



CENTRAL VALLEY REGIONAL
WATER QUALITY CONTROL BOARD

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

For
The Control of Nutrients in Clear Lake

Peer Review Draft Staff Report

November 2005



CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY



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11020 Sun Center Drive #200
Rancho Cordova, CA 95670

Phone: (916) 464-3291
eMail: info5@waterboards.ca.gov
Web site: <http://www.waterboards.ca.gov/centralvalley/>

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REPORT PREPARED BY:

LORI WEBBER
Environmental Scientist
Sacramento River Watershed Unit

**REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION**

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EXECUTIVE SUMMARY

The Central Valley Regional Water Quality Control Board (Central Valley Regional Board) has determined that the beneficial uses of Clear Lake are impaired due to excess nutrients, primarily phosphorus. Clear Lake is listed on the 303(d) list of impaired waterbodies. Central Valley Water Board staff is proposing additions to two Chapters of the Basin Plan: Implementation, and Surveillance and Monitoring that will address nutrients in Clear Lake.

Studies indicate that excess phosphorus contributes to the occurrence of nuisance blooms of blue-green algae in Clear Lake during summer and fall periods. Most sources of phosphorus to Clear Lake are sediment driven and include erosion from agricultural and urban areas, instream channel erosion, timber harvesting, runoff from roads, construction, gravel mining, wildfires, control burns, off highway vehicle (OHV) use, and dredging and filling. Fertilizer use (both urban and rural) and sewer and septic overflows may also contribute phosphorus to the lake.

The technical portion of this TMDL was developed using water quality models. Two computer models were utilized; the Loading Simulation Program in C ++ (LSPC) and the Environmental Fluid Dynamics Code (EFDC). These models are part of the U.S. EPA's "TMDL Toolbox" and have been used successfully for TMDL development throughout the country¹. LSPC is a watershed model and EFDC is a receiving water model. Tetra Tech took advantage of the extensive data set that exists for Clear Lake (including a 30 plus year record of water quality observations in the lake) to calibrate, validate and run the model.

The receiving water model was used to simulate chlorophyll-a concentrations in Clear Lake during a period of years from 1985 to 1991. Between 1985 and 1990 blue-green algae growth was relatively scarce, and these years were designated "compliant" years. During 1991-1992 nuisance blooms of blue-green algae were prevalent therefore these years were determined to be "non-compliant". The highest simulated chlorophyll-a concentration during the compliant years was 73 µg/L. Based on this simulation, chlorophyll-a values can reach up to 73 µg/L and water quality in the lake would not be impaired. Thus, this value was chosen as the target to calculate the Clear Lake Nutrient TMDL.

This staff report includes a proposed amendment to the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins. The Basin Plan amendment establishes a TMDL for Clear Lake that includes a phosphorus load allocation and an implementation plan to achieve the required load reductions. The allocated loading of phosphorus to the lake is 90,000 kg per year. This represents a 40% reduction in phosphorus loading from historical levels. The 90,000 kg is allocated to

¹ More information on the TMDL toolbox, and the LSPC and EFDC models can be found at:
<http://www.epa.gov/athens/wwqtsc/>

point and nonpoint source dischargers. Point source dischargers – Lake County Stormwater Permittees and the California Department of Transportation – are each given a waste load allocation of 2,000 and 90 kg per year respectively. Nonpoint source dischargers – the U.S. Bureau of Land Management, the U.S. Forest Service, and Lake County – are given a load allocation of 85,000 kg phosphorus per year.

The implementation plan is designed to achieve the required load reductions and bring Clear Lake into compliance with its beneficial uses. The implementation plan directs responsible parties to estimate their loading to the lake and implement additional actions to control phosphorus, where needed. These actions may include implementation of best management practices, wetlands restoration and other projects designed to reduce erosion. These actions are expected to reduce the overall phosphorus loading to the lake by approximately 40% of historic levels. Responsible parties will be required to update the Regional Board on their progress towards meeting the phosphorus loading reduction requirements and achievement of beneficial uses in Clear Lake. Conditions in Clear Lake will be monitored to determine if the occurrence of nuisance blue-green algae blooms has been reduced and the lake is coming into compliance with its water quality objectives. Regional Board staff will review the data provided by the responsible parties in 2011 and again in 2016.

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INTRODUCTION AND BACKGROUND

This Central Valley Regional Water Quality Control Board report (staff report) addresses proposed amendments to the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins (CVRWQCB, 1998). The amendments address regulation of nutrients in the Clear Lake watershed, Lake County, California.

California Water Code Section 13240 requires Central Valley Water Boards to prepare and adopt a Basin Plan to regulate water quality. The Central Valley Regional Water Quality Control Board (Central Valley Water Board) initially adopted a Basin Plan in 1975. The Basin Plan was revised and updated in 1989 and 1994. The current edition (Fourth Edition 2004) incorporates several amendments approved since 1994. The Basin Plan satisfies Section 303 of the Clean Water Act, which requires states to adopt water quality standards to meet federal regulatory requirements. Basin Plans are adopted and amended by the Water Board using a structured process involving full public participation and State environmental review. A Basin Plan includes a discussion of:

1. Beneficial uses to be protected,
2. Water quality objectives, and
3. An implementation plan needed for achieving water quality objectives.

The proposed Basin Plan amendments for the control of nutrients in Clear Lake will be legally applicable once the amendments are adopted by the Water Board and approved by the State Water Resources Control Board (State Water Board), State Office of Administrative Law, and the U.S. Environmental Protection Agency (USEPA). Implementation will begin after the Basin Plan Amendments are legally applicable.

The proposed Basin Plan amendments for Clear Lake include the requirements of a Total Maximum Daily Load (TMDL) for nutrients in Clear Lake. These requirements include a numeric water quality target, load allocations and a margin of safety.

The Basin Plan amendment process is a certified regulatory program pursuant to the California Environmental Quality Act (CEQA), which exempts the Water Board from preparing an Environmental Impact Report or Negative Declaration. In accordance with SWRCB regulations, this staff report provides an analysis of alternatives and an evaluation of potential environmental impacts. An Environmental Impact checklist has been completed and is included in Section 11 of this Staff Report.

The purpose of this staff report is to present the proposed Basin Plan amendment and to provide the rationale behind each part of the amendment. Section 1 provides an introduction and background for the Basin Plan amendment process. Section 2 presents a summary of the proposed changes to the Basin Plan. Section 3 describes the beneficial uses and existing conditions of Clear Lake. Section 4 summarizes the TMDL elements. Additional information on these elements is presented in the Technical TMDL Report (Tetra Tech, 2004), which is being released for review along with this staff report. Section 5 discusses consistency with Federal and State laws and policies. Section 6

presents and evaluates the implementation alternatives for the water quality control program. Section 7 describes the monitoring that will be required pursuant to this Basin Plan amendment.

1.1 Watershed Area to be Considered

Clear Lake is located in the Coast Ranges, about 100 miles north of San Francisco. It is the largest natural lake located entirely within the borders of California. The lake is 18 miles long and has a surface area of 68 square miles and is divided into three arms, the Upper Arm, Oaks Arm and Lower Arm (Figure 1.1). Clear Lake is relatively shallow, the average depth of the lake is 27 feet and the maximum depth is 60 feet. Water temperatures average 40 °F in the winter and 76 °F in the summer (Tetra Tech, 2004). The lake's only outlet is through Cache Creek, which flows out of the Lower Arm. A dam on Cache Creek is located five miles below the lake.

Clear Lake supports abundant aquatic and terrestrial biological resources. There are an estimated 29 species of fish (13 native and 16 introduced) in Clear Lake (Jones & Stokes, 2003). Wetlands and other habitat areas along the shoreline of the lake support a variety of waterfowl and songbirds, both resident and migratory. Mammalian species such as deer, bobcat, mink, muskrat, opossum, skunk, raccoon and otter make their home in the Clear Lake environs (LCDPW, Aquatic Mgt. Plan, 2004). The Clear Lake watershed covers an area of 441 square miles (Tetra Tech, 2004). Most (75%) of the watershed drains into the Upper Arm, which is the largest of the three arms. The two largest streams are Scotts Creek and Middle Creek, which join in the Middle Creek marsh area before draining to the Upper Arm through Rodman Slough. These two creeks drain 30% of the watershed (Richerson et. al., 1994). Elevations within the watershed range from 4,299 feet at the top of Mount Konocti to 1,318 feet at lake level (Aquatic Plant Mgt. Plan (LCDPW), 2004). Vegetation ranges from grasslands and chaparral-type plants in the lowlands to coniferous forests in the upper elevations.

The Mendocino National Forest owns land in the upper Middle Creek watershed and the BLM owns land in the Scott's creek watershed. Livestock grazing and timber harvesting occurs on these publicly owned lands, as well as private lands in the higher elevations of the watershed.

