include criteria for the drinking water constituents of concern addressed by the Drinking Water Policy. The SIP is the implementation program for NPDES program and establishes a standardized approach for permitting discharges of toxic pollutants.

2.3 CENTRAL VALLEY DRINKING WATER POLICY WORKGROUP FINDINGS

In February 2012, the Workgroup produced a report titled *Central Valley Drinking Water Policy Workgroup Synthesis Report* which synthesized the technical studies conducted by the Workgroup since 2003 to inform the Drinking Water Policy. The following is a staff summary of work completed by the Workgroup and findings from the Synthesis Report. The entire report can be found in Appendix D.

The Workgroup was created in 2002. Key participants in the formation of the Workgroup were the Central Valley Water Board, CUWA, SRCSD, California Bay-Delta Authority, and the Department of Health Services (now the Department of Public Health). A number of other stakeholders have been heavily involved in the Workgroup process, including:

- USEPA
- California Department of Water Resources
- City of Sacramento Storm Water Quality Improvement Program
- County of Sacramento Storm Water Quality Program
- City of Vacaville
- Central Valley Clean Water Association
- California Rice Commission
- Northern California Water Association

An early step by the Workgroup was to develop a technical work plan for developing the Drinking Water Policy, which included a description of technical tasks to be completed, a budget and a schedule. The technical work plan was finalized in January 2003 and has been used by the Workgroup throughout the process to guide its activities.

In 2004, CUWA, acting on behalf of the Workgroup, received a Proposition 50 grant that was used to fund technical studies that were scoped by the Workgroup to fulfill the intent of the 2003 work plan. A total of $970,000 was received under the grant. Using this funding, the Workgroup hired several contractors to complete specific tasks under the work plan, as follows:

- Brown and Caldwell Database Development

• Starr Consulting	Water Quality Goals and Objectives Review
• Malcolm Pirnie	Drinking Water Treatment and Cost Evaluation
• West Yost Associates	Wastewater Effluent Source Control Evaluation
• Geosyntec	Urban Runoff Source Control Evaluation
• NewFields	Agricultural Source Control evaluation and land use assessment
• Systech	Watershed modeling for San Joaquin and Sacramento River basins
• Resource Management Associates	Water quality modeling of Delta using DSM2

The Drinking Water Policy Workgroup identified a list of prioritized water quality constituents of concern:

- Disinfection by-product precursors (DBP): organic carbon, bromide
- Dissolved minerals: total dissolved solids, salinity, conductivity
- Nutrients: nitrogen species (total, total Kjeldahl, organic, nitrate, nitrite, ammonia) and phosphorus species (total, orthophosphate)
- Pathogens: (*Giardia, Cryptosporidium)* and indicator organisms: (total coliform, fecal coliform, *Enterococcus*, *Escherichia coli)*

Conceptual models for each of the prioritized constituents of concern were developed to gain an improved understanding of sources, transformations, transport processes, and associated impacts. These models were used to identify data gaps as well as to direct future investigations and management practices. After reviewing the conceptual models developed for the constituents of concern, a more detailed analytical model was deemed necessary by the Workgroup to draw conclusions on sources and downstream effects.

The Workgroup identified three major loading sources of the prioritized water quality constituents of concern: publically owned treatment works (POTW), urban runoff, and irrigated agriculture. For each of the source categories, source evaluations were conducted for the drinking water constituents of concern. Further information about the source evaluations can be found in the Central Valley Drinking Water Policy Workgroup Synthesis Report (Appendix D).

Future scenarios were developed based upon projections for the regulatory climate and loading regimes of each of the three source categories. The future scenarios projected (1) the current regulatory climate (March, 2011) forward to 2030 with modified land use and population (2030 Present), (2) imposed a realistic projection of regulatory constraints (2030 Plausible), and (3) projected 'limit of technology' regulatory requirements (2030 Outer Boundary). The scenarios were modeled numerically to evaluate the impact of changes in source loading on water quality at public water system intakes. However, the inability to properly calibrate the models due to budget and time constraints made quantification of the results unreliable. Although the modeling results should not be used to quantitatively predict organic carbon concentrations at public water system intakes, the source control scenarios that were evaluated indicate that organic carbon concentrations at public water system intakes

in the Sacramento River and the Delta will not likely increase in the future. Further information about the model development and application can be found in the Central Valley Drinking Water Workgroup Synthesis Report (Appendix D).

The impacts of projected changes in water quality on drinking water treatment processes were evaluated. The EPA Water Treatment Plant Model (EPAWTPM) Version 2.0 was used to evaluate the performance of virtual water treatment plants under the current and three projected future source control scenarios. Based upon the source evaluations completed for POTWs, urban runoff, and irrigated agriculture, it is expected that concentrations of organic carbon, a primary driver for drinking water treatment plant upgrades, will not increase in the future. The model was run with existing water quality conditions and with both existing drinking water regulations and plausible future drinking water regulations to determine if water treatment plant upgrades would be necessary. Because water quality is expected to slightly improve with the three future scenarios that were modeled, no treatment targets were exceeded with the existing drinking water regulatory environment. Under the projected future regulatory scenario that evaluated more stringent future drinking water regulations, the model predicted that water treatment upgrades would be needed for water treatment plants treating water from the upper watershed (Sacramento River), the Delta, and at some locations along the California Aqueduct. Further information about the water treatment evaluation can be found in the Central Valley Drinking Water Workgroup Synthesis Report (Appendix D).

The Workgroup has determined that sufficient information has been developed to proceed with the development of the Drinking Water Policy. There are other ongoing efforts to address some of the constituents of concern identified by the Workgroup. The Workgroup has deferred addressing salinity and nutrients to the Central Valley Salinity Alternatives for Long Term Sustainability (CV-SALTS) and Nutrient Policy projects. Information developed by the Workgroup was used by the Central Valley Water Board to help formulate the Drinking Water Policy.

2.4 Clarification for Interpreting Narrative Objectives Associated with Drinking Water Protection

There are existing Basin Plan narrative objectives for surface waters associated with drinking water protection, and the Policy also includes a proposed narrative objective. The Drinking Water Policy will provide some clarification regarding how those objectives are to be interpreted. The Policy will clarify that the existing narrative objective for chemical constituents includes drinking water chemical constituents of concern, such as organic carbon. The Policy will define the geographic scope, compliance points, and process for interpreting the proposed narrative *Cryptosporidium* and *Giardia* objective as well as provide an implementation program based on numeric trigger levels and a process for addressing trigger exceedance.

The Policy will also point out that the Basin Plan includes seven important points that apply to water quality objectives and that one important point is that achievement of objectives depends on applying them to controllable water quality factors. 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. Finally, the Policy will recognize the Central Valley Water Board's direction to staff in Resolution R5-2010-0079 to continue considering drinking water constituents of concern when National Pollutant Discharge

Elimination System (NPDES) facilities conduct their antidegradation analysis when such analyses are applicable.

2.5 Multi-Barrier Approach to Drinking Water Protection

USEPA and DPH regulate public drinking water systems to ensure safe drinking water. Both agencies require public water systems to utilize the multi-barrier approach to drinking water protection. The multi-barrier approach to protecting public health includes source water protection, water treatment (with multiple barriers in the treatment train), protection of water quality in the drinking water distribution system, public outreach, and monitoring. While source water protection is the first barrier, it is not intended to provide pristine water that does not require treatment but rather, to prevent source water degradation from requiring additional treatment and placing more reliance on the treatment process. High quality source waters minimize public health risk if there is a breakdown in the treatment process. The Drinking Water Policy will also acknowledge and support a multi-barrier approach for protecting public health.

2.6 US EPA Regulation of Drinking Water Quality

2.6.1 Long Term 2 Enhanced Surface Water Rule

In March of 2006 the United States Environmental Protection Agency promulgated the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) to protect public health from illness due to *Cryptosporidium* and other microbial pathogens in drinking water (71 FR 654). Entities potentially regulated by the LT2ESWTR are public water systems (Section 141.3 of Title 40 of the Code of Federal Regulations) that use surface water or ground water under the direct influence of surface water. Large public water systems (serving at least 10,000 people) are required to monitor for Cryptosporidium for a period of two years. To reduce monitoring costs, small filtered public water systems (serving fewer than 10,000 people) initially monitor just for *Escherichia coli* (*E. coli)* for one year as a screening analysis and are required to monitor for *Cryptosporidium* only if their *E. coli* levels exceed specified threshold values. Small filtered public water systems that exceed the *E. coli* trigger, as well as all small unfiltered public water systems, must monitor for *Cryptosporidium* for one or two years, depending on the sampling frequency. Filtered public water systems will be classified in one of four treatment categories (bins) based on the results of the source water *Cryptosporidium*. This bin classification determines the degree of additional *Cryptosporidium* treatment, if any, the filtered public water system must provide. Monitoring starting dates were staggered by system size. The largest systems (serving at least 100,000 people) began monitoring in October 2006 and the smallest systems (serving fewer than 10,000 people) did not begin monitoring until October 2008. After completing monitoring and determining their treatment bin, systems generally had three years to comply with any additional treatment requirements. Systems must conduct a second round of monitoring six years after completing the initial round to determine if source water conditions have changed significantly.

2.7 Planning Efforts That Could Impact Drinking Water Constituents of Concern

There are planning efforts that address drinking water constituents of concern. In Resolution R5-2010-0079, the Central Valley Water Board recognized there are ongoing efforts to

address salinity and nutrients in surface waters, including the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) program and the State Water Board effort to develop a Nutrient Policy for inland surface waters. In the Resolution, the Central Valley Water Board recognized that the CV-SALTS and Nutrient Policy efforts to be the appropriate venues to work on salinity and nutrients. Other planning efforts that could affect drinking water constituents of concern include the Recycled Water Policy which established a Constituents of Emerging Concern (CEC) Advisory Panel, the Bay Delta Conservation Plan, the State Water Board's Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, and the Delta Science Council Delta Plan.

2.7.1 Central Valley Salinity Alternatives for Long-Term Sustainability

In 2006, the Central Valley Water Board, the State Water Board, and stakeholders began a joint effort to address salinity and nitrate problems in California's Central Valley and adopt long-term solutions that will sustain the Valley's lifestyle; support regional economic growth, maintain a world class agriculture, maintain reliable, high quality water supply, and protect the environment. Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) is a collaborative basin planning effort aimed at developing and implementing a comprehensive salinity and nitrate management program. More information on CV-SALTS can be found on the following website:

http://www.cvsalinity.org/

2.7.2 Nutrient Policy

In 2011, the State Water Board initiated a process to develop a nutrient policy for inland surface waters, excluding inland bays and estuaries in California. The nutrient policy could include objectives and control strategies to help improve water quality in aquatic habitats by providing the benchmarks that describe conditions necessary to protect beneficial uses. Creating a nutrient policy for the inland waters of the state will assist in supporting the Water Boards mission to preserve, enhance, and restore the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations.

The State Water Board intends to develop narrative nutrient objectives, with numeric guidance to translate the narrative objectives. This numeric guidance, could include the Nutrient Numeric Endpoint framework which establishes numeric endpoints based on the response of a water body to nutrient over-enrichment (e.g., algal biomass, dissolved oxygen, etc.).

The technical foundation of the nutrients for freshwater lakes and streams has been developed and the State Water Board initiated public scoping and peer review in 2011. This effort and ongoing efforts in San Francisco Bay and other estuaries in the State should provide information that will assist the Water Boards in determining what nutrient levels are appropriate for Delta waters. Currently there is no schedule for developing nutrient numeric endpoints for the Delta. More information on the nutrient policy and development of nutrient numeric endpoints can be found on the following website:

http://www.waterboards.ca.gov/plans_policies/nutrients.shtml

2.7.3 Constituents of Emerging Concern

The State Water Board's 2009 Recycled Water Policy required the establishment of a Constituents of Emerging Concern (CEC) Advisory Panel. The Panel was charged with providing guidance for developing monitoring programs that assess potential CECs, including personal care products, pharmaceuticals, hormones, food additives, transformation products, and nanomaterials. Because the detection of many of these chemicals is so recent, robust methods for their quantification and toxicological data for interpreting potential human or ecosystem health effects are not always available. The Panel released a report in April 2012 with recommendations for development of the following: develop bio-analytical tools for efficient; integrated monitoring assessment of CECs; filling data gaps on sources, fates, occurrence and effects of CECs; and assessing the relative risk of CEC and other monitored chemicals. .Additional information on CECs could be utilized by Water Board staff when there is an update to the Drinking Water Policy. More information on the CEC Advisory Panel can be found on the following website:

http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/cec_ecosystems_rpt.pdf

2.7.4 Bay Delta Conservation Plan

The Bay Delta Conservation Plan (BDCP) aims to enhance and restore the ecosystem processes and function, including seasonal flood plain habitat, sub-tidal and intertidal habitat, hydrologic conditions, and salinity within the Delta estuary, as well as to reduce direct losses of fish and other aquatic organisms. An objective of the BDCP is to obtain long-term (50-year) permits to operate water and energy projects, both existing and new. BDCP Covered Activities are those that support water supply and power generation, such as water conveyance and facilities maintenance and improvements, as well as any restoration efforts that impact threatened and endangered species. The BDCP could lead to structural and/or regulatory changes in the Delta and its tributaries and could affect loads and concentrations of drinking water constituents of concern. More information on BDCP can be found on the following website:

http://baydeltaconservationplan.com/Home.aspx

2.7.5 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

The State Water Board is the lead agency and will prepare environmental documentation for the potential update and changes to implementation of the 2006 Bay-Delta Plan. State Board plans to: 1) review and update of water quality objectives, including flow and salinity objectives, and the program of implementation in the Bay-Delta Plan; and 2) consider changes to water rights and water quality regulation consistent with the program of implementation. The environmental documentation will identify and evaluate the significant environmental impacts associated with potential changes to the Bay-Delta Plan and potential changes to water rights and other measures implementing the plan that may be needed to ensure the reasonable protection of beneficial uses in the Bay-Delta watershed. Through the environmental review process, the Board will identify possible ways to minimize the significant effects and describe a range of reasonable alternatives to the potential changes to the Bay-Delta Plan and its

implementation through water rights and other measures. More information on the Bay-Delta Plan can be found on the following website:

http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/

2.7.6 Delta Stewardship Council Delta Plan

The Delta Stewardship Council was created by legislation to achieve the state mandated coequal goals for the Delta. "'Coequal goals' means the two goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place." The Delta Plan contains a set of regulatory policies that will be enforced by the Delta Stewardship Council's appellate authority and oversight. The Delta Plan also contains priority recommendations, which are non-regulatory but call out actions essential to achieving the coequal goals. One of the recommendations is "The Central Valley Regional Water Quality Control Board should complete the Central Valley Drinking Water Policy by July 2013." More information on the Delta Plan can be found on the following website:

http://deltacouncil.ca.gov

3 BENEFICIAL USES

3.1 REGULATIONS THAT APPLY TO BENEFICIAL USE DESIGNATION

3.1.1 Federal Regulations and Guidance

Federal regulations require the protection of designated uses. Federal regulations establish special protections for Clean Water Act section 101(a)(2) uses. Clean Water Act section 101(a)(2) states that it is a national goal that wherever attainable, water quality should be sufficient "for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water." These uses are also referred to as "fishable/swimmable" uses.

3.1.2 State Regulations and Guidance

The Water Code includes designation of beneficial uses in both basin plans and statewide plans. (Wat. Code, §13050, subd. (j).) The Water Code defines beneficial uses of water as including, but not limited to: "domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves." (Wat. Code, §13050, subd. (f).)

State Water Board Resolution No. 88-63, commonly known as the Sources of Drinking Water Policy, establishes the state policy that all waters are considered suitable or potentially suitable to support the MUN beneficial use, with certain exceptions.

3.2 APPLICABLE BENEFICIAL USES

Designated uses are those uses specified in water quality standards for each water body or segment whether or not they are being attained. (40 CFR §131.3(f).) In Table II-1 of the Basin Plan, beneficial uses for listed water bodies within the Sacramento and San Joaquin River basins are identified as Existing, Existing Limited, or Potential.

The beneficial uses of the Sacramento and San Joaquin River basins include: municipal and domestic supply (MUN), agricultural supply (AGR), industrial service supply (IND), industrial process supply (PRO), water contact recreation (REC-1), non-contact water recreation (REC-2), warm freshwater habitat (WARM), cold freshwater habitat (COLD), migration of aquatic organisms (MIGR), spawning, reproduction, and/or early development (SPWN), wildlife habitat (WILD), navigation (NAV), commercial and sport fishing (COMM), shellfish harvesting (SHELL),and preservation of biological habitats of special significance (BIOL).

The proposed Basin Plan Amendment will add a Drinking Water Policy to the Basin Plan to protect the MUN beneficial use, a narrative water quality objective for *Cryptosporidium* and *Giardia* to protect the public water system component of the MUN beneficial use, and an implementation plan for the proposed narrative objective. The proposed Basin Plan Amendment will not alter the beneficial use chapter of the Basin Plan.

4 WATER QUALITY OBJECTIVES

4.1 REGULATIONS THAT APPLY TO ESTABLISHING WATER QUALITY OBJECTIVES

4.1.1 Federal Regulations and Guidance

Federal regulations require States to adopt narrative or numeric water quality criteria (synonymous with water quality objectives in California) to protect designated beneficial uses (40 CFR §131.11(a)(1).)

4.1.2 State Regulations and Guidance

Water Code section13050, subdivision (h) 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."

Pursuant to Water Code section 13241, when adopting water quality objectives, the Regional Water Board is required to consider:

(a) Past, present, and probable future beneficial uses of water;
(b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
(c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area;
(d) Economic considerations;
(e) The need for developing housing within the region;
(f) The need to develop and use recycled water; and
(g) The Program of Implementation (Wat. Code, §13242) – addressed in Section 5.

4.2 CLARIFICATION OF CHEMICAL CONSTITUENTS NARRATIVE OBJECTIVE

On page III-3 of the Basin Plan, there is a narrative for chemical constituents, "Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses." A footnote will be added to this objective to clarify that it includes all chemical constituents including drinking water chemical constituents of concern, such as organic carbon.

4.3 ALTERNATIVE NARRATIVE OBJECTIVES FOR *CRYPTOSPORIDIUM* AND *GIARDIA*

In Resolution R5-2010-0079, the Central Valley Water Board directed staff to bring a final drinking water policy to the Board no later than three years after adoption of the Resolution, assuming that resources are available to support policy development. The Resolution stated that one element of the policy could be development of narrative or numeric water quality objectives. The Resolution also stated that additional data, information and analysis would be required to develop numeric water quality objectives for organic carbon, *Cryptosporidium* and *Giardia* to protect the drinking water beneficial use. It would be necessary to have a better understanding of the ecosystem needs for organic carbon in the Delta, more data on background levels of these constituents in the Delta and tributaries to the Delta, information on the fate and transport of these parameters, drinking water treatment options and costs, and source control options and costs. The results of the Proposition 50 grant funded source

evaluation and control studies did not support the development of numeric water quality objectives for organic carbon, *Cryptosporidium* or *Giardia*. Instead of numeric water quality objectives, staff is proposing a narrative water quality objective and implementation program for *Cryptosporidium* and *Giardia* to protect the public water supply component of the MUN beneficial use.

Subsequent to the conclusion of the Proposition 50 grant, members of the workgroup compiled available LT2ESWTR *Cryptosporidium* and *Giardia* monitoring data at public water system intakes and at several other locations. The information was used to assess the current state of knowledge about the pathogens *Cryptosporidium* and *Giardia* in the project area (the Central Valley below the first major dams; the area is bounded by Shasta Dam on the Sacramento River, Millerton Dam on the San Joaquin River, and Folsom Dam on the American River). Available data for *Cryptosporidium* do not indicate a current impairment of the public water system component of the MUN beneficial use as indicated in section 4.5 of the staff report.

Cryptosporidium and *Giardia* are in surface waters from animal and human sources and can cause illness if consumed in drinking water. Sensitive sub-populations, such as immuno-suppressed individuals, can be even more susceptible to illness. As levels of *Cryptosporidium* and *Giardia* in source waters increase, water treatment requirements become more stringent to account for the increased risk of illness and the cost for drinking water treatment increases.

Under the Safe Drinking Water Act, all public water systems using surface water sources are required by the LT2ESWTR to provide 2 log (99 percent) removal/inactivation in *Cryptosporidium* through a combination of filtration and disinfection. All public water systems serving at least 10,000 people were required to sample their source water for *Cryptosporidium* and *E. coli* at least monthly for 24 months and will be required to conduct another round of monitoring starting in 2015. Systems serving fewer than 10,000 people were only required to sample for *E. coli* unless the *E. coli* results were sufficiently high to trigger *Cryptosporidium* monitoring. The public water systems were classified in one of four bins based on their monitoring results. The LT2ESWTR bins specify drinking water treatment requirements based on source water concentrations of *Cryptosporidium*, with more stringent water treatment required for higher levels of *Cryptosporidium*. Most public water systems within the Central Valley Region covered by the Drinking Water Policy have been placed in Bin 1. There are three public water systems within the Central Valley Region covered by the Drinking Water Policy that have been placed in Bin 2 based on *Cryptosporidium* monitoring results. These systems were required to provide an additional one log reduction in *Cryptosporidium* as a result of the Bin 2 classification. They were able to comply with the requirements without additional upgrades to their existing treatment plants. Two facilities complied by meeting more stringent filter effluent turbidity requirements, and one facility had upgraded to meet Bin 2 requirements prior to conducting the LT2ESWTR monitoring. In addition to the LT2ESWTR requirements for *Cryptosporidium*, the Surface Water Treatment Rule (SWTR) requires treatment to ensure at least 3-log removal/inactivation of *Giardia* cysts.

Cryptosporidium is a significant concern because it contaminates surface waters used as drinking water sources, it is resistant to chlorine and other disinfectants, and it has caused waterborne disease outbreaks. Consuming water with *Cryptosporidium,* a contaminant in drinking water sources, can cause gastrointestinal illness, which may be severe in people with weakened immune systems (e.g., infants and the elderly) and sometimes fatal in people with

severely compromised immune systems (e.g., cancer and AIDS patients). The Basin Plan does not currently contain any water quality objectives for *Cryptosporidium* or *Giardia*, and there is inadequate information to develop numeric water quality objectives. The alternatives for *Cryptosporidium* and *Giardia* water quality objectives are described below.

4.3.1 Alternative 1. No Project

4.3.1.1 Alternative 1a. No Project, No New Action

Cryptosporidium and *Giardia* can cause illness if consumed in drinking water. Antidegradation directives provide protection of water quality for *Cryptosporidium* and *Giardia*; however, a water quality objective is needed to provide additional specific protection for the public water system component of the MUN beneficial use from the potential impacts from *Cryptosporidium* and *Giardia*. The No Project Alternative would leave the Basin Plan without a water quality objective for *Cryptosporidium* or *Giardia*.

4.3.1.2 Alternative 1b. No Project, Implement Plan to Support Development of Objective

Under this alternative, a water quality objective for *Cryptosporidium* and *Giardia* would not be adopted at this time, but may be considered in the future for all beneficial uses after additional study and monitoring is complete. This alternative would also leave the Basin Plan without a water quality objective for *Cryptosporidium* or *Giardia*.

4.3.2 Alternative 2. Objective to Protect Multiple Beneficial Uses

Most narrative water quality objectives in the Basin Plan are created to protect multiple beneficial uses, and there are other beneficial uses besides MUN (e.g. REC-1) which could be impacted by the concentrations of *Cryptosporidium* and *Giardia* in water. However, in gathering information for the Drinking Water Policy, the focus was on potential impacts to public water systems and information was not obtained regarding how other beneficial uses might be impacted by the levels of *Cryptosporidium and Giardia* in water. To support a water quality objective that protects multiple beneficial uses, information regarding potential impacts to other beneficial uses would need to be collected and evaluated.

4.3.3 Alternative 3. Objective to Protect Public Water System Component of MUN

This alternative would be to adopt a narrative objective for *Cryptosporidium* and *Giardia* that specifically supports the public water system component of the MUN beneficial use. The objective would include a prescribed geographic scope and compliance points for the evaluation of ambient waters at public water system intakes. Implementation requirements for the objective will include numeric ambient trigger levels at public water system intakes and a process for addressing trigger exceedance.

In gathering information for the Drinking Water Policy, the focus was on potential impacts to public water systems. Much of the available *Cryptosporidium* and *Giardia* monitoring data was gathered in response to USEPA's LT2ESWTR. Staff will use drinking water treatment requirements associated with source water quality conditions to assess how *Cryptosporidium*

and *Giardia* levels are affecting the public water system component of the MUN beneficial use and to interpret the narrative water quality objective for *Cryptosporidium* and *Giardia*.

4.4 Recommended Water Quality Objective Alternative

Cryptosporidium and *Giardia* can cause illness if consumed in drinking water. The Basin Plan does not currently contain any water quality objective to limit the levels of *Cryptosporidium* or *Giardia* in drinking water supplies. Information is not available at this time to develop a water quality objective to protect all beneficial uses that can be impacted by *Cryptosporidium* and *Giardia.* Data has been compiled and implementation triggers are available for a narrative *Cryptosporidium* and *Giardia* water quality objective to protect the public water system component of the MUN beneficial use. Alternative 3 represents the best protection of water quality based upon available information, because information regarding potential impacts to other beneficial uses was not collected and evaluated. The proposed Basin Plan language for the narrative objective can be found in Section 5 of this Staff Report.

