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

Staff Report

June 2006

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

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EXECUTIVE SUMMARY

The Central Valley Regional Water Quality Control Board (Central Valley Water 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 spring, 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 Basin Plan Amendment was developed by Tetra Tech. They used water quality models to estimate phosphorus loads, generate a water quality target and calculate the load reductions necessary to reach the target. 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 country. LSPC was used to model the watershed and EFDC was used to model the lake. 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 models.

The LSPC model incorporated land use, hydrology and meteorological data to model the watershed contributions of phosphorus to Clear Lake. The estimated phosphorus loads were used as inputs for the EFDC model. EFDC 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 phosphorus load allocations for Clear Lake.

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 includes the requirements of a TMDL for Clear Lake that

consist of a numeric target and a phosphorus load allocation. The amendment also includes an implementation plan to achieve the load reductions. The allocated loading of phosphorus to the lake is 87,100 kg per year. This represents a 40% reduction in average annual phosphorus loading. The 87,100 kg is allocated to point and nonpoint source dischargers. Point source dischargers – Lake County Stormwater Permittees (County of Lake, Cities of Clearlake and Lakeport) and the California Department of Transportation – are each given a waste load allocation of 2,000 and 100 kg per year respectively. Nonpoint source dischargers – the U.S. Bureau of Land Management, the U.S. Forest Service, irrigated agricultural dischargers 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 eliminate the impairment to the beneficial uses in Clear Lake. The implementation plan directs responsible parties to estimate their loading to the lake and implement additional actions, such as best management practices to control phosphorus, if needed. Conditions in Clear Lake will be monitored to determine if the lake is in compliance with its beneficial uses. The responsible parties will be required to update the Central Valley Water Board on their progress towards meeting the phosphorus load reduction requirements.

Recent improvements in water clarity may be a result of the erosion control work already completed by the County and other organizations, or it may indicate that factors other than phosphorus play a role in the occurrence of nuisance algae blooms. Further study is necessary before a determination can be made on the impairment status of the lake. For this reason, the Basin Plan Amendment also recommends that additional studies be conducted to validate the chlorophyll-a target and load allocations and to determine the effect that other constituents (such as nitrogen or iron) might have on nuisance algae blooms in the lake.

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1 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, 2004). The amendments address regulation of nutrients in the Clear Lake watershed, Lake County, California.

California Water Code Section 13240 requires the Regional 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 and a time schedule 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 Appendix A 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[1]. 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 ºF in the winter and 76 ºF 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 chapparal-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

[1] The Tetra Tech report is available on the Internet at: http://www.waterboards.ca.gov/centralvalley/programs/tmdl/ClearLake/ClkDraftTechTMDL.pdf