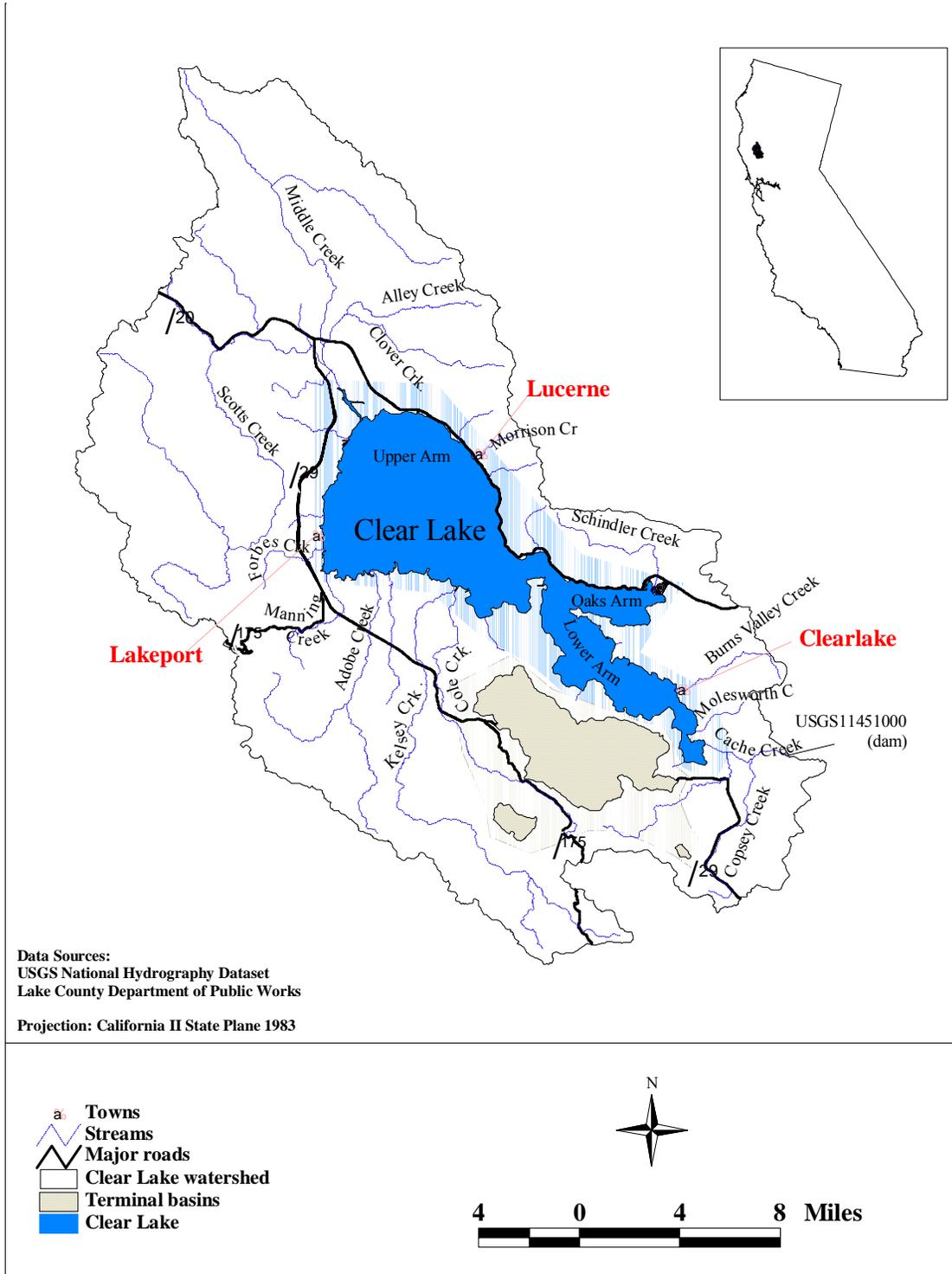
Agricultural and urban land uses in the Clear Lake watershed are located primarily in the lowland areas adjacent to the lake. Walnuts and pears are the major crops in the area. Vineyard conversion has become increasingly prevalent in the County. Pear and walnut orchards as well as grasslands, oak savanna and oak woodlands are being converted to vineyards (Jones & Stokes, 2003).

The Clear Lake watershed is sparsely populated. Only 2.5 % of the watershed is urbanized (Tetra Tech, 2004). The largest municipality is the town of Clearlake (population 13,100), which is located at the end of the Lower Arm. Lakeport (population 4,800) is the county seat and is located on the western shore of the Upper Arm. The

communities of Nice (population 2,500) and Lucerne (population 2,800) lie along Highway 20 on the northern shore of the Upper Arm. The area is experiencing rapid urban growth with new subdivisions planned or being built in some areas.

Tourism is an important part of the economy in Lake County. Fishing and swimming in Clear Lake are popular recreation activities that bring tourists to the area.

Figure 1.1 Clear Lake and the surrounding watershed



1.2 Need for Amendment to the Basin Plan

Section 303(d)(1)(A) of the Clean Water Act requires the State of California to:

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

In 1986 the Water Board identified Clear Lake as impaired due to nutrients and recommended that it be placed on the 303(d) List of Impaired Waterbodies. The Water Board based its recommendation to list Clear Lake on observations of nuisance algae blooms, as well as watershed studies and experimental data on the problem of excess nutrients in the Lake.

The Water Board will develop a water quality management strategy for each waterbody and pollutant in the Central Valley identified on California's 303(d) List. The management strategy for control of nutrients in Clear Lake will be conducted in several phases:

- Total Maximum Daily Load Development: involves the technical analysis of the sources of pollutant, the fate and transport of those pollutants, the numeric target(s), and the amount of pollutant reduction that is necessary to attain the target. The draft *Total Maximum Daily Load for Nutrients in Clear Lake, Lake County, California Technical Report* was developed by Tetra Tech and is being released for review with this Staff Report.
- Basin Planning: focuses on the development of a Basin Plan amendment and a Staff Report for Central Valley Water Board consideration. The Basin Plan amendment will include those policies and regulations that the Central Valley Water Board believes are necessary to attain water quality objectives.
- Implementation: focuses on the establishment of a framework that ensures that appropriate practices or technologies are implemented (Section 13241 and Section 13242 of the Porter-Cologne Water Quality Act), including those elements necessary to meet federal TMDL requirements (CWA Section 303(d)).

The narrative water quality objective for biostimulatory substances in the Basin Plan states "*Water shall not contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses*".

At this time the Basin Plan does not include numeric water quality objectives for biostimulatory substances or an implementation plan to control biostimulatory substances in Clear Lake. Therefore, the Water Board staff proposes that the Basin Plan be amended to include an implementation plan to control nutrient inputs in Clear Lake.

2 PROPOSED AMENDMENTS TO THE BASIN PLAN

2.1 Summary of Proposed Amendments

The proposed modifications to the Basin Plan include:

1. An implementation program for the control of phosphorus loads to Clear Lake.
2. A monitoring strategy for evaluating the efficacy of the implementation program.

The existing Basin Plan language is in *italics* while text additions are indicated by underline. No text deletions are proposed.

Modifications are proposed for the following chapters of the Basin Plan:

- Chapter IV (Implementation)
- Chapter V (Surveillance and Monitoring)

No modifications are proposed for the following chapters of the Basin Plan:

- Chapter I (Introduction)
- Chapter II (Existing and Potential Beneficial Uses)
- Chapter III (Water Quality Objectives)
- Basin Plan Appendix

2.2 Proposed amendment to the Basin Plan Chapter IV (Implementation)

The proposed modification to the Implementation Chapter is the addition of a water quality management strategy for nutrients in the Clear Lake watershed. The proposed modification adds a new subheading under “Actions and Schedule to Achieve Water Quality Objectives” labeled **Clear Lake Nutrients**. A detailed description of the water quality management strategy is provided in Section 8 of this staff report. No deletions are proposed for Chapter IV.

Central Valley Regional Board staff proposes the following language be added after the new subheading **Clear Lake Nutrients**.

1. Nuisance algae blooms impair beneficial uses in Clear Lake, which is a violation of the narrative basin plan objective that states “water shall not contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses”.
2. Studies indicate that the incidence of algal blooms can be significantly reduced if phosphorus loads the lake are reduced by about 40% from historical levels. This would equal an annual allowable loading of about 90,000 kg. Therefore, for this implementation plan, an average annual (five year rolling average) phosphorus load of 90,000 kg is established as the loading capacity for Clear Lake.

3. Waste load allocations for the NPDES facilities discharging to the lake or tributaries are as follows:
 - a. Lake County Stormwater Permittees (County of Lake, City of Clearlake, City of Lakeport) - 2,000 kg/yr
 - b. California Department of Transportation (Caltrans) – 90 kg/yr
4. The load allocation for nonpoint source dischargers is 85,000 kg/yr (average annual load based on five year rolling average). The U.S. Bureau of Land Management (USBLM), U.S. Forest Service (USFS) and Lake County (County) are responsible for controlling phosphorus discharges from those portions of the watershed within their respective authority.
5. The Regional Board intends to periodically review the phosphorus loading capacity and allocations and the implementation provisions, with the first review beginning no later than December 31, 2011. The Regional Board recommends that studies be conducted on Clear Lake prior to this date to confirm that the allocations are appropriate. The Regional Board will review the studies and determine if there is sufficient information to adopt a water quality objective for Clear Lake or to make changes to the loading capacity and allocations.
6. Compliance with load and waste load allocations is required by 2016.
7. Pursuant to CWC 13267, the Executive Officer will require responsible parties– County of Lake (County), City of Clearlake, City of Lakeport, USBLM, and USFS– to submit a plan to the Regional Board, which will include items a. through i., as applicable, below, by December 31, 2011. By December 31, 2016, responsible parties are also required to submit progress reports that update progress on items a. through i., as indicated below. The plan and progress reports can be submitted by each entity or combined into one report.

The County shall be responsible for providing:

- a. Estimation of annual phosphorus loads to the Lake
- b. Description of practices implemented to comply with existing on-site wastewater treatment system ordinances and an evaluation of effectiveness of these practices.
- c. Description of conditions in the lake related to nuisance algae blooms.