4.5 Evaluation of Water Code Section 13241 Factors

Section 13241 of the Water Code identifies six factors that must be addressed when evaluating a basin plan amendment. 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 following sections discuss the factors as they relate to each alternative.

4.5.1 Beneficial Uses

The beneficial uses of the Sacramento and San Joaquin River basins include: municipal and domestic supply (MUN), agricultural supply (AGR), industrial service supply (IND), industrial process supply (PRO), water contact recreation (REC-1), non-contact water recreation (REC-2), warm freshwater habitat (WARM), cold freshwater habitat (COLD), migration of aquatic organisms (MIGR), spawning, reproduction, and/or early development (SPWN), wildlife habitat (WILD), navigation (NAV), commercial and sport fishing (COMM), shellfish harvesting (Shell),and preservation of biological habitats of special significance (BIOL).

Information for this project has been compiled solely for the public water system component of the MUN beneficial use. If new information becomes available to protect the other components of the MUN beneficial use, it would need to be considered though a separate decision process.

4.5.2 Environmental Characteristics of the Hydrographic Unit

Sacramento River

The Sacramento River drains the northern part of the Central Valley and covers 27,210 square miles. For planning purposes, this includes all watersheds tributary to the Sacramento River that are north of the Cosumnes River watershed, the drainage sub-basins of Cache and Putah Creeks and the Yolo and Sutter Bypasses.

The principal streams are the Sacramento River and its larger tributaries: Feather, Yuba, Bear, and American Rivers to the east; and Cottonwood, Stony, Cache, and Putah Creeks to the west. The remaining inputs come from streams entering from smaller watersheds along the river and from agricultural and storm drain systems. The Sacramento River basin supplies more than 80% of the fresh water flows to the Sacramento-San Joaquin Delta. There are over 50 sub-basins or tributaries within the Sacramento River.

Inflow to the Sacramento and Feather Rivers comes from a variety of sources. In addition to the natural hydrologic processes of rain fall runoff, snowmelt, and base flow from groundwater discharge, flows are greatly affected by reservoir releases, water diversions, irrigation return flows, and diversions through bypasses. Both the Sutter and Yolo bypasses have the capacity to carry larger volumes of water than the Sacramento River channel when they are utilized to prevent flooding during high flows.

San Joaquin River

The San Joaquin River flows northward and drains the portion of the Central Valley south of the Sacramento-San Joaquin Delta and north of the Tulare Lake Basin. The San Joaquin River Basin covers 15,880 square miles. The Basin includes the entire area drained by the San Joaquin River and all watersheds tributary to the river. The principal streams in the basin are the San Joaquin River and its larger tributaries: the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne and Merced rivers.

The lower Basin (below Millerton Reservoir) has had a highly managed hydrology since implementation of the Central Valley Project (CVP) in 1951. Most of the San Joaquin River flow is diverted into the Friant-Kern Canal, leaving the river channel upstream of the Mendota Pool dry except during periods of wet weather flow and major snow melt. Poorer quality (higher salinity) water is imported from the Delta for irrigation along the west side of the river to replace water lost through diversion of the upper San Joaquin River flows. During the irrigation season, the flows in the river between the Mendota Pool and Salt Slough consist largely of groundwater accretions. Salt Slough and Mud Slough are the principal drainage arteries for the Grassland Sub-Watershed and add significantly to the flows and waste loads in the San Joaquin River upstream of its confluence with the Merced River. Discharges from three major river systems, the Merced, Tuolumne, and Stanislaus Rivers, which drain the Sierra Nevada, dominate flow and quality of discharges from the east side of the Lower San Joaquin River Basin. Flows from the west side of the river basin are dominated by agricultural return flows since westside streams receive no snowmelt to maintain their flows and most go dry during the summer months.

The major land use in the valley floor along the Lower San Joaquin River is agriculture, with over 2.1 million irrigated acres, representing 22% of the irrigated acreage in California. Urban growth on the valley floor is converting historical agricultural lands to urban areas and is leading to increased potential for storm water and urban impacts to local waterways.

Sacramento-San Joaquin Delta

The Delta is composed of about 738,000 acres of which about 48,000 acres are water surface area. The Delta is located where California's two major river systems, the Sacramento and San Joaquin rivers, converge to flow westward, meeting incoming seawater from the Pacific Ocean through San Francisco Bay. The Delta is bordered by the cities of Sacramento to the north, Stockton and Tracy to the south, and Pittsburg to the west. This former wetland area has been reclaimed into more than 60 islands and tracts that are now devoted primarily to farming. The Delta is interlaced with about 700 miles of waterways. A network of levees protects the islands and tracts from flooding, most of which lie near or below sea level.

The Sacramento and San Joaquin river systems drain about 40 percent of California's surface area and support a variety of beneficial uses. The Bay-Delta Estuary is one of the largest, most important estuarine systems for fish and waterfowl production on the Pacific Coast of the United States. About 90 species of fish are found in the Delta. The Delta's channels serve as a migratory route and nursery area for Chinook salmon, striped bass, white and green sturgeon, American shad, and steelhead trout. These anadromous fishes spend most of their adult lives either in the lower bays of the estuary or in the ocean. Other resident fishes in the estuary include delta smelt, longfin smelt, Sacramento splittail, catfish, largemouth bass, black bass, crappie, and bluegill.

Water from the Delta supports about $400 billion dollars of the State's $1.5 trillion dollar economy. The watershed of the Bay-Delta Estuary provides a portion of the drinking water to 25 million people in the Bay Area, Central Valley, Central Coast, and Southern California and water to over 3.7 million acres of irrigated farmland, including some of the State's most productive agricultural areas, both inside and outside of the Estuary north and south of the Delta.

The Delta and its tributaries provide drinking water for millions of Californians, and there has been monitoring at existing and potential public water system intakes to evaluate the potential impacts of *Cryptosporidium and Giardia* on public water systems. Data collected from the existing and potential public water system intakes and at several other ambient locations are included in Appendix C.

Treatment Requirements Based on Source Water Quality

USEPA and CDPH started basing water treatment requirements on the quality of source water in the early 1990s. The degree of removal and inactivation of pathogens is based on the microbial quality of the source water.

Giardia

Under the Surface Water Treatment Rule (SWTR), the general requirements for public water systems are to provide treatment to ensure at least 3-log (99.9 percent) reduction of *Giardia* cysts. The California SWTR Staff Guidance Manual provides a description of source waters that require additional treatment above the minimum 3-log *Giardia* reduction (California Department of Health Services, 1991). The Guidance Manual states:

"...in a few situations, source waters are subjected to significant sewage and recreational hazards, where it may be necessary to require higher levels of virus and cyst removals..."

Due to the expense associated with pathogen monitoring, California Department of Public Health (CDPH) staff historically relied on monthly median total coliform levels as a guide for increased treatment. When monthly medians exceeded 1,000 most probable number per 100 milliliters (MPN/100 ml), CDPH staff considered requiring additional log reduction. Coliform bacteria have been used for decades to assess the microbiological quality of drinking water. These bacteria are present in the intestines of humans and other warm-blooded animals and are found in large numbers in fecal wastes. Most species occur naturally in the aquatic environment so their presence does not always indicate fecal contamination. More recently, CDPH staff has started to rely upon fecal coliform and *E. coli* as more specific indicators of mammalian fecal contamination. When the monthly median *E. coli* or fecal coliform density exceeds 200 MPN/100 ml, CDPH staff considers requiring additional log reduction. Evaluation of pathogen reduction levels based on coliform bacterial density is not as scientifically valid as basing them on actual pathogen concentrations. The relationship between coliforms and pathogenic cysts is tenuous, but in the absence of other information, CDPH uses coliform density to determine required pathogen reduction levels for individual water treatment plants (WTPs).

Cryptosporidium

The Interim Enhanced Surface Water Treatment Rule was promulgated by USEPA on 16 December 1998. Public water systems that use surface water or groundwater under the direct influence of surface water and serve at least 10,000 people were required to comply with the provisions of this rule by January 2002. CDPH incorporated this regulation into Title 22 in December 2007, and it was effective in January 2008. The state rule contains additional monitoring and reporting requirements. This rule established a drinking water Maximum Contaminant Level Goal[2] for *Cryptosporidium* of zero and established a treatment technique requirement of 2-log (99 percent) removal of *Cryptosporidium*.

USEPA promulgated the LT2ESWTR on January 5, 2006 to provide additional *Cryptosporidium* protection for drinking water consumers supplied from surface water sources. CDPH plans to incorporate the provisions of the LT2ESWTR into Title 22 in 2013. This regulation requires public water systems using surface water sources to conduct source water monitoring to determine if additional action is needed to reduce *Cryptosporidium*. Filtered drinking water systems are not required to conduct source water monitoring if the system provides a total of at least 5.5-log of treatment for *Cryptosporidium*. Public water systems serving at least 10,000 people (large systems) are required to sample their source water for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 24 months. Systems serving less than 10,000 people (small systems) have the option of conducting the *Cryptosporidium* monitoring or first monitoring for *E. coli* twice per month for 12 months and then monitoring for *Cryptosporidium* if *E. coli* levels are high enough to trigger the additional monitoring.

A second round of source water monitoring is required by all systems that must begin six years after initial bin classification. Final compliance dates vary based on system size and range from April 2015 (for large systems) through October 2017 (for small systems).

[2] The Maximum Contaminant Level Goal is a non-enforceable concentration of a drinking water contaminant, set at the level at which no known or anticipated adverse effects on human health occur and which allows an adequate safety margin.

The LT2ESWTR requires that all analyses be conducted using USEPA Method 1623. Method 1623 provides information on both presumed and confirmed detections of protozoans. A presumed detection is determined by using immunofluorescence assay with fluorescein isothiocyanate (FITC) to identify appropriately sized particles that could be cysts or oocysts. A confirmed detection is determined by staining with a dye (DAPI) and examination with a differential interference contrast (DIC) microscope to identify internal structures. Particles that exhibit characteristics that clearly indicate they are not oocysts (such as too many nuclei) can be excluded from the total number of oocysts reported under the LT2ESWTR. For the LT2ESWTR compliance, public water systems were required to report the number of oocysts based on FITC staining but using DAPI and DIC to exclude any particles that were obviously not *Cryptosporidium*.

Filtered drinking water treatment systems are classified in one of four bins based on their monitoring results, as shown in Table 1. According to the LT2ESWTR, "When determining LT2ESWTR bin classification, systems must calculate individual sample concentrations using the total number of oocysts counted, unadjusted for method recovery, divided by the volume assayed. Bin classification is determined by the maximum running annual average (RAA) of two years of monthly samples. The ranges of *Cryptosporidium* concentrations that define LT2ESWTR bins reflect consideration of analytical method recovery and the percent of *Cyrptosporidium* oocysts that are infectious. Consequently, sample analysis results will not be adjusted for these factors." (Federal Register, 2003).

Table 1. LT2ESWTR Drinking Water Bin Classification

Bin Classification	Maximum Running Annual Average (oocysts/L)	Action Required (log reduction)
1	< 0.075	none
2	0.075 to < 1.0	1
3	1.0 to < 3.0	2
4	≥ 3.0	2.5

Table 2 provides a summary of the drinking water treatment requirements by bin classification and filtration treatment type. Conventional filtration systems classified in Bins 2, 3 and 4 must provide 1.0 to 2.5-log additional action for *Cryptosporidium*. Systems will select from a wide range of treatment and management strategies in the microbial toolbox to meet their additional action requirements. The microbial toolbox contains various methods of achieving the additional treatment requirements including watershed management, pretreatment, additional treatment, and optimizing existing treatment processes. Systems classified in Bin 3 and Bin 4 must achieve at least 1 log of additional treatment using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV light.

Table 2. Drinking Water Treatment Requirements by Bin Classification

Bin Classification	Filtration Treatment			
	Conventional filtration (including softening)	Direct Filtration	Slow Sand or Diatomaceous Earth Filtration	Alternative Filtration Technology
Bin 1	No additional treatment	No additional treatment	No additional treatment	No additional treatment
Bin 2	1-log	1.5-log	1-log	As determined by state
Bin 3	2-log[1]	2.5-log[1]	2-log[1]	As determined by state[1]
Bin 4	2.5-log[1]	3-log[1]	2.5-log[1]	As determined by state[1]

[1]Systems must achieve at least 1-log through ozone, chlorine dioxide, UV, membranes, bag/cartridge filters, or bank filtration.

Giardia and *Cryptosporidium* Monitoring

Source waters may be contaminated with a number of pathogenic bacteria, viruses, and protozoa, along with non-pathogenic naturally occurring microorganisms. Routine monitoring for all possible pathogens is impractical so the focus of most source water monitoring is on indicator bacteria and the regulated pathogenic protozoa, *Giardia* and *Cryptosporidium*. This section presents a synopsis of the *Giardia* and *Cryptosporidium* monitoring that has been conducted by public water systems and others in the upstream watershed, the Delta, and the State Water Project. The available data are limited spatially and temporally but provide the best available information on the current condition of the watershed.

The data discussed in this section are divided into WTP intake monitoring and other ambient monitoring. The rationale for doing this is that the monitoring conducted by water treatment agencies for compliance with the LT2ESWTR was done on a regular monthly basis for 24 months. The data collected at the other locations in the watershed were not always collected monthly; there are periods of monthly monitoring, quarterly monitoring, and occasionally monitoring was conducted more than once per month. Tables 3 and 4 present the results for the monitoring conducted at WTP intakes and Table 5 presents the other ambient monitoring data.

Table 3. *Cryptosporidium* Monitoring Results at Water Treatment Plant Intakes

Location	*Cryptosporidium*							
	No. of Samples	% Detect	Avg.	Max	LT2ESWTR Monitoring Period	LT2ESWTR Maximum RAA	% of Bin 2 Level	LT2ESWTR Bin Classification
Sacramento River Basin								
Feather River								
Yuba City WTP Intake	24	0	0.000	0.0	4/07 - 3/09	0.000	0	1
American River								
Folsom Lake Intake	26	0	0.000	0.0	1/04 - 12/05	0.000	0	1
Folsom South Canal Intake	53	0	0.000	0.0		0.000	0	1
Fairbairn WTP Intake	30	10	0.009	0.1	12/01 - 11/03	0.023	31	1
Putah Creek								
Waterman WTP Intake on Putah South Canal	24	8	0.008	0.1	10/06 - 9/08	0.017	23	1
Barker Slough								
Barker Slough Pumping Plant	56	4	0.005	0.2	10/06 - 9/08	0.000	0	1
Sacramento River								
Bella Vista WTP Intake	25	0	0.000	0	2/08 - 2/10	0.000	0	1
Woodland Davis WTP Intake	25	12	0.018	0.3	8/09 - 8/11	0.030	40	1
Bryte Bend WTP Intake	51	20	0.039	0.8	1/08 - 12/09	0.019	25	1
Sacramento WTP Intake	39	8	0.023	0.5	3/03 - 2/05	0.058	77	1
Freeport Intake	24	17	0.019	0.2	4/05 - 3/07	0.031	41	1
San Joaquin River Basin								
Sonora WTP Intake on South Fork Stanislaus R.	25	16	0.030	0.3	4/08 - 3/10	0.047	63	1
Stockton East Water District Stanislaus R. Diversion	20	15	0.020	0.2	10/06 - 9/08	0.033	44	1
Stockton East Water District Calaveras R. Diversion	24	8	0.017	0.2	10/06 - 9/08	0.033	44	1
Stockton East Water District Intake	24	8	0.038	7.0	10/06 – 9/08	0.075	100	2
Delta								
Old River at CCWD Intake	24	8	0.008	0.1	11/10 - 10/12	.008	11	1
Victoria Canal at	24	4	0.004	0.1	11/10 -10/12	.008	11	1

Location	*Cryptosporidium*							
	No. of Samples	**% Detect**	**Avg.**	**Max**	**LT2ESWTR Monitoring Period**	**LT2ESWTR Maximum RAA**	**% of Bin 2 Level**	**LT2ESWTR Bin Classification**
CCWD Intake								
Randall Bold WTP Intake	33	0	0	0	1/04 - 12/05	0.000	0	1
Bollman WTP Intake	32	3	0.063	2.0	1/04 - 12/05	0.000	0	1
South Bay Aqueduct								
Patterson Pass WTP Intake	24	0	0	0	12/03 -11/05	0.000	0	1
Penitencia WTP Intake	79	0	0	0	1/03 - 12/04	0.000	0	1
Delta-Mendota Canal								
Delta-Mendota Canal Intake	24	13	0.049	1.0	1/07 - 12/08	0.091	121	2

Table 4. *Giardia* Monitoring Results at Water Treatment Plant Intakes

Location	*Giardia*			
	No. of Samples	**% Detected**	**Average**	**Max**
Sacramento River Basin				
Feather River				
Yuba City WTP Intake	NA	NA	NA	NA
American River				
Folsom Lake Intake	26	23	0.045	0.5
Folsom South Canal Intake	52	0	0.000	0.0
Fairbairn WTP Intake	30	80	0.259	0.9
Putah Creek				
Waterman WTP Intake on Putah South Canal	3	0	0.000	0.0
Barker Slough				
Barker Slough Pumping Plant	56	16	0.114	3
Sacramento River				
Bella Vista WTP Intake	NA	NA	NA	NA
Woodland Davis WTP Intake	5	80	2.6	7
Bryte Bend WTP Intake	51	55	0.785	12
Sacramento WTP Intake	39	69	0.265	2
Freeport Intake	24	46	0.116	0.7
San Joaquin River Basin				
South Fork Stanislaus R. WTP Intake	NA	NA	NA	NA
Stockton East Water District Stanislaus R. Diversion	NA	NA	NA	NA
Stockton East Water District Calaveras R. Diversion	NA	NA	NA	NA
Stockton East Water District Intake	NA	NA	NA	NA
Delta				
Old River at CCWD Intake	24	25	0.038	0.2
Victoria Canal at CCWD Intake	24	25	0.033	0.2
Randall Bold WTP Intake	NA	NA	NA	NA
Bollman WTP Intake	NA	NA	NA	NA
South Bay Aqueduct				
Patterson Pass WTP Intake	NA	NA	NA	NA
Penitencia WTP Intake	55	2	0.002	0.1
Delta-Mendota Canal				
Delta-Mendota Canal Intake	NA	NA	NA	NA

Table 5. *Cryptosporidium* and *Giardia* Monitoring Results at Other Ambient Sites

Location	*Cryptosporidium*				*Giardia*				Type of Test
	No. of Samples	% Detected	Average	Max	No. of Sample	% Detected	Average	Max	
Sacramento River Basin									
American River									
Discovery Park	39	5	0.023	0.8	39	59	0.477	11	Presumptive
Discovery Park	39	3	0.003	0.1	39	21	0.021	0.1	Confirmed - DAPI/DIC Positive
Sacramento River									
Veteran's Bridge	52	13	0.027	0.3	53	42	0.174	1.2	Presumptive
Veteran's Bridge	52	4	0.006	0.2	53	25	0.042	0.3	Confirmed - DAPI/DIC Positive
Freeport Marina (R1)	80	8	0.021	0.4	80	60	0.289	1.8	Presumptive
Freeport Marina (R1)	80	4	0.005	0.2	78	29	0.064	0.7	Confirmed - DAPI/DIC Positive
Cliff's Marina	80	38	.86	1.2	80	80	0.548	8.5	Presumptive
Cliff's Marina	80	14	0.019	0.2	80	54	0.161	1.1	Confirmed - DAPI/DIC Positive
River Mile 44	29	28	0.090	1.0	29	66	0.445	3	Presumptive
River Mile 44	29	14	0.021	0.2	29	41	0.076	0.4	Confirmed - DAPI/DIC Positive

Note: See explanation on page 25 of presumed and confirmed results.

Sacramento River Basin

Yuba River

Nevada Irrigation District's Lake Wildwood WTP receives water from Deer Creek. Although the LT2ESWTR monitoring data were not available, this system was classified in Bin 2 per CDPH.

Feather River

The Yuba City WTP intake is the only location on the Feather River for which *Cryptosporidium* data are available. There are no *Giardia* data for the Feather River. *Cryptosporidium* was not detected during the LT2ESWTR monitoring so the maximum running annual average (RAA) is 0.000 oocysts/L for the Yuba City WTP intake and this intake is in Bin 1.

American River

Tables 3 shows that LT2ESWTR pathogen data are available at three WTP intakes on the American River and Table 5 shows there are additional data at Discovery Park. The Folsom Lake intake of San Juan Water District and the Folsom South Canal intake of Golden State Water Company are located upstream of most of the Sacramento urban area. The City of Sacramento's Fairbairn WTP intake is about 20 miles downstream of Folsom Lake in the midst of the urban area. The Discovery Park site is at the mouth of the American River. All three WTP intakes have been placed in Bin 1.

The LT2ESWTR maximum RAA of *Cryptosporidium* is 0.000 oocysts/L at the Folsom Lake intake and the Folsom South Canal intake. *Giardia* was not detected in 52 samples collected at the Folsom South Canal intake but it was detected in 23 percent of the samples collected at the Folsom Lake intake. The average *Giardia* level at the Folsom Lake intake was

0.045 cysts/L. The LT2ESWTR maximum RAA of *Cryptosporidium* was 0.023 oocysts/L at the Fairbairn WTP intake. Giardia was detected in 80 percent of the 30 samples collected at the Fairbairn WTP intake and the average *Giardia* level is 0.259 cysts/L.

The Discovery Park data were not collected to satisfy the LT2ESWTR monitoring requirements so the maximum RAA for *Cryptosporidium* was not calculated. *Cryptosporidium* was detected in 5 percent of the samples at an average level of 0.023 oocysts/L and *Giardia* was detected in 59 percent of the samples at an average level of 0.477 cysts/L.

Putah Creek

The City of Fairfield's Waterman WTP intake on the Putah South Canal represents the pathogen quality of Putah Creek several miles downstream from Lake Berryessa. The maximum RAA for *Cryptosporidium* is 0.017 oocysts/L, resulting in a Bin 1 designation. *Giardia* was not detected in the three samples that were analyzed.

Barker Slough

Water is pumped out of Barker Slough into the North Bay Aqueduct, which provides water to communities in Solano and Yolo counties. The *Cryptosporidium* maximum RAA was 0.000 oocysts/L during the LT2ESWTR monitoring period, resulting in a Bin 1 designation. *Giardia* was detected in 16 percent of the 56 samples collected at an average level of 0.114 cysts/L.

Sacramento River

Table 3 shows that LT2ESWTR pathogen data are available at four existing and one planned (Woodland Davis) WTP intakes on the Sacramento River and Table 5 shows there are additional data at four other locations in the Sacramento area. The WTP intakes are located in the upper reach downstream of Shasta Dam (Bella Vista), upstream of the American River confluence (Woodland Davis and Bryte Bend), and downstream of the American River confluence (Sacramento and Freeport). All five WTP intakes have been placed in Bin 1.

The LT2ESWTR maximum RAA of *Cryptosporidium* is 0.000 oocysts/L at the Bella Vista WTP intake. *Giardia* data were not available at this location. The LT2ESWTR maximum RAA of *Cryptosporidium* was 0.030 oocysts/L at the Woodland Davis WTP intake location and 0.019 oocysts/L at the Bryte Bend WTP intake. *Giardia* was detected in four of five samples collected at the Woodland Davis WTP intake at an average level of 2.6 cysts/L. This is higher than any of the other WTP intakes on the Sacramento River. At the Bryte Bend WTP intake, *Giardia* was detected in 55 percent of the samples at an average level of 0.785 cysts/L. The LT2ESWTR maximum RAA of *Cryptosporidium* is 0.058 oocysts/L at the Sacramento WTP intake and 0.031 oocysts/L at the Freeport intake. *Giardia* was detected in 69 percent of the samples at the Sacramento WTP intake at an average level of 0.265 cysts/L. *Giardia* was detected in 46 percent of the samples at the Freeport intake at an average level of 0.116 cysts/L.

Table 5 presents data collected upstream of the Sacramento urban area (Veteran's Bridge), upstream of the Sacramento Regional Wastewater Treatment Plant (SRWTP) discharge (Freeport Marina) and downstream of the SRWTP discharge (Cliff's Marina and River Mile 44). These data were not collected to satisfy the LT2ESWTR monitoring requirements so the maximum RAA for *Cryptosporidium* was not calculated. These data show that both

Cryptosporidium and *Giardia* are detected more frequently and at higher levels downstream of the SRWTP discharge. *Cryptosporidium* was detected in 13 percent of the samples at Veteran's Bridge and 8 percent of the samples at Freeport Marina. The average levels are 0.027 oocysts/L and 0.021 oocysts/L, respectively. *Cryptosporidium* was detected in 38 percent of the samples at Cliff's Marina and 28 percent of the samples at River Mile 44. The average levels at these two sites are 0.086 oocysts/L and 0.090 oocysts/L. The average *Giardia* levels range from 0.174 cysts/L at Veteran's Bridge to 0.548 cysts/L at Cliff's Marina.

San Joaquin River Basin

Stanislaus River

Cryptosporidium data are available at the Tuolumne Utilities District's Sonora WTP on the South Fork of the Stanislaus River. *Giardia* data are not available at this location. The LT2ESWTR maximum RAA is 0.047 oocysts/L at the South Fork Stanislaus River WTP intake, resulting in a Bin 1 classification.

Combined Stanislaus and Calaveras River

Stockton East Water District conducted *Cryptosporidium* monitoring at its diversion point on the Stanislaus River, its diversion point on the Calaveras River, and at its WTP, which receives a blend of Stanislaus and Calaveras river water. Although both sources would be classified in Bin 1, the combined sources had a maximum RAA of 0.075 oocysts/L, resulting in a Bin 2 classification.