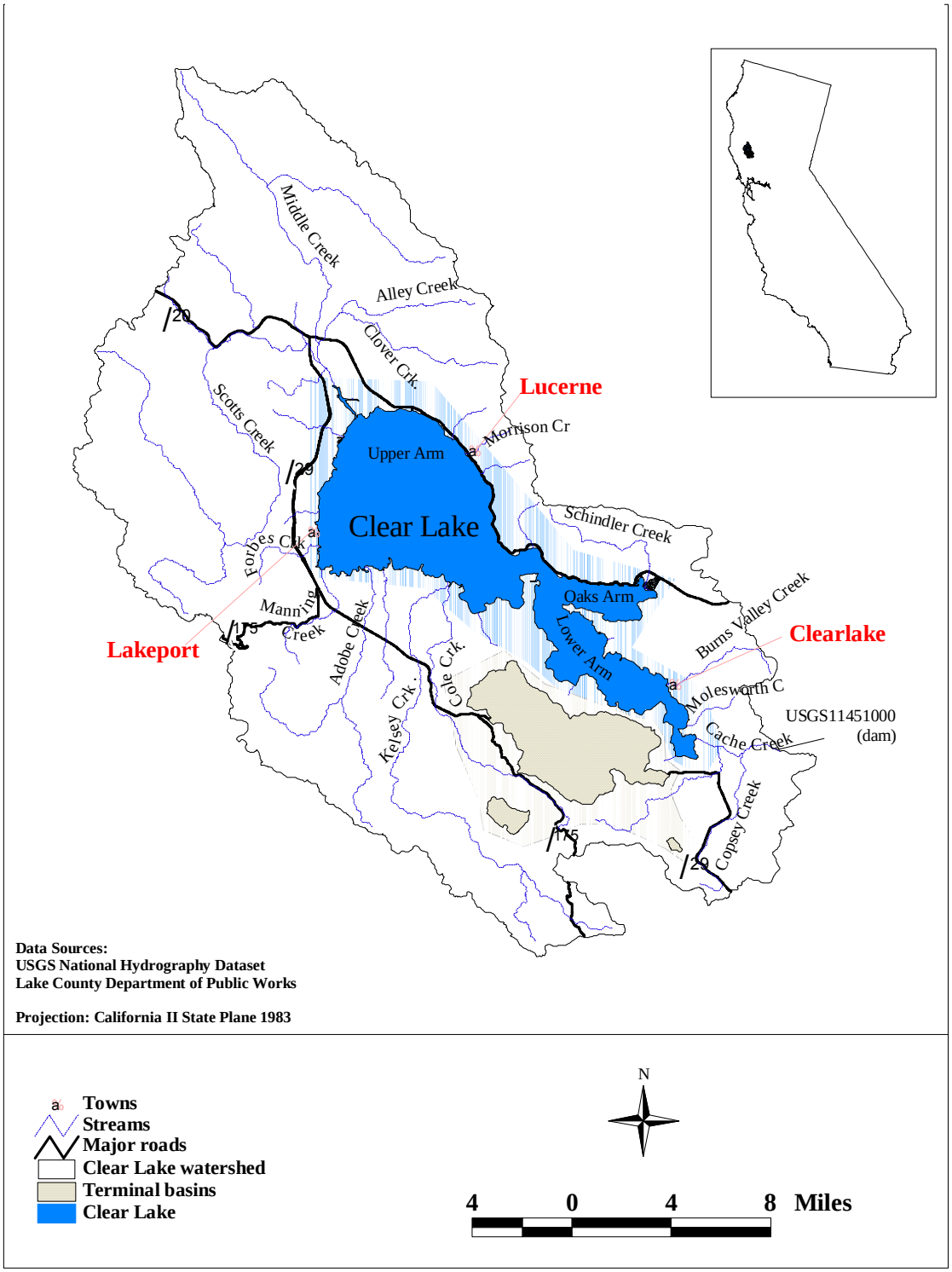
timber harvesting occurs on these publicly owned lands, as well as private lands in the higher elevations of the watershed.

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 Central Valley 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 Central Valley 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 report entitled *Total Maximum Daily Load for Nutrients in Clear Lake, Lake County, California Technical Report*[2] 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. It will also include an implementation plan, which consists of the actions that Central Valley Water Board staff and the responsible parties will take to carry out the requirements of the Basin Plan Amendment.

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

[2] The report is available on the Internet at:
http://www.waterboards.ca.gov/centralvalley/programs/tmdl/ClearLake/ClkDraftTechTMDL.pdf

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 <u>underline</u>. 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 6 of this staff report. No deletions are proposed for Chapter IV.

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

<u>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"</u>

<u>Research and studies have concluded that there are likely multiple factors that influence the occurrence of nuisance algae blooms in Clear Lake. Recent improvements in water clarity may be due to a reduction in phosphorus loading or a result of other factors such as iron or sulfur availability, changes to lake ecology (introduced species, etc.), water year type or a combination of factors.</u>

For the purposes of this program of implementation both phosphorus loading and other factors that may affect algae growth will be addressed.

1. Modeling studies predict that a 40% reduction in average phosphorus loading will significantly reduce the incidence of algae blooms. A 40% reduction would equal an annual allowable loading of approximately 87,100 kg. Therefore, for this program of implementation, an average annual (five year rolling average) phosphorus load of 87,100 kg is established as the loading capacity for Clear Lake.

2. Waste load allocations for the NPDES facilities discharging to the lake or tributaries are as follows:

   a. Lake County Stormwater Permittees (Lake County, City of Clearlake, City of Lakeport) - 2,000 kg/yr
   b. California Department of Transportation (Caltrans) – 100 kg/yr

3. The load allocation for nonpoint source dischargers is 85,000 kg/yr average annual load (five year rolling average). The U.S. Bureau of Land Management (USBLM), U.S. Forest Service (USFS), Lake County (County) and irrigated agriculture are responsible for controlling phosphorus discharges from those portions of the watershed within their respective authority.