For activities on lands they manage, the USBLM and USFS shall be responsible for providing:

- d. Description of actions to control erosion from grazing, an evaluation of their effectiveness, and estimates of phosphorus loading from grazing.

All responsible parties shall be responsible for providing:

- e. Estimates of phosphorus loads from each of the responsible parties.
- f. Description of actions implemented to control phosphorus loads entering the lake and an estimate of resulting load reductions.
- g. Description of actions planned to control phosphorus loads entering the lake and an estimate of expected load reductions.
- h. Description of actions to control erosion from unpaved roads, an evaluation of their effectiveness, and estimates of phosphorus loading from unpaved roads.
- i. Description of how implementation of phosphorus control strategies will achieve the required load allocation by 2016.

2.3 Proposed Amendments to the Basin Plan Chapter V (Monitoring and Surveillance)

The proposed modification to the Surveillance and Monitoring Chapter includes a monitoring program for phosphorus and chlorophyll-a in Clear Lake and its surrounding watershed for the purposes of determining compliance with the narrative water quality objective and evaluating the success of the TMDL implementation program. A detailed description of the monitoring program is provided in Section 6 of this report.

Regional Board staff proposes to add a new heading in Chapter V entitled **Clear Lake Nutrients**, which will include the following language.

Monitoring shall be conducted to measure phosphorus loading to the lake and to assess the effectiveness of implementation activities on algae growth in the lake. The tributary streams to the lake shall be monitored for phosphorus to determine loading to the lake. Monitoring shall occur within Clear Lake to assess the occurrence of nuisance algae blooms in the lake. To assess algae growth, secchi disk depth or chlorophyll-a shall be monitored.

The monitoring and reporting program for any waste discharge requirements or waiver of waste discharge requirements that addresses nutrient runoff from irrigated lands in the Clear Lake watershed must determine the phosphorus loading from the irrigated lands.

3 BENEFICIAL USES AND EXISTING CONDITIONS

3.1 Clear Lake Beneficial Uses Cited in the Basin Plan

Table 3.1 lists the existing and potential beneficial uses of Clear Lake. Clear Lake provides water for domestic, municipal and agricultural uses within its watershed. It is also a source of agricultural, domestic and industrial waters downstream in the Cache Creek watershed. The beneficial uses that are impaired by nutrients in Clear Lake are municipal and domestic supply, recreation and wildlife habitat. Excess algae cause difficulty treating Clear Lake water to drinking water turbidity standards. Contact and non-contact recreation can be impaired during the summer and fall due to nuisance algae blooms. Algae blooms die and decay, contributing to low dissolved oxygen conditions which can adversely impact aquatic life.

Table 3.1 Existing and Potential Beneficial Uses of Clear Lake

Beneficial Use	Status
Municipal and Domestic Supply (MUN)	Existing (a)
Agriculture – irrigation and stock watering (AGR)	Existing
Recreation – contact (REC-1) and other non-contact (REC-2)	Existing (a)
Freshwater habitat (WARM)	Existing (a)
Spawning (SPWN) – warm	Existing
Wildlife Habitat (WILD)	Existing
Freshwater Habitat (COLD)	Potential
Commercial and/or sportfishing (COMM)	Existing

(a) Beneficial uses impaired by nutrients in Clear Lake

3.2 Existing Conditions

Historical records indicate that Clear Lake is “eutrophic” or nutrient rich and that aquatic plants growth occur naturally. Observations from the late nineteenth century describe Clear Lake’s waters as “cloudy”, “yellowish brown” with the bottom covered by “deep, dense moss” and a “green scum” covering the surface in September and October (Stone, 1874). Researchers from UC Davis reviewed historical observations of Clear Lake’s water quality and concluded that although Clear Lake is naturally nutrient rich, large blooms of scum-forming blue-green algae are a relatively recent phenomenon. They attribute this shift to scum-forming algae to an increase in sediment inputs to the lake due to road building and other construction activities beginning in the 1920’s and 1930’s. Sediment contains phosphorus, a nutrient that promotes the growth of algae (Richerson et. al., 1994). Goldstein and Tolsdorf (1994) estimated that about 50% of the existing sediment yield to Clear Lake is due to anthropogenic sources.

Total phosphorus concentrations in the lake range from less than 0.1 mg/L during the winter to highs greater than 0.3 mg/L during the summer and fall. Concentrations of total phosphorus have peaked at above 0.6 mg/L during some years, especially during drought conditions. The Upper Arm generally experiences higher total phosphorus concentrations than the Oaks and Lower Arms. Dissolved phosphorus peaks range from less than 0.1 mg/L during most years to highs greater than 0.4 mg/L (Richerson et. al, 1994).

Blue-green algae blooms occur in Clear Lake during the spring, summer and fall. Horne, (1972) described a spring bloom of the blue-green *Aphanazomenon* and a fall bloom of the blue-green algae *Microcystis* and *Anabaena*. Richerson et. al. (1994) noted that blue-green algae biomass increased during drought years, especially during the summer and fall of 1989 and 1990. During drought conditions phosphorus concentrations may be higher than in normal years due to lack of dilution. The increased phosphorus concentrations can fuel the growth of algae, which die and decay on the lakebed, causing low dissolved oxygen conditions, which in turn promote the release of more phosphorus from the sediments (Tetra Tech, 2004).

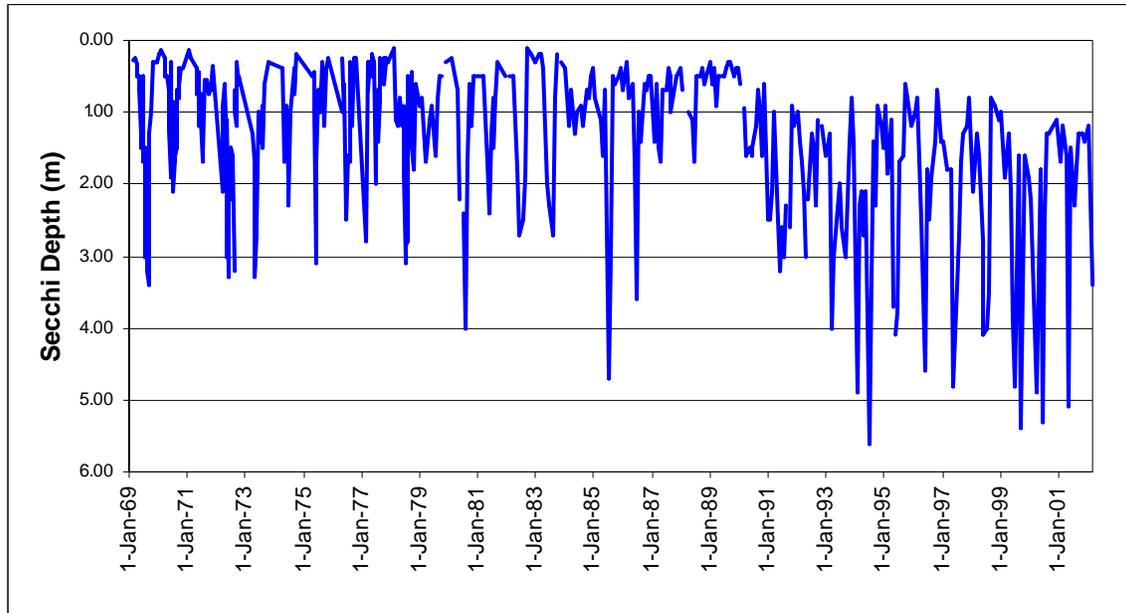
Iron may play a role in the occurrence of blue-green algae blooms. Some blue-green algae have the ability to fix atmospheric nitrogen. This gives them a competitive advantage over other algae when phosphorus levels are high. Iron is released from lake sediments and becomes available for uptake by algae. Iron availability might ultimately limit blue-green growth in the summer and fall. However limited data has made it difficult to test this hypothesis (Richerson et. al., 1994).

The abundant nutrients present in Clear Lake also promote the growth of attached aquatic macrophytes. These plants provide habitat for certain fish species, but they also cause problems for boaters. In recent years, improved clarity in the lake has allowed the macrophyte population to flourish. In 1994 the aquatic plant *Hydrilla verticillata* was discovered in the lake. This invasive species can reproduce from fragments and therefore is not eradicated by mechanical methods. The County is currently implementing an aggressive Hydrilla eradication program that includes surveying, mapping and applying herbicides where infestations are discovered.

Since about 1991, the clarity of Clear Lake has improved dramatically. Figure 3.1 shows secchi depth readings from 1969 to 2001. Secchi depth is a measure of the clarity of water. Prior to 1991 secchi depth rarely peaked above 3 meters and often fell below one meter. Beginning about 1991 secchi depths peaks have increased to 4 or 5 meters, and they have rarely dropped below 1 meter. The actual cause of this improvement is not fully understood. The County has implemented many activities to reduce erosion from the surrounding watershed. Notably, since 1991, instream gravel mining has been almost completely eliminated from tributaries to the lake. Additionally, the County has been working with the USFS, USBLM, the East Lake and West Lake RCDs, and local watershed groups to implement erosion control projects throughout the watershed.

