Final Draft

Use of Copper To Control Aquatic Weeds In Loch Lomond Reservoir

California Environmental Quality Act Initial Study And Mitigated Negative Declaration

March 25, 2005

Project Sponsor and Lead Agency:
City of Santa Cruz Water Department
809 Center Street, Room 102
Santa Cruz, California 95060
Contact: Bob Barrett (831) 420-5485

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1.0 PROJECT DESCRIPTION

1.1 Introduction

The City of Santa Cruz Water Department (herein referred to as the "Department") serves a suburban population of 90,000 people situated in and about the City of Santa Cruz which is located within a Mediterranean climate of wet, mild winters and warm, dry summers on the Central-Northern California coast, south of San Francisco in Santa Cruz County. The Department's primary objective is to provide a safe, clean, and continuous supply of water for municipal and fire protection purposes to Santa Cruz and to the unincorporated surrounding areas. Refer to **Figures 1 and 2**.

The Department owns and manages 3,880 acres of land in the Santa Cruz Mountains including the Loch Lomond Reservoir (herein referred to as the "reservoir"), an impoundment of the Newell Creek Drainage. The reservoir is located 9 miles north of Santa Cruz, is about 2.5 miles long and has a maximum width of approximately 1,500 feet. It is fed by the Newell Creek drainage basin, which includes Newell Creek, extending three miles upstream of the reservoir and 2 miles downstream of the Newell Creek Dam to the San Lorenzo River. Loch Lomond Recreation Area was originally developed as a nature preserve and recreation area in the 1950's, and the reservoir was opened for public recreation in 1963 after the completion of the Newell Creek Dam two years earlier. The reservoir has been used as a source of water supply for the City of Santa Cruz since 1961. As part of the City's agreement for the completion of a dam, the entire area was open to the community for recreational activity, including hiking, boating, and fishing.

Loch Lomond Recreation Area offers fishing, boating, picnicking, and hiking. As a City of Santa Cruz drinking water reservoir, swimming and other body-contact water sports are not permitted. The California Department of Fish and Game stocks the reservoir with rainbow trout approximately every three weeks from March to July. Largemouth bass, bluegill, and channel catfish also maintain populations in the reservoir. Picnic areas are provided with tables, barbecues, water, and restrooms. Hiking is permitted on established trails.

The Department produces, operates and maintains water storage, diversion, collection, pumping, and treatment facilities including the Graham Hill Water Treatment Plant (GHWTP), which can process up to 24 million gallons of water per day and is the only conventional water treatment plant on the Monterey Bay. Year-round average production is 10 million gallons per day, but summer daily production can be as high as 16 to 18 million gallons per day. At capacity, 45 million gallons of water can be stored in the reservoir system. The Department's Water Quality Lab monitors raw water sources, finished water, and distributed water. The Department has maintained a State certified laboratory since the 1970's and in 1990, a larger laboratory was built to increase the analytical capabilities in microbiology, inorganic chemistry, and organic chemistry.

The reservoir is a lacustrine environment and although not nutrient enriched, nevertheless can experience blue green algal blooms during the summer months due to available nutrients, warm water temperatures, and abundant sunlight.

The presence of blue-green algae can cause reservoir water to become discolored and unpleasantly odorous. These algae produce cyanotoxins, which are harmful to humans, fish and other animals. Further, metabolic products released by the algae react with chlorine during the

treatment process to produce potentially carcinogenic disinfection by-products (DBPs). When a large algae population dies off the decomposition can deplete the available oxygen and lead to fish kills, further damaging water quality. In order to prevent these problems and to insure that the water customers receive an adequate supply of water that meets drinking water requirements, an aquatic pesticide is applied when a blue-green algae bloom is imminent.

The Department conducts weekly water quality sampling in the reservoir to assess overall algae population. Species present at the surface and at the levels of the two upper water intakes (elevations 550 and 530 feet respectively) are identified and counted and may be analyzed for chlorophyll. When known nuisance species are on the increase (i.e., *Anabaena*, *Aphanizomenon*, etc.), sampling is increased to daily and when the counts and chlorophyll values indicate a bloom appears certain, an aquatic pesticide is applied. Copper containing aquatic pesticides have most recently been applied in 2002 and 2003. No copper was applied in 2004.

Application Best Management Practices (BMPs) include a written protocol for application, as well treatment of less than the entire reservoir at one time. The application of copper generally occurs between the months of April through September. A typical application takes one to one and half days to complete. The product used in the application is a chelated copper solution, Cutrine-Plus® (0.909 pounds copper per gallon with chelating agent). The application rate is approximately 0.6 gallons per acre-foot. The target copper concentration is 0.2 ppm (parts per million or milligrams per Liter or mg/L) in the top 10 feet of the reservoir.

Reservoir management includes a program to limit nutrient inflows to the reservoir. Nutrient concentrations in the reservoir are not high. The Newell Creek watershed, which drains to the reservoir, is characterized by timber harvest operations, vineyards and sparse mountain residential development. The City owns nearly 50% of the headwaters of Newell Creek. Except for a recreational facility that is operated by the City as a requirement of the development of the reservoir, this property is undeveloped and maintained as watershed lands for the purpose of source water protection. The City is currently in the process of developing a comprehensive plan to guide future management of these lands. The primary goals of this plan are protection of water quality and water quantity. While excessive nutrient inflows are not seen as a major contributor to algae blooms, the Department includes water resources management staff designated to oversee watershed activities to insure that water quality impacts are minimized.