4. Regional Water Board staff will work with the responsible parties – Stormwater permittees, Caltrans, USBLM, USFS, County and irrigated agriculture – to develop and implement a plan to collect the information needed to determine what factors are important in controlling nuisance blooms and to recommend what control strategy should be implemented. The responsible parties will submit the plan to the Regional Water Board by [one year after approval by OAL]. The plan should address the following topics:
   - Studies to assess the current limnological conditions and to determine the appropriate measures necessary for Clear Lake to meet the Basin Plan objectives
   - Appropriate monitoring for evaluating conditions in the lake
   - Effective collection of phosphorus loading information from the various sources
   - Practices implemented or planned to control phosphorus loading to the lake
   - Develop criteria to determine when Clear Lake is no longer impaired

5. Compliance with load and waste load allocations for phosphorus in Clear Lake is required by [ten years after approval by OAL]. However, by [five

years and three months after approval by OAL], the Regional Board will consider information developed and determine whether the phosphorus load and waste load allocations should continue to be required or if some other control strategy or approach is more appropriate. To the extent that other controllable water quality factors, besides phosphorus, cause or contribute to nuisance algae blooms, those factors will be addressed in revisions to this program of implementation. Implementation of phosphorus control practices to achieve load and waste load allocations will occur under waste discharge requirements or waivers of waste discharge requirements.

6. If Clear Lake is attaining its beneficial uses and the Regional Water Board determine that phosphorus loads above allocated amounts are not causing or contributing to nuisance algae problems, the Regional Water Board will amend the Basin Plan to revise this nutrient control program for Clear Lake.

The proposed modification ads a new subheading under "Estimated Costs of Agricultural Water Quality Control Programs and Potential Sources of Financing" labeled Clear Lake Nutrient Control Program.

Estimated costs to implement BMPs, if necessary, are $400,000 to $1,800,000 (2006 dollars).

Potential funding sources include:

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

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 nutrient control program.

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

The responsible parties – Lake County, City of Clearlake, City of Lakeport, Caltrans, USBLM, USFS and irrigated agriculture – will work with Regional Water Board staff to estimate nutrient loadings from activities in the watershed. Loading estimates can be conducted using either water quality monitoring or computer modeling or a combination of the two.

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 (a)
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 plant growth occurs 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 1920s and 1930s. 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 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).

Nitrogen is another nutrient that can promote algae growth. When phosphorus concentrations are high nitrogen can become the limiting nutrient with regard to algae growth. Clear Lake is often nitrogen limited during the summer and fall (Tetra Tech, 2004). However, some species of blue-green algae (such as *Aphanazomenon* and *Anabaena*) can “fix” (utilize) atmospheric nitrogen. When this occurs there is essentially an unlimited source of nitrogen for these species. Horne and Goldman (1974) estimated that 30% to 60% of the nitrogen budget was due to nitrogen fixation.

Iron may play a role in the occurrence of blue-green algae blooms. 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).

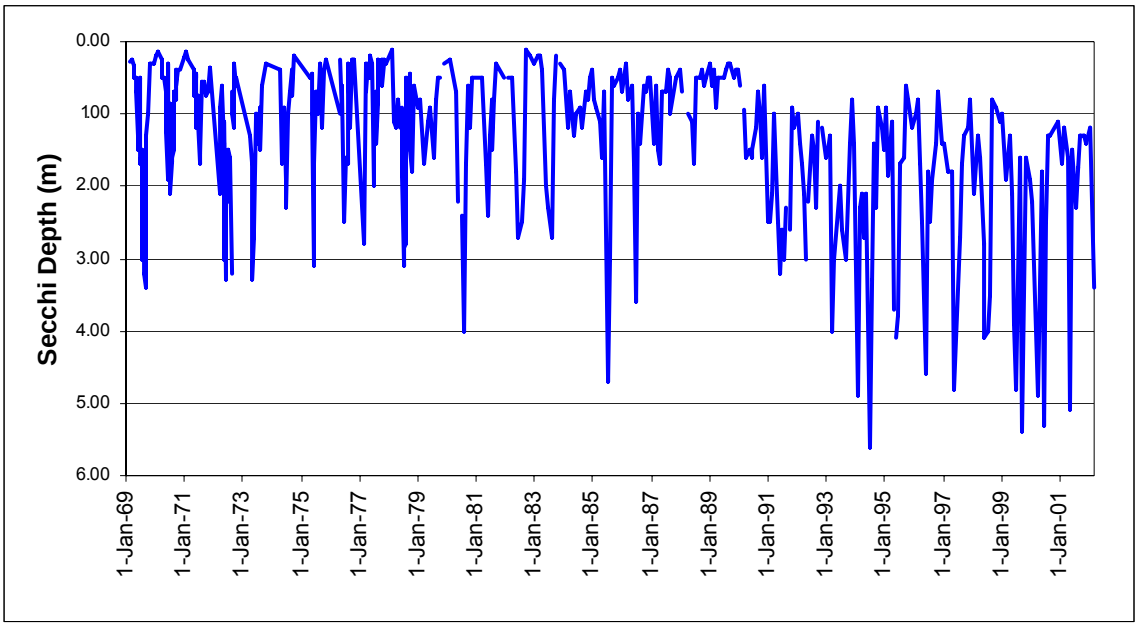
Harmful algae blooms (HABs) occur when certain species of blue-green algae release toxins into the water column (Paerl, H.W., 2005). A study conducted by the Lake County Department of Public Health in 1991 concluded that blue-green algae toxins are unlikely to cause serious acute human health effects from swimming or drinking water in Clear Lake. The report also stated that it is difficult to determine if there are long-term, chronic effects from drinking water but that the toxin levels were low enough that the authors felt that long-term effects were probably negligible (CA Dept. of Health Services, 1991). Since 1991 there has

been renewed interest in HABs throughout California. As new information becomes available this issue may be re-investigated in Clear Lake.