Other factors besides phosphorus may have an impact the occurrence of blue-green algae blooms in the lake. These factors may include another substance that controls blue-green algae growth (such as iron) or may be related to interactions in the aquatic food chain in the lake. Further study may be needed to fully understand the complex interactions that occur in Clear Lake. For this reason the Basin Plan amendment calls for additional studies to better understand the relationship between phosphorus loading and blue-green algae. The chlorophyll-a target and phosphorus load allocations will be reviewed in December of 2011, and adjusted if needed. In the meantime, the focus of the implementation program will be on reducing phosphorus loading because most of the studies conducted in Clear Lake conclude that controlling phosphorus will ultimately inhibit nuisance blue-green algae growth.

Figure 3.1: Secchi depth in Clear Lake 1969-2001



4 TMDL ELEMENTS

Tetra Tech developed a technical TMDL for Clear Lake. Their report is entitled *Total Maximum Daily Load for Nutrients in Clear Lake, Lake County, California – Technical Report* (Tetra Tech report).

Tetra Tech utilized an extensive data set of water quality, land use and meteorological data to model the Clear Lake aquatic system. Two computer models were utilized; the Loading Simulation Program in C ++ (LSPC) and the Environmental Fluid Dynamics Code (EFDC). These models are part of the U.S. EPA’s "TMDL Toolbox" and have been used successfully for TMDL development throughout the country². LSPC is a

² More information on the TMDL toolbox, and the LSPC and EFDC models can be found at: <http://www.epa.gov/athens/wwqtsc/>

watershed model and EFDC is a receiving water model. LSPC was used to model hydrology and nutrient loading from the Clear Lake watershed. Nutrient loads were simulated by the model based on established relationships between land use, meteorological conditions, hydrology and water quality. The model was calibrated and validated using streamflow and water quality data from three stream gages in the watershed (Scott's Creek, Middle Creek and Kelsey Creek). The hydrology and water quality outputs from the LSPC model were used as inputs into EFDC. This model was used to simulate physical, chemical and biological processes occurring within Clear Lake. Particular attention was paid to the interactions between nutrients and other chemical constituents and blue-green algae growth. The results of this model included a simulation of chlorophyll-a concentrations in the lake.

The following subsections build on the technical report done by Tetra Tech as well as other studies conducted in Clear Lake. Each of the TMDL elements is described below.

4.1 Target

The Basin Plan contains a narrative objective for “biostimulatory substances” which states that *“Water shall not contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses”*.

The water quality of Clear Lake is impaired by the occurrence of nuisance blue-green algae. Although phosphorus concentrations are considered to be the key contributor to the growth of blue-green algae, factors such as temperature, residence time and clarity, among others, play a role in algae production. In order to determine compliance with this TMDL, it will be necessary to measure the occurrence of nuisance algae growth. Two measures that can be used to estimate algae growth in water are chlorophyll-a and secchi disk depth. Chlorophyll-a is a chemical that is used by plants during photosynthesis. It is present in all algae (Wetzel, 1983). Secchi disk depth is a measure of the clarity of water. During the summer and fall, algae levels will have a direct effect on the clarity of water in Clear Lake.

Tetra Tech used their model to develop a chlorophyll-a target for Clear Lake. Chlorophyll-a levels were simulated for a seven-year period from 1985 to 1992. The period of time from 1985 to 1989 is considered a “compliant” period. During this time significant nuisance blooms of blue-green algae were not observed in Clear Lake. The period of time from 1990 to 1992 experienced nuisance blue-green algae blooms and these were termed the “non-compliant” years. The highest simulated chlorophyll-a concentration during the “compliant” years was 73 µg/L. Based on this simulation, it is expected that chlorophyll-a levels can reach as high as 73 µg/L and no nuisance blue-green algae blooms would occur in the lake. This value was used as the target to calculate the TMDL.

4.2 Source Analysis

As mentioned in Section 3.2 prior studies indicate that excess phosphorus is a primary driver of nuisance blue-green algae blooms in Clear Lake. Phosphorus tends to bind to sediments and therefore any activity that leads to erosion and the delivery of sediment to the lake will increase phosphorus loading. The use of fertilizers, and sewer and septic overflows may also be sources of phosphorus. The following activities are the most likely sources of excess phosphorus to Clear Lake.

- *Paved and unpaved roads:* Erosion from both paved and unpaved roads contributes to excess sediment loads from the watershed.
- *Agricultural activities:* Irrigation return flows may contain elevated levels of nutrients (both nitrogen and phosphorus) from fertilizer application. Return flows may also contain sediment eroded from farmlands. Recently, many areas have been converted from grasslands or woodlands to vineyards. This activity can result in increased erosion, especially immediately after conversion.
- *Instream channel erosion:* Erosion can be accelerated by removal of riparian vegetation, which causes the stream to erode its banks. Invasive plant species such as Tamarisk (*Tamarisk spp.*) and Arundo (*Arundo donax*) may contribute to instream erosion by armoring the stream banks and redirecting streamflow to erosive areas.
- *Construction:* Construction activities involving earth movement can expose soils and make areas prone to erosion. Lake County is experiencing rapid urbanization in some locations.
- *Gravel mining:* Instream gravel mining destabilizes stream channels and leads to accelerated erosion. Most instream gravel mining has been eliminated in the Clear Lake watershed since the early 1990's. One facility still exists on Scott's Creek.
- *Wildfires and control burns:* Fires remove overlying vegetation, making the soils unstable, which can promote erosion. Wildfires are a common occurrence in the watershed. Both the BLM and the USFS use control burns on their lands.
- *Timber harvesting:* Timber harvesting activities such as road building can contribute to excess erosion. Timber harvesting occurs in USFS lands located primarily in the Middle Creek watershed as well as private forested lands located in the upper elevations of the watershed.
- *Livestock grazing:* Livestock trample riparian areas making them susceptible to erosion. Livestock feces may also be a source of nutrients.
- *Off highway vehicles (OHVs):* OHV use can destroy overlying vegetation and cause accelerated erosion. OHV use in the Clear Lake watershed occurs on BLM, USFS and private lands.
- *Dredging and filling:* Dredging and filling activities near water courses may contribute to increased erosion.
- *Urban stormwater runoff:* Impervious areas cause higher peak runoff flows, which can contribute to erosion of stream channels. Also, stormwater runoff can contain nutrients from urban fertilizer applications.
- *Sewage and septic overflows:* Sewer and septic overflows can deliver both nitrogen and phosphorus to the lake.

4.3 Load Allocations

The Tetra Tech report describes a load allocation strategy for Clear Lake based on the watersheds that are tributary to the lake. The loading allocations were presented on a daily average basis. The daily average loading of phosphorus to the lake during the simulated years (1985 to 1992) was 411.39 kg. Regional Board staff used the daily average loading values to calculate yearly average phosphorus loads. Based on this calculation the average annual phosphorus loading to the lake is about 150,000 kg. Tetra Tech calculated an acceptable daily average loading rate of 239.10 kg phosphorus that would be necessary to achieve compliance with the chlorophyll-a target. This translates to an average annual loading rate of approximately 90,000 kg phosphorus, a reduction of about 40% from estimated historical levels.

In the Basin Plan amendment the allowable annual phosphorus load is partitioned into point sources (wasteload allocations) and nonpoint sources (load allocations). There are two point source dischargers in the Clear Lake watershed, the stormwater permittees (County of Lake, City of Lakeport and City of Clearlake) and Caltrans. About 2.5% of the Clear Lake watershed is urbanized. The stormwater permittees were given a waste load allocation of 2,000 kg phosphorus per year based on this percentage. Caltrans maintains approximately 135 miles of roads within the Clear Lake watershed. These roads represent no more than 0.1% of the Clear Lake watershed so Caltrans was given a waste load allocation of 90 kg phosphorus per year. Nonpoint sources were given a load allocation of 85,000 kg phosphorus per year based on their expected percent contribution to the lake.

4.4 Linkage Analysis

In Clear Lake, phosphorus enters the water column via both external and internal loading. External phosphorus loading occurs primarily when winter and spring rains cause erosion from the surrounding watershed, which delivers phosphorus-bearing sediments. Most of this material settles to the bottom of the lake. During the summer and fall, decomposition of organic material on the lakebed causes oxygen levels in the sediments to drop. This condition favors the release of phosphorus from the sediments, resulting in an internal load of the nutrient from the sediments to the water column. In Clear Lake, the internal load can be larger than the external load, especially during drought years (Richerson et.al., 1994). A large external load during any one rainy season does not necessarily correspond to a large internal load the following summer. Lake level also affects the concentration of phosphorus in the water column. When lake levels are high the phosphorus load is diluted and concentrations tend to be lower (Tetra Tech, 2005).

Phosphorus is typically the limiting nutrient for biological growth in aquatic systems (Wetzel, 1983). However, in Clear Lake phosphorus concentrations can be high enough, especially during the summer, to make nitrogen the limiting nutrient (Richerson et. al., 1994). When phosphorus levels are high, some blue-green algae have a competitive advantage over other algae because they have the ability to fix atmospheric nitrogen,

which allows them to take advantage of the abundant available phosphorus. Other factors such as light intensity, temperature and wind speed also affect the growth of blue-green algae. When conditions are right, blue-green algae can form noxious scums. These scums usually occur in Clear Lake during the summer and fall, when elevated phosphorus concentrations, high temperatures and lack of wind, among other factors, contribute to excessive blue-green algal growth (Richerson et. al., 1994). The presence of these scums is the main reason that the lake is considered impaired. Although, at times, algae concentrations in the water column make the water so green that use of the lake for recreation is curtailed.