Sacramento San Joaquin Delta

Contra Costa Water District (CCWD) has two WTPs (Randall Bold and Bollman) which treat water diverted at its four Delta intakes (the Mallard Slough, Rock Slough, Old River, and Middle River on Victoria Canal Intakes). CCWD provided LT2ESWTR monitoring for the influent to the Randall Bold WTP and Bollman WTP. The LT2ESWTR maximum RAA at these two locations is 0.000 oocysts/L, resulting in Bin 1 designations. CCWD completed construction of one of its four Delta intakes, the Middle River Intake on Victoria Canal, after the LT2ESWTR monitoring of WTP influent was performed; as a condition of its CDPH water supply permit, CCWD conducted LT2ESWTR monitoring at the Middle River Intake and, for comparison, at the Old River Intake. The LT2ESWTR maximum RAA at both locations is 0.008 oocysts/L, resulting in Bin 1 designations. *Giardia* data are available for the Old River and Middle River intakes. *Giardia* was above detection levels in 6 of the 24 samples collected at Old River, for an average level of 0.038 cysts/L. At Middle River, *Giardia* was above detection levels in 6 of the 24 samples collected, for an average level of 0.033 cysts/L.

California Aqueduct

LT2ESWTR monitoring was conducted for a number of WTPs that treat water from the California Aqueduct and all have received a Bin 1 designation. The Work Group determined that data would be presented for WTPs treating water from the South Bay Aqueduct since these WTPs are closest to the Delta and best represent the quality of water pumped from the Delta into the California Aqueduct. Tables 3 and 4 present data for Zone 7 Water Agency's Patterson Pass WTP intake and Santa Clara Valley Water District's Penitencia WTP intake. The LT2ESWTR maximum RAA for *Cryptosporidium* is 0.000 oocysts/L at both intakes.

Giardia data are available at the Penitencia WTP intake. *Giardia* was detected in 2 percent of the samples at an average level of 0.002 cysts/L.

Delta-Mendota Canal

Water is pumped from the Delta into the Delta-Mendota Canal, which is a source of water for the City of Tracy. The LT2ESWTR maximum RAA for *Cryptosporidium* is 0.091 oocysts/L, resulting in a Bin 2 designation. *Giardia* data are not available at this location.

Summary

- The LT2ESWTR monitoring has resulted in most WTPs for which data were available to be placed in Bin 1, meaning that the standard 2-log *Cryptosporidium* removal in WTPs is required and no additional action is required at this time.
- Three WTPs in the area covered by the Drinking Water Policy were placed in Bin 2 (Lake Wildwood, Stockton East Water District, and the City of Tracy). Lake Wildwood and Stockton East WTP are addressing the Bin 2 classification by meeting more stringent turbidity standards. The City of Tracy WTP was required to implement UV treatment by their 2008 permit and did not have to make any modifications to meet the Bin 2 requirement. In fact, none of the WTPs were required to install additional treatment measures as a result of being placed in Bin 2.
- Tables 3 and 4 present a summary of the available data collected at WTP intakes. The available pathogen data indicate that the WTPs in the upper reaches of the Sacramento River and its tributaries are treating water that has low levels of *Cryptosporidium* and *Giardia*. The maximum RAA of *Cryptosporidium* for the upper watershed sites is 0.000 oocysts/L. Most of the WTPs treating water from the Delta are also treating water with low levels of pathogens. The City of Tracy's Delta-Mendota Canal intake is the only Delta WTP that does not have Bin 1 designation.
- The highest levels of pathogens are found at WTP intakes in the Delta-Mendota Canal, Lake Wildwood, the Sacramento and Stockton urban areas, and at the Tuolumne Utilities District Sonora WTP intake on the South Fork of the Stanislaus River. In the Sacramento area, the maximum RAA for *Cryptosporidium* ranges from 0.019 oocysts/L (Bryte Bend) to 0.058 oocysts/L (Sacramento). As indicated in Tables 3 and 4, the maximum RAA at the Sacramento WTP intake is 77 percent of the level that would result in a Bin 2 designation (0.075 oocysts/L). *Giardia* levels in the Sacramento urban area are an order of magnitude higher than in the upper watershed and the Delta, based on the limited data available. In the Stockton urban area, the maximum RAA for *Cryptosporidium* is 0.075 oocysts/L at Stockton East Water District's WTP intake. This is the minimum level that resulted in a Bin 2 designation. The Sonora WTP intake maximum RAA of 0.047 oocysts/L represents 63 percent of the Bin 2 designation level.

The LT2ESWTR monitoring information provides evidence that the proposed narrative objective is being met.

4.5.3 Water Quality Conditions That Could Reasonably Be Achieved

The narrative water quality objective is designed to protect existing water quality and prevent pathogen levels from increasing at public water system intakes. *Cryptosporidium* monitoring has resulted in drinking water utilities being placed in the first two bins of the LT2ESWTR. The

bins contain a range of Cryptosporidium levels that can be used to establish water quality conditions at the public water system intakes. As discussed above, there are no current violations of the proposed narrative water quality objective for the pathogens, *Cryptosporidium* and *Giardia.* Since the proposed objective has not been violated, it is reasonable that the proposed objective can continue to be met. To ensure that the narrative objective continues to be met, numerical triggers linked to drinking water treatment requirements for *Cryptosporidium* will be incorporated into the implementation section of the Basin Plan, along with Central Valley Water Board actions in the event that the triggers are exceeded.

Cryptosporidium and *Giardia* contamination can come from point sources such as discharge from POTWs, as well as non-point sources such as urban runoff and agriculture and livestock production systems (Knox, et al., 2007). Pathogens also originate from other sources such as human-water contact and from illegal discharges such as boater-generated sewage. Pathogens are mainly shed in the feces of wildlife, humans, livestock and pets. There are a number of management practices and treatment strategies available to reduce pathogen loads from POTWs, urban runoff, and agricultural lands.

Reducing a controllable source or sources of pathogen loading may not result in a measurable reduction in the pathogen load of the related surface water. Therefore, directed actions considered under the proposed policy should be carefully evaluated for efficacy. The following is provided for information related to the current knowledge of pathogen reduction. There are a number of management practices and treatment strategies available to reduce pathogen loads from POTWs, urban runoff, and agricultural lands

POTWs

Municipal wastewater is treated and disinfected prior to discharge in order to remove or inactivate pathogens to low levels. Effluent pathogen data are available for two secondary treatment plants in the Central Valley, as shown in Table 6.

Table 6. *Cryptosporidium* and *Giardia* Levels in Secondary Effluent

	***Cryptosporidium* (oocysts/L)**				***Giardia* (cysts/L)**			
	No. of Samples	**% Detected**	**Average**	**Maximum***	**No. of Samples**	**% Detected**	**Average**	**Maximum***
SRWTP* Presumptive	87	97%	9	88	87	100%	43	400
SRWTP* Confirmed	75	89%	4	79	75	95%	15	160
Vacaville Presumptive**	11	45%	0.5	1.8	11	27%	0.05	0.4
Vacaville Confirmed**	10	0%	0	0	11	18%	0.04	0.4

**The maximum Cryptosporidium and Giardia concentrations shown in this table do not represent typical SRWTP effluent concentrations. The maximum concentrations shown on this table for SRWTP secondary effluent occurred during a period of unusually heavy rainfall between 16-18 February 2004. During this same time period, Cryptosporidium and Giardia concentrations from samples collected along the Sacramento River, including a site upstream of the SRWTP discharge, were also significantly elevated compared to concentrations found during average rainfall conditions. ** Data for Vacaville collected between January 2011-January 2012.*

At the present time, 62 percent of the POTW wastewater flows to surface waters within the Delta and Sacramento and San Joaquin River watersheds receive secondary treatment and 38 percent receive tertiary treatment. Under current permit conditions, 94 percent of the wastewater flows will receive tertiary treatment by 2030 (West Yost, 2011). To achieve an essentially pathogen-free wastewater, filtration (to produce a very low-solids effluent) followed by some form of disinfection would be required (West Yost Assoc., 2011). Typically in California and across the Nation, POTWs use chlorine as a disinfectant because of its effectiveness and cost effectiveness (Blatchley III, *et al.*, 2005). However, some studies indicate that chlorination is not as effective at inactivating some protozoan cysts such as *Cryptosporidium* compared to ultraviolet (UV) disinfection (Tetra Tech, Inc., 2007). Chlorination is more effective than UV disinfection in inactivating other pathogens (Tetra Tech, Inc., 2007). Each disinfection technology must be compared for effectiveness and reliability and the pathogen removal requirement.

The City of Sacramento's combined sewer system (CSS) in the older downtown "core" area conveys and treats the combined urban runoff and sewage to the Sacramento Regional Wastewater Treatment Plant where it receives secondary treatment and disinfection prior to being discharged. Intermittent discharges from the City of Sacramento's combined system reservoirs to the Sacramento River occur when flows to the Sacramento Regional Wastewater Treatment Plant exceed 60 MGD and available storage is filled. In all but extreme conditions, this combined system flow receives primary treatment and is disinfected with chlorine before discharge to the river (Geosyntec, 2011).

Between October 2003 and September 2012, the City of Sacramento combined sewer system averaged 4 overflow events per year with an annual average overflow volume of 221 million gallons (MG). The combined sewer system utilizes two main discharge points for treated overflow events -- the Combined Wastewater Treatment Plant (CWTP) and Pioneer Reservoir. The Pioneer Reservoir facility discharges an average yearly volume of 182 MG and the CWTP discharges 39 MG per year. Only a small fraction (<0.25%) of the total system flow volume does not receive at least primary treatment, including disinfection. A majority of system flow, approximately 6,250 MG per year, is conveyed to the Sacramento Regional Wastewater Treatment Plant.

Constructed treatment wetlands have been used successfully to achieve reduction rates of about 2 log for *Cryptosporidium* and *Giardia* (Redder et al., 2010). There are a number of studies which demonstrate the effectiveness of constructed wetlands in reducing levels of *Cryptosporidium* and *Giardia* in domestic wastewater (Bonadonna et al., 2011) (Redder et al., 2009) (Reinoso et al., 2008) (Karim et al., 2003) (Stott et al., 2001) (Thurston et al., 2001)

Urban Runoff

Protozoa sources carried in urban runoff include deposition of human or animal waste or can be associated with cross connections to or overflows from sewage or combined sewage conveyance systems to the municipal separate stormwater sewer system (MS4). There are no data on the levels of *Cryptosporidium* and *Giardia* in urban runoff in the Central Valley.

The urban runoff source control study (Geosyntec, 2011) assessed available pathogen control approaches that are typically distributed throughout an urban area. Most control measure studies have not specifically quantified pathogen removal; however, fecal indicator bacteria (FIB) are commonly measured. Low impact development reduces the total volume and load of

pathogens. Media filters were reported as the most effective measure to reduce FIB median concentrations (220 MPN/100mL), while extended detention basins were moderately effective (465 MPN/100ML) and biofilters were the least effective (2,300 MPN/100mL). Older development areas can be retrofitted in some cases with these types of controls, but usually at a much greater cost. The urban runoff source control study (Geosyntec, 2011) also describes the City of Santa Monica 0.5 MGD dry weather runoff treatment and recycling facility, which includes filtration and disinfection of dry weather runoff. Such facilities are one option for addressing runoff from established urban areas.

Reducing the sources of urban pathogen contamination can be achieved through education of the public as well as through reduction of illegal camping activities and homelessness in the riparian corridor. Municipalities have implemented pet waste disposal stations at public parks. Additional pet waste disposal outreach was accomplished through bilingual mailings that featured various ways to reduce deleterious impacts on local water quality, including the proper cleanup and disposal of domestic pet waste (Larry Walker Assoc., 2009). Illegal camps are also of concern as a potential source of fecal waste (Starr Consulting et al., 2010). Camping bans and cleanup efforts have been implemented in the Sacramento area in an effort to control activities that contribute to pathogen contamination of local surface waters (Starr Consulting, et al., 2010). Targeting these source control efforts can be improved through source identification studies, but ultimately complete removal of both anthropogenic and natural pathogenic material is not possible through source control alone.

Direct Contact

Body contact recreation in general has long been known to be a source of pathogen contamination, resulting partly from personal sanitary conduct and partly from a natural shedding process. Body contact recreation is a potential source of pathogens during the warm months but not generally during the winter months due to cold water temperatures. Restrooms in highly used recreational areas could help reduce this source.

Agricultural Lands

In the event that pathogen loading from agriculture (including irrigated and non-irrigated crop, and livestock operations) must be reduced, this can be achieved by using a combination of irrigation management, livestock and grazing management, vegetative filters such as filter (or buffer) strips (Knox, et al., 2007), and possibly other measures affecting runoff or how it is routed downstream of fields, pastures, and rangelands. For example, relatively small filter strips (~ 3m or ~10 ft in length along flow lines) have been shown to remove up to 99.9% of *Cryptosporidium parvum* oocysts from storm runoff generated during mild to moderate precipitation events (Atwill, 2002). However, the effectiveness of filter strips varies according to soil slope, soil infiltration rate, and flow rate. The pathogen load and removal efficiency of filter strips depend on factors such as livestock densities, runoff residence times in filter strips, irrigation timing, and irrigation duration (George, 2011). As another example, studies have shown constructed wetlands to improve water quality and remove *Cryptosporidium* and *Giardia* from pasture and dairy runoff (Knox et al., 2008; Hogan et al., 2012).

A comprehensive listing of potential management practices, or a description about how, if necessary, they might be arrayed on the landscape is beyond the scope of this report.

Wildlife

Wildlife, including wildlife using habitat in natural, restored, or managed wetlands, is an uncontrollable source of *Cryptosporidium* and *Giardia.* When the Board reviews this Policy in 2023, it will consider any new information about the control of *Cryptosporidium* and *Giardia* from wetlands and upland areas.

4.5.4 Economic Consideration

The proposed narrative water quality objective and its implementation plan are designed to protect existing water quality and prevent water treatment plants from being classified in a higher bin level. The current bin assignments reflect existing water quality conditions at the public water system intakes. As discussed in Sections 4.5.2 and 4.5.3, there are no current violations of the proposed narrative water quality objective for the pathogens, *Cryptosporidium* and *Giardia*. At this time, no additional measures are required to comply with the proposed water quality objective. Numerical triggers linked to drinking water treatment requirements for *Cryptosporidium* will be incorporated into the implementation section of the Basin Plan, along with Regional Board actions in the event that the triggers are exceeded.

If a Central Valley Water Board investigation of a trigger exceedance leads to the need for additional source control, there are treatment options for many of the sources. Effective though costly treatment strategies and management practices are available to reduce pathogen loads from POTWs. Pathogen-specific "passive" BMPs commonly deployed for urban runoff and irrigated pastures can be effective in reducing pathogens in the water column, but have performance limitations related to capacity and are not feasible in all urban areas.

The source control evaluation studies summarized in the Workgroup Synthesis Report (Appendix C) included some cost estimates for treatment components and management practices for POTWs and urban runoff.

<u>POTWs</u>

Filtration followed by advanced UV disinfection is commonly used to treat *Cryptosporidium* and *Giardia* in POTWs. Construction costs to add these treatment components to major POTWs in the Delta and upstream tributaries were roughly estimated to be $195 million in December 2010 dollars (West Yost, 2011). The cost estimate does not include treatment upgrades that are already mandated and does not include operation and maintenance costs.

<u>Urban Runoff</u>

The urban runoff source control evaluation[3] summarized BMP performance for fecal indicator bacteria (FIB). *Cryptosporidium* and *Giardia* performance data are limited so these were not specifically evaluated. However, the urban runoff source control evaluation did consider both passive and active control approaches, which can reduce the volume and/or concentration of a range of constituents. Passive approaches, including infiltration, retention basins, media filters and bioretention, do not specifically target pathogens, but can reduce peak concentrations of FIB and flows. Costs to implement passive treatment systems in new development within the Sacramento and San Joaquin Valleys were estimated at $14.9 billion to comply with probable regulatory requirements and to meet the needs of projected urban growth. Retrofit of existing industrial areas was only considered in the "outer boundary" (most intensive) regulatory

[3] Geosyntec Consultants. *Urban Runoff Source Control Evaluation for Central Valley Drinking Water Policy*. March 23, 2011.

scenario, and was estimated to cost $143,400 per acre of retrofitted drainage area. Active advanced treatment would be required to effectively deactivate or completely remove *Cryptosporidium*. However, costs were not estimated as part of the source control evaluation.

As part of their 2007 antidegradation analysis[4], the Sacramento Stormwater Quality Partnership estimated that 10,000 acres of new development would require 87 mgd of treatment capacity in addition to several extended retention basins to treat the 85 percentile storm event. The total additional cost of the active treatment facilities would be $12,000 per acre served, with annual maintenance costs of $300 per acre served. Retrofit of existing development with active treatment was not considered.

Agricultural Lands

Considering the effectiveness demonstrated for filter strips in removing *Cryptosporidium*, they are one possible management measure that could be used to treat runoff, including that coming from rural lands. Other measures have been identified (e.g., irrigation and grazing management, treatment wetlands), and more may be identified in the future. Optimal measures actually vary substantially depending on field conditions, location, topographic setting, crop or livestock operation type, season, climate, etc. For example, when attempting to avoid pollutant transport to streams from grazed lands, animal exclosure (fencing with alternative watering points) and rotation of grazing to non-irrigated areas are frequently more effective than filter strips. There are many such examples. Thus, the optimal application of such measures (if and where necessary) requires site-specific knowledge. More importantly, current water quality data do not suggest that widespread implementation of measures beyond current practice would ever be needed.

Nevertheless, since the actual future need for and configuration of such management practices are currently unknown, a placeholder example involving a substantial complex of filter strips along waterbodies has been developed for the purpose of calculating a representative range of costs for source control from irrigated (including agricultural) lands.

The ability of rural land managers to finance such measures (including costs for the land required) varies widely. Filter strips are usually at least 12 feet wide and often 30 to 40 feet wide. In 2006, average costs to develop filter strips were about $750 per acre (Yolo County RCD website, 2012). Land costs for such facilities could range from $5,000 per acre (least costly field crops and infrastructure) to over $20,000 per acre (most costly permanent crops and infrastructure).

At this time, no additional requirements are being placed upon agricultural land managers as part of the proposed project. Furthermore, funding of such hypothetical facilities might come from many sources (special districts, coalitions, joint ventures among interested parties, grant funds, incentives, etc.), and not necessarily from owners of affected lands upon which source control facilities would be located. Since a situation could arise in which a trend of increasing pathogen concentration at public water system intakes were attributable to rural land sources, it is useful to contemplate the potential cost to implement these types of facilities.

[4] Sacramento Stormwater Quality Partnership. *Antidegradation Analysis for Fourth NPDES Permit Term. (Section 7.1.1)* Prepared by Larry Walker Associates. September 2007.

In the event of exceedances of the proposed numeric trigger and implementation of this type of mitigation as a corrective action (see Figure IV-I: Schematic Overview of Actions prompted by *Cryptosporidium* Trigger Exceedance), potential costs to develop filter strips in a 10-foot-wide filter strip along both sides of one percent of the approximately 38,000 stream-miles in the Central Valley (along 760 miles of shoreline) would be about $690,000, with total land values ranging from $6.7 M to $15 M (representing an average value range from $8,000 to $14,000 on 921 acres). Annual operations, maintenance, and monitoring of these facilities were estimated at approximately $138,000 (20% of the initial development cost). Sensitive reaches along waterbodies in the Central Valley might also fall into non-agricultural areas, where other measures (rather than filter strips) might be more appropriate. Again, this calculation is intended to illustrate the cost of protecting water bodies along a substantial length of sensitive shoreline. It is not considered to represent a probable future condition.

Drinking Water Treatment

Drinking water treatment plants currently meet LT2ESWTR requirements for their established bin levels. However, if additional treatment is required in the future, filtration and advanced UV disinfection can be used to treat *Cryptosporidium* and *Giardia* in water treatment facilities. Construction costs to add these treatment components to treatment facilities range from approximately $431,000 to $585,000 per million gallons per day. Operation and maintenance costs for these systems range from $200 to $228 per million gallons (Malcolm Pirnie Inc., 2011).

Monitoring Program

There may be costs associated with monitoring conducted as a result of the proposed Policy. Monitoring for some drinking water constituents of concern may be required by current regulations. Other monitoring, such as ambient water quality assessments and focused limited-term studies, will be coordinated with the Delta Regional Monitoring Program, if possible. The Delta Regional Monitoring Program is a Central Valley Water Board initiated stakeholder effort to address the need for a comprehensive monitoring, assessment and reporting program. It will initially be funded by resources previously dedicated to receiving water monitoring, in kind services, and other interested parties. Primary stakeholders currently include NPDES permit holders within and near tributaries to the Delta, agriculture, water contractors, and agencies.

The costs for the monitoring will vary according to monitoring frequency and monitoring goals. Analytical cost for detection of *Cryptosporidium* and *Giardia* using USEPA Method 1623 is about $500 per sample. There is also additional labor costs associated with collection of the samples.

4.5.5 Need for Housing

None of the alternatives would restrict the development of housing.

4.5.6 Need to Develop and Use Recycled Water

None of the alternatives would restrict the development or use of recycled water. The alternatives, therefore, are consistent with the need to develop and use recycled water.

5 IMPLEMENTATION PROGRAM

5.1 REGULATIONS THAT APPLY TO ESTABLISHING IMPLEMENTATION PROGRAMS

5.1.1 Federal Regulations and Guidance

Section 402 of the Clean Water Act requires a permitting system which USEPA addressed by promulgating 40 CFR Section 122, which are the regulations pertaining to the NPDES program. The State's regulations pertaining to NPDES permits must be consistent with the federal regulations.

Title 40 CFR Section122.44(d)(1)(ii) sets forth the criteria for establishing a procedure for determining whether a discharge has a reasonable potential to cause or contribute to a violation of water quality standards. It states, "When determining whether a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a narrative or numeric criteria within a State water quality standard, the permitting authority shall use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water." While the federal regulations do not contain explicit procedures to derive effluent limitations, USEPA has provided guidance (USEPA, 1991) that includes explicit procedures. The proposed policy through its actions to interpret and evaluate compliance with the proposed *Cryptosporidium* and *Giardia* water quality objective (see section 5.2 below) establishes procedures for determining reasonable potential under 40 CFR section 122.44(d)(1)(ii) that apply only to such determinations with respect to the proposed *Cryptosporidium* and *Giardia* water quality objective.

5.1.2 State Regulations and Guidance

Pursuant to Water Code Section13050, subdivision (j)(3), a basin plan amendment must include an implementation program to achieve water quality objectives. Water Code section13242 prescribes the program of implementation for achieving water quality objectives, which include the following:

- description of the actions necessary to achieve the water quality objectives;
- time schedule; and
- a monitoring and surveillance program.

5.2 ACTIONS NECESSARY TO ACHIEVE PROPOSED *CRYPTOSPORIDIUM* AND *GIARDIA* WATER QUALITY OBJECTIVE

To interpret and evaluate compliance with the proposed objective, numeric triggers tied to USEPA's drinking water requirements based on *Cryptosporidium* concentrations will be used. It is appropriate to solely use *Cryptosporidium* concentrations as the indicator of compliance with the *Cryptosporidium* and *Giardia* objective since *Cryptosporidium* is not as readily treated as *Giardia* when conventional drinking water treatment processes are employed, and USEPA promulgated new drinking water requirements specifically to address *Cryptosporidium.*

Under the LT2ESWTR, public water systems are required to monitor for *Cryptosporidium* at their intakes; the monitoring results are used to establish the bin level for the water system. The goal of the implementation program for the proposed narrative objective is to protect water quality at public water system intakes by ensuring that controllable sources do not cause pathogen levels to increase above the range of the existing bin classification. To help public water systems stay in their existing bin classifications, ambient *Cryptosporidium* triggers at public water system intakes are included below based on LT2ESWTR bin classifications. The triggers and changes in the LT2ESWTR bin levels do not indicate a violation of the narrative *Cryptosporidium* and *Giardia* water quality objective. The proposed numeric trigger would instead prompt the Water Board to coordinate with CDPH, the affected public water system, and the dischargers that are potential sources of pathogens to assess the data and evaluate the need to conduct source evaluations and implement control options. The public water system may decline assistance from the Central Valley Water Board in addressing compliance with the LT2ESWTR.

A water agency siting a potential new intake is required by CDPH to conduct a watershed sanitary survey and the monitoring required by the LT2ESWTR to determine their bin classification prior to construction of a new public water system. The agency will also have to meet all requirements and policies of CDPH for locating a public water system intake in an area that is not adversely affected by sources of pathogens.

Cryptosporidium Trigger Exceedance

If *Cryptosporidium* monitoring data from an existing public water system intake indicates that the maximum running annual average has reached 80 percent of the next highest level, as existed in 2013, the Central Valley Water Board would conduct the investigation described in below. Table 7 shows the LT2ESWTR bin classifications and the 80 percent trigger levels.

Table 7. Bin Levels and 80 Percent Triggers

Bin Classification	Maximum Running Annual Average (oocysts/L)	80 Percent Trigger (oocysts/L)
1	< 0.075	0.06
2	0.075 to < 1.0	0.80
3	1.0 to < 3.0	2.4

The decision to establish triggers as 80% of the next bin classification is based on policy and resource consideration. The Central Valley Water Board does not have the resources to investigate minor changes in pathogen levels. The Workgroup recognized the resource limitation but wanted to have some cushion before the bin classification is increased. The Workgroup determined that establishing the trigger at 80% of the bin level provides a reasonable compromise between the use of limited resources and the need to act before a change in the bin classification.