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 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[3]. 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.

Figure 3.1: Secchi depth in Clear Lake 1969-2001



[3] Secchi depth is measured by dropping a secchi disk (a round disk that is painted half white and half black) into the water until it cannot be seen anymore. The distance to lack of visibility is then noted as the secchi depth.

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 the load allocations and blue-green algae growth. The chlorophyll-a target and phosphorus load allocations will be reviewed five years after approval of the Basin Plan Amendment by OAL, and adjusted if needed.

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 country[4]. The LSPC model estimates loads that are generated in a watershed by land use. The EFDC estimates the reaction of the water body to loads of nutrients. In this case the water body represented by EFDC is Clear Lake. 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 summarize the technical Tetra Tech report 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

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

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. Central Valley Water 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 87,271.5 kg phosphorus, a reduction of about 40% from estimated 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 permitees (County of Lake, City of Lakeport and City of Clearlake) and Caltrans. About 2.5% of the Clear Lake watershed is urbanized. The stormwater permitees 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 100 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. Therefore the total load phosphorus load allocation is 87,100 kg per year. The remaining 171.5 kg of phosphorus can be considered part of the margin of safety.

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.

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.

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 and nitrogen 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

As discussed on page 65 of the Tetra Tech report, the 40% phosphorus load reduction required under this TMDL will result in a maximum concentration of 65 µg/L chlorophyll-a. This results in an 8 µg/L margin of safety, or 10%. For the loading allocations 171.5 kg of phosphorus remained un-allocated, which can be considered a margin of safety. 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 nutrient control program. This would contribute to an overall improvement of wetland habitat within the watershed.

5.4 State Water Board Policies

5.4.1 State Water Board's Water Quality Control Policy for Addressing Impaired Waters

The State Water Board adopted the Water Quality Control Policy for Addressing Impaired Waters to describe the requirements for how the State and Regional Water Boards must correct impairments to the waters of the State through the TMDL program.

"…impaired waters will be corrected (and implementation plans crafted) using existing regulatory tools."

"TMDLs are adopted with programs that implement correction of the impairment …"

"The TMDL may be adopted with and reflected in assumptions underlying a Basin Plan Amendment, or other regulation or policy for water quality control that is designed to guide the Regional Board in correcting the impairment."

The proposed Basin Plan Amendment contains all the necessary elements of a TMDL, and an implementation plan that uses existing regulatory tools to correct the impairment caused by nutrients in Clear Lake. The solution to the impairment will affect multiple persons and require multiple actions of the Central Valley Water Board so it is being implemented through a Basin Plan Amendment. The Basin Plan Amendment has, therefore, been prepared in a manner consistent with the State Water Board's Water Quality Control Policy for Addressing Impaired Waters.

5.4.2 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 Water 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.

5.4.3 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.

5.4.4 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.

5.4.5 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.

5.4.6 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.

5.4.7 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 State and Regional Water Boards 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 control program makes use of these tools, where applicable, to control non-point sources of nutrients and therefore is consistent with this policy.

5.4.8 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 control program 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 (County of Lake, City of Lakeport, City of Clearlake) to assess their phosphorus loads and reduce the loads from urban areas to 2,000 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 Central Valley Water 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 (Richerson et. al., 1994, Goldstein and Tolsdorf, 1994, Tetra Tech, 2004).

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 four implementation options for the control of phosphorus into Clear Lake.

As mentioned in Section 3.2, Existing Conditions, nitrogen concentrations are often high in the lake, especially during the summer and fall. It has been argued that the implementation program should also consider nitrogen controls as well as phosphorus controls. However, nitrogen fixation by certain species of blue-green algae may make nitrogen controls less effective.

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, Central Valley Water Board staff recognizes that further study is needed to determine whether other factors other than phosphorus inputs have an impact on algae growth in the lake. For this reason, the Basin Plan Amendment calls for additional studies to be conducted to investigate the role of other factors such as nitrogen, iron and sulfur and to evaluate the chlorophyll-a target and load allocations.