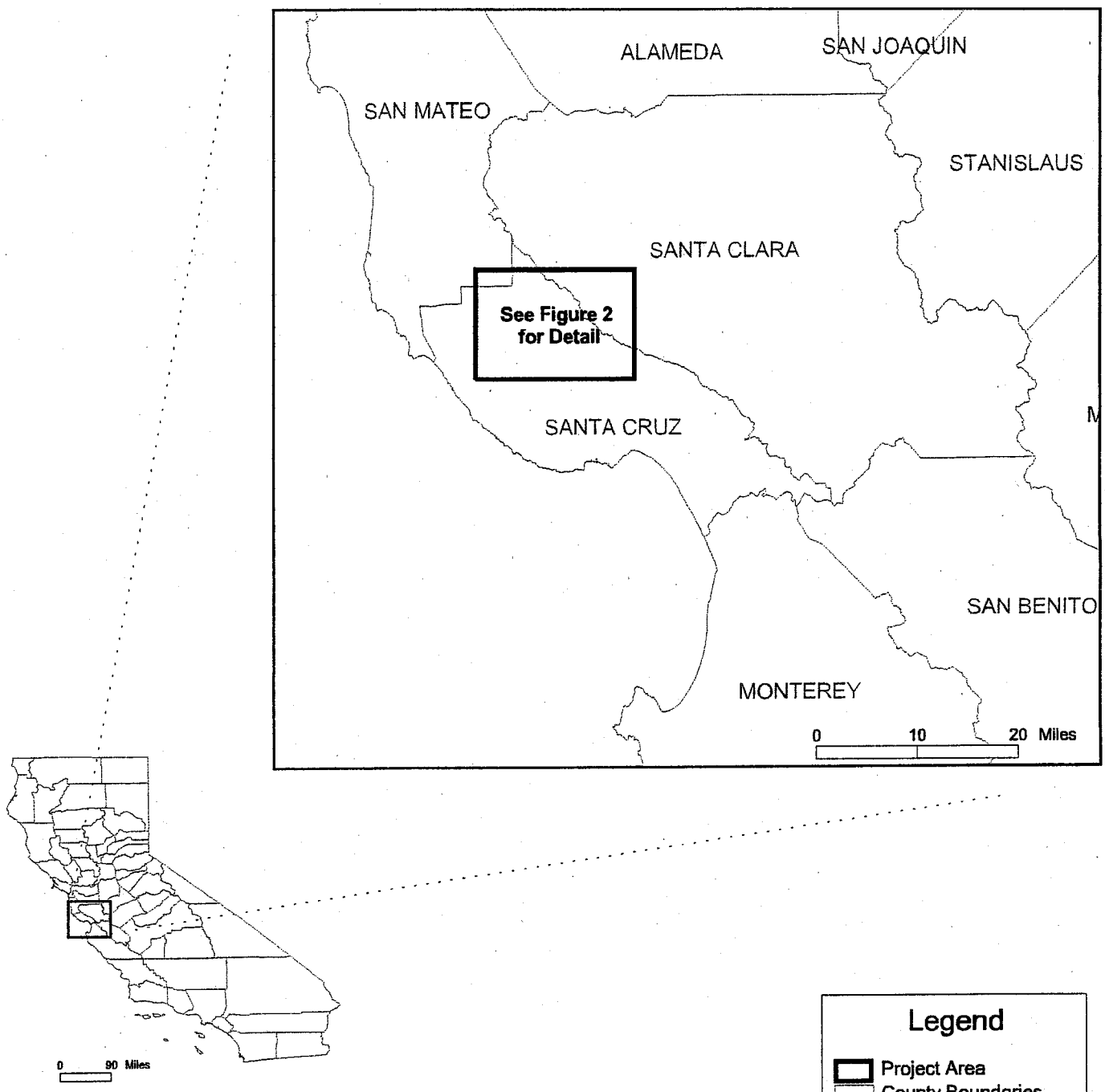
The possibility of using other algae control methods is currently under investigation. As needed, these methods will undergo a CEQA compliance review. A brief discussion of these alternative algal control methods is presented below.

Since May 2003, the Department has been running a trial of the SolarBee® Reservoir Circulators. At that time five of the SolarBees® were installed in the reservoir. The function of the SolarBees® is to raise the dissolved oxygen and pH in the treated zone. The mixing action causes more ammonia (N) to be stripped from the reservoir, and more phosphorus (P) to be precipitated with calcium hardness to form hydroxyapatite, a stable non-nutrient which settles to the bottom of the reservoir. The SolarBee® enables the "good" diatoms and green algae to out-compete the "harmful" blue-green algae for phosphorus. Phosphorus remains the limiting nutrient all season, instead of nitrogen, thus preventing the blue-green algae from taking over. Because the algae blooms are infrequent, historically one or two per year, the Department has not yet been able to answer the question of whether or not the SolarBees® are preventing algae

blooms in the reservoir. The Department has promising data showing three occasions when pre-bloom conditions did not result in blooms. No aquatic pesticides were applied in 2004. However, in 2004 the Department found that chronic low, yet significant, levels of blue-green algae did impact the water quality. By the end of the season, the algae population had reached a detrimental level. Adjustments have been made to the SolarBees® to improve their performance. The Department will continue the SolarBees® trial through the 2005 season.

An alternative method of algae control is the SonicSolutions™ ultrasonic device. This device eliminates algae by using ultrasonic waves to burst the cell walls of the algae. SonicSolutions™ claims that the device is safe for fish, plants and other aquatic life. The number of units required for a reservoir the size of the reservoir, as well as the logistics of supplying electrical power to each of them, make this an impractical option. However, the City is pursuing a trial of an