If the affected public water system requests assistance, the Central Valley Water Board should coordinate with CDPH, the affected public water system, and possible controllable sources to

assess the data and evaluate the need to conduct source evaluations and implement control options. The affected public water system may decline assistance from the Central Valley Water Board in addressing their compliance with the LT2ESWTR. The coordination and investigation effort should include the following steps represented by the schematic overview in Figure 1 and as described in more detail in the text following Figure 1.

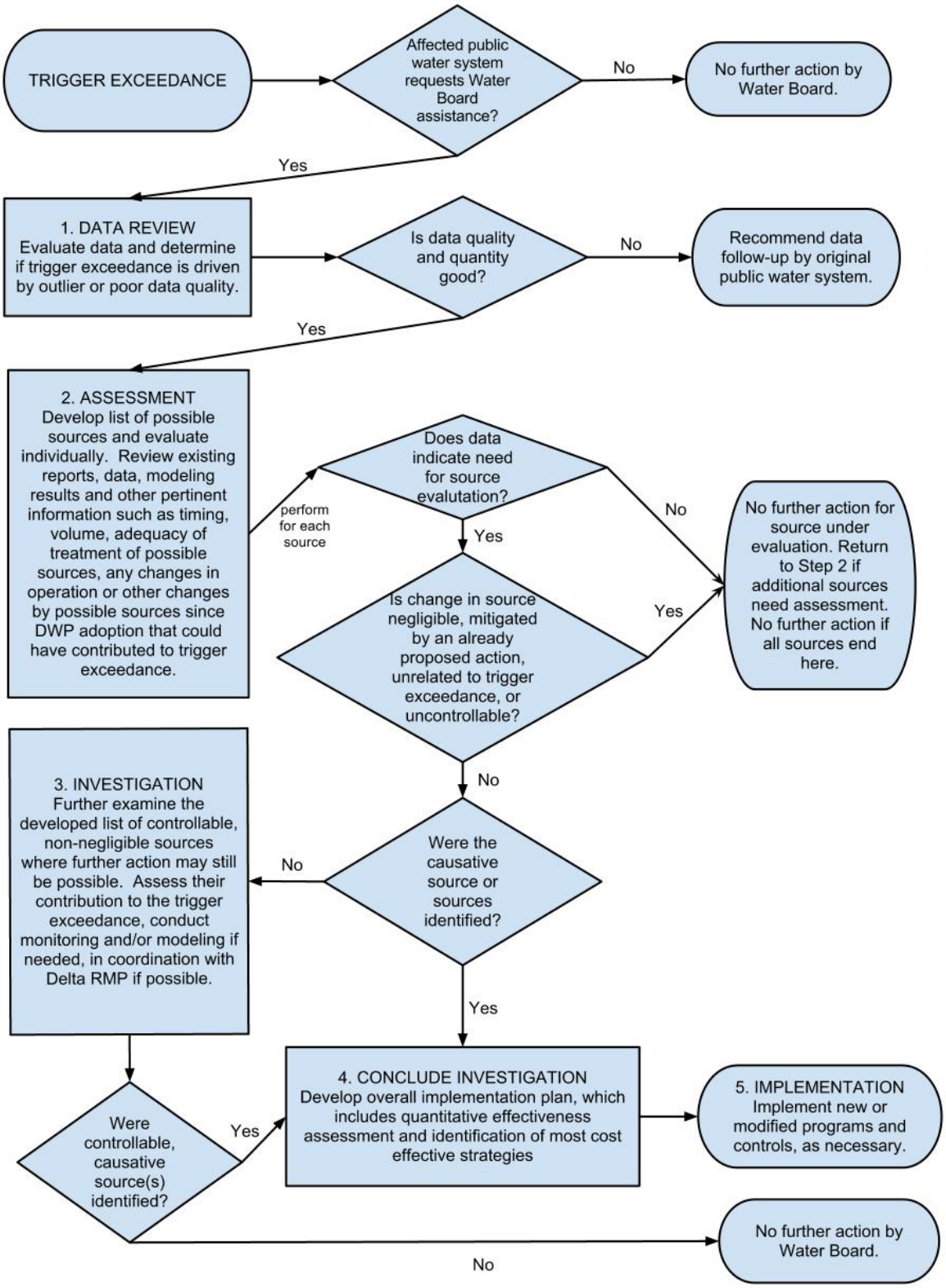

Figure 1: Schematic Overview of Actions prompted by *Cryptosporidium* Trigger Exceedance

Step1. Data Review

Once a public water system informs the Central Valley Water Board of a trigger exceedance and requests assistance with upstream source control, Board staff will coordinate with CDPH, the affected public water system and potential sources to initiate a quality and quantitative review of the data used to support the trigger exceedance. In some cases, an assessment of the effect of outliers may be necessary. Further follow-up may not be necessary if, after omission of unreliable data (reporting or analytical error), the numeric trigger threshold is not reached.

Step 2. Assessment

The second step is for the Central Valley Water Board, in coordination with CDPH, the affected public water system, and potential sources (e.g., wastewater treatment or storm water management entities, wetland managers, etc.), to compile and assess existing data. The objective of the assessment is to identify potentially responsible sources and determine whether they are controllable. The review will also consider existing conditions and the likelihood that pathogens will continue to increase. Sources will be considered individually. If the source of the trigger exceedance is identified, then evaluation of other sources will be cursory.

Identify Potentially Responsible Sources

Existing data could include the most recent watershed sanitary survey, the one-time *Cryptosporidium* special study discussed in Section 5.3, and any other available information on potential sources of pathogens in the tributary waters near the public water system intake. This information will be used to develop an initial list of the potential causes of the trigger exceedance. Potential sources may include urban runoff, agricultural discharges, confined animal facilities, grazing animals, treated wastewater, recreation, and natural sources such as wildlife. More information is provided in Table 8.

Table 8. Source Identification Tools

Assessment Type	Description	Desired Outcome
Watershed Sanitary Survey	Identify likely sources of increasing trends in pathogen levels from sanitary survey	List of potential sources of pathogens and relative contributions
Historical upstream watershed pathogen data	Summarize available ambient baseline pathogen data (especially near intake); review unregulated and uncontrollable sources	Augment list of potential sources and relative contributions with data not included in source water's sanitary survey
Pathogen special study	Coordinated monitoring at public water system intakes, ambient locations, and representative discharge locations	Data used to assess potential sources if trigger is exceeded and may preclude additional data collection
New sources	Identify new sources in the tributary watershed during the period of increase (e.g., known changes in permitted discharges, new wetland operations, etc.)	Quantification of relative impact from new sources to existing sources and public water system intake levels
Episodic conditions	Evaluate watershed activities at the time of sampling that could increase pathogen	Relate known conditions to values driving trigger exceedance

	concentrations including recreational, flood, or other episodic events	
Assessment of existing monitoring data near public water system intake	Evaluate the geographic extent of increased pathogen levels based on a review of available ambient data and available fingerprinting or other modeling information regarding the magnitude of contribution of upstream sources to the intake in question.	Determine if there are localized sources and to better develop an understanding of fate and transport of pathogens in the vicinity of the intake.
Trends	Evaluate existing data for trends in pathogen levels at the public water system intake and upstream	Determine if there is an increasing trend of pathogen presence in the vicinity of the public water system intake
Data gaps	Evaluate unquantified and unidentified sources and recommend follow-up data collection, if necessary	Identify critical data collection and analysis needs

Review Controllable Sources

Controllable water quality factors, as defined in Section III-1.0 of the Basin Plan will be reviewed to determine if any of them could have caused or substantially contributed to the increased level of pathogens at the public water system intake. Factors to be considered are included in Table 9.

Table 9. Controllable Source Assessment

Assessment Type	Description	Desired Outcome
Timing of Discharge	Review discharge records and public water system intake data	Determine if controllable source discharge(s) occurred during the time that pathogen levels increased
Volume of Discharge	Evaluate hydrodynamic and/or water quality modeling results or simple loading calculations in the upstream reaches of the rivers	Assess possible contribution of controllable source discharge when mixed with ambient waters
Changes in Operations	Evaluate operational records; look for increased flows, operational upsets, spills, etc.	Identify relationship between discharge changes and higher levels of pathogens at public water system intake
Adequacy of treatment	Evaluate effectiveness of treatment process in removal and/or inactivation of pathogens	Consider treatment when determining source applicability.

Step 3. Investigation

If after Step 2 there is still uncertainty regarding whether a trigger exceedance is due to controllable source(s), the Central Valley Water Board will proceed to a more detailed investigation. At this point, the need for monitoring and/or modeling will be evaluated. To increase efficiency, any monitoring effort should be coordinated with the Delta Regional Monitoring Program or other regional watershed collaboration if possible. The objective of the investigation is to fill critical data gaps identified in the assessment that are necessary to further address the exceedance of the numeric trigger.

Step 4. Conclude Investigation
Based on the results of Steps 1 through 3, the Central Valley Water Board will determine if any controllable sources can be identified as causing or substantially contributing to the increased level of pathogens that resulted in the trigger exceedance. It is possible, due to the nature of pathogen data and to uncontrollable sources in the watershed, that a controllable source will not be identified. If controllable sources are identified, the sources will be required to develop an implementation plan, which includes an effectiveness assessment and identification of the most cost effective strategies and actions to ensure a safe public water supply. The goal of the implementation plan is to prevent increases in pathogens.

Step 5. Implementation
Identified controllable sources, including new sources that are not currently regulated, will be required to implement the plan described in Step 4. Ongoing monitoring by the public water systems and the Delta Regional Monitoring Program or other regional monitoring effort may be necessary to track program effectiveness in maintaining existing pathogen levels. Monitoring by sources may also be necessary to assess implementation effectiveness.

Antidegradation Analysis
In addressing *Cryptosporidium* and *Giardia* in an antidegradation analysis for evaluating the public water system component of the MUN beneficial use, the results of the downstream ambient trigger analysis at public water system intakes shall be considered. In cases where triggers at the nearest public water system intake have not been exceeded, the analysis should be simplified and may be curtailed, depending on the magnitude of the discharge in question and the likelihood of potential impact at public water system intakes. If trigger has been exceeded, information from the resulting investigation should be considered in the antidegradation analysis.

5.3 TIME SCHEDULE
The public water system component of the MUN beneficial use is currently fully supported throughout the project area. No implementation actions are expected to be required to comply with the narrative water quality objective for *Cryptosporidium* and *Giardia.* Beginning in 2015, public water systems will be required by the LT2ESWTR to collect data which may trigger implementation actions.

5.4 MONITORING AND SURVEILLANCE PROGRAM
To support the goal of maintaining current conditions, it would be useful to improve knowledge of existing conditions and to monitor for trends for drinking water constituents of concern, refine models and to provide baseline information for the implementation program. Drinking water constituents of concern have been identified as organic carbon, salt, nutrients, *Cryptosporidium,* and *Giardia.* All monitoring will be coordinated with the Delta Regional Monitoring Program, if possible. The following will be included in the proposed Basin Plan amendment:

- A one-time *Cryptosporidium* special study to characterize ambient background conditions and potential sources, which will be used if a trigger is exceeded. This special study will be developed with interested stakeholders after adoption of the Policy.

- Support for gathering information needed for future analytical model refinement.
- Central Valley Water Board consideration of monitoring for organic carbon, salinity, and nutrients when waste discharge requirements are renewed.

5.5 Alternative Implementation Program Elements

There are several elements of the Basin Plan that address the protection of the MUN beneficial use. These elements include several water quality objectives, Management Agency Agreements, Memorandums of Agreement, Memorandums of Understanding, and Control Action Considerations of both the State Water Board and Central Valley Water Board. However there is currently no section of the Basin Plan that compiles all of these elements that govern the protection of the public water system component of the MUN beneficial use. In addition to the proposed narrative water quality objective for the pathogens *Cryptosporidium* and *Giardia*, staff is proposing the addition of a Drinking Water Policy and language regarding its implementation to the Basin Plan under the headings "Water Quality Concerns" and "Control Action Considerations of the Central Valley Water Board."

The proposed Drinking Water Policy would compile all elements of the Basin Plan that apply to the protection of the MUN beneficial use as well as clarify that the existing narrative water quality objective for chemical constituents does include drinking water chemical constituents of concern, such as organic carbon. The Drinking Water Policy would recognize the importance of a multi-barrier approach, balancing source water protection with water treatment, to protect municipal supplies of drinking water. The Drinking Water Policy would acknowledge that, according to source evaluation studies conducted in 2011 that examined publically owned treatment works, urban runoff, and irrigated agriculture, concentrations of organic carbon at public water system intakes are not expected to increase over time. The source evaluations were conducted based on current and projected regulatory requirements.

The proposed Drinking Water Policy includes an implementation element to specifically address compliance with the proposed narrative objective. To interpret and evaluate compliance with the proposed objective, numeric triggers tied to USEPA's drinking water requirements based on *Cryptosporidium* concentrations will be established. However, exceedances of the triggers or changes to LT2ESWTR bin levels would not be violations of the proposed narrative objective nor are the triggers or bin levels to be used as numeric effluent limits. The implementation element will include the numeric triggers and a process for addressing exceedance of the triggers.

5.5.1 Alternative 1. No Implementation Program

This Alternative would not include the implementation element for the proposed narrative *Cryptosporidium* and *Giardia* objective and therefore would not provide numeric triggers for the objective or a process for addressing exceedance of the triggers. This may generate confusion regarding implementation of the proposed narrative objective and may not comply with Water Code provisions which require a program of implementation for water quality objectives.

5.5.2 Alternative 2. Implementation with Numeric Triggers and Follow-up Action

This alternative would include a Drinking Water Policy Implementation section that provides information regarding implementation of the narrative *Cryptosporidium* and *Giardia* objective including numeric triggers based on 80 % of the bin levels and a process to address trigger exceedances.

5.5.3 Alternative 3. Implementation with Numeric Triggers without Follow-up Action

This alternative would include a Drinking Water Policy Implementation section that provides information regarding implementation of the narrative *Cryptosporidium* and *Giardia* objective including numeric triggers based on 80 % of the bin levels but not include the process to address trigger exceedances.

5.5.4 Alternative 4. Implementation with Monitoring Program Only

This alternative coincides with the alternative 1b for water quality objectives which would not establish a new objective for *Cryptosporidium* and *Giardia* at this time. Instead, it would include implementation language in the Basin Plan to direct additional evaluation to assess the need to develop a water quality objective for *Cryptosporidium* and *Giardia* that protects all beneficial uses. Because no objective would be added, it would not contain the Drinking Water Policy Implementation section that provides information regarding implementation of the narrative *Cryptosporidium* and *Giardia* objective including numeric triggers and a process to address trigger exceedances

5.6 Recommended Implementation Program Alternative

It is necessary to have numerical triggers for the proposed narrative objective as well as a process for addressing exceedances of the triggers. Implementation Program Alternative 2 would best address these concerns. Below is a matrix showing how the water quality objective alternatives discussed earlier correspond to the implementation alternatives.

Matrix of Corresponding Water Quality Objective and Implementation Alternatives

Water Quality Objective Alternatives	Implementation Alternatives
1a. No Project, No new action	1. No implementation program
1b. No Project, Study plan to support development of objective to protect multiple beneficial uses	4. Implementation with monitoring program only
2. Objective to protect multiple uses	None available
	2. Implementation with numeric triggers and

3. Objective to protect Public Water Supply component of MUN	follow-up action, or 3. Implementation with triggers without follow-up action

6 PROPOSED BASIN PLAN AMENDMENT

The proposed changes to the Basin Plan are as follows. The project area map in Appendix A will be included as an appendix to the Basin Plan. Text additions to the existing Basin Plan language are underlined and *italicized*. Modify the Basin Plan under the heading, "Water Quality Objectives for Inland Surface Waters**"** (page III-3.00), as follows:

Cryptosporidium and Giardia

Waters shall not contain Cryptosporidium and Giardia in concentrations that adversely affect the public water system component[5] of the MUN beneficial use. This narrative water quality objective for Cryptosporidium and Giardia shall be applied within the Sacramento-San Joaquin Delta and its tributaries below the first major dams (shown in Appendix X) and should be implemented as specified in Section IV of the Basin Plan. Compliance with this objective will be assessed at existing and new public water system intakes.

Add footnote for existing Chemical Constituents narrative objective:

Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.*

**This includes drinking water chemical constituents of concern, such as organic carbon.*

Modify the Basin Plan under the heading, "Water Quality Concerns**"** (page IV-1.00), as follows:

8. Drinking Water Policy

The Regional Water Board supports protection of the MUN beneficial use in surface waters of the Sacramento-San Joaquin Delta and its tributaries. The Delta provides drinking water to over 25 million people in the Southern California, Central Valley, Central Coast, and San Francisco Bay regions, and several million people obtain their water supply from the tributaries of the Delta. The tributaries of the Sacramento and San Joaquin Rivers that originate in the Cascades and Sierra Nevada Mountains generally have high water quality. However, as the tributaries flow into lower elevations, they are affected by natural processes, urban, industrial, and agricultural land uses, and a highly managed water supply system. This Policy pertains to the following drinking water constituents of concern: organic carbon, Cryptosporidium, Giardia, salt and nutrients. Work on the Policy was initiated in 2000 in response to concerns that these constituents might pose significant drinking water risks and result in significant additional treatment costs for water agencies due to the potential increased loading as a result of population growth in the watershed. Source control evaluations conducted in 2011 show that the load of organic carbon and nutrients will not likely increase in the future as a result of current regulatory actions. Monitoring of Cryptosporidium at public water system intakes from 2006 to 2011, as required by USEPA regulations, has not resulted in additional treatment requirements for public water systems treating water from the Delta and its tributaries. The Cryptosporidium and Giardia narrative objective and associated implementation program are to maintain existing conditions for public water systems, to comply with the Policy with Respect to Maintaining High Quality of Water in California and the Antidegradation Implementation Policy.

[5] Public water system as defined in Health and Safety Code, section 116275, subdivision (h)

Other elements of the Drinking Water Policy include the following:

- *The Basin Plan contains the following elements that address the protection of the MUN beneficial use:*
  - *All water quality objectives are developed to protect the MUN beneficial use unless otherwise stated. The Basin Plan also includes specific narrative and numeric objectives to protect the MUN beneficial use.*
  - *The existing narrative water quality objective for chemical constituents includes drinking water chemical constituents of concern, such as organic carbon.*
  - *The Implementation Chapter of the Basin Plan contains the following Policies relevant to the protection of the MUN beneficial use:*
    - *Resolution No. 68-16, Policy with Respect to Maintaining High Quality of Water in California (IV – 8.00).*
    - *Resolution No. 88-63, Sources of Drinking Water Policy (IV – 9.00).*
    - *Antidegradation Implementation Policy (IV – 15.01).*
    - *Policy for Application of Water Quality Objectives (IV – 16.00).*
    - *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California; a.k.a. State Implementation Plan or SIP (IV-26.02)*
  - *Continued coordinated monitoring and modeling of the identified drinking water constituents of concern is necessary to confirm that concentrations will not likely increase to levels that adversely affect beneficial uses. Monitoring completed to support the implementation of the Drinking Water Policy shall be coordinated with other monitoring programs already in place as well as the Delta Regional Monitoring Program. The Delta Regional Monitoring Program is a Regional Water Board initiated stakeholder effort to address the need for a comprehensive monitoring, assessment and reporting program.*
- *To further protect the public health, drinking water utilities employ a multi-barrier approach to control contaminants that includes source water protection, water treatment, and protection of distribution system water quality.*
- *Source evaluations based on 2011 permit conditions for publically owned treatment works, urban runoff, and irrigated agriculture, indicate that concentrations of organic carbon at public water system intakes are not expected to increase over time.*
- *Drinking water constituents of concern shall continue to be considered when NPDES facilities conduct their Antidegradation analysis.*
- *If there are significant changes to the characteristics of the project area, drinking water treatment standards based on source water quality, or knowledge regarding drinking water constituents of concern, the Central Valley Water Board may consider the need to reevaluate the Drinking Water Policy. The Drinking Water Policy will be reviewed by the Regional Water Board in 2023 to determine if the provisions should be revised.*
- *The Regional Water Board supports and recognizes the importance of USEPA's efforts to refine analytical methods to measure Cryptosporidium and Giardia in water.*

- *The Regional Water Board supports refinement of analytical modeling efforts to improve understanding of the fate and transport of drinking water constituents of concern.*
- *It is appropriate to use Cryptosporidium concentrations as an indicator of compliance with the Cryptosporidium and Giardia objective since Cryptosporidium is not as readily treated as Giardia when conventional drinking water treatment processes are employed, and USEPA promulgated new drinking water requirements specifically to address Cryptosporidium*

Modify the Basin Plan under the heading, "Control Action Considerations of the Central Valley Regional Water Board**"** (page IV-16.00), as follows:

8. Drinking Water Policy Implementation

As a part of the Drinking Water Policy, a narrative objective has been established for Cryptosporidium and Giardia to protect the public water system component of the MUN beneficial use. Although it is unclear what levels of Cryptosporidium and Giardia will impair this use, the goal of implementation is to maintain existing levels of pathogens at public water system intakes. This will be achieved by addressing controllable sources that are shown to cause or substantially contribute to Cryptosporidium levels increasing to the trigger level of the next highest bin classification. In accordance with the USEPA Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), public water systems are required to monitor for Cryptosporidium at their intakes; the monitoring results are used to establish the bin classification for the water system. To assure that Cryptosporidium levels at public water systems stay within the range of their existing bin classifications, triggers at public water system intakes are included below based on USEPA LT2ESWTR bin classifications. The triggers and the changes to LT2ESWTR bin levels do not indicate a violation of the narrative water quality objective for Cryptosporidium and Giardia nor are the triggers and the LT2ESWTR bin levels to be used for numeric effluent limits. Instead, the proposed numeric triggers may prompt action by the Regional Water Board.

Cryptosporidium Ambient Trigger Exceedance

If Cryptosporidium monitoring data from an existing public water system intake indicate that the maximum running annual average[6] has reached 80 percent of the next highest bin, as existed in 2013, the affected public water system may request that the Regional Water Board initiate the investigation described below and shown in Figure IV-1. Table IV-x shows the 2013 LT2ESWTR bin classifications and the 80 percent trigger levels.

Table IV-x. Bin Levels and 80 Percent Triggers

Bin Classification	Maximum Running Annual Average (oocysts/L)	80 Percent Trigger (oocysts/L)
1	< 0.075	0.06
2	0.075 to < 1.0	0.80
3	1.0 to < 3.0	2.40

If the affected public water system requests assistance, the Regional Water Board should coordinate with CDPH, the affected public water system and potential sources (e.g., storm water management entities, wastewater treatment or wetland managers, etc.) to assess the data and evaluate the need to conduct source evaluations and implement control options. The affected public water system may decline assistance from the Regional Water Board in

[6] *Maximum Running Annual Average as defined in USEPA Long Term 2 Enhanced Surface Water Treatment Rule*

addressing their compliance with the LT2ESWTR. The coordination and investigation effort should include the steps represented by the schematic overview in Figure IV-1.

Antidegradation Analysis

In addressing Cryptosporidium and Giardia in an antidegradation analysis for evaluating the public water system component of the MUN beneficial use, the monitoring results of the nearest impacted public water system intake shall be considered. In cases where a trigger (Section IV) at the nearest public water system intake has not been exceeded, the analysis should be simplified and may be curtailed, depending on the magnitude of the discharge in question and the likelihood of potential impact at public water system intakes. If a trigger has been exceeded, information from the resulting investigation should be considered in the antidegradation analysis.

Reasonable Potential

The Regional Water Board evaluated data representing 2013 conditions. An evaluation of this data indicates that the narrative water quality objective for Cryptosporidium and Giardia is being attained in surface waters at all public water system intakes in the Delta and its tributaries. The triggers and the changes between LT2ESWTR bin levels do not indicate a violation of the narrative water quality objective for Cryptosporidium and Giardia nor are the triggers and the LT2ESWTR bin levels to be used for numeric effluent limits.

The Regional Water Board will determine reasonable potential in accordance with the applicable state and federal regulatory requirements. For NPDES permittees, the numeric triggers as applied at the public water system intakes are part of the Regional Water Board's procedures under 40 CFR § 122.44(d)(1)(ii) for determining whether a discharge has reasonable potential. At the request of an affected public water system, implementation of the trigger provisions described in (Figure IV-1, flowchart) will help to ensure that management measures prevent violations of the narrative objective. As a result, NPDES dischargers are not expected to have a reasonable potential to cause or contribute to an excursion above the narrative objective, and NPDES permits are not expected to include effluent limitations to implement the narrative objective.