Richerson et. al. (1994) reviewed 24 years of water quality data and algae data on Clear Lake and found that algae biomass generally tended to increase when phosphorus concentrations were high, but in some isolated cases elevated phosphorus concentrations did not result in large increases in algal biomass. It was hypothesized that another substance, possibly iron, was controlling algal growth during those periods. This hypothesis cannot be evaluated using existing data, however iron would also be controlled by the erosion control strategies proposed in the implementation section of this TMDL.

As mentioned previously, the occurrence of nuisance blue-green algal blooms is due to many factors including phosphorus concentrations, temperature, light intensity and wind patterns. Notwithstanding, controlling phosphorus inputs is expected to ultimately reduce blue-green algae blooms. Reducing external phosphorus inputs will result in less phosphorus cycling through the system. Over time, phosphorus loss via outflow through Cache Creek and permanent burial in sediments should reduce phosphorus concentrations in the water column to the point where they become limiting to algae growth. As phosphorus concentrations decrease, a reduction in blue-green algae blooms is expected to occur (Richerson et. al., 1994).

Since Clear Lake is impaired due to excess blue-green algae, it was determined that a measure of algal biomass would be an appropriate method to evaluate beneficial use attainment in the lake. Algae biomass can be estimated by measuring chlorophyll-a concentrations or secchi disk depths.

4.5 Margin of Safety

The estimated acceptable annual loading rate is approximately 90,000 kg phosphorus. The combined load allocation and waste load allocations add up to 87,090 kg. This leaves an explicit margin of safety of 2,090 or 2%. Implicit margin of safety calculations occurred throughout the TMDL development process as conservative assumptions were made in developing the model.

5 CONSISTENCY WITH FEDERAL AND STATE LAWS AND POLICIES

Federal and State agencies have adopted water quality control policies and water quality control plans to which Central Valley Water Board actions must conform. The following section describes each of the policies that are applicable to the proposed Basin Plan amendment. It also discusses applicable Central Valley Water Board policies that are contained in the Basin Plan.

5.1 Federal Antidegradation Policy

The federal Antidegradation policy requires states to maintain and protect existing water quality even in cases where the quality of the water exceeds the levels necessary to protect aquatic and recreational beneficial uses (40 CFR 131.12). The proposed Basin Plan amendment would establish a numeric objective and an implementation plan for nutrients in Clear Lake. This action is designed to improve, not reduce, water quality of the lake.

5.2 Federal and State Endangered Species Acts

The bald eagle is found in the Clear Lake watershed. It is listed as endangered on both the federal and state endangered species lists. Endangered species are not expected to be adversely affected by any portion of the Basin Plan amendment. The implementation plan is designed to improve the water quality of Clear Lake by eliminating or greatly reducing the occurrence of nuisance algae blooms. Habitat for endangered species and other wildlife is expected to be improved by the implementation program.

5.3 Federal and State Wetland Plans and Policies

The federal *Wetland Mitigation Action Plan* was released in December 2002 and provides “guidance to ensure effective, scientifically-based restoration of wetlands impacted by development activities”. It lays out 17 action items that federal agencies will take to improve wetlands restoration and achieve the Administration’s goal of “no net loss” of wetlands. The *California Wetlands Conservation Policy* set forth 7 statewide initiatives, and three regional strategies, and created a task force to achieve the goal of “no net loss” and a “long term net gain” of wetlands in California. Wetlands can trap excess nutrients and prevent them from discharging into a lake. Wetland creation is a practice that may be undertaken pursuant to this TMDL implementation program. This would contribute to an overall improvement of wetland habitat within the watershed.

5.4 State Water Board Policies

5.4.1 The State Policy for Water Control

This policy is the basis for the State Water Board to protect water quality through the implementation of water resources management programs. It was adopted in 1972 and lays out 12 general principles for the protection of water quality in areas such as

wastewater treatment, criteria development, regional planning and monitoring. The Central Valley Regional Board's water quality control plans and waste discharge requirements must conform to this policy. The proposed Basin Plan amendment is consistent with this policy in that it provides an implementation plan to reduce the level of nutrients in Clear Lake.

5.4.2 State Water Board Resolution No. 68-16, Statement of Policy with Respect to Maintaining High Quality of Water in California

Resolution 68-16 states that dischargers cannot reduce the quality of surface or ground water even if the reduction would still allow the protection of beneficial uses. The proposed Basin Plan amendment establishes an implementation plan for nutrients in Clear Lake. The implementation plan is designed to improve water quality and will not result in a degradation of high quality waters.

5.4.3 State Water Board Resolution No. 88-63, Sources of Drinking Water Policy

This policy states that, except under specifically defined exceptions, all surface and ground waters of the State are to be protected as existing or potential sources of municipal and domestic supply. Clear Lake is an existing source of drinking water. The proposed Basin Plan amendment establishes a plan to control nutrient inputs into the Clear Lake. It is designed to improve water quality and will not adversely affect a source of drinking water. The MUN beneficial use is currently impaired in Clear Lake. The implementation program will result in an improvement in the MUN beneficial use for Clear Lake.

5.4.4 State Water Board Resolution No. 90-67, Pollutant Policy Document

The Pollutant Policy Document requires, in part, that the Central Valley Water Board develop water quality objectives and a mass emission strategy for limiting loads of heavy metals, among other pollutants, from entering the Delta. The proposed Basin Plan amendment is concerned with nutrients. Heavy metal emissions are not a component of this amendment.

5.4.5 State Water Board Resolution No. 92-49, Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304

This resolution contains policies and procedures for Central Valley Water Boards to follow for oversight of cleanup projects to ensure that cleanup and abatement activities protect the high quality of surface and groundwater. In order to comply with the water quality objective, the proposed Basin Plan amendment provides an implementation plan to reduce nutrient loading into Clear Lake. The implementation measures to reduce nutrient inputs into Clear Lake are consistent with Resolution No. 92-49.

5.4.6 Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program

The Nonpoint Source (NPS) Pollution Control Program is a statewide, coordinated effort to address nonpoint sources of pollution through the implementation of management practices. The *NPS Implementation Plan* describes the activities that state agencies -

including State and Regional Boards – are taking to reduce NPS pollution. The *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* describes the tools that the SWRCB and the RWQCBs have at their disposal to implement the NPS Program. These are planning authority, administrative permitting authority (waste discharge requirements [WDRs], waivers of WDRs, and basin plan prohibitions), and enforcement options. The implementation plan for the Clear Lake nutrient TMDL makes use of these tools, where applicable, to control non-point sources of nutrients and therefore is consistent with this policy.

5.4.7 Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Plan or SIP)

This policy, adopted in March 2000, implements criteria for priority toxic pollutants contained in the California Toxics Rule (promulgated by the U.S. EPA) as well as other priority toxic pollutant criteria and objectives. It pertains to the discharge of toxic pollutants. The SIP does not apply to the Clear Lake nutrient TMDL because the implementation program is concerned with nutrients and not priority pollutants.

5.5 Central Valley Water Board Policies

5.5.1 Urban Runoff

This policy requires sub-regional municipal and industrial plans to assess the impact of urban runoff on receiving water quality and to consider abatement measures if problems exist. The Basin Plan amendment and implementation plan require stormwater permittees to assess their phosphorus loads and reduce the loads from urban areas to 1,745 kg/yr, and is therefore consistent with this policy.

5.5.2 Controllable Factors Policy

This policy states that controllable water quality factors cannot cause further degradation of water quality in locations where water quality objectives are already exceeded. The narrative water quality objective for biostimulatory substances is currently being exceeded in Clear Lake. This Basin Plan Amendment includes an implementation plan to reduce controllable inputs of nutrients so that the water quality objective may be achieved.

5.5.3 The Water Quality Limited Segment Policy

This policy requires additional treatment beyond minimum federal requirements on discharges to Water Quality Limited Segments. The policy states that dischargers will be allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment. The purpose of this Basin Plan amendment is to establish an implementation plan to control nutrient inputs into Clear Lake, a water quality limited segment. The TMDL for nutrients in Clear Lake establishes the total maximum load that can be applied to the lake and still meet beneficial uses. The TMDL determines the sources of nutrients and allocates load reductions to each source in order to meet the water quality objective.

5.5.4 Antidegradation Implementation Policy

This policy requires the Central Valley Water Board to apply and implement State Water Board Resolution No. 68-16 when regulating discharge that could affect waters of the State and to apply methods of best practicable treatment or control to maintain high quality of water. As noted above, the proposed Basin Plan amendment establishes an implementation plan for the control of nutrients in Clear Lake. The implementation plan is designed to improve water quality and will not result in a degradation of high quality waters.

5.5.5 Policy for Application of Water Quality Objectives

This policy, in part, defines water quality objectives, specifies that objectives may be narrative or numeric and indicates that the objectives apply to all waters for which beneficial uses have been defined. The policy also discusses mixing zones and the use of NPDES permits to establish effluent limits and time schedules for compliance. It also requires the Central Valley Water Board to adopt numeric objectives on a site-specific basis where compliance with narrative objectives is required. The existing water quality objectives in the Basin Plan for nutrients are narrative. This Basin Plan amendment will apply a numeric target for nutrients in Clear Lake. This numeric target will be used to determine compliance with the narrative standard, which is consistent with this policy.

5.5.6 Mercury Control Program in Clear Lake

In December 2002 the Regional Board approved a mercury TMDL for Clear Lake. This TMDL adopted a water quality objective for mercury in fish tissue and a program of implementation to control mercury inputs into the lake. The implementation program specifies that mercury inputs from the surrounding watershed shall be reduced by 20%. This reduction shall be accomplished by implementing erosion control projects. The implementation program for the Clear Lake nutrient TMDL calls for reducing phosphorus by controlling excess erosion from the surrounding watershed and is therefore consistent with this policy.