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. Since 1991 the clarity of the lake has improved, possibly due to the results of these activities. 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 Full Circle Effluent Pipeline

Full Circle is a wastewater reuse system whereby wastewater from communities surrounding Clear Lake is diverted for injection into the Geysers geothermal resource area for geothermal power generation. The first phase of the project was constructed in the 1990s and consists of a pipeline serving the communities in the northern and eastern portion of the lake. The second phase will divert wastewater from existing treatment plants in Lakeport and Kelseyville for injection into Geysers geothermal resource area. The schedule for the second phase includes planning and environmental review during 2004-2005, final design and funding acquisition during 2005-2006, and construction during 2006-2008.

6.1.3 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.

6.1.4 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, which is made up of the stormwater permittees (County of Lake, City of Clearlake, City of Lakeport), 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 Community Development Department 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.

6.1.5 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. Central Valley Water Board staff review applications for coverage under the waiver and conduct inspections on a select number of operations.

6.1.6 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 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.

6.1.7 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 United States 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 four options were considered for implementation of the Clear Lake nutrient control program:

6.2.1 Alternative 1 – No Action

Under this alternative the activities described in Section 6.1 above would continue as is, with no additional requirements. No monitoring or reporting would be required of the responsible parties and the Central Valley Water Board would not review progress towards achieving the loading reduction required under this nutrient control program.

6.2.2 Alternative 2 – Individual Reporting

This alternative would add additional requirements to the existing activities that are now occurring in the Clear Lake watershed. These requirements would be continued studies, reports or management plans, monitoring, and possibly implementation of Best Management Practices (BMPs) to control phosphorus loading to the lake.

Continued Studies: As discussed in Section 3.2, Clear Lake is a complex system and several questions remain regarding nutrient cycling and algal blooms in the lake. Under Alternatives 2 these questions would be evaluated through continued studies. These studies would include investigating the cause of the recently improved clarity in the lake and the role of nitrogen or iron in controlling algae blooms. Under this alternative, additional studies may also be conducted to evaluate the chlorophyll-a target and loading allocations.

Reports or Management Plans: By five years after approval of the Basin Plan Amendment by OAL the responsible parties would be required to submit a report or management plans to the Central Valley Water Board that evaluates their progress towards meeting the load allocations and waste load allocations described in the Basin Plan Amendment. Responsible parties would be required to estimate their phosphorus loads, describe actions implemented and actions planned to reduce phosphorus loading, and gauge the effectiveness of their phosphorus control actions. By ten years after approval by OAL responsible parties would be required to submit a progress report updating the Central Valley Water Board on these items.

Monitoring: Monitoring would be conducted to evaluate conditions within the lake, estimate phosphorus loading into the lake (tributary monitoring) and evaluate the effectiveness of implementation actions. Monitoring conducted as part of the

Irrigated Lands waiver program would also be incorporated into the overall analysis. The results of the monitoring would be used to guide further implementation activities, as necessary.

BMP Implementation: Central Valley Water Board staff would review the reports submitted by the responsible parties to evaluate whether the actions they are implementing are improving conditions in Clear Lake with respect to nuisance algae blooms. If the Central Valley Water Board determines that conditions are not improving, responsible parties might be required to implement BMPs to control phosphorus loading to the lake.

Each responsible party would be responsible for producing a report or management plan that contains the required information. However, the responsible parties would be encouraged to work together to conduct studies, estimate phosphorus loading and monitor conditions in the lake.

6.2.3 Alternative 3 – Adaptive Implementation

Under Alternative 3 the responsible parties would be required to work together to develop and implement a plan to collect the information necessary to determine what factors are important in controlling nuisance blooms and to recommend what control strategy should be implemented.

The plan would address the following topics:

- Studies needed to evaluate the factors affecting algae growth in the lake. Recent data indicate that clarity has improved in the lake yet phosphorus levels have not dropped appreciably. Other factors such as nitrogen, iron or sulfur may have an impact on algae growth in the lake.
- Appropriate monitoring for evaluating conditions in the lake. It should be determined whether chlorophyll-a or secchi depth, or another method is the most appropriate measure of nuisance algae growth in the lake.
- Effective collection of phosphorus loading information from the lake. Phosphorus loading can be determined through either computer modeling or monitoring or a combination of the two methods.
- Practices implemented or planned to control phosphorus loading to the lake. An accounting of these activities is necessary to determine progress towards achieving compliance with the loading allocations.
- Information necessary to determine if Clear Lake is no longer impaired. Central Valley Water Board staff and the responsible parties should agree upon the conditions within the lake that when achieved would mean that beneficial uses are being attained.