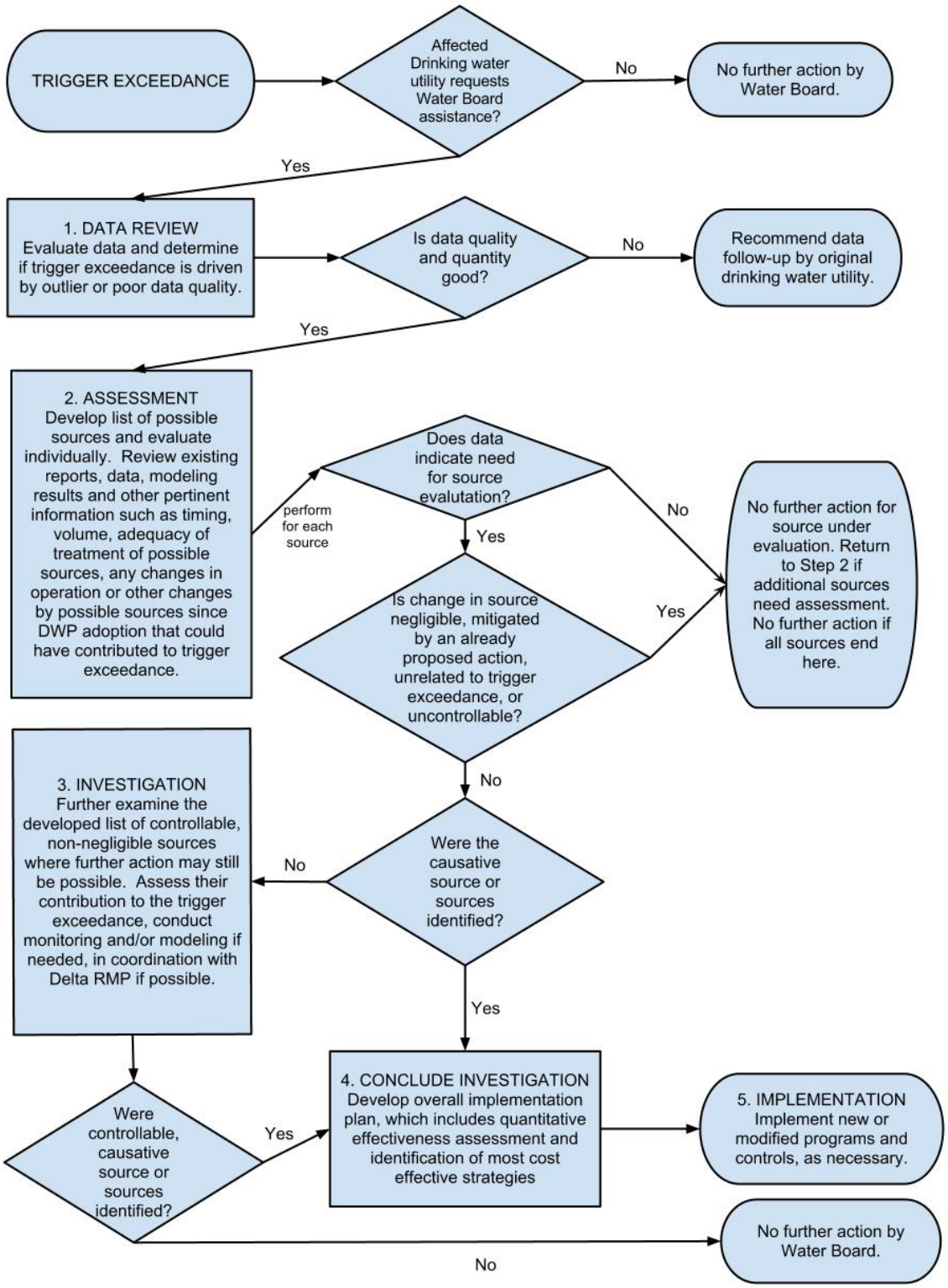

Figure IV-1: Schematic Overview of Actions prompted by *Cryptosporidium* Trigger Exceedance

Modify the Basin Plan under the heading, “Estimated Costs of Agricultural Water Quality Control Programs and Potential Sources of Funding” (page IV-39.00), as follows:

Drinking Water Policy

The total estimated costs to implement management practices, if necessary, range from zero to approximately $6.8 million (2013 dollars).

Potential funding sources include:

1. *Those identified in the San Joaquin River Subsurface Agricultural Drainage Control Program and Pesticide Control Program.*

Modify the Basin Plan under the heading, “Surveillance and Monitoring” (page V-5.00), as follows:

Drinking Water Policy

Monitoring and surveillance for the Drinking Water Policy consists of two elements.

Cryptosporidium and Giardia Monitoring

It is not the intent of the Drinking Water Policy to require routine effluent monitoring for Cryptosporidium and Giardia. Rather, the Regional Water Board should work with interested stakeholders to gather data that could be used to help identify potential sources if Cryptosporidium levels increase to the trigger level (in Section IV) at an existing public water system intake in the future. This one-time Cryptosporidium special study could be conducted through the Delta Regional Monitoring Program or through another coordinated effort between dischargers, drinking water suppliers, and state agencies. The study will characterize ambient background conditions and potential sources to be used when and if exceedance of a trigger occurs. The study is envisioned to last two years targeting the period of Long Term 2 Enhanced Surface Water Treatment Rule second round monitoring. The study may consist of the following elements:

- *Literature review to identify available source information*
- *Continued monitoring at existing public water systems intakes*
- *Monitoring at several ambient locations that will be identified as sites that integrate the pathogen sources where historic pathogen data are unavailable*
- *Monitoring at several representative discharge locations, if representative pathogen concentrations are not available or if coordinated data are necessary*
- *Hydrodynamic and particle tracking models to simulate the transport of pathogens from potential sources to public water system intakes*
- *If needed, focused studies to identify the viability and fate and transport of Cryptosporidium.*

A report documenting the results of the special study should be prepared.

Organic carbon, salinity, and nutrients

As waste discharge requirements are renewed, the Regional Water Board should consider the necessity for inclusion of monitoring of organic carbon, salinity, and nutrients. This consideration should include a combination of the following:

1. *The location with respect to drinking water intakes.*
2. *The importance of the load based on available information.*
3. *Whether the information exists that the load has significantly increased.*
4. *Importance of data to management decisions to protect drinking water.*

For general permits, agriculture and small dischargers (smaller than 5 mgd), careful consideration should be made as to whether monitoring for these constituents is necessary.

Where water quality monitoring is performed to evaluate management practices to control other constituents, the Regional Water Board recommends monitoring of organic carbon, salinity, and nutrients be considered to evaluate the influence on drinking water quality.

7 CONSISTENCY WITH OTHER LAWS, PLANS AND POLICIES

Any proposed changes to the Regional Water Board Basin Plans must be consistent with existing Federal and State laws and regulations including adopted State and Regional 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 narrative objective and Drinking Water Policy described by the proposed Basin Plan amendment.

7.1 CONSISTENCY WITH FEDERAL AND STATE LAWS

Federal agencies have adopted regulations implementing federal laws to which Central Valley Water Board actions must conform. The following Federal and State laws are relevant to the proposed Basin Plan amendment:

- Antidegradation Policy (40 CFR §131.12)
- Clean Water Act (33 U.S.C. § 1251 et seq.)
- Federal & State Endangered Species Acts (50 CFR § 402 *et seq*., California Fish and Game Code §2050-2116 *et seq*.)

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

7.1.1 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 Delta has not been designated an outstanding National resource, and thermal discharges were not evaluated during the development of the Drinking Water Policy. The goal of the narrative objective and the implementation plan is to prevent degradation at public water system intakes as described in Chapter 6. Therefore, adoption of the proposed Basin Plan Amendment to add a Drinking Water Policy and a narrative objective is consistent with the Federal Antidegradation Policy.

7.1.2 Clean Water Act

7.1.2.1 State Adoption of Standard

Under Section 303(c) of the Clean Water Act, water quality standards adopted by a State are subject to USEPA approval. The State must adopt water quality criteria that protect the designated use and such criteria must be based on sound scientific rationale. Information is not available to derive numeric water quality objectives so the Central Valley Water Board is proposing a narrative water quality objective that is protective of the public water system component of the MUN beneficial use. Therefore the proposed policy is consistent with the Clean Water Act.

7.1.2.2 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.

The proposed Drinking Water Policy establishes that the current conditions are in compliance with the proposed water quality objective and waste dischargers are not required to implement additional actions to comply with the proposed policy. Also as stated in the staff report, wildlife using habitat in natural, restored, or managed wetlands is an uncontrollable source of *Cryptosporidium* and *Giardia.* Therefore, adoption of the proposed amendment will not adversely affect or have net loss to current wetlands. Therefore, these laws and regulations pertaining to wetland loss are not applicable to the proposed Basin Plan amendment.

7.1.3 Federal & State Endangered Species Act

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 Wildlife and similarly maintains State lists of rare, threatened and endangered species. The proposed Basin Plan amendment is not expected to affect fish and wildlife. Therefore, the Endangered Species Act is not applicable to the proposed Basin Plan amendment.

7.2 Consistency with State Water Board Policies

The State Water Board is authorized to adopt state policy for water quality control (Wat. Code, §13140). State Water Board water quality control plans supersede any regional water quality control plans for the same waters to the extent of any conflict. (Wat. Code, §13170.) The following are the State Water Board policies:

- 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 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 No. 2002-0040)
- Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Resolution No. 2005-0019)
- Policy for Developing California's Clean Water Act Section 303(d) list (Resolution No. 2004-0063)
- Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options (Resolution No. 2005-0050)
- Policy for Compliance Schedules in Nation Pollutant Discharge Elimination System Permits (Resolution No. 2008-0025)
- Policy for Water Quality Control for Recycled Water (Resolution No. 2009-0011)

These policies are described in the following sections.

7.2.1 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."

Adoption of the proposed Basin Plan Amendment to add a Drinking Water Policy and a narrative objective with implementation plan is consistent with the State Antidegradation Policy. The goal of the narrative objective and the implementation plan is to maintain existing conditions in accordance with the Antidegradation Policy.

7.2.2 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. For the San Francisco Bay-Delta system, the policy requires implementation of a program which controls toxic effects through a combination of source control for toxic materials, upgraded waste treatment, and improved dilution of wastewaters to provide full protection to the biota and the beneficial uses of San Francisco Bay-Delta waters.

The proposed amendment addresses pathogens, organic carbon, nutrients, and salt, and none of these constituents are toxic pollutants. Specifically, the proposed Policy includes a narrative objective and an implementation plan to maintain existing conditions for *Cryptosporidium* and *Giardia*, which are non-toxic pollutants. Therefore, this policy is not applicable to the proposed Basin Plan amendment.

7.2.3 Resolution No. 88-63: Sources of Drinking Water Policy

This policy states that all waters of the state, with certain exceptions, are to be protected as existing or potential sources of municipal and domestic supply water. The proposed Basin Plan amendment does not affect the MUN designation of waters and is consistent with this policy.

7.2.4 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 as a guide to update portions of their Basin Plans. The Pollutant Policy Document requires that the Central Valley Water Board develop a Mass Emissions Strategy for limiting loads of pollutants from entering the Sacramento-San Joaquin Delta. The purpose of the Mass Emissions Strategy 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 Water Code and the Federal Clean Water Act.

The proposed Basin Plan amendment will not have impacts to accumulation of pollutants in sediment or bioaccumulation of pollutant substances in tissues of aquatic organisms; therefore, this Policy is not applicable to the proposed Basin Plan amendment.

7.2.5 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. The proposed Basin Plan amendment does not require any immediate cleanup and abatement activities. There are implementation provisions in the proposed amendment that which could identify a future need for cleanup and abatement activities. If cleanup and abatement activities are required as a result of implementation of proposed amendment, it will be in accordance with Resolution No. 92-49.

7.2.6 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 Water Code Section 13394. The proposed Basin Plan amendment does not address any of the constituents needing cleanup plans; therefore, the Cleanup Plan is not applicable to the proposed Basin Plan amendment.

7.2.7 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 amendment does not require immediate implementation measures for point source or nonpoint source discharges. There are implementation provisions in the proposed amendment that which could identify a future need for implementation measures. If implementation measures for nonpoint source discharges are required as a result of implementation of proposed amendment, it will be in accordance with Resolution No. 99-114 and Resolution No. 2004-0030.

7.2.8 Resolution No. 2004-0063: Policy for Developing California's Clean Water Act Section 303(d) List

Pursuant to Water Code section 13191.3, subdivision (a), this State policy for water quality control describes the process by which the State Water Board and the Regional Water Boards will comply with the listing requirements of Clean Water Act Section 303(d). The Listing Policy establishes a standardized approach for developing California's Section 303(d) list to achieve water quality standards and maintain beneficial uses in all of California's surface waters. The Listing Policy applies only to the listing process methodology used to comply with Clean Water Act Section 303(d).

Clean Water Act Section 303(d) requires states to identify waters that do not meet, or are not expected to meet by the next listing cycle, applicable water quality standards after the application of certain technology-based controls and schedule such waters for development of Total Maximum Daily Loads (40 CFR §130.7(c) and (d)).

The proposed Basin Plan amendment includes a narrative objective and establishes that the current conditions comply with the proposed narrative objective. The triggers in the implementation provisions do not indicate exceedance of the proposed narrative objective and will not be used for establishing the Clean Water Act Section 303(d) list but will be used to prevent degradation of water quality by triggering an implementation plan.

7.2.9 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;
- Water Code section 13191.3, subdivision (a) requirements to prepare guidelines to be used by the Regional Water Boards in listing, delisting, developing, and implementing TMDLs pursuant to CWA Section 303(d) of 33 USC Section 1313(d); and

Water Code section 13191.3, subdivision (b) requires 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 Water Board and Regional Water 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 Water 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 Water 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 Water Board finds that the solution will actually correct the impairment, the Regional Water 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.

D4. If a solution to an impairment is being implemented by a non-regulatory action of another entity, and the Regional Water Board finds that the solution will actually correct the impairment, the Regional Water 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."

No water bodies have been listed as impaired due to *Cryptosporidium and Giardia,* nor will they be listed based on the information in the proposed amendment. Therefore, this policy is not applicable to the proposed Basin Plan amendment.

7.2.10 Resolution No. 2009-0011: Water Quality Control for Recycled Water Policy

This Policy is intended to establish consistent and predictable requirements in order to increase the use of recycled water in California. The Policy establishes mandates for the use of recycled water; requires the development by stakeholders and the adoption by Regional Water Quality Control Boards of regional salt/nutrient management plans; establishes requirements for regulating incidental runoff from landscape irrigation with recycled water; establishes criteria and procedures for recycled water landscape irrigation projects eligible for streamlined permitting; establishes procedures for permitting groundwater recharge projects; establishes procedures for implementing State Water Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California" for recycled water projects; requires the establishment of a scientific advisory panel to advise the State Water Board on regulation of constituents of emerging concern; and establishes actions and incentives to promote the use of recycled water.

The proposed Basin Plan amendment would not restrict the development or use of recycled water; therefore, the amendment is consistent with the need to develop and use recycled water.

7.3 Consistency with Central Valley Regional Water Quality Board Policies

The following are the Central Valley Water Board policies:

- Urban Runoff Policy
- Controllable Factors Policy
- Water Quality Limited Segment Policy
- Antidegradation Implementation Policy
- Application of Water Quality Objectives Policy
- Watershed Policy

These policies and their relevance to the proposed Basin Plan amendment are described in the following sections.

7.3.1 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 amendment addresses constituents that have not been shown to be water quality problems in urban runoff. If future monitoring shows that urban runoff is linked to a trigger exceedence, it will be addressed through the Drinking Water Policy implementation provisions. The implementation provisions include requirements to assess the problem and to consider abatement measures to address the problem, in compliance with the Urban Runoff Policy. The Basin Plan amendment includes specific language that effluent limits should not be based on the triggers developed for the amendment. Exceedance of a trigger does not indicate a violation of the proposed narrative objective but triggers a Water Board investigation.

7.3.2 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 Central Valley Water Board, and that may be reasonably controlled."

The proposed Basin Plan amendment is consistent with the Controllable Factors Policy. The proposed amendment includes implementation provisions to protect existing conditions by assessing controllable sources and developing implementation plans, as needed.

7.3.3 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."

Cryptosporidium and Giardia are not listed on the CWA Section 303(d) list as constituents causing impairments. The proposed amendment should not be used as the basis to list *Cryptosporidium and Giardia* on the CWA Section 303(d) list. Therefore, this policy is not applicable to the proposed Basin Plan amendment.

7.3.4 Antidegradation Implementation Policy

Consistency of the proposed Basin Plan amendment with the federal and state antidegradation policies is discussed earlier in this section.

7.3.5 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, rather than at an intake, wellhead or other point of consumption…
>
> The numerical and narrative water quality objectives define the least stringent standards that the Regional Water Boards will apply to regional waters in order to protect beneficial uses… However, the water quality objectives do not require improvement over naturally occurring background concentrations….
>
> To evaluate compliance with the narrative water quality objectives, the Regional Water Board considers, on a case-by-case basis, direct evidence of beneficial use impacts, all material and relevant information submitted by the discharger and other interested parties, and relevant numerical criteria and guidelines developed and/or published by other agencies and organizations (e.g., State Water Board, California Department of Health Services, California Office of Environmental Health Hazard Assessment, California Department of Toxic Substances Control, University of California Cooperative Extension, California Department of Fish and Game, USEPA, U.S. Food and Drug Administration, National Academy of Sciences, U.S. Fish and Wildlife Service, Food and Agricultural Organization of the United Nations)…"

The proposed Basin Plan amendment is focused on the protection of the MUN beneficial use and the proposed objective and implementation policy is limited in scope to public water system intakes. The amendment includes this policy in its description of current Basin Plan policies that protect MUN. The statement in this Policy regarding the application of objectives to all waters is applied generally to water quality objectives with no specified compliance locations. However, it does not preclude the Board from establishing water quality objective with specific compliance points.

7.3.6 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 amendment was developed with the assistance of the Workgroup, which is a stakeholder-based platform formed to develop the Drinking Water Policy. The proposed Basin Plan amendment includes an implementation program to investigate the source area of any degradation as indicated by exceedance of triggers at public water system intakes. The investigation would likely include review of the watershed sanitary survey assessment of upstream sources, which is consistent with a watershed based approach to addressing water quality problems. Therefore, the proposed Basin Plan amendment is consistent with the Watershed Policy.

8 ENVIRONMENTAL ANALYSIS

8.1 Environmental Impacts of the Proposed Project

The environmental impacts for the proposed project (i.e., the proposed Basin Plan amendment) are discussed in Appendix B, CEQA Checklist. Based on the CEQA evaluation, the proposed Basin Plan amendment and the reasonably foreseeable means of compliance will not result in any significant environmental impacts, and no mitigation measures are proposed. The proposed narrative objective is currently being met, and there is no anticipated need to implement control measures.

8.2 Reasonable Foreseeable Methods of Compliance

The Central Valley Water Board is required to perform, at the time it adopts a rule or regulation requiring the installation of pollution control equipment, or a performance standard or treatment requirement, an environmental analysis of the reasonable foreseeable methods of compliance. (PRC §21159.)

The proposed Basin Plan amendment does not require any immediate installation of pollution control equipment or a performance standard or treatment requirement since the proposed narrative objective is to maintain current conditions. To maintain current conditions, an implementation program with triggers is included in the proposed amendment. Exceedance of the triggers could lead to implementation of measures described in Section 4.5.3.

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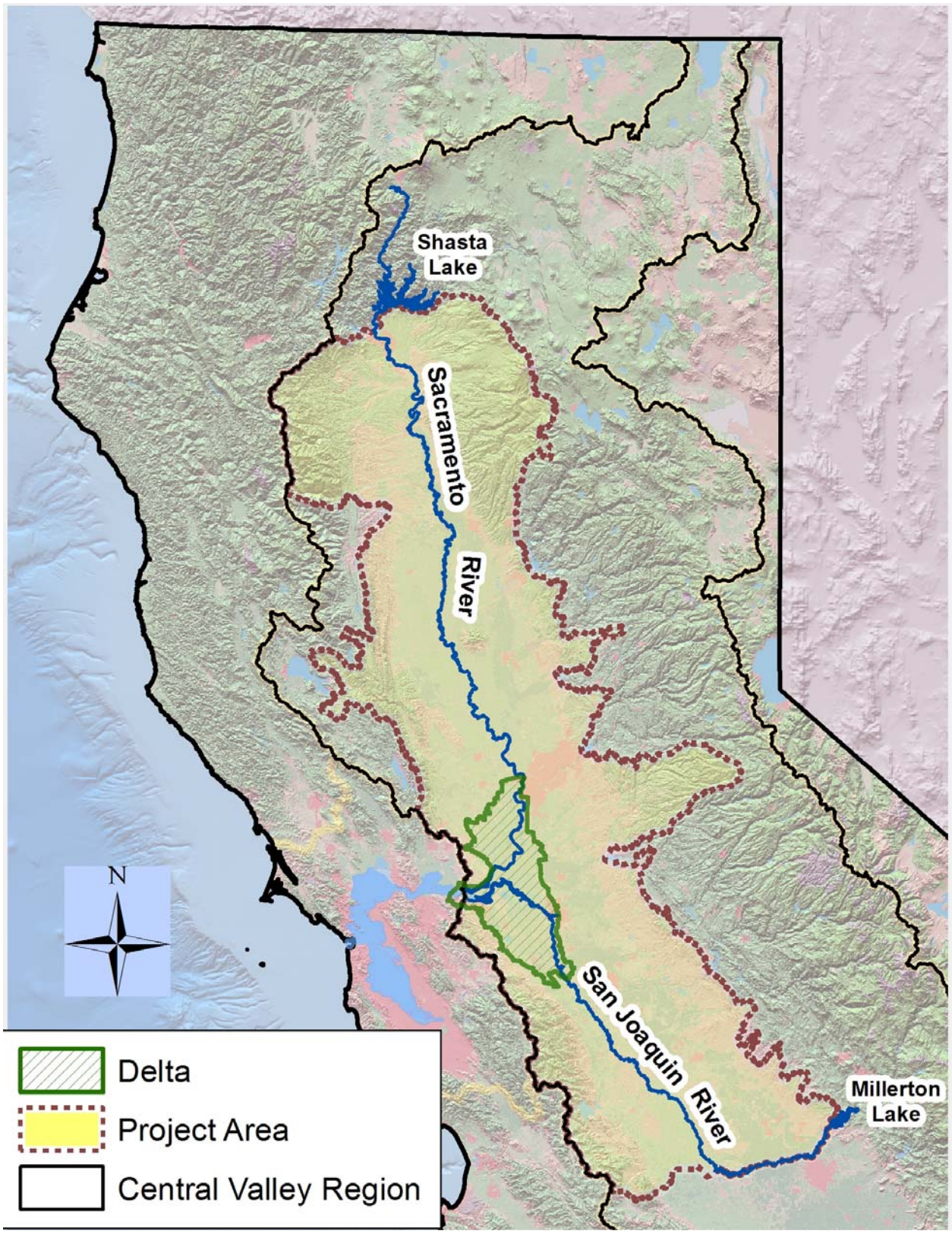
Appendix A: Map of Project Area
Proposed New Appendix to Basin Plan


Shasta Lake
Sacramento River
San Joaquin River
Millerton Lake
N
Delta
Project Area
Central Valley Region

Appendix B: California Environmental Quality Act Checklist

Amendment to the Water Quality Control Plan to Establish a Drinking Water Policy for Surface Waters of the Sacramento-San Joaquin Delta and Upstream Tributaries

Environmental Checklist

California Environmental Quality Act Requirements

The Central Valley Regional Water Quality Control Board ("Central Valley Water Board" or "Board"), as a Lead Agency under the California Environmental Quality Act (CEQA), is responsible for evaluating all the potential environmental impacts that may occur due to changes made to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins ("Basin Plan"). (Public Resources Code (PRC) §21000 et seq.) The Secretary of Resources has determined that the Central Valley Water Board's Basin Planning Process qualifies as a certified regulatory program pursuant to PRC section 21080.5 and California Code of Regulations, title 14, section 15251, subdivision (g). This determination means that, together, the Staff Report, this Environmental Evaluation (consisting mostly of the Environmental Factors Checklist) and other supporting documentation satisfy the requirements of State Water Board's Regulations for Implementation of CEQA, Exempt Regulatory Programs, which are found at California Code of Regulations, title 23, section 3775 et seq.

This Environmental Evaluation documents staff's analysis of potential environmental impacts that could occur from reasonably foreseeable methods of implementing the proposed recommended and alternative actions discussed in the Staff Report. The evaluation is organized into three sections: (1) a description of the Proposed Project, (2) the Environmental Factors Checklist, including a discussion of potential environmental impacts and mitigation measures for each of the 18 resource categories, and (3) the final Determination.

Proposed Project

The proposed project is a Basin Plan amendment to establish a Drinking Water Policy that protects surface waters of the Sacramento-San Joaquin Delta and its tributaries below the first major dams. The project addresses the following drinking water constituents of concern: Cryptosporidium, Giardia, organic carbon, nutrients and salinity.

The project will include a narrative water quality objective for *Cryptosporidium* and *Giardia* to protect the public water system component of the MUN beneficial use, implementation provisions for the narrative objective, monitoring and surveillance provisions to support the Drinking Water Policy, clarification of the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern, and compilation of existing Basin Plan elements associated with the protection of the MUN beneficial use.

1. Project title:

Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins to Establish a Drinking Water Policy for Surface Waters of the Sacramento-San Joaquin Delta and Upstream Tributaries

2. Lead agency name and address:

California Regional Water Quality Control Board, Central Valley Region
11020 Sun Center Drive, #200, Rancho Cordova, CA 95670

3. Contact person and phone number:

Jay Simi, Water Resources Control Engineer, (916) 464-4833
Sue McConnell, Senior Water Resources Control Engineer, (916) 464-4798

4. Project location:

The project area includes surface waters of the Delta and its tributaries below the first major dams. The boundaries of the project are Shasta Dam on the Sacramento River, Millerton Dam on the San Joaquin River, and Folsom Dam on the American River. The geographic setting and watershed characteristics are more thoroughly described in Section 4.5.2 of the *Central Valley Water Board Staff Report supporting the Amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins to Establish a Drinking Water Policy for Surface Waters of the Sacramento – San Joaquin Delta and Upstream Tributaries*.