6 PROGRAM OF IMPLEMENTATION

As mentioned in Section 3.2, previous studies of Clear Lake indicate that the nuisance blue-green algae problem is a result of excess phosphorus inputs to the lake. These studies recommend that phosphorus loading from the surrounding watershed be controlled to improve water quality in the lake (Horne, 1972, Richerson et. al., 1994, Goldstein and Tolsdorf, 1994, Tetra Tech, 2004). Since the early 1990s clarity in the lake has increased but phosphorus levels in the lake have remained about the same. This would indicate that other factors besides phosphorus concentrations might have an impact on the occurrence of nuisance blue-green algae growth in the lake. This implementation program focuses on reducing phosphorus because the best available scientific studies indicate that phosphorous load reductions will positively affect nuisance blue-green algae levels. However, Regional Board staff recognizes that further study is needed to determine whether other actions in addition to controlling phosphorus are needed to bring

Clear Lake into compliance with water quality objectives. For this reason, the Basin Plan amendment calls for further study and review of the chlorophyll-a target and load allocations in December 2011.

Most phosphorus is delivered to the lake attached to sediments that have eroded from the watershed. Therefore activities that cause an increase in erosion will most likely increase phosphorus loading to the lake. Excess phosphorus may enter the lake through erosion from roads, agricultural lands, stream channels, construction, gravel mining, wildfires and control burns, timber harvesting, livestock grazing, off highway vehicle use, dredging and filling, and stormwater runoff. Other activities such as fertilizer use or sewer and septic overflows may also increase the phosphorus loading to the lake. This section describes existing efforts and evaluates three implementation options for the control of phosphorus into Clear Lake.

6.1 Related Efforts

Currently there are many activities being undertaken pursuant to other programs or permits that contribute to reducing phosphorus loading in the Clear Lake watershed. These activities are summarized below.

6.1.1 Middle Creek Flood Damage Reduction and Ecosystem Restoration Project

The Lake County Department of Public Works (LCDPW) is working with the US Army Corps of Engineers (USACE) and other agencies to restore 1,400 acres of wetlands near Rodman Slough, which is located at the confluence of Middle and Scotts Creeks. These two creeks drain into the upper arm and represent 57% of the inflow into Clear Lake. The USACE estimated that the restoration project would reduce annual phosphorus loading from Scott's and Middle creeks to Clear Lake by 40%.

6.1.2 East and West Lake Resource Conservation Districts

The East and West Lake Resource Conservation Districts (RCDs) provide technical and financial assistance to promote conservation of soil, water and related resources. The RCDs work with watershed groups and local landowners to implement erosion control projects in the Clear Lake watershed. These projects reduce the overall sediment load into the lake. East and West Lake RCDs are currently working with state regulatory agencies to develop a streamlined permitting process for erosion control projects in their areas. This will facilitate implementation of projects that have an overall positive impact on the environment.

6.1.3 Stormwater Permits (Phase II, Construction, Caltrans)

There are three statewide stormwater permits operating in the Clear Lake watershed. The Phase II stormwater permit addresses discharges from urbanized areas. The construction permit applies to construction activities that disturb one acre or more. The Caltrans stormwater permit addresses stormwater runoff from all state roads. The Lake County Clean Water Program Advisory Council administers the Phase II and construction permits in Lake County. They have developed a Stormwater Management Plan (http://www.waterboards.ca.gov/stormwtr/docs/lake_co_swmp.pdf) that lists the best

management practices (BMPs) that are being implemented to address stormwater runoff. These BMPs include public education and outreach, public involvement and participation, illicit discharge detection and elimination, construction site stormwater runoff control, post-construction stormwater management and pollution prevention/good housekeeping for municipal operations. As part of the stormwater program, Lake County Department of Public Works is updating the grading ordinance for the County. The Caltrans stormwater permit requires that agency to implement BMPs to reduce the impact of stormwater runoff from state roads.

6.1.4 Timber Waiver Program

Timber harvest activities that may cause a discharge of waste to waters of the state are regulated under the Timber Waiver Program of the Central Valley Water Board. In January 2003 the Central Valley Water Board adopted a Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities. Timber harvesting operations must meet certain requirements in order to apply for coverage under this waiver. These requirements include implementing practices designed to eliminate erosion, as well as pre, during and post-harvest monitoring to evaluate if the practices have been implemented effectively. These measures are implemented in addition to the practices required under the State Forest Practices Rules. Timber harvesting activities occur in the Clear Lake watershed on both private and U.S. Forest Service lands (Mendocino National Forest). These operations are required to apply for coverage under the Timber Waiver. Regional Board staff review applications for coverage under the waiver and conduct inspections on a select number of operations.

6.1.5 Irrigated Lands Program

Discharges from agricultural lands in the Central Valley Region are regulated under the Irrigated Lands Program. Dischargers of irrigation return flows and stormwater discharge from irrigated lands can apply for coverage under the Agricultural Waiver if they meet certain conditions. Most dischargers choose to participate in one of the nine large “coalition groups” that have been organized to meet the requirements of the program. The coalition groups are responsible for monitoring the effects of agricultural discharge in their areas and reporting the results to the Central Valley Water Board. The Sacramento Valley Water Quality Coalition has conducted monitoring throughout the Sacramento River watershed to assess the impact of agricultural runoff on water quality. In Lake County the Farm Bureau has organized a local group, called the Lake County Farm Bureau Education Corporation (LCFBEC), which works with the Sacramento Valley Water Quality Coalition. LFCBEC is working to find funding for monitoring and implementation of best management practices on agricultural lands in Lake County.

6.1.6 Water Quality Certification Program

Under Section 404 of the Clean Water Act (CWA) any dredge and fill activity that would cause a discharge to waters of the U.S. must receive a federal permit. The U.S. Army Corps of Engineers administers the Section 404 permits. Section 401 of the CWA states that a 404 permit also requires certification from the respective state. The Central Valley Water Board’s Water Quality Certification Program (WQC) works to fulfill this requirement. Typical projects for which WQC is requested include new subdivisions,

bridges, roads, pipeline construction; levee reconstruction; wetland habitat improvement; pier installation; boat harbor dredging; gravel mining; flood control excavation; and minor stream crossings. There are about 8 WQC applications each year in Lake County. Typical projects include highway maintenance, lagoon dredging, mine reclamation and construction activities near watercourses.

6.2 Implementation Alternatives Considered

The following three options were considered for implementation of the Clear Lake nutrient TMDL:

6.2.1 Alternative 1 – No Action

Under this alternative the activities described in Section 8.1 above would continue as is, and no additional requirements would be added. No monitoring and reporting would be required of the responsible parties and the Regional Board would not review progress towards achieving the loading reduction required under this TMDL.

6.2.2 Alternative 2 – Adaptive Implementation

This alternative builds upon the existing activities that are now occurring in the Clear Lake watershed by requiring responsible parties to estimate phosphorus loads and evaluate the success of their phosphorus control actions. Part of the implementation plan will be to conduct further studies to determine if the proposed control strategy is the appropriate course of action to eliminate nuisance algae blooms from Clear Lake.

By December 31, 2011 responsible parties will be required to submit a report to the Regional Board that evaluates their progress towards meeting the load allocations and waste load allocations described in the basin plan amendment.

Central Valley Water Board staff will review the reports submitted by the responsible parties to determine if the actions they are implementing are improving conditions in Clear Lake with respect to nuisance algae blooms. If staff determines that conditions are not improving, responsible parties may be required to implement additional actions to control phosphorus loading to the lake.

6.2.3 Alternative 3 – Immediate BMP Implementation

Under this alternative each Responsible Party would be required to reduce all controllable sources of phosphorus. Under this alternative, for example, the USFS, BLM and Caltrans would be required to fully implement erosion control activities even if actions located in other parts of their watersheds (such as the Middle Creek Marsh Restoration Project) are sufficient to reduce phosphorus loading to acceptable levels.

6.3 Evaluation of Alternatives

6.3.1 Attainment of Water Quality Objectives

Alternative One may or may not result in the attainment of water quality objectives in Clear Lake. Water quality has improved in the lake since the early 1990's most likely as a result of existing activities. However, it is unknown whether these actions are adequate for long term improvement in the lake. Alternative 2 requires the responsible parties to estimate phosphorus loading from their lands and to report to the Regional Board whether or not the loading reduction has been achieved and beneficial uses restored. The Regional Board would review the reports from the responsible parties and determine if additional measures are needed to achieve compliance. In this way, it is expected that Alternative 2 would result in the achievement of water quality objectives. Alternative 3 would require all responsible parties to reduce their phosphorus loads to the level achievable regardless of the impact of other actions. This would most likely result in a greater than 40% reduction in phosphorus loading. Alternative 3 would also result in the attainment of water quality objectives in the lake.

6.3.2 Cost

Under Alternative 1, no additional activities would be required and the cost of this alternative would be zero. Alternatives 2 and 3 would require additional actions. Alternative 2 requires at a minimum that Responsible Parties estimate phosphorus loading from their areas of influence and report to the Central Valley Water Board on the effectiveness of their phosphorus control strategies. Additional BMP implementation may be required under Alternative 2 if monitoring shows that the phosphorus control strategies are not working.