The plan would be due to the Central Valley Water Board one year after the Basin Plan Amendment is adopted by the Office of Administrative Law. Once the plan is submitted, Central Valley Water Board staff would work with the responsible parties to find funding to implement the different elements of the

plan. To implement the plan the responsible parties would have to conduct studies, monitor conditions in the lake, estimate phosphorus loads, describe management practices and determine the impairment status of the lake. This information will be submitted to the Central Valley Water Board.

Five years after adoption of the Basin Plan Amendment Central Valley Water Board staff would review the information submitted by the responsible parties to determine whether the phosphorus load and waste load allocations should continue to be required or if some other control strategy or approach is more appropriate. If staff determines that conditions are not improving, responsible parties might be required to implement additional Best Management Practices (BMPs) to control phosphorus loading to the lake.

If at any time, based on the information provided by the responsible parties, the Central Valley Water Board determines that Clear Lake is attaining its beneficial uses and that phosphorus loads do not cause or contribute to nuisance algae problems, the load allocations and waste load allocations will no longer apply.

6.2.4 Alternative 4 –Immediate BMP Implementation

Under this alternative each Responsible Party would be required to reduce all controllable sources of phosphorus to Clear Lake. 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 1 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. Alternatives 2 and 3 require the responsible parties to estimate phosphorus loading from their lands and to report to the Central Valley Water Board on whether or not the load reduction has been achieved and beneficial uses restored. Alternative 3 also requires that a consensus opinion be developed on what constitutes fully attained. The Central Valley Water Board would review the information provided by the responsible parties and determine if additional measures are needed to achieve compliance. In this way, it is expected that Alternatives 2 and 3 would result in the achievement of water quality objectives. Alternative 4 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 4 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, 3 and 4 would require additional actions. The elements of Alternative 2 are reports, studies, monitoring, load estimates, and possibly BMP implementation. The elements of Alternative 3 are planning, studies, monitoring, load estimates and possibly BMP implementation. Alternative 4 would require BMP implementation on all controllable sources of phosphorus to Clear Lake. The estimated costs of these elements are described below.

Reports: Under Alternative 2, two reports are required (five and ten years after approval of the Basin Plan Amendment by OAL). The estimated cost of each report is $5,000. Two reports in a minimum reporting cost of $10,000. If each responsible party submitted a separate report the cost would be $60,000

Planning: Under Alternative 3 the responsible parties would develop a plan that describes how they will address the elements required under the proposed Basin Plan Amendment. It is estimated that development of a plan would cost $5,000.

Studies: Under Alternatives 2 and 3 further studies would be conducted to evaluate the dynamics of the Clear Lake ecosystem. The cost of these studies is variable. Richerson, et. al., (1994) conducted an in-depth study of algae in Clear Lake that cost $160,000. The County of Lake estimates that, with inflation, the cost of updating the report would cost $400,000.

Loading Estimates: Under Alternatives 2 and 3 phosphorus loading estimates from each responsible party would be required. Loading estimates can be determined either through computer modeling or by monitoring, or a combination of the two methods. The estimated minimum cost of a loading estimate using computer modeling is $5,000 per loading estimate. Monthly water quality monitoring at 20 sites at an estimated cost of $100 per sample would amount to $24,000 per year. In order to obtain loading estimates the stream gages on Scott's, Middle and Kelsey creeks would have to be maintained. The estimated cost of maintaining the stream gages is $50,000/year.

Monitoring conditions in the lake: Alternatives 2 and 3 would require the responsible parties to determine the appropriate monitoring strategy for evaluating conditions in the lake. Water clarity (secchi depth) or chlorophyll-a can be used to monitor conditions in the lake. The Department of Water Resources is currently conducting water quality monitoring within the lake about 10 times a year that includes measuring nutrient levels and water clarity. This monitoring is expected to continue. Chlorophyll-a monitoring costs approximately $70/sample. Chlorophyll-a would be monitored during the growing season (April through October). The cost of monitoring for chlorophyll-a ($70/sample at three sites at three depths for 6 months) is estimated at $3,780 per year.

BMP Implementation: Under Alternatives 2 and 3, the Central Valley Water Board would review the information about phosphorus loading and conditions in the lake submitted by the responsible parties. Depending on the results of this evaluation, additional BMP implementation may be required. Alternative 4 would require immediate BMP implementation in areas where phosphorus is being discharged.

The Clear Lake watershed has an estimated total stream length of 2,872,831 feet. For the purposes of this cost estimate it is assumed that BMPs would have the most direct impact on water quality if they were implemented within the 50-foot buffer zone around each stream. There are a total of 8,495 acres of land within the 50-foot buffer zone.