5. Description of project:

The Central Valley Water Board is proposing an amendment to the Basin Plan to:

1) Establish a narrative water quality objective for *Cryptosporidium* and *Giardia* to protect the public water system component of the MUN beneficial use. As described in the Staff Report, there are currently no violations of the water quality objective. The implementation plan includes numeric triggers to prompt investigatory action by the Central Valley Water Board to identify sources of changes in existing water quality. However, the numeric triggers would not indicate a violation of the water quality objective.
2) Include monitoring and surveillance language designed to support the Drinking Water Policy. This includes a one-time special study to characterize ambient background conditions and potential sources of *Cryptosporidium* in the project area and consideration of monitoring for organic carbon, nutrients and salinity when waste discharger requirements are renewed.
3) Clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon.
4) Compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

Implementation Actions

The proposed Basin Plan amendment will include an implementation plan for the narrative water quality objective for *Cryptosporidium* and *Giardia*. As described in the Staff Report, there are no current violations of the water quality objective. The goal of the implementation plan is to maintain existing water quality.

Existing water quality with respect to *Cryptosporidium* and *Giardia* is defined by the established bin classifications of public water systems according to the US EPA's Long Term 2 Enhanced Surface Water Treatment Rule. Bin Classifications are based on *Cryptosporidium* levels in the drinking water treatment system influent.

Numeric triggers included in the implementation plan are set at 80% of the next bin classification threshold. Exceedance of the numeric triggers or bin classifications would not indicate a violation of the water quality objective. Rather, the triggers could prompt an investigation by the Central Valley Water Board into the source(s) of the change in existing water quality. Elements of the investigation are described in the Staff Report.

Environmental Checklist

Evaluation of the Environmental Impacts in the Checklist

1. The board must complete an environmental checklist prior to the adoption of plans or policies for the Basin/208 Planning program as certified by the Secretary for Natural Resources. The checklist becomes a part of the Substitute Environmental Documentation (SED).

2. For each environmental category in the checklist, the board must determine whether the project will cause any adverse impact. If there are potential impacts that are not included in the sample checklist, those impacts should be added to the checklist.

3. If the board determines that a particular adverse impact may occur as a result of the project, then the checklist boxes must indicate whether the impact is "Potentially Significant," "Less than Significant with Mitigation Incorporated," or "Less than Significant."

   a. "Potentially Significant Impact" applies if there is substantial evidence that an impact may be significant. If there are one or more "Potentially Significant Impact" entries on the checklist, the SED must include an examination of feasible alternatives and mitigation measures for each such impact, similar to the requirements for preparing an environmental impact report.

   b. "Less than Significant with Mitigation Incorporated" applies if the board or another agency incorporates mitigation measures into the SED that will reduce an impact that is "Potentially Significant" to a "Less than Significant Impact." If the board does not require the specific mitigation measures itself, then the board must be certain that the other agency will in fact incorporate those measures.

   c. "Less than Significant" applies if the impact will not be significant, and mitigation is therefore not required.

   d. If there will be no impact, check the box under "No Impact."

4. The board must provide a brief explanation for each "Potentially Significant," "Less than Significant with Mitigation Incorporated," "Less than Significant," or "No Impact" determination in the checklist. The explanation may be included in the written report described in section 3777(a)(l) or in the checklist itself. The explanation of each issue should identify: (a) the significance criteria or threshold, if any, used to evaluate each question; and (b) the specific mitigation measure(s) identified, if any, to reduce the impact to less than significant. The board may determine the significance of the impact by considering factual evidence, agency standards, or thresholds. **If** the "No Impact" box is checked, the board should briefly provide the basis for that answer. If there are types of impacts that are not listed in the checklist, those impacts should be added to the checklist.

   5. The board must include mandatory findings of significance if required by CEQA Guidelines section 15065.

6. The board should provide references used to identify potential impacts, including a list of information sources and individuals contacted.

This section presents the impacts and mitigation, where applicable, for the proposed implementation alternatives evaluated in the Staff Report. Each of these implementation alternatives has been independently evaluated. The Environmental Factors Checklist is organized into 18 resource categories, each of which includes a description of potential impacts and mitigation.

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 baseline for this environmental impact analysis is defined as the conditions in the project area, as described in the Staff Report, as of 2011. The baseline for this analysis includes mandated improvements required under NPDES permits adopted prior to the end of 2010. This baseline does not consider potential future changes to the project area that could result from current or proposed regulatory or policy changes.

I. AESTHETICS

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use. The proposed project will have no effect on scenic vistas and will not degrade visual character. The proposed project will not result in any visible change; therefore, the project will have no effect on aesthetics.

II. AGRICULTURE AND FOREST RESOURCES

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest 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 to forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Boards.

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
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?	☐	☐	☒	☐

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As described in the Staff Report, numeric triggers for *Cryptosporidium* are included in the implementation plan. The triggers are set at 80% of the next bin classification threshold as defined by the US EPA Long Term 2 Enhanced Surface Water Treatment Rule. In the event of a trigger exceedance, identified controllable sources may be required to develop and implement a source control strategy. The source control strategy could include additional water quality monitoring and/or implementation of management practices to control *Cryptosporidium* and *Giardia.*

Farmland has been identified as a potential source of *Cryptosporidium* and *Giardia* due to fertilization practices and the presence of wildlife. If Farmland is identified as a contributing source of a trigger exceedance, additional requirements could potentially be placed upon agricultural land managers. Source control actions have been identified that could result in limited conversion of Farmland to non-agricultural use. The use of vegetative buffer strips and constructed wetlands are potential management practices that have been shown to effectively control the movement of *Cryptosporidium* and *Giardia* from both agricultural and rural lands. If vegetative buffer strips or wetlands are to be implemented, it is likely that a portion of Farmland would be converted to non-agricultural use. Impacts from the implementation of vegetative buffer strips or constructed wetlands include initial capital costs associated with construction of the buffer strips or wetlands, ongoing costs associated with maintenance of the buffer strips or wetlands, and long term economic loss associated with the loss of productive Farmland.

Additional requirements placed upon agricultural land managers to ensure compliance with the proposed project could increase operational costs for farming. Increased operation costs could potentially result in conversion of Farmlands to non-agricultural uses if the additional costs associated with ensuring compliance with the proposed project make continued farming economically infeasible.

As discussed in the Staff Report, there are currently no additional requirements being placed upon agricultural land managers as part of the proposed project. Additional requirements may be implemented if there is an exceedance of the proposed numeric trigger and if Farmlands are identified as a contributing source. Should additional control measures be required as a result of the proposed project, it is expected that measures will be taken by the implementing entity to minimize the impacts of construction and ongoing maintenance of those control measures.

III. AIR QUALITY

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As described in the Staff Report, numeric triggers for *Cryptosporidium* are included in the implementation plan. The triggers are set at 80% of the next bin classification threshold as defined by the US EPA Long Term 2 Enhanced Surface Water Treatment Rule. In the event of a trigger exceedance, identified controllable sources may be required to develop and implement a source control strategy. The source control strategy could include additional water quality monitoring and/or implementation of management practices to control *Cryptosporidium* and *Giardia*.

There are source control practices described in the Staff Report that could potentially negatively impact air quality. Should additional source control measures be required for publically owned treatment works, additional treatment measures may need to be constructed and maintained. Any new construction may create dust, and long term operation of additional treatment measures could generate additional greenhouse gasses due to increased power consumption. Vegetative buffer strips and constructed wetlands have been identified as a control measure that could be used to control the movement of *Cryptosporidium* and *Giardia* from runoff in both Farmland and urban areas. If vegetative buffer strips or constructed wetlands are implemented, short-term dust impacts could be created during construction in the areas immediately surround the implementation areas.

As discussed in the Staff Report, no source control practices are currently required to be implemented as part of the proposed project. Additional control measures may be implemented if there is an exceedance of the proposed numeric trigger, and if they are required by the source control plan that is developed. Should additional control measures be required as a result of the proposed project, it is expected that measures will be taken by the implementing entity to minimize the environmental impacts of construction and ongoing maintenance of those control measures.

IV. BIOLOGICAL RESOURCES

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (such as marsh, vernal, pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As described in the Staff Report, numeric triggers for *Cryptosporidium* are included in the implementation plan. The triggers are set at 80% of the next bin classification threshold as defined by the US EPA Long Term 2 Enhanced Surface Water Treatment Rule. In the event of a trigger exceedance, identified controllable sources may be required to develop and implement a source control strategy. The source control strategy could include additional water quality monitoring and/or implementation of management practices to control *Cryptosporidium* and *Giardia.*

As discussed in the Staff Report, no source control practices are currently required to be implemented as part of the proposed project. Also, wildlife using habitat in natural, restored, or managed wetlands is an uncontrollable source of *Cryptosporidium* and *Giardia* and not subject to the implementation plan. Therefore, the Drinking Water Policy will not affect biological resources such as wetlands.

V. CULTURAL RESOURCES **ENVIRONMENTAL FACTORS**	**POTENTIALLY SIGNIFICANT IMPACT**	**LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED**	**LESS THAN SIGNIFICANT IMPACT**	**NO IMPACT**
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 geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As discussed in the Staff Report, no source control practices are currently required to be implemented as part of the proposed project. Additional control measures may be implemented if there is an exceedance of the proposed numeric trigger, and they are required by the source control plan that is developed. Should additional control measures be required as a result of the proposed project, it is expected that measures will be taken by the implementing entity to minimize the environmental impacts of construction and ongoing maintenance of those control measures. Additional control measures, if needed, should not include construction in previously undisturbed areas. Therefore, the proposed project will not impact cultural resources.

VI. GEOLOGY AND SOILS **ENVIRONMENTAL FACTORS**	**POTENTIALLY SIGNIFICANT IMPACT**	**LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED**	**LESS THAN SIGNIFICANT IMPACT**	**NO IMPACT**
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?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As discussed in the Staff Report, no source control practices are currently required to be implemented as part of the proposed project. Additional control measures will only be implemented if there is an exceedance of the proposed numeric trigger, and they are required by the source control plan that is developed. Should additional control measures be required as a result of the proposed project, it is expected that measures will be taken by the implementing entity to minimize the environmental impacts of construction and ongoing maintenance of those control measures. Any additional control measures, if needed, will not result in substantial soil erosion or loss of topsoil. Therefore, the proposed project will not impact geology and soils.

VII. GREENHOUSE GAS EMISSIONS	**POTENTIALLY SIGNIFICANT IMPACT**	**LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED**	**LESS THAN SIGNIFICANT IMPACT**	**NO IMPACT**
Would the project:				
a) Generate Greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As described in the Staff Report, numeric triggers for *Cryptosporidium* are included in the implementation plan. The triggers are set at 80% of the next bin classification threshold as defined by the US EPA Long Term 2 Enhanced Surface Water Treatment Rule. In the event of a trigger exceedance, identified controllable sources may be required to develop and implement a source control strategy. The source control strategy could include additional water quality monitoring and/or implementation of management practices to control *Cryptosporidium* and *Giardia*.

There are source control practices described in the Staff Report that could potentially negatively impact air quality. Should additional source control measures be required for publically owned treatment works additional treatment measures may need to be constructed and maintained. Any new construction may create dust and long term operation of additional treatment measures could generate additional greenhouse gasses due to increased power consumption.

As discussed in the Staff Report, there are currently no source control practices being implemented as part of the proposed project. Additional control measures may be implemented if there is an exceedance of the proposed numeric trigger and the source control plan that is developed requires them. Should additional control measures be required as a result of the proposed project it is expected that measures will be taken by the implementing entity to minimize the environmental impacts of construction and ongoing maintenance of those control measures. The Drinking Water Policy will have a less then significant impact on the generation of Greenhouse gas emissions and no impact on plans, policy or regulations adopted for the purpose of reducing emissions of greenhouse gases.

VIII. HAZARDS AND HAZARDOUS MATERIALS ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒
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?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use. The project does not generate, transport or otherwise involve any hazardous materials. There are no elements of the proposed project that would impact hazards or hazardous materials.

IX. HYDROLOGY AND WATER QUALITY				
ENVIRONMENTAL FACTORS	**POTENTIALLY SIGNIFICANT IMPACT**	**LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED**	**LESS THAN SIGNIFICANT IMPACT**	**NO IMPACT**
Would the Project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion 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 which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

Though the proposed project will establish a new water quality objective, there are no current violations of the objective. The implementation program included in the proposed project will ensure that current conditions for *Cryptosporidium* and *Giardia*, as defined by the established bin classifications of public water systems according to the US EPA Long Term 2 Enhanced Surface Water Treatment Rule, will be maintained.

Under the proposed project there is potential for degradation of water quality with respect to *Cryptosporidium* and *Giardia.* The implementation program included in the proposed project applies only in the instance of an exceedance of the numeric trigger for *Cryptosporidium*. Under the proposed project, no action would be required under the implementation program if *Cryptosporidium* levels increase but remain below the applicable numeric trigger. The impact of this potential degradation of water quality on the public water system component of the MUN beneficial use would be less than significant as there would be no additional burden on public water system operators and no change in the quality of the treated water.

Under the proposed project there is potential for degradation of water quality with respect to *Cryptosporidium* and *Giardia.* The implementation program included in the proposed project applies only in the instance of an exceedance of the numeric trigger for *Cryptosporidium*. Under the proposed project, no action would be required under the implementation program if *Cryptosporidium* levels increase but remain below the applicable numeric trigger. The impact of this potential degradation of water quality on the public water system component of the MUN beneficial use would be less than significant as there would be no additional burden on public water system operators and no change in the quality of the treated water.

No elements of the proposed project will impact groundwater supplies, alter drainage patterns or significantly degrade water quality. No elements of the proposed project will place housing or other structures in the 100-year flood zone or expose people or structures to risk of loss, injury, or death due to flooding.

X. LAND USE AND PLANNING

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for Cryptosporidium and Giardia along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As described in the Staff Report, numeric triggers for *Cryptosporidium* are included in the implementation plan. The triggers are set at 80% of the next bin classification threshold as defined by the US EPA Long Term 2 Enhanced Surface Water Treatment Rule. In the event of a trigger exceedance, identified controllable sources may be required to develop and implement a source control strategy. The source control strategy could include additional water quality monitoring and/or implementation of management practices to control *Cryptosporidium* and *Giardia.*

As discussed in the Staff Report, there are currently no source control practices being implemented as part of the proposed project. Additional control measures may be implemented if there is an exceedance of the proposed numeric trigger and the source control plan that is developed requires them. Should additional control measures be required as a result of the proposed project it is expected that measures will be taken by the implementing entity to minimize the environmental impacts of construction and ongoing maintenance of those control measures. Also, wildlife using habitat in natural, restored, or managed wetlands is an uncontrollable source of Cryptosporidium and Giardia and not subject to the implementation plan; therefore, the Drinking Water Policy will not affect the planning efforts that include wetlands.

XI. MINERAL RESOURCES

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Would the Project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use. There are no elements of the proposed project that would impact mineral resources.

XII. NOISE

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As described in the Staff Report, numeric triggers for *Cryptosporidium* are included in the implementation plan. The triggers are set at 80% of the next bin classification threshold as defined by the US EPA Long Term 2 Enhanced Surface Water Treatment Rule. In the event of a trigger exceedance, identified controllable sources may be required to develop and implement a source control strategy. The source control strategy could include additional water quality monitoring and/or implementation of management practices to control *Cryptosporidium* and *Giardia*.

There are source control practices described in the Staff Report that could potentially create noise. Should additional source control measures be required for publically owned treatment works additional treatment measures may need to be constructed and maintained. Noise created during construction could impact the areas immediately surrounding the publically owned treatment facility during the construction period. Noise could also be created if construction vegetative buffer strips are required to control the movement of *Cryptosporidium* and *Giardia* from Farmlands and other rural lands. These impacts would be less than significant.

As discussed in the Staff Report, no source control practices are currently required to be implemented as part of the proposed project. Additional control measures may be implemented if there is an exceedance of the proposed numeric trigger and the source control plan that is developed requires them. Should additional control measures be required as a result of the proposed project it is expected that measures will be taken by the implementing entity to minimize the impacts of construction and ongoing maintenance of those control measures.

XIII. POPULATION AND HOUSING **ENVIRONMENTAL FACTORS**	**POTENTIALLY SIGNIFICANT IMPACT**	**LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED**	**LESS THAN SIGNIFICANT IMPACT**	**NO IMPACT**
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?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use. There are no elements of the proposed project that would impact population and housing.

XIV. PUBLIC SERVICES

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Would the Project:				
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☒	☐
Other public facilities?	☐	☐	☐	☒

As described in the Staff Report, direct contact recreation has been identified as a potential source of *Cryptosporidium* and *Giardia*. Should additional source control measures be required to control source loading of *Cryptosporidium* and *Giardia* due to direct contact recreation there could be some impact on parks. Making additional restroom facilities available to the public was identified as one possible measure that could control source loading from direct contact recreation. Construction and maintenance of these facilities will add to the costs associated with park maintenance. As park maintenance costs increase the availability of services could be lessened due to budget constraints.

As discussed in the Staff Report, no source control practices are currently required to be implemented as part of the proposed project. Additional control measures may be implemented if there is an exceedance of the proposed numeric trigger and the source control plan that is developed requires them. Should additional control measures be required as a result of the proposed project it is expected that measures will be taken by the implementing entity to minimize the impacts of construction and ongoing maintenance of those control measures. This is a less than significant impact on Parks.

XV. RECREATION

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒	☐

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As described in the Staff Report, numeric triggers for *Cryptosporidium* are included in the implementation plan. The triggers are set at 80% of the next bin classification threshold as defined by the US EPA Long Term 2 Enhanced Surface Water Treatment Rule. In the event of a trigger exceedance, identified controllable sources may be required to develop and implement a source control strategy. The source control strategy could include additional water quality monitoring and/or implementation of management practices to control *Cryptosporidium* and *Giardia*.

As described in the Staff Report, direct contact recreation has been identified as a potential source of *Cryptosporidium* and *Giardia*. Should additional source control measures be required to control source loading of *Cryptosporidium* and *Giardia* due to direct contact recreation there could be some impact on recreational facilities. Making additional restroom facilities available to the public was identified as one possible measure that could control source loading from direct contact recreation. Construction and maintenance of these facilities will add to the costs associated with recreational facility maintenance. As recreational facility maintenance costs increase the availability of services could be lessened due to budget constraints. This is a less than significant impact.

As discussed in the Staff Report, no source control practices are currently required to be implemented as part of the proposed project. Additional control measures may be implemented if there is an exceedance of the proposed numeric trigger and the source control plan that is developed requires them. Should additional control measures be required as a result of the proposed project it is expected that measures will be taken by the implementing entity to minimize the impacts of construction and ongoing maintenance of those control measures.

XVI. TRANSPORTATION / TRAFFIC

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Would the Project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards 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) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use. There are no elements of the proposed project that would impact transportation and traffic.

XVII. UTILITIES AND SERVICE SYSTEMS

ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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?	☐	☐	☐	☒
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?	☐	☐	☐	☒

The proposed project establishes a narrative water quality objective for *Cryptosporidium* and *Giardia* along with implementation provisions. The proposed project will also include monitoring and surveillance language designed to support the Drinking Water Policy, clarify the existing chemical constituents objective to explicitly include drinking water chemical constituents of concern such as organic carbon, and it will compile existing Basin Plan elements associated with the protection of the MUN beneficial use.

As described in the Staff Report, numeric triggers for *Cryptosporidium* are included in the implementation plan. The triggers are set at 80% of the next bin classification threshold as defined by the US EPA Long Term 2 Enhanced Surface Water Treatment Rule. In the event of a trigger exceedance, identified controllable sources may be required to develop and implement a source control strategy. The source control strategy could include additional water quality monitoring and/or implementation of management practices to control *Cryptosporidium* and *Giardia*.

Both publically owned treatment works (POTW) and urban runoff have been identified as potential sources of *Cryptosporidium* and *Giardia*. Should source reductions be required, management practices have been identified that could reduce loading of *Cryptosporidium* and *Giardia* from POTWs and urban runoff.

Addition of advanced filtration followed by UV disinfection to existing POTWs or the use of constructed wetlands would result in a reduction of *Cryptosporidium* and *Giardia* loading. Construction and maintenance of these additional treatment facilities could result in increased capital and ongoing operational costs for POTW operators. Implementation of these facilities could create noise and dust impacts in the immediate surroundings during construction and could increase greenhouse gas emissions due to increased power consumption over the life of the facilities.

Vegetative buffer strips and constructed wetlands have been identified as a management practice that could potentially be used to control *Cryptosporidium* and *Giardia* loading from urban runoff. Implementation of vegetative buffer strips and constructed wetlands could create noise and dust during construction. Other practices include public education and installation of pet waste disposal stations. These practices would not require or result in construction or expansion of new storm water drainage facilities.

As discussed in the Staff Report, no source control practices are currently required to be implemented as part of the proposed project. Additional control measures may be implemented if there is an exceedance of the proposed numeric trigger and the source control plan that is developed requires them. Should additional control measures be required as a result of the proposed project it is expected that measures will be taken by the implementing entity to minimize the impacts of construction and ongoing maintenance of those control measures.

XVIII. MANDATORY FINDINGS OF SIGNIFICANCE ENVIRONMENTAL FACTORS	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Would the Project:				
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 which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Based on the analysis of potential environmental impacts associated with implementation of the Basin Plan, none of the 18 environmental factors listed in the Environmental Checklist would have a "Potentially Significant Impact." Also, a statement of overriding considerations is not necessary since there are no unavoidable adverse environmental effects associated with this project.

(3) Determination

On the basis of this initial evaluation:

- ☒ 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.