Table 6.1 summarizes the range of estimated costs for Alternatives 1, 2 and 3. Alternative 1 is estimated at zero cost because no additional actions are required. Alternative 2 may require as little as \$20,000 to implement if all parties work together to submit their reports and it is determined that no additional BMPs would be necessary. The cost range for Alternative 3 is based on implementation of BMPs in at least 30% of stream miles and 30% of the 50 ft. buffer zone. A detailed breakdown of how these costs were developed is provided in Appendix A.

Table 6.1: Summary of Estimated Costs of Alternatives

Alternative	Estimated Cost
Alternative 1	\$0
Alternative 2	\$20,000 – \$18,477,921
Alternative 3	\$26,130,317 - \$56,511,939

6.3.3 Feasibility

This section discusses the technical feasibility of implementing each of the three Alternatives. Alternative 1 is technically feasible because it is a no action alternative that includes activities that are currently underway. Alternatives 2 and 3 involve estimating phosphorus loads, report writing and BMP implementation. Load estimation can be done via computer modeling or monitoring. Both of these activities are technically feasible methods for estimating loading that have been employed for TMDLs and other efforts where pollutant loading is a concern. The proposed BMPs are discussed in Appendix 1.

They are technically feasible methods that are promoted by the National Resource Conservation Service (NRCS). Other technically feasible BMPs that address erosion exist and may be employed as a result of this TMDL.

6.4 Recommended Alternative

Regional Board staff recommends the adoption of Alternative 2. This approach represents a balance between the need to reduce phosphorus loading to the lake and the cost of implementation actions. The adaptive implementation approach will ensure that the appropriate actions are being taken to address the impairment in Clear Lake. Under Alternative 1 no loading estimates or reports would be submitted to the Regional Board. The Regional Board would find it difficult to determine if Clear Lake is meeting its beneficial uses. Implementation of Alternative 3 would most likely bring Clear Lake in compliance with the water quality objectives, however full implementation of this alternative may result in unnecessary expenditures of resources. Alternative 2 is the preferred option because it includes a feedback mechanism, which allows the Regional Board and the responsible parties to work together to evaluate current activities and focus resources where there is the greatest need and greatest potential for improvement.

7 MONITORING

Monitoring will be conducted to assess compliance with water quality objectives, determine phosphorus loading to the lake and to gauge the effectiveness of implementation actions undertaken pursuant to this TMDL.

In order to determine if the lake is in compliance with the narrative water quality objective, monitoring must occur within the lake. Chlorophyll-a or secchi depth can be measured to estimate the algae biomass in the lake.

In response to the TMDL implementation plan Responsible Parties may choose to estimate their phosphorus loading through monitoring. If this is done, monitoring must occur at the appropriate locations and frequency necessary to estimate phosphorus loading. This monitoring will most likely occur in the tributaries and it will be necessary to measure stream flow at the same time in order to estimate phosphorus loads.

Monitoring may also be conducted to determine the effectiveness of implementation actions. In these cases monitoring may be conducted before and after implementation, upstream and downstream, or using paired watersheds. The type of implementation action will determine the most appropriate effectiveness monitoring strategy.

8 REFERENCES

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APPENDIX A: COSTS

Table 1 is a list of selected BMPs that can be implemented in the Clear Lake watershed to control erosion. Some of the BMPs are implemented on an area basis and their unit costs are shown by acre. Other BMPs are implemented on a linear basis and their associated costs are shown by foot.

Table 1: Cost of Selected BMPs³

Practice_Name	Component	Unit_Type	Unit_Cost
Filter Strip	Filter Strip	AC	\$100
Critical Area Planting	Critical Area Planting	AC	\$500
Restoration and Management of Declining Habitats	Restoration and Management of Declining Habitats	AC	\$1,000
Lined Waterway or Outlet	Lined Waterway or Outlet	FT	\$30
Clearing and Snagging	Clearing and Snagging	FT	\$50
Stream Corridor Improvement	Stream Corridor Improvement	FT	\$50
Streambank and Shoreline Protection	Streambank and Shoreline Protection	FT	\$125

The total stream length in the Clear Lake watershed is estimated to be at 2,872,831 feet. Assuming a 50-foot buffer around each stream results in a total of 8,495 acres of land where implementation of erosion control BMPs would have the most direct effect.

Table 2 lists the estimated costs for the Alternatives 1, 2 & 3. Alternative 1 would result in no additional actions and therefore the estimated cost is \$0. Alternative 2 would require loading estimates, report writing and possibly Best Management Practice (BMP) implementation. Alternative 3 would require implementation of BMPs on at least 30% of the stream length and 30% of the 50-foot buffer zone area. The estimated costs of these elements are described below.

Table 2: Estimated Costs for Alternatives 1, 2 & 3

Action	Unit	Unit Cost	Total Cost
<i>Alternative 1</i>			
No Action	Current activities continue as is	\$0	\$0
<i>Alternatives 2 & 3 – Estimates, Reports and BMP Implementation</i>			
Loading Estimates	Computer modeling or monitoring	\$5,000 (modeling) \$24,000 (monitoring)	\$10,000 – \$48,000
Reports	2 Reports	\$5,000	\$10,000 - \$50,000
Erosion Control BMPs	As identified (Assume 5% stream length and 5% buffer zone)	See Table XX Above	\$4,330,483 - \$18,379,912

³ Cost estimates from the Natural Resource Conservation Service: www.nrcs.usda.gov/technical/efotg

<i>Alternative 3 - Additional BMP Implementation</i>			
Erosion Control BMPs	Erosion control on an additional 25% of stream length and 25% of 50 ft. buffer zone.	See Table XX above	\$21,546,235 - \$38,034,019

Loading Estimates: Under options 2 and 3 each responsible party must submit a phosphorus loading estimate to the Regional Board by December 2011 and again in December 2016. Loading estimates can be determined either through computer modeling or by monitoring. The minimum cost of loading estimate through computer modeling is estimated to be \$5,000. Monthly water quality monitoring at 20 sites at a cost of \$100 per sample would amount to \$24,000 per year. In order to comply with the requirements in of the implementation plan responsible parties would have to monitor twice (in 2011 and 2016) to determine their loading (if they chose this method). Responsible parties can work together on their loading estimates or they can submit separate estimates.

Reports: It is estimated that each report would cost \$5,000. Under options 2 and 3 two reports are required (December 31, 2011 and December 31, 2013) which would cost at a minimum \$10,000. There are five responsible parties - County of Lake (County), City of Clearlake, City of Lakeport, BLM, and USFS. Each responsible party can submit a separate report or they can combine their efforts into one report. If each responsible party submitted a separate report the cost of the reporting would total \$50,000.

BMP Implementation: Alternative 1 would require no additional BMPs. Under Alternative 2, the Regional Board would receive a report in December 2011 from the responsible parties describing progress towards the goal of bringing Clear Lake in compliance with water quality objectives. Depending on this evaluation, additional BMP implementation may be required. For the purposes of this cost estimate, it is estimated that additional BMPs would have to be implemented on 5% of stream length and 5% of the 50 ft. buffer zone to bring the lake into compliance with water quality objectives. This estimate takes into account existing projects (such as the Middle Creek Ecosystem Restoration Project) that are being or will be implemented to control erosion. Under Alternative 3 the same loading estimates and reporting requirements would exist, plus an estimated additional 25% of stream length and 25% of the buffer zone would require BMP implementation. It is estimated that Alternative 3 would necessitate implementation of BMPs on at least 30% of the stream lengths and 30% of the 50 ft. buffer zone.

Table 3 summarizes the estimated cost ranges for each of the three alternatives. Alternative 1 would require no additional work and the cost would be \$0. Alternative 2 would require at a minimum loading estimates and report writing. The low value of \$20,000 is the estimated cost of Alternative 2 if responsible parties worked together on their reports and loading estimates. Additional BMP implementation may also be

required as part of Alternative 2. Alternative 3 would require loading estimates, report writing and BMP implementation on at least 30% of the stream length and 30% of the 50 foot buffer zone.

Table 3: Summary of Estimated Costs of Alternatives

Alternative	Estimated Cost
Alternative 1	\$0
Alternative 2	\$20,000 – \$18,477,921
Alternative 3	\$26,130,317 - \$56,511,939

APPENDIX B: ENVIRONMENTAL CHECKLIST AND DISCUSSION

All Basin Plans and plan amendments are subject to the California Environmental Quality Act (CEQA). The Secretary of Resources has certified the State Board's water quality planning process as meeting the requirements of Section 21080.5 of CEQA. The Basin Planning process is determined to be "functionally equivalent to" CEQA's requirement for preparation of an environmental impact report or negative declaration and initial study. The process includes developing a written report (staff report), an initial draft of the amendment, and an Environmental Checklist Form.

The proposed project establishes an implementation plan to control nutrient inputs to Clear Lake, CA. The impacts of activities undertaken pursuant to the implementation plan are also considered in this evaluation. To comply with the TMDL, dischargers may choose to implement Management Practices (MPs) to control erosion and thereby reducing nutrient inputs to Clear Lake. Some MPs consist of on-the-ground projects that may have localized, short-term adverse impacts on the environment. However, these projects would require a permit that would include an environmental review, and their net impact on the environment is expected to be positive.

I. Project Title:

Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins: Sacramento – Clear Lake TMDL for Nutrients

II. Lead agency name and address:

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

III. Contact persons and phone number:

Lori Webber, Environmental Scientist
916-464-4745

IV. Project location:

Clear Lake and its watershed.