Under Alternatives 2 and 3 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 erosion control projects (such as the Middle Creek Ecosystem Restoration Project) that are being or will be implemented. It is estimated that Alternative 4 would necessitate implementation of BMPs on at least 30% of the stream lengths and 30% of the 50 ft. buffer zone.

Table 6.1 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 6.1: Cost of Selected BMPs[5]

Practice Name	Unit Type	Unit Cost
Filter Strip	AC	$100
Critical Area Planting	AC	$500
Restoration and Management of Declining Habitats	AC	$1,000
Lined Waterway or Outlet	FT	$30
Clearing and Snagging	FT	$50
Streambank and Shoreline Protection	FT	$125

Table 6.2 lists the estimated costs for Alternatives 1, 2, 3 and 4. Alternative 1, No Action, would result in no additional actions and therefore the estimated cost is $0. Alternative 2, Individual Reporting would require studies, monitoring, loading estimates, reports and possibly BMP implementation. Alternative 3, Adaptive Implementation, would require planning, studies, monitoring, loading estimates and possibly BMP implementation. Alternative 4, Immediate BMP Implementation, would require implementation of BMPs on and estimated 30% of

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

the stream length and 30% of the 50-foot buffer zone area. The estimated costs of these four alternatives are described below.

Table 6.2: Estimated Costs for Alternatives 1, 2 & 3

Action	**Cost**
Alternative 1	
No action – current activities continue as is	$0
Alternatives 2 & 3	
Reports (Alternative 2 only)	$10,000 - $60,000
Planning (Alternative 3 only)	$5,000
Continuing studies	Variable (est. $400,000)
Loading estimates using computer modeling	$5,000 each
Loading estimates using monitoring	$24,000/yr (modeling) $50,000/yr (stream gages)
Chlorophyll-a monitoring	$3,780/yr
Erosion control BMPs as identified (assume 5% of stream length and 5% of buffer zone)	$4,330,483 - $18,379,912
Alternative 4	
Erosion control BMPs on 30% of stream length and 30% of 50ft. buffer zone)	$26,011,317 - $56,413,940

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. Alternative 2 would require report writing, studies, monitoring, phosphorus load estimating and possibly BMP implementation. Alternative 3 involves planning, studies, monitoring, phosphorus load estimating, and possibly BMP implementation. Planning and report writing are common actions that resource management agencies conduct to guide their activities. Persons with the appropriate scientific background could conduct the continued studies. Researchers from the University of California at Davis conducted the first Clean Lakes Study (Richerson, et. al., 1994). These people, or people with similar scientific backgrounds would be available to perform the continued studies. Monitoring in the lake would require technically trained personnel. Currently the monitoring is being conducted by DWR who are technically capable of performing these actions. Any additional sample collection could be collected and processed by appropriately trained personnel. Loading 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. Alternatives 2 and 3 might include BMP

implementation and Alternative 4 would require BMP implementation. The BMPs used in the cost analysis 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 nutrient control program.

6.4 Recommended Alternative

Central Valley Water Board staff recommends the adoption of Alternative 3, Adaptive Implementation. 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 other information about the lake would be submitted to the Central Valley Water Board. The Central Valley Water Board would find it difficult to determine if Clear Lake is meeting its beneficial uses. Alternative 2 would result in the information needed to assess conditions in Clear Lake but also may result in duplicative reporting and a waste of resources if each of the responsible parties submits an individual report. Alternative 2 might also result in requirements for excessive BMP implementation since each of the responsible parties will be evaluated separately; thus, not taking advantage of load reductions other responsible parties are able to achieve. Implementation of Alternative 4 would most likely bring Clear Lake into compliance with the water quality objectives, however full implementation of this alternative may result in unnecessary expenditures of resources. Alternative 3 is the preferred option because it combines resources, and includes a feedback mechanism, which allows the Central Valley Water 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

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. The State Department of Water Resources currently monitors nutrients and Secchi depth in Clear Lake ten times a year. Central Valley Water Board staff recommends that this monitoring continue and that the responsible parties use the data to assess conditions in Clear Lake.

In response to the 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.

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APPENDIX A: 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 – the Control of Nutrients in Clear Lake

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 it 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.

- ☐ Aesthetics
- ☐ Hazards & Hazardous Materials
- ☐ Public Services
- ☐ Agriculture Resources
- ☐ Hydrology/Water Quality
- ☐ Recreation
- ☐ Air Quality
- ☐ Land Use Planning
- ☐ Biological Resources
- ☐ Mineral Resources
- ☐ Utilities/Service Systems
- ☐ Cultural Resources
- ☐ Noise
- ☐ Mandatory Findings of Significance
- ☐ Geology/Soils
- ☐ Transportation/Traffic

On the basis of this initial evaluation:

☒ I find that the proposed Basin Plan Amendment could not have a significant effect on the environment

❑ If find that although the proposed Basin Plan Amendment could have a significant impact on the environment, there will not be a significant effect in

this case because feasible alternatives and/or feasible mitigation measures exist that would substantially lessen any significant impact. These alternatives are discussed in the attached written report.