Appendix C: *Cryptosporidium* and *Giardia* Data

Cryptosporidium Monitoring at Drinking Water Intakes

Sacramento River Basin

Feather River

Yuba City Water Treatment Plant Intake

Date	*Cryptosporidium* (oocysts/L)
4/4/07	0
5/3/07	0
6/6/07	0
7/2/07	0
8/1/07	0
9/5/07	0
10/1/07	0
11/7/07	0
12/5/07	0
1/2/08	0
2/6/08	0
3/5/08	0

Date	*Cryptosporidium* (oocysts/L)
4/2/08	0
5/9/08	0
6/4/08	0
7/2/08	0
8/6/08	0
9/3/08	0
10/1/08	0
11/5/08	0
12/4/08	0
1/7/09	0
2/4/09	0
3/6/09	0

American River

Folsom Lake Intake

Date	*Cryptosporidium* (oocysts/L)
5/15/03	< 0.1
9/22/03	< 0.1
1/20/04	< 0.09
2/18/04	< 0.09
3/22/04	< 0.1
4/19/04	< 0.1

Date	*Cryptosporidium* (oocysts/L)
5/18/04	< 0.1
6/21/04	< 0.09
7/19/04	< 0.09
8/18/04	< 0.09
9/20/04	< 0.09
10/18/04	< 0.09

Date	*Cryptosporidium* (oocysts/L)
11/22/04	< 0.1
12/21/04	< 0.1
1/18/05	< 0.09
2/22/05	< 0.09
3/22/05	< 0.1
4/19/05	< 0.09
5/18/05	< 0.09

Date	*Cryptosporidium* (oocysts/L)
6/21/05	< 0.1
7/19/05	< 0.09
8/22/05	< 0.1
9/20/05	< 0.09
10/18/05	< 0.1
11/22/05	< 0.1
12/20/05	< 0.1

Folsom South Canal Intake

Date	*Cryptosporidium* (oocysts/L)
8/20/03	0.00
9/24/03	0.00
10/14/03	0.00
11/13/03	0.00
12/16/03	0.00
1/21/04	0.00
2/17/04	0.00
3/16/04	0.00
4/22/04	0.00
5/13/04	0.00
6/15/04	0.00
7/19/04	0.00
8/17/04	0.00
9/16/04	0.00
10/15/04	0.00
11/16/04	0.00
12/16/04	0.00

Date	*Cryptosporidium* (oocysts/L)
1/15/05	0.00
2/16/05	0.00
3/17/05	0.00
4/15/05	0.00
5/16/05	0.00
6/16/05	0.00
7/19/05	0.00
8/18/05	0.00
9/15/05	0.00
10/17/05	0.00
11/15/05	0.00
12/15/05	0.00
1/17/06	0.00
2/15/06	0.00
3/15/06	0.00
4/13/06	0.00
5/16/06	0.00

Date	*Cryptosporidium* (oocysts/L)
6/15/06	0.00
7/13/06	0.00
8/15/06	0.00
9/14/06	0.00
10/12/06	0.00
11/15/06	0.00
12/14/06	0.00
1/16/07	0.00
2/19/07	0.00
3/14/07	0.00
4/17/07	0.00

Date	*Cryptosporidium* (oocysts/L)
5/15/07	0.00
6/19/07	0.00
7/17/07	0.00
8/15/07	0.00
9/17/07	0.00
10/15/07	0.00
11/15/07	0.00
12/13/07	0.00

Fairbairn Water Treatment Plant Intake

Date	*Cryptosporidium* Fluorescence Antibody (oocysts/L)
4/30/01	< 0.09
5/14/01	< 0.09
7/9/01	< 0.09
10/8/01	< 0.09
11/1/01	< 0.1
12/10/01	< 0.09
1/14/02	< 0.09
2/11/02	< 0.09
3/11/02	< 0.09
4/8/02	< 0.09
5/13/02	< 0.09

Date	*Cryptosporidium* Fluorescence Antibody (oocysts/L)
6/10/02	< 0.09
7/8/02	< 0.09
8/12/02	< 0.09
9/9/02	< 0.09
10/14/02	<0.09
11/12/02	< 0.09
12/9/02	< 0.09
1/13/03	< 0.09
1/27/03	< 0.09
2/3/03	< 0.09
3/3/03	< 0.09

Date	*Cryptosporidium* Fluorescence Antibody (oocysts/L)
4/7/03	< 0.09
5/5/03	0.09
6/2/03	< 0.09
7/7/03	0.09

Date	*Cryptosporidium* Fluorescence Antibody (oocysts/L)
8/4/03	< 0.09
9/2/03	0.09
10/6/03	< 0.09
11/3/03	< 0.09

Putah Creek

Waterman Water Treatment Plant Intake on Putah South Canal

Date	*Cryptosporidium* (oocysts/L)
10/18/06	0
11/15/06	0
12/20/06	0
1/17/07	0
2/21/07	0
3/21/07	0
4/18/07	0
5/16/07	0.1
6/20/07	0.1
7/18/07	0
8/14/07	0
9/19/07	0

Date	*Cryptosporidium* (oocysts/L)
10/16/07	0
11/20/07	0
12/19/07	0
1/16/08	0
2/20/08	0
3/19/08	0
4/16/08	0
5/21/08	0
6/18/08	0
7/16/08	0
8/20/08	0
9/17/08	0

Barker Slough

Barker Slough Pumping Plant

Date	*Cryptosporidium* (oocysts/L)
1/21/04	< 0.1
2/18/04	0.2
4/21/04	< 0.1
5/19/04	< 0.1
6/16/04	< 0.1
7/21/04	< 0.1
8/18/04	< 0.1
9/15/04	< 0.1
10/20/04	< 0.1
11/17/04	< 0.1
12/16/04	< 0.1
1/19/05	< 0.1
2/16/05	< 0.1
3/16/05	< 0.1
4/20/05	< 0.1
5/18/05	< 0.3
6/15/05	0.1
7/20/05	< 0.1
8/17/05	< 0.1
9/21/05	< 0.1
10/19/05	< 0.125
11/16/05	< 0.1
12/14/05	< 0.1
1/18/06	< 0.1
2/15/06	< 0.1
3/15/06	< 0.1

Date	*Cryptosporidium* (oocysts/L)
4/19/06	< 0.1
5/17/06	< 0.1
6/21/06	< 0.1
7/19/06	< 0.1
8/16/06	< 0.2
9/20/06	< 0.1
10/18/06	< 0.1
11/15/06	< 0.1
12/20/06	< 0.1
1/17/07	< 0.1
2/21/07	< 0.1
3/21/07	< 0.1
4/18/07	0
5/17/07	0
6/21/07	0
7/18/07	0
8/15/07	0
9/19/07	0
10/17/07	0
11/21/07	0
12/19/07	0
1/16/08	0
2/20/08	0
3/19/08	0
4/16/08	0
5/21/08	0

Date	*Cryptosporidium* (oocysts/L)
6/18/08	0
7/16/08	0

Date	*Cryptosporidium* (oocysts/L)
8/20/08	0
9/17/08	0

Sacramento River

Bella Vista Water Treatment Plant Intake

Date	*Cryptosporidium* (oocysts/L)
2/27/08	0
3/24/08	0
4/21/08	0
5/27/08	0
6/23/08	0
7/30/08	0
8/27/08	0
9/23/08	0
10/27/08	0
11/24/08	0
12/29/08	0
1/26/09	0
2/23/09	0

Date	*Cryptosporidium* (oocysts/L)
3/23/09	0
4/27/09	0
5/26/09	0
6/22/09	0
7/27/09	0
8/25/09	0
9/21/09	0
10/26/09	0
11/17/09	0
12/29/09	0
1/25/10	0
2/22/10	0

Woodland Davis Water Treatment Plant Intake

Date	*Cryptosporidium* (oocysts/L)
8/25/09	0
9/28/09	0
10/27/09	0
11/30/09	0

Date	*Cryptosporidium* (oocysts/L)
12/28/09	0.089
1/26/10	0.273
2/24/10	0
3/30/10	0

Date	*Cryptosporidium* (oocysts/L)
4/27/10	0
5/25/10	0
6/29/10	0
7/27/10	0
8/31/10	0
9/28/10	0
10/26/10	0
11/30/10	0
12/28/10	0

Date	*Cryptosporidium* (oocysts/L)
1/25/11	0
2/22/11	0.095
3/29/11	0
4/26/11	0
5/31/11	0
6/28/11	0
7/26/11	0
8/30/11	0

Bryte Bend Water Treatment Plant Intake

Date	*Cryptosporidium* (oocysts/L)
10/2/00	< 0.09
12/21/00	0.09
3/26/01	< 0.2
5/16/01	0.09
9/4/01	< 0.2
11/13/01	< 0.09
5/20/02	< 0.1
8/19/02	< 0.1
2/10/03	< 0.09
5/13/03	< 0.09
9/16/03	< 0.1
11/18/03	0.1
3/4/04	< 0.1
5/6/04	< 0.1
8/18/04	< 0.1

Date	*Cryptosporidium* (oocysts/L)
11/4/04	< 0.1
2/8/05	< 0.2
5/11/05	0.8
8/24/05	< 0.1
12/7/05	0.3
2/1/06	0.2
4/2/07	< 0.093
5/1/07	< 0.0909
6/5/07	< 0.093
7/2/07	< 0.0909
8/1/07	< 0.0909
9/19/07	0.093
1/10/08	< 0.0909
2/4/08	0.136 *
3/5/08	< 0.093

Date	*Cryptosporidium* (oocysts/L)
4/8/08	< 0.0909
5/5/08	< 0.0909
6/4/08	< 0.0909
7/8/08	< 0.0909
8/12/08	< 0.0909
9/4/08	< 0.0909
10/7/08	0
11/4/08	0.095 *
12/2/08	0
1/6/09	0
2/4/09	0

Date	*Cryptosporidium* (oocysts/L)
3/9/09	0
4/6/09	0
5/6/09	0
6/2/09	0
7/6/09	0
8/6/09	0
9/8/09	0
10/6/09	0
11/3/09	0
12/8/09	0.089 *

* Data Corrected by Bonny Starr

Sacramento Water Treatment Plant Intake

Date	*Cryptosporidium* Fluorescence Antibody (oocysts/L)
4/30/01	< 0.1
5/14/01	< 0.1
7/9/01	< 0.1
10/8/01	< 0.1
11/1/01	< 0.1
1/14/02	< 0.09
2/11/02	< 0.09
3/11/02	< 0.09
4/8/02	< 0.1
5/13/02	< 0.09
6/10/02	< 0.1

Date	*Cryptosporidium* Fluorescence Antibody (oocysts/L)
7/8/02	< 0.09
8/12/02	< 0.09
9/9/02	< 0.09
10/14/02	< 0.09
3/4/03	< 0.09
4/7/03	< 0.09
5/5/03	< 0.09
6/2/03	< 0.09
7/7/03	< 0.09
8/4/03	< 0.09
9/2/03	< 0.09

Date	*Cryptosporidium* Fluorescence Antibody (oocysts/L)
10/6/03	< 0.09
11/3/03	< 0.09
12/1/03	0.2
1/5/04	< 0.1
2/2/04	< 0.09
3/1/04	0.2
4/5/04	< 0.09
5/3/04	< 0.09
6/7/04	< 0.09

Date	*Cryptosporidium* Fluorescence Antibody (oocysts/L)
7/6/04	< 0.09
8/2/04	< 0.09
9/7/04	< 0.09
10/4/04	< 0.09
11/1/04	< 0.09
12/6/04	< 0.09
1/3/05	0.5
2/7/05	< 0.09

Freeport Intake

Date	*Cryptosporidium* (oocysts/L)
4/18/05	<0.09
5/16/05	0.09
6/20/05	0.09
7/21/05	< 0.09
8/15/05	< 0.05
9/19/05	< 0.09
10/17/05	< 0.09
11/21/05	< 0.09
12/19/05	0.2
1/16/06	< 0.09
2/21/06	< 0.09
3/20/06	< 0.09

Date	*Cryptosporidium* (oocysts/L)
4/17/06	< 0.09
5/15/06	0.09
6/19/05	< 0.09
7/17/06	< 0.09
8/21/06	< 0.09
9/18/06	< 0.09
10/16/06	< 0.09
11/21/06	< 0.1
12/18/06	< 0.09
1/22/07	< 0.09
2/20/07	< 0.09
3/19/07	< 0.091

San Joaquin River Basin

Sonora Water Treatment Plant Intake on South Fork Stanislaus River

Date	*Cryptosporidium* (oocysts/L)
11/8/06	0
4/9/08	0
5/7/08	0
6/11/08	0
7/9/08	0
8/6/08	0
9/10/08	0
10/8/08	0
11/5/08	0
12/10/08	0
1/7/09	0
2/4/09	0.186
3/11/09	0

Date	*Cryptosporidium* (oocysts/L)
4/8/09	0
5/6/09	0
6/10/09	0
7/8/09	0
8/5/09	0
9/9/09	0
10/7/09	0
11/4/09	0
12/9/09	0.279
1/6/10	0
2/3/10	0.186
3/10/10	0.093

Stockton East Water District Stanislaus River Diversion

Date	*Cryptosporidium* (oocysts/L)
10/18/06	0.1
11/15/06	0
12/13/06	0
4/18/07	0
5/16/07	0.1
6/13/07	0
7/18/07	0
8/15/07	0
9/12/07	0

Date	*Cryptosporidium* (oocysts/L)
10/17/07	0
11/14/07	0.2
12/12/07	0
2/13/08	0
3/10/08	0
4/16/08	0
5/14/08	0
6/18/08	0
7/16/08	0

8/18/08	0
9/17/08	0

Stockton East Water District Calaveras River Diversion

Date	***Cryptosporidium* (oocysts/L)**
10/18/06	0
11/15/06	0
12/13/06	0.2
1/17/07	0
2/14/07	0.2
3/14/07	0
4/18/07	0
5/16/07	0
6/13/07	0
7/18/07	0
8/15/07	0
9/12/07	0

Date	***Cryptosporidium* (oocysts/L)**
10/17/07	0
11/14/07	0
12/12/07	0
1/16/08	0
2/13/08	0
3/10/08	0
4/16/08	0
5/14/08	0
6/18/08	0
7/16/08	0
8/18/08	0
9/17/08	0

Stockton East Water District Intake

Date	***Cryptosporidium* (oocysts/L)**
10/18/2006	0
11/15/2006	0.2
12/13/2006	0
1/17/2007	0
2/14/2007	0.7
3/14/2007	0
4/18/2007	0
5/16/2007	0
6/13/2007	0

Date	***Cryptosporidium* (oocysts/L)**
7/18/2007	0
8/15/2007	0
9/12/2007	0
10/17/2007	0
11/14/2007	0
12/12/2007	0
1/16/2008	0
2/13/2008	0
3/10/2008	0

Date	*Cryptosporidium* (oocysts/L)
4/16/2008	0
5/14/2008	0
6/18/2008	0

Date	*Cryptosporidium* (oocysts/L)
7/16/2008	0
8/18/2008	0
9/17/2008	0

Sacramento – San Joaquin River Delta

Old River at Contra Costa Water District Intake

Date	*Cryptosporidium* (oocysts/L)
11/15/10	ND
12/6/10	ND
1/3/11	ND
2/7/11	ND
3/7/11	0.1
4/4/11	ND
5/2/11	ND
6/1/11	ND
7/1/11	ND
8/1/11	ND
9/1/11	ND
10/1/11	ND

Date	*Cryptosporidium* (oocysts/L)
11/1/11	ND
12/1/11	ND
1/1/12	ND
2/1/12	ND
3/1/12	0.1
4/1/12	ND
5/1/12	ND
6/1/12	ND
7/1/12	ND
8/1/12	ND
9/1/12	ND
10/1/12	ND

Victoria Canal at Contra Costa Water District Intake

Date	*Cryptosporidium* (oocysts/L)
11/15/10	ND
12/6/10	ND
1/3/11	ND
2/7/11	ND

Date	*Cryptosporidium* (oocysts/L)
3/7/11	ND
4/4/11	0.1
5/2/11	ND
6/1/11	ND

Date	*Cryptosporidium* (oocysts/L)
7/1/11	ND
8/1/11	ND
9/1/11	ND
10/1/11	ND
11/1/11	ND
12/1/11	ND
1/1/12	ND
2/1/12	ND

Date	*Cryptosporidium* (oocysts/L)
3/1/12	ND
4/1/12	ND
5/1/12	ND
6/1/12	ND
7/1/12	ND
8/1/12	ND
9/1/12	ND
10/1/12	ND

Randall Bold Water Treatment Plant Intake

Date	*Cryptosporidium* (oocysts/L)
1/20/04	< 1
2/19/04	< 1
3/23/04	< 1
4/13/04	< 1
5/11/04	< 1
6/15/04	< 1
7/20/04	< 1
8/24/04	< 1
9/21/04	< 1
10/19/04	< 1
11/16/04	< 1
12/14/04	< 1
1/18/05	< 1
2/22/05	< 1
3/15/05	< 1
4/19/05	< 1

Date	*Cryptosporidium* (oocysts/L)
4/19/05	< 1
5/17/05	< 1
6/21/05	< 1
7/19/05	< 1
8/16/05	< 1
9/13/05	< 1
10/18/05	< 1
11/15/05	< 1
12/20/05	< 1
1/17/06	< 1
2/21/06	< 1
3/21/06	< 1
4/18/06	< 1
5/16/06	< 1
6/20/06	< 1
7/18/06	< 1

8/15/06	< 0.9

Bollman Water Treatment Plant Intake

Date	*Cryptosporidium* (oocysts/L)
1/20/04	< 1
2/17/04	< 1
3/23/04	< 1
4/13/04	< 1
5/11/04	< 1
6/15/04	< 1
7/20/04	< 1
8/24/04	< 1
9/30/04	< 1
10/19/04	< 1
11/16/04	< 1
12/14/04	< 1
1/18/05	< 1
2/22/05	< 1
3/15/05	< 1
4/19/05	< 1

Date	*Cryptosporidium* (oocysts/L)
5/24/05	< 1
6/21/05	< 1
7/19/05	< 1
8/16/05	< 1
9/13/05	< 1
10/18/05	< 1
11/15/05	< 1
12/20/05	< 1
1/17/06	2
2/21/06	< 1
3/21/06	< 1
4/18/06	< 1
5/16/06	< 1
6/20/06	< 1
7/18/06	< 1
8/15/06	< 1

South Bay Aqueduct

Patterson Pass Water Treatment Plant Intake

Date	*Cryptosporidium* (oocysts/L)
12/17/03	< 0.1
1/20/04	< 0.1
2/17/04	< 0.1
3/16/04	< 0.1
4/20/04	< 0.1
5/18/04	< 0.1
6/15/04	< 0.1
7/20/04	< 0.1
8/17/04	< 0.1
9/14/04	< 0.1
10/19/04	< 0.1
11/16/04	< 0.1

Date	*Cryptosporidium* (oocysts/L)
12/14/04	< 0.1
1/18/05	< 0.1
2/15/05	< 0.1
3/15/05	< 0.1
4/19/05	< 0.1
5/17/05	< 0.1
6/15/05	< 0.1
7/19/05	< 0.1
8/16/05	< 0.1
9/21/05	< 0.1
10/18/05	< 0.1
11/15/05	< 0.1

Penitencia Water Treatment Plant Intake

Date	*Cryptosporidium* (oocysts/L)
1/28/03	< 0.1
2/18/03	< 0.1
3/18/03	< 0.1
4/15/03	< 0.1
5/20/03	< 0.1
6/17/03	< 0.1
7/15/03	< 0.1
8/18/03	< 0.1
9/16/03	< 0.1
10/14/03	< 0.1
11/15/03	< 0.1
12/16/03	< 0.1

Date	*Cryptosporidium* (oocysts/L)
1/20/04	< 0.1
2/17/04	< 0.1
3/16/04	< 0.1
4/20/04	< 0.1
5/18/04	< 0.1
6/15/04	< 0.1
7/20/04	< 0.1
8/17/04	< 0.1
9/14/04	< 0.1
10/19/04	< 0.1
11/16/04	< 0.1
12/14/04	< 0.1

Date	*Cryptosporidium* (oocysts/L)
1/17/06	< 0.1
2/14/06	< 0.1
3/14/06	< 0.1
4/18/06	< 0.1
5/16/06	< 0.1
6/20/06	< 0.1
7/18/06	< 0.1
8/15/06	< 0.1
9/19/06	< 0.1
10/17/06	< 0.1
11/15/06	< 0.1
12/19/06	< 0.1
2/20/07	< 0.1
3/20/07	< 0.1
4/17/07	< 0.1
5/15/07	< 0.1
6/19/07	< 0.1
7/17/07	< 0.1
8/14/07	< 0.1
9/18/07	< 0.1
10/16/07	< 0.1
11/13/07	< 0.1
12/11/07	< 0.1
1/15/08	< 0.1
2/19/08	< 0.1
4/1/08	< 0.1
5/27/08	< 0.1
6/17/08	< 0.1

Date	*Cryptosporidium* (oocysts/L)
7/22/08	< 0.1
8/19/08	< 0.1
9/16/08	< 0.1
10/14/08	< 0.1
11/10/08	< 0.1
12/9/08	< 0.1
2/3/09	< 0.1
3/10/09	< 0.1
4/14/09	< 0.1
5/5/09	< 0.1
6/9/09	< 0.1
7/14/09	< 0.1
8/18/09	< 0.1
9/8/09	< 0.1
10/20/09	< 0.1
11/17/09	< 0.1
12/8/09	< 0.1
1/12/10	< 0.1
2/16/10	< 0.1
3/16/10	< 0.1
6/8/10	< 0.1
7/13/10	< 0.1
8/10/10	< 0.1
9/14/10	< 0.1
10/19/10	< 0.1
11/16/10	< 0.1
12/14/10	< 0.1

Delta - Mendota Canal

Delta – Mendota Canal Intake

Date	*Cryptosporidium* (oocysts/L)
1/07	0.093
2/07	0.000
3/07	0.000
4/07	0.000
5/07	0.000
6/07	0.000
7/07	0.000
8/07	0.000
9/07	0.000
10/07	0.000
11/07	0.000
12/07	0.000

Date	*Cryptosporidium* (oocysts/L)
1/08	0.000
2/08	0.000
3/08	0.000
4/08	0.000
5/08	0.090
6/08	0.000
7/08	0.000
8/08	0.000
9/08	0.000
10/08	0.000
11/08	0.000
12/08	1.000

Giardia Monitoring at Drinking Water Intakes

Sacramento River Basin

American River

Folsom Lake Intake

Date	*Giardia* (cysts/L)
5/15/03	< 0.1
9/22/03	0.1
1/20/04	< 0.09
2/18/04	0.09
3/22/04	0.2
4/19/04	< 0.1
5/18/04	< 0.1
6/21/04	0.09
7/19/04	< 0.09
8/18/04	< 0.09
9/20/04	< 0.09
10/18/04	< 0.09
11/22/04	< 0.1

Date	*Giardia* (cysts/L)
12/21/04	0.2
1/18/05	0.5
2/22/05	< 0.09
3/22/05	< 0.1
4/19/05	< 0.09
5/18/05	< 0.09
6/21/05	< 0.1
7/19/05	< 0.09
8/22/05	< 0.1
9/20/05	< 0.09
10/18/05	< 0.1
11/22/05	< 0.1
12/20/05	< 0.1

Folsom South Canal Intake

Date	*Giardia* (cysts/L)
8/20/03	0.00
9/24/03	0.00
10/14/03	0.00
11/13/03	0.00
12/16/03	0.00
1/21/04	0.00

Date	*Giardia* (cysts/L)
2/17/04	0.00
3/16/04	0.00
4/22/04	0.00
5/13/04	0.00
6/15/04	0.00
7/19/04	0.00

Date	*Giardia* (cysts/L)
8/17/04	0.00
9/16/04	0.00
10/15/04	0.00
11/16/04	0.00
12/16/04	0.00
1/15/05	0.00
2/16/05	0.00
3/17/05	0.00
4/15/05	0.00
5/16/05	0.00
6/16/05	0.00
7/19/05	0.00
8/18/05	0.00
9/15/05	0.00
10/17/05	0.00
11/15/05	0.00
12/15/05	0.00
1/17/06	0.00
2/15/06	0.00
3/15/06	0.00
4/13/06	0.00
5/16/06	0.00

Date	*Giardia* (cysts/L)
6/15/06	0.00
7/13/06	0.00
8/15/06	0.00
9/14/06	0.00
10/12/06	0.00
11/15/06	0.00
12/14/06	0.00
1/16/07	0.00
2/19/07	0.00
3/14/07	NA
4/17/07	0.00
5/15/07	0.00
6/19/07	0.00
7/17/07	0.00
8/15/07	0.00
9/17/07	0.00
10/15/07	0.00
11/15/07	0.00
12/13/07	0.00

Fairbairn Water Treatment Plant Intake

Date	*Giardia* Fluorescence Antibody (cysts/L)
4/30/01	< 0.09
5/14/01	< 0.09
7/9/01	< 0.09
10/8/01	0.3
11/1/01	0.2
12/10/01	< 0.09
1/14/02	0.09
2/11/02	0.09
3/11/02	0.09
4/8/02	0.3
5/13/02	0.3
6/10/02	0.2
7/8/02	0.5
8/12/02	0.2
9/9/02	0.2

Date	*Giardia* Fluorescence Antibody (cysts/L)
10/14/02	0.5
11/12/02	0.3
12/9/02	0.5
1/13/03	< 0.09
1/27/03	0.09
2/3/03	< 0.09
3/3/03	0.2
4/7/03	0.2
5/5/03	0.2
6/2/03	0.09
7/7/03	0.9
8/4/03	0.8
9/2/03	0.09
10/6/03	0.4
11/3/03	0.5

Putah Creek

Waterman Water Treatment Plant Intake on Putah South Canal

Date	*Giardia* (cysts/L)
7/11/05	< 0.1
10/10/05	< 0.1
9/6/06	< 0.1

Barker Slough

Barker Slough Pumping Plant

Date	*Giardia* (cysts/L)
1/21/04	< 0.1
2/18/04	1.4
4/21/04	< 0.1
5/19/04	< 0.1
6/16/04	< 0.1
7/21/04	0. 3
8/18/04	0.1
9/15/04	0.3
10/20/04	< 0.1
11/17/04	< 0.1
12/16/04	< 0.1
1/19/05	< 0.1
2/16/05	< 0.1
3/16/05	< 0.1
4/20/05	< 0.1
5/18/05	< 0.3
6/15/05	< 0.1
7/20/05	< 0.1
8/17/05	< 0.1
9/21/05	< 0.1
10/19/05	< 0.125
11/16/05	< 0.1
12/14/05	0.1
1/18/06	0.1
2/15/06	0.1
3/15/06	< 0.1
4/19/06	< 0.1

Date	*Giardia* (cysts/L)
5/17/06	< 0.1
6/21/06	< 0.1
7/19/06	< 0.1
8/16/06	< 0.2
9/20/06	< 0.1
10/18/06	< 0.1
11/15/06	< 0.1
12/20/06	< 0.1
1/17/07	< 0.1
2/21/07	< 0.1
3/21/07	< 0.1
4/18/07	3
5/17/07	0
6/21/07	0
7/18/07	0
8/15/07	0
9/19/07	0
10/17/07	0
11/21/07	0
12/19/07	1
1/16/08	0
2/20/08	0
3/19/08	0
4/16/08	0
5/21/08	0
6/18/08	0
7/16/08	0

Date	*Giardia* (cysts/L)
8/20/08	0

Date	*Giardia* (cysts/L)
9/17/08	0

Sacramento River

Woodland Davis Water Treatment Plant Intake

Date	*Giardia* (cysts/L)
8/25/09	0
9/28/09	2
10/27/09	7

Date	*Giardia* (cysts/L)
11/30/09	2
12/28/09	2

Bryte Bend Water Treatment Plant Intake

Date	*Giardia* (cysts/L)
10/2/00	< 0.09
12/21/00	0.5
3/26/01	< 0.2
5/16/01	0.09
9/4/01	0.3
11/13/01	< 0.09
5/20/02	< 0.1
8/19/02	0.3
2/10/03	0.09
5/13/03	< 0.09
9/16/03	0.1
11/18/03	0.9
3/4/04	< 0.1
5/6/04	< 0.1
8/18/04	0.5

Date	*Giardia* (cysts/L)
11/4/04	1
2/8/05	< 0.2
5/11/05	< 0.8
8/24/05	< 0.1
12/7/05	0.2
2/1/06	0.6
4/2/07	0.186
5/1/07	< 0.0909
6/5/07	< 0.093
7/2/07	0.182
8/1/07	< 0.0909
9/19/07	0.093
1/10/08	< 0.0909
2/4/08	1
3/5/08	< 0.093

Date	*Giardia* (cysts/L)
4/8/08	0.273
5/5/08	0.182
6/4/08	0.364
7/8/08	< 0.0909
8/12/08	< 0.0909
9/4/08	0.182
10/7/08	0
11/4/08	12
12/2/08	2
1/6/09	1
2/4/09	1