V. Project sponsor's name and address:

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

VI. General plan designation:

Not applicable

VII. Zoning:

Not applicable

VIII. Description of project:

The Central Valley Regional Water Quality Control Board proposes to amend the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins. The purpose of the amendment is to implement a total maximum daily load water (TMDL) management strategy for nutrients in Clear Lake. The Basin Plan amendments include an implementation plan to reduce nutrient loading into Clear Lake. The implementation plan recommends activities such water quality monitoring, implementation of erosion control MPs, and public education and outreach to achieve the goals of the TMDL.

IX. Surrounding land use and setting:

The region affected by this amendment is Clear Lake and its tributary watersheds. The land uses in the area include agriculture, urban, grasslands, shrublands and forested lands.

X. Other public agencies whose approval is required (e.g. permits, financing approval, or participation agreement.)

State Water Resources Control Board
Office of Administrative Law
U.S. Environmental Protection Agency

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental resource categories identified below are analyzed herein to determine whether the Proposed Project would result in adverse impacts to any of these resources. None of the categories below are checked because the Proposed Project is not expected to result in “significant or potentially significant impacts” to any of these resources.

- | | |
|--|---|
| <input type="checkbox"/> Aesthetics | <input type="checkbox"/> Biological Resources |
| <input type="checkbox"/> Hazards & Hazardous Materials | <input type="checkbox"/> Mineral Resources |
| <input type="checkbox"/> Public Services | <input type="checkbox"/> Utilities/Service Systems |
| <input type="checkbox"/> Agriculture Resources | <input type="checkbox"/> Cultural Resources |
| <input type="checkbox"/> Hydrology/Water Quality | <input type="checkbox"/> Noise |
| <input type="checkbox"/> Recreation | <input type="checkbox"/> Mandatory Findings of Significance |
| <input type="checkbox"/> Air Quality | <input type="checkbox"/> Geology/Soils |
| <input type="checkbox"/> Land Use Planning | <input type="checkbox"/> Transportation/Traffic |

On the basis of this initial evaluation:

- I find that the Proposed Project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

- I find that although the Proposed Project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the Project have been made by or agreed to by the Project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

- I find that the Proposed Project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
- I find that the Proposed Project MAY have a “potentially significant impact” or “potentially significant unless mitigated” impact on the environment, but at least one effect: 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
- I find that although the Proposed Project could have a significant effect on the environment because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the Proposed Project, nothing further is required.

Signature	Date
Printed name	For

THRESHOLDS OF SIGNIFICANCE

Potential impacts were determined to be significant if the Proposed Project or its alternatives would result in changes in environmental conditions that would, either directly or indirectly, cause a substantial loss of habitat or a substantial degradation of water quality of other resources. The analysis of potential environmental impacts is based on the possible approaches to controlling nutrient inputs to Clear Lake in response to the proposed Basin Plan amendment. These approaches include monitoring to characterize nutrient inputs from various sources, implementing MPs to reduce nutrient inputs from erosion and public education and outreach.

EVALUATION OF ENVIRONMENTAL IMPACTS

This Environmental Checklist has been prepared in compliance with the requirements of CEQA relating to certified regulatory programs.

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
I. AESTHETICS Would the Project:				
a) Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to control nutrient inputs into Clear Lake. The implementation plan would result in a reduction of nuisance blue-green algae blooms in the lake, which would improve aesthetics. In order to comply with the proposed TMDL implementation plan, dischargers may choose to implement erosion control MPs. Some erosion BMPs (such as filter strips) may have a positive effect on aesthetics by enhancing the natural environment adjacent to streams and rivers.

II. AGRICULTURE RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the Project:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Involve other changes in the existing	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				

The proposed project is expected to cause a less than significant impact on agricultural resources. In some cases, MP implementation could result in the conversion of a small portion of agricultural land. This type of conversion is not expected to significantly alter the amount of farmland in existence. The creation of wetlands to trap nutrient inputs to Clear Lake is a recommended activity in the implementation program. The creation of a wetland that would result in a large-scale conversion of agricultural land would be subject to an environmental review process.

III. AIR QUALITY – Where available, the significance criteria established by the applicable air quality management or air pollution control the District may be relied upon to make the following determinations. Would the Project:

a) Conflict with or obstruct implementation of the applicable air quality plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Create objectionable odors affecting a substantial number of people?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to control nutrient inputs into Clear Lake. No adverse impacts to air quality are expected as a result of this project. Actions taken by dischargers to comply with the implementation plan that may affect air quality (such as using heavy equipment for stream restoration projects) will most likely require a permit that would include an environmental review.

IV. BIOLOGICAL RESOURCES – Would the Project:

a) Have a substantial adverse effect, either directly, or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulators, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US fish and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
Wildlife Service?				
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs into Clear Lake. The project would result in an overall benefit to biological resources by reducing the occurrence of nuisance algae blooms, which can harm fish and wildlife.

The implementation of MPs may result in temporary, negative impacts to biological resources. For example, an erosion control project involving removal of invasive vegetation might result in a localized, short-term increase in sedimentation. These projects would be subject to separate environmental review process before implementation. The overall impact of these types of projects is likely to be positive.

V. CULTURAL RESOURCES – Would the Project:

a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Directly or indirectly destroy a unique paleontological resource of site or unique geological feature?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Disturb any human remains, including those interred outside of formal cemeteries?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. No adverse impacts to cultural resources are expected as part of this project. Activities undertaken pursuant to the implementation plan that may affect cultural resources (such as a stream restoration project) will most likely require a permit that would include an environmental review.

VI. GEOLOGY AND SOILS – Would the Project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Strong seismic ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. The implementation plan calls for actions to reduce soil erosion and the net impact on geology and soils from this project is expected to be positive. Activities undertaken pursuant to the implementation plan that may affect geology and soils (such as a stream restoration project) will most likely require a permit that would include an environmental review.

VII. HAZARDS AND HAZARDOUS MATERIALS – Would the Project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

No impacts from hazards or hazardous materials are expected as part of this project.

VIII. HYDROLOGY AND WATER QUALITY – Would the Project:

a) Violate any water quality standards or waste discharge requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
substantially increase the rate or amount of surface runoff in a manner which results in flooding on- or off-site?				
e) Create or contribute runoff water which exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Otherwise substantially degrade water quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
j) Inundation by seiche, tsunami, or mudflow?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Establishment of an implementation plan for the nutrients in Clear Lake is not expected to adversely affect hydrology or water quality of the area. Instream or riparian erosion control projects may alter stream courses and temporarily negatively impact water quality. These actions would most likely require a permit that would include an environmental review. The net result of these activities is expected to benefit hydrology and water quality.

IX. LAND USE AND PLANNING – Would the Project:

a) Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Establishment of an implementation plan for the nutrients in Clear Lake is not expected to adversely affect land use planning activities of the area.

X. MINERAL RESOURCES – Would the Project:

a) Result in the loss of availability of a known mineral resource that would be of value to the	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. No adverse impacts to mineral resources are expected as part of this project. Activities undertaken pursuant to the implementation plan that may affect mineral resources (such as a stream restoration project) would most likely require a permit that would include an environmental review.

XI. NOISE – Would the Project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) A substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. No adverse impacts to noise are expected as part of this project. Activities undertaken pursuant to the implementation plan that may affect noise (such as a stream restoration project) would most likely require a permit that would include an environmental review.

XII. POPULATION AND HOUSING – Would the Project?

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Displace substantial numbers of existing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
housing, necessitating the construction of replacement housing elsewhere?				
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. No adverse impacts to population and housing are expected as part of this project. Activities undertaken pursuant to the implementation plan that may affect population and housing would most likely require a permit that would include an environmental review.

XIII. PUBLIC SERVICES

a) Would the Project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

Fire protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Police protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Schools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Parks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other public facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. No adverse impacts to public services are expected as part of this project. Activities undertaken pursuant to the implementation plan that may affect public services would most likely require a permit that would include an environmental review.

XIV. RECREATION

a) Would the Project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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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?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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The project's net impact on recreation is expected to be positive. The implementation of the Clear Lake nutrient TMDL is intended to reduce the occurrence of nuisance bluegreen algae blooms. Algae blooms negatively

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
affect recreational uses in the lake. If the nuisance algae blooms are reduced, recreational benefits should improve.				

XV. TRANSPORTATION/TRAFFIC – Would the Project:

a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio to roads, or congestion at intersections?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion/management agency for designated roads or highways?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Result in inadequate emergency access?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Result in inadequate parking capacity?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. No adverse impacts to transportation/traffic are expected as part of this project. Activities undertaken pursuant to the implementation plan that may affect transportation and traffic would most likely require a permit that would include an environmental review.

XVI. UTILITIES AND SERVICE SYSTEMS – Would the Project?

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Have sufficient water supplies available to serve the Project from existing entitlements and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Be served by a landfill with sufficient permitted capacity to accommodate the Project's solid waste disposal needs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Comply with federal, state, and local statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. No additional wastewater treatment or stormwater facilities would be required pursuant to this plan. The proposed project is expected to have no impact on utilities and services systems.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

a) Does the Project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number of restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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 probably future projects)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Does the Project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The proposed project establishes an implementation plan to reduce nutrient inputs to Clear Lake. These activities, and the activities that are undertaken to implement the plan, are expected to have an overall beneficial impact on the environment. There are no probable future changes in Regional Board programs that would lead to cumulatively significant impacts when combined with likely impacts from the proposed Basin Plan amendment.