- ❑ I find that the proposed Basin Plan Amendment may have a significant effect on the environment. There are no feasible alternatives and/or mitigation measures available which would substantially lessen any significant adverse impacts. See attached written report for a discussion of this determination.

/s/	23 June 2006
Pamela C. Creedon Executive Officer Central Valley Water Board	Date

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?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

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-	☐	☐	☐	☒

Impact	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporation	Less Than Significant Impact	No Impact
agricultural use?				
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☒	☐

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?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

The proposed project establishes 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,	☐	☐	☐	☒

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
or regulators, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

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?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource of site or unique	☐	☐	☐	☒

Impact	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporation	Less Than Significant Impact	No Impact
geological feature?				
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

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:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
Iii) Seismic-related ground failure,, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒

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	☐	☐	☐	☒

Impact	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporation	Less Than Significant Impact	No Impact
materials?				
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a Project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project result in a safety hazard for people residing or working in the Project area?	☐	☐	☐	☒
f) For a Project within the vicinity of a private airstrip, would the Project result in a safety hazard for people residing or working in the Project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

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?	☐	☐	☐	☒
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	☐	☐	☐	☒

Impact	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporation	Less Than Significant Impact	No Impact
level which would not support existing land uses or planned uses for which permits have been granted?				
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which 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?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

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?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project (including, but	☐	☐	☐	☒

Impact	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporation	Less Than Significant Impact	No Impact
not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

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 region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

The proposed project establishes 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?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?	☐	☐	☒	☐
e) For a Project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or	☐	☐	☐	☒

Impact	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporation	Less Than Significant Impact	No Impact
working in the Project area to excessive noise levels?				
f) For a Project within the vicinity of a private airstrip, would the Project expose people residing or working in the Project area to excessive noise levels?	☐	☐	☐	☒

The proposed project establishes 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)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

The proposed project establishes 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?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT

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?	☐	☐	☐	☒
b) Does the Project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

The 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 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?	☐	☐	☐	☒
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion/management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or	☐	☐	☐	☒

Impact	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporation	Less Than Significant Impact	No Impact
programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				

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?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the Project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the Project that it has adequate capacity to serve the Project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the Project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

The proposed project establishes 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	☐	☐	☐	☒

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
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?				
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)?	☐	☐	☐	☒
c) Does the Project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

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 Central Valley Water Board programs that would lead to cumulatively significant impacts when combined with likely impacts from the proposed Basin Plan Amendment.

APPENDIX B: RECCOMENDED FORMAT FOR COMMENT LETTERS

Comment letters to the Central Valley Water Board on staff recommendations serve two purposes: 1) to point out areas of agreement; and 2) to suggest revisions to staff recommendations. Clear statements of both areas of agreement and suggested revisions will assist the Central Valley Water Board and staff in understanding the recommendations of the commenter. In order to aid staff in identifying suggested revisions and to respond to the specific issues raised by the commenter, the following format for comment letters is suggested:

Format for Comments Suggesting Revisions

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

The recommended format is below.
Section # and Paragraph #. *Please indicate the Section number and the paragraph number (e.g., third, second, 4th) of the text on which you are basing your comments.*

Comment #. *One sentence description or title for the comment*
Suggested revision to the Basin Plan Amendment language or staff report. For suggested
revisions to the Basin Plan Amendment language please use underline/strikeout to show changes from the staff proposal. For suggested changes to the staff report, please clearly indicate the section(s) being addressed. The discussion related to the suggested revisions should be clearly supported by reference to applicable law or scientific or technical reports, where appropriate.

Format for Comments Supporting Staff Recommendations

If the commenter concurs with a staff recommendation, a statement to that effect will assist the Central Valley Water Board in determining what action, if any, to take on the staff recommendation. In general, no supporting discussion need be presented, unless the commenter feels that the staff recommendation could be further enhanced or clarified. The recommended format is below.

Section #, Paragraph #.
Comment #. *One sentence description or title for the comment*.

The provision(s) of the proposed Basin Plan Amendment that the commenter supports should be clearly stated. The commenter may want to provide their reason for supporting the provision of the proposed Basin Plan Amendment,

especially if it differs from the staff rationale. Additional legal or scientific citations can also be provided.