Date	*Giardia* (cysts/L)
3/9/09	0
4/6/09	0
5/6/09	0
6/2/09	1
7/6/09	0
8/6/09	1
9/8/09	0
10/6/09	3
11/3/09	8
12/8/09	4

Sacramento Water Treatment Plant Intake

Date	*Giardia* Fluorescence *Antibody* (cysts/L)
4/30/01	0.1
5/14/01	0.1
7/9/01	0.1
10/8/01	0.1
11/1/01	< 0.1
1/14/02	< 0.09
2/11/02	0.09
3/11/02	0.3
4/8/02	0.3
5/13/02	0.2
6/10/02	< 0.1
7/8/02	< 0.09

Date	*Giardia* Fluorescence *Antibody* (cysts/L)
8/12/02	< 0.09
9/9/02	0.2
10/14/02	0.2
3/4/03	< 0.09
4/7/03	< 0.09
5/5/03	0.09
6/2/03	0.09
7/7/03	0.09
8/4/03	< 0.09
9/2/03	0.3
10/6/03	0.6
11/3/03	0.6

Date	*Giardia* Fluorescence *Antibody* (cysts/L)
12/1/03	0.3
1/5/04	1
2/2/04	0.4
3/1/04	0.2
4/5/04	< 0.09
5/3/04	0.2
6/7/04	0.09
7/6/04	< 0.09

Date	*Giardia* Fluorescence *Antibody* (cysts/L)
8/2/04	0.2
9/7/04	0.09
10/4/04	0.4
11/1/04	< 0.09
12/6/04	2
1/3/05	2
2/7/05	< 0.09

Freeport Intake

Date	*Giardia* (*cysts*/L)
4/18/05	0.09
5/16/05	< 0.09
6/20/05	0.4
7/21/05	< 0.09
8/15/05	< 0.05
9/19/05	< 0.09
10/17/05	0.2
11/21/05	0.7
12/19/05	0.1
1/16/06	< 0.09
2/21/06	0.2
3/20/06	< 0.09

Date	*Giardia* (*cysts*/L)
4/17/06	< 0.09
5/15/06	< 0.09
6/19/05	< 0.09
7/17/06	< 0.09
8/21/06	0.09
9/18/06	< 0.09
10/16/06	0.4
11/21/06	0.1
12/18/06	0.3
1/22/07	0.2
2/20/07	< 0.09
3/19/07	< 0.091

Sacramento – San Joaquin River Delta

Old River at Contra Costa Water District Intake

Date	*Giardia* (cysts/L)
11/15/10	0.2
12/6/10	ND
1/3/11	ND
2/7/11	ND
3/7/11	0.1
4/4/11	ND
5/2/11	0.11
6/1/11	ND
7/1/11	0.2
8/1/11	ND
9/1/11	ND
10/1/11	ND

Date	*Giardia* (cysts/L)
11/1/11	ND
12/1/11	ND
1/1/12	0.1
2/1/12	ND
3/1/12	ND
4/1/12	ND
5/1/12	ND
6/1/12	ND
7/1/12	ND
8/1/12	0.2
9/1/12	ND
10/1/12	ND

Victoria Canal at Contra Costa Water District Intake

Date	*Giardia* (cysts/L)
11/15/10	ND
12/6/10	0.1
1/3/11	0.2
2/7/11	ND
3/7/11	ND
4/4/11	ND
5/2/11	ND
6/1/11	ND
7/1/11	0.1
8/1/11	ND

Date	*Giardia* (cysts/L)
9/1/11	ND
10/1/11	ND
11/1/11	ND
12/1/11	0.1
1/1/12	ND
2/1/12	ND
3/1/12	ND
4/1/12	ND
5/1/12	ND
6/1/12	ND

Date	*Giardia* (cysts/L)
7/1/12	0.1
8/1/12	0.2

Date	*Giardia* (cysts/L)
9/1/12	ND
10/1/12	ND

Penitencia Water Treatment Plant Intake

Date	*Giardia* (cysts/ L)
1/17/06	< 0.1
2/14/06	< 0.1
3/14/06	< 0.1
4/18/06	< 0.1
5/16/06	< 0.1
6/20/06	< 0.1
7/18/06	< 0.1
8/15/06	< 0.1
9/19/06	< 0.1
10/17/06	< 0.1
11/15/06	< 0.1
12/19/06	< 0.1
2/20/07	< 0.1
3/20/07	< 0.1
4/17/07	< 0.1
5/15/07	< 0.1
6/19/07	< 0.1
7/17/07	< 0.1
8/14/07	< 0.1
9/18/07	< 0.1
10/16/07	< 0.1
11/13/07	< 0.1
12/11/07	< 0.1

Date	*Giardia* (cysts/ L)
1/15/08	0.1
2/19/08	< 0.1
4/1/08	< 0.1
5/27/08	< 0.1
6/17/08	< 0.1
7/22/08	< 0.1
8/19/08	< 0.1
9/16/08	< 0.1
10/14/08	< 0.1
11/10/08	< 0.1
12/9/08	< 0.1
2/3/09	< 0.1
3/10/09	< 0.1
4/14/09	< 0.1
5/5/09	< 0.1
6/9/09	< 0.1
7/14/09	< 0.1
8/18/09	< 0.1
9/8/09	< 0.1
10/20/09	< 0.1
11/17/09	< 0.1
12/8/09	< 0.1
1/12/10	< 0.1

Date	*Giardia* (cysts/ L)
2/16/10	< 0.1
3/16/10	< 0.1
6/8/10	< 0.1
7/13/10	< 0.1
8/10/10	< 0.1
9/14/10	< 0.1

Date	*Giardia* (cysts/ L)
10/19/10	< 0.1
11/16/10	< 0.1
12/14/10	< 0.1

Cryptosporidium and *Giardia* Monitoring Results at Other Ambient Sites

Sacramento River Basin

American River

Discovery Park

Date	*Cryptosporidium* DAPI/DIC Positive (oocysts/L)	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
8/15/00	< 0.1	< 0.1	< 0.1	< 0.1
9/19/00	< 0.1	< 0.1	< 0.1	< 0.1
10/17/00	< 0.1	< 0.1	< 0.1	< 0.1
11/7/00	< 0.1	< 0.1	< 0.1	< 0.1
12/19/00	< 0.1	< 0.1	< 0.1	0.4
2/20/01	< 0.1	< 0.1	0.1	0.1
4/17/01	< 0.1	< 0.1	< 0.1	0.3
5/15/01	< 0.1	< 0.1	< 0.1	0.1
7/19/01	< 0.1	< 0.1	0.1	0.3
9/18/01	< 0.1	< 0.1	< 0.1	0.1
10/16/01	< 0.1	< 0.1	< 0.1	< 0.1
11/13/01	0.1	0.8	< 0.1 *	1.4
12/18/01	< 0.1	0.1	0.1	1.1
1/15/02	< 0.1	< 0.1	< 0.1	< 0.1
2/5/02	< 0.1	< 0.1	< 0.1	0.1
3/5/02	< 0.1	< 0.1	< 0.1	0.1
4/3/02	< 0.1	< 0.1	< 0.1	0.1
5/7/02	< 0.1	< 0.1	< 0.1	< 0.1
6/4/02	< 0.1	< 0.1	< 0.1	< 0.1
7/9/02	< 0.1	< 0.1	< 0.1	0.2
8/6/02	< 0.2	< 0.2	< 0.2	< 0.2

Date	*Cryptosporidium* DAPI/DIC Positive (oocysts/L)	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
9/3/02	< 0.1	< 0.1	< 0.1	0.3
10/1/02	< 0.1	< 0.1	< 0.1	< 0.1
11/5/02	< 0.1	< 0.1	< 0.1	< 0.1
12/3/02	< 0.1	< 0.1	0.1	0.2
1/7/03	< 0.1	< 0.1	< 0.1	< 0.1
2/6/03	< 0.1	< 0.1	< 0.1	0.3
3/4/03	< 0.1	< 0.1	< 0.1	0.2
4/1/03	< 0.1	< 0.1	< 0.1	0.4
5/6/03	< 0.1	< 0.1	< 0.1	0.1
6/10/03	< 0.1	< 0.1	0.1	0.6
8/5/03	< 0.1	< 0.1	< 0.1	0.2
10/14/03	< 0.1	< 0.1	< 0.1 *	11
12/11/03	< 0.1	< 0.1	< 0.1	< 0.1
2/18/04	< 0.1	< 0.1	0.1	0.9
4/13/04	< 0.1	< 0.1	< 0.1	< 0.1
6/8/04	< 0.1	< 0.1	0.1	0.1
8/11/04	< 0.1	< 0.1	< 0.1	< 0.1
10/6/04	< 0.1	< 0.1	< 0.1	< 0.1

* Estimated

Sacramento River

Veteran's Bridge

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
7/20/99	< 0.1	< 0.1	< 0.1	< 0.1
8/17/99	< 0.1	< 0.1	< 0.1	< 0.1
9/21/99	< 0.1	< 0.1	< 0.1	0.1

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
10/19/99	< 0.1	< 0.1	0.1	0.1
11/16/99	< 0.1	< 0.1	0.3	0.3
12/13/99	< 0.1	< 0.1	< 0.1	0.3
1/19/00	< 0.3	0.3	< 0.3	< 0.3
2/15/00	< 0.1	< 0.1	< 0.1	< 0.1
3/22/00	< 0.1	< 0.1	< 0.1	< 0.1
4/18/00	< 0.1	< 0.1	< 0.1	< 0.1
5/16/00	< 0.1	< 0.1	0.1	0.1
7/18/00	< 0.1	< 0.1	< 0.1	< 0.1
8/15/00	< 0.1	< 0.1	< 0.1	< 0.1
7/19/01	< 0.1	< 0.1	< 0.1	0.3
9/18/01	< 0.1	< 0.1		
9/19/01			< 0.1	< 0.1
10/16/01	< 0.1	< 0.1	0.2	0.3
11/13/01	0.1	0.3	0.1	0.9
12/18/01	0.2	0.2	0.2	1.2
1/15/02	< 0.2	< 0.2	< 0.2	< 0.2
2/5/02	< 0.1	< 0.1	< 0.1	< 0.1
3/5/02	< 0.1	< 0.1	< 0.1	0.1
4/2/02	< 0.1	< 0.1	< 0.1	< 0.1
5/7/02	< 0.2	< 0.2	< 0.2	< 0.2
6/4/02	< 0.1	< 0.1	< 0.1	< 0.1
7/9/02	< 0.2	< 0.2	< 0.2	< 0.2
8/6/02	< 0.1	< 0.1	< 0.1	< 0.1
9/3/02	< 0.2	< 0.2	< 0.2	< 0.2
10/1/02	< 0.1	< 0.1	< 0.1	< 0.1
11/5/02	< 0.1	< 0.1	< 0.1	0.6

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
12/3/02	< 0.1	< 0.1	0.2	0.7
1/7/03	< 0.2	< 0.2	0.2	0.4
2/6/03	< 0.3	< 0.3	< 0.3	< 0.3
3/4/03	< 0.2	< 0.2	< 0.2	0.2
4/1/03	< 0.2	< 0.2	< 0.2	< 0.2
5/6/03	< 0.2	< 0.2	< 0.2	< 0.2
6/10/03	< 0.2	< 0.2	< 0.2	0.2
8/5/03	< 0.2	< 0.2	< 0.2	0.4
10/14/03	< 0.1	< 0.1	< 0.1	< 0.1
12/10/03			< 0.4	0.8
2/17/04	< 0.2	0.2	0.2	0.8
4/13/04	< 0.1	< 0.1	< 0.1	< 0.1
6/8/04	< 0.1	< 0.1	< 0.1	< 0.1
8/11/04	< 0.1	< 0.1	< 0.1	< 0.1
10/6/04	< 0.2	< 0.2	0.2	0.4
12/8/04	< 0.1	< 0.1	0.1	0.4
2/15/05	< 0.2	< 0.2	< 0.2	< 0.2
4/13/05	< 0.2	< 0.2	< 0.2	< 0.2
6/8/05	< 0.1	0.1	< 0.1	< 0.1
8/2/05	< 0.1	0.1	0.1	< 0.1
10/5/05	< 0.1	< 0.1	< 0.1	< 0.1
12/6/05	< 0.2	0.2	< 0.2	0.4
2/8/06	< 0.2	< 0.2	< 0.2	< 0.2
4/5/06	< 0.2	< 0.2	0.2	0.2

Freeport Marina (R1)

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
6/23/99	< 0.1	< 0.1	< 0.1	0.3
7/21/99	< 0.1	< 0.1	< 0.1	< 0.1
8/18/99	< 0.1	< 0.1	< 0.1	< 0.1
9/22/99	< 0.1	< 0.1	< 0.1	0.2
10/20/99	< 0.1	< 0.1	< 0.1	0.1
11/17/99	< 0.1	< 0.1	0.2	0.5
12/8/99	< 0.1	< 0.1	< 0.1	0.4
12/14/99	< 0.1	< 0.1	< 0.1	0.1
1/19/00	< 0.1	< 0.1	0.4	0.7
1/26/00	< 0.1	0.1	0.1	0.1
2/16/00	< 0.1	< 0.1	< 0.1	< 0.1
3/7/00	< 0.1	< 0.1	< 0.1	0.1
3/23/00	< 0.1	< 0.1	< 0.1	< 0.1
4/11/00	< 0.1	< 0.1	0.1	0.2
4/19/00	< 0.1	< 0.1	< 0.1	0.2
5/17/00	< 0.1	< 0.1	< 0.1	< 0.1
6/7/00	< 0.1	< 0.1	< 0.1	< 0.1
6/21/00	< 0.1	< 0.1	< 0.1	< 0.1
7/11/00	< 0.1	< 0.1	< 0.1	< 0.1
7/19/00	< 0.1	< 0.1	< 0.1	< 0.1
8/1/00	< 0.1	< 0.1	< 0.1	< 0.1
8/16/00	< 0.1	< 0.1	0.2	0.2
9/12/00	< 0.1	< 0.1	0.3	0.4
9/20/00	< 0.1	< 0.1	0.2	0.2
10/4/00	< 0.1	< 0.1	0.1	0.3
10/18/00	< 0.1	< 0.1	< 0.1	< 0.1

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
11/1/00	< 0.1	< 0.1	0.2	0.6
12/5/00	< 0.1	< 0.1	< 0.1	0.6
12/20/00	< 0.1	< 0.1	< 0.1	0.2
1/9/01	< 0.1	< 0.1	0.3	0.8
1/17/01	< 0.1	< 0.1	< 0.1	0.3
2/6/01	< 0.1	< 0.1	0.1	0.3
2/21/01	< 0.1	< 0.1	< 0.1	0.1
3/6/01	< 0.3	< 0.3	< 0.3	< 0.3
4/18/01	< 0.1	< 0.1	< 0.1	0.1
5/2/01	< 0.1	< 0.1	0.1	0.2
7/6/01	< 0.1	< 0.1	< 0.1	0.1
7/19/01	< 0.1	< 0.1	0.1	0.4
9/6/01	< 0.1	< 0.1	< 0.1	0.1
9/19/01	0.1	0.3	0.2	0.9
10/2/01	< 0.1	< 0.1	0.1	0.5
10/16/01	< 0.1	< 0.1	< 0.1	0.1
11/7/01	< 0.1	< 0.1	0.7 *	1.4
11/14/01	0.1	0.3	< 0.1	0.8
12/5/01	< 0.4	0.4	< 0.4	< 0.4
12/19/01	< 0.2	< 0.2	0.2	1.2
1/16/02	< 0.2	< 0.2	< 0.2	< 0.2
2/6/02	< 0.1	< 0.1	< 0.1	0.3
3/6/02	< 0.1	< 0.1	< 0.1	< 0.1
4/3/02	< 0.1	< 0.1	< 0.1	0.1
5/8/02	< 0.1	< 0.1	< 0.1	< 0.1
6/5/02	< 0.1	< 0.1	< 0.1	< 0.1

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
7/10/02	< 0.1	< 0.1	0.1	0.1
8/7/02	< 0.2	< 0.2	< 0.2	< 0.2
9/4/02	< 0.1	< 0.1	< 0.1	< 0.1
10/2/02	< 0.1	< 0.1	< 0.1	< 0.1
12/4/02	< 0.1	< 0.1	0.2 *	1.1
1/8/03	< 0.2	< 0.2	< 0.2	< 0.2
2/5/03	< 0.2	< 0.2	< 0.2	< 0.2
3/5/03	< 0.1	< 0.1	< 0.1	< 0.1
4/2/03	< 0.1	< 0.1	< 0.1	< 0.1
5/7/03	< 0.2	< 0.2	< 0.2	0.2
6/11/03	< 0.2	< 0.2	< 0.2	0.2
8/6/03	< 0.1	< 0.1	< 0.1	0.2
10/15/03	< 0.1	< 0.1	< 0.1	0.4
12/11/03	< 0.2	< 0.2	< 0.2	1.6
2/17/04	< 0.3	< 0.3	< 0.3	1.8
4/13/04	< 0.1	< 0.1	< 0.1	< 0.1
6/9/04	< 0.1	< 0.1	< 0.1	< 0.1
8/11/04	< 0.1	< 0.1	< 0.1	< 0.1
10/6/04	< 0.1	< 0.1	0.1	0.4
12/8/04	< 0.1	0.4	0.1	0.4
2/15/05	< 0.1	< 0.1		1.8
4/13/05	< 0.2	< 0.2		< 0.2
6/8/05	< 0.1	< 0.1	< 0.1	< 0.1
8/3/05	< 0.1	< 0.1	< 0.1	< 0.2
10/5/05	< 0.1	< 0.1	< 0.1	< 0.1
12/6/05	0.2	0.2	0.2	1.6

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
2/8/06	< 0.2	< 0.2	0.2	0.2
4/5/06	< 0.2	< 0.2	< 0.2	< 0.2

* Estimated

Cliff's Marina

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
6/23/99	< 0.1	< 0.1	0.5	0.5
7/21/99	< 0.1	< 0.1	1.1	1.9
8/17/99	< 0.1	< 0.1	0.1	0.4
9/22/99	< 0.1	< 0.1	0.2	0.2
10/20/99	0.1	0.1	0.1	0.3
11/17/99	< 0.1	< 0.1	< 0.1	0.4
12/8/99	< 0.1	< 0.1	0.3	0.9
12/14/99	< 0.1	< 0.1	0.4	0.5
1/19/00	< 0.1	< 0.1	0.7	0.9
1/26/00	< 0.1	< 0.1	< 0.1	< 0.1
2/17/00	< 0.1	0.1	0.1	0.2
3/7/00	0.1	0.1	0.1	0.1
3/23/00	< 0.1	< 0.1	< 0.1	0.2
4/11/00	< 0.1	< 0.1	0.2	0.3
5/17/00	< 0.1	< 0.1	< 0.1	< 0.1
6/7/00	< 0.1	< 0.1	0.3	0.4
6/21/00	< 0.1	< 0.1	0.3	0.4
7/11/00	< 0.1	< 0.1	0.2	0.2
7/19/00	< 0.1	< 0.1	0.1	0.1

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
8/1/00	0.1	0.1	< 0.1	<0.1
8/16/00	< 0.1	< 0.1	0.1	0.2
9/12/00	< 0.1	< 0.1	0.1	0.3
9/20/00	< 0.1	< 0.1	0.2	0.2
10/4/00	< 0.1	< 0.1	0.2	0.5
10/18/00	< 0.1	< 0.1	< 0.1	0.1
11/1/00	< 0.1	< 0.1	0.5	1.4
11/8/00	< 0.1	< 0.1	0.4	1
12/5/00	< 0.1	0.1	< 0.1	1.2
12/20/00	< 0.1	< 0.1	< 0.1	0.2
1/9/01	< 0.1	0.1	0.1	0.5
1/17/01	< 0.1	< 0.1	0.6	1.4
2/6/01	0.1	0.1	0.3	1
2/21/01	0.1	0.1	< 0.1	0.2
3/6/01	< 0.1	< 0.1	< 0.5	< 0.5
4/18/01	< 0.1	< 0.1	0.4	0.6
5/2/01	< 0.1	0.1	0.1	0.3
5/16/01	< 0.1	< 0.1	0.2	0.5
7/6/01	< 0.1	< 0.1	0.2	0.3
7/19/01	< 0.1	0.1	< 0.1	0.2
9/6/01	< 0.1	0.1	0.2	0.4
9/19/01	< 0.1	0.1	< 0.1	0.3
10/2/01	0.1	0.4	0.3 *	1.3
10/16/01	0.2	0.8	0.4 *	3.1
11/7/01	< 0.1	< 0.1	0.1	0.2
11/14/01	0.1	0.2	< 0.1	0.5
12/5/01	< 0.4	< 0.4	< 0.4	< 0.4

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
12/19/01	0.2	0.6	0.8 *	2.8
1/16/02	< 0.2	< 0.2	< 0.2	< 0.2
2/6/02	< 0.1	< 0.1	< 0.1	< 0.1
3/6/02	< 0.1	0.1	< 0.1	0.6
4/3/02	0.2	0.2	< 0.1	0.3
5/8/02	< 0.1	0.2	< 0.1	0.1
6/5/02	< 0.1	< 0.1	< 0.1	< 0.1
7/10/02	0.2	0.3	< 0.1	< 0.1
8/7/02	< 0.2	< 0.2	0.2	0.4
9/4/02	< 0.1	< 0.1	< 0.1	< 0.1
10/2/02	< 0.1	0.1	< 0.1	0.3
12/4/02	< 0.1	0.2	0.4 *	1.2
1/8/03	< 0.2	< 0.2	< 0.2	0.4
2/5/03	< 0.1	< 0.1	< 0.1	< 0.1
3/5/03	< 0.1	< 0.1	< 0.1	0.2
4/2/03	< 0.1	< 0.1	< 0.1	0.1
5/7/03	< 0.2	< 0.2	< 0.2	< 0.2
6/11/03	< 0.1	0.1	0.2	0.4
8/6/03	< 0.2	0.2	< 0.2	0.2
10/15/03	< 0.1	< 0.1	< 0.1	0.5
2/18/04	< 0.4	1.2	0.8 *	8.5
4/13/04	< 0.1	< 0.1	< 0.1	< 0.1
6/9/04	< 0.1	< 0.1	< 0.1	0.1
8/11/04	< 0.1	< 0.1	< 0.1	0.1
10/6/04	< 0.1	0.1	0.1	0.1
12/8/04	< 0.1	< 0.1	0.1	0.2
2/15/05	< 0.1	< 0.1	0.3	1.3

Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
4/13/05	< 0.2	< 0.2	< 0.2	< 0.2
6/8/05	< 0.1	0.2	< 0.1	< 0.1
8/3/05	< 0.1	0.2	0.1	0.4
10/5/05	< 0.1	< 0.1	< 0.1	< 0.1
12/6/05	< 0.2	0.4	0.2	1.2
2/8/06	< 0.2	< 0.2	0.4	0.4
4/5/06	< 0.2	0.2	< 0.2	0.2

* Estimated

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Date	*Cryptosporidium DAPI/DIC Positive (oocysts/L)*	*Cryptosporidium Fluorescence Antibody (oocysts/L)*	*Giardia DAPI/DIC Positive (cysts/L)*	*Giardia Fluorescence Antibody (cysts/L)*
7/19/00	< 0.1	< 0.1	< 0.1	< 0.1
8/16/00	< 0.1	< 0.1	< 0.1	< 0.1
10/18/00	< 0.1	< 0.1	0.3	0.5
12/20/00	0.2	0.3	< 0.1	< 0.1
2/21/01	< 0.1	< 0.1	0.1	0.5
7/19/01	< 0.1	< 0.1	0.1	0.1
9/19/01	0.1	0.5	0.2	0.9
10/16/01	< 0.1	< 0.1	0.1 *	1.4
12/19/01	0.2	1	0.4	2
1/16/02	< 0.2	< 0.2	< 0.2	< 0.2
2/6/02	< 0.1	< 0.1	< 0.1	0.2
3/6/02	< 0.1	< 0.1	< 0.1	< 0.1
4/3/02	< 0.1	< 0.1	< 0.1	0.2
5/8/02	< 0.1	< 0.1	< 0.1	< 0.1
6/5/02	< 0.1	0.1	< 0.1	< 0.1

7/10/02	< 0.2	< 0.2	< 0.2	0.4
8/7/02	< 0.1	< 0.1	< 0.1	< 0.1
9/4/02	< 0.1	0.1	< 0.1	< 0.1
10/2/02	< 0.1	0.1	0.1	0.1
11/6/02	< 0.1	< 0.1	0.1	0.3
12/4/02	0.1	0.4	0.3 *	3
1/8/03	< 0.2	< 0.2	< 0.2	0.4
2/5/03	< 0.2	< 0.2	< 0.2	< 0.2
3/5/03	< 0.1	< 0.1	< 0.1	0.4
4/2/03	< 0.1	< 0.1	0.1	0.2
6/11/03	< 0.1	0.1	< 0.1	0.3
8/6/03	< 0.1	< 0.1	< 0.1	0.5
10/15/03	< 0.1	< 0.1	0.2	0.7
12/11/03	< 0.2	< 0.2	0.2	0.8

* Estimated

Appendix D: Drinking Water Policy Workgroup Synthesis Report

http://www.waterboards.ca.gov/centralvalley/water_issues/drinking_water_policy/dwp_wrkgrp_synthesis_rpt.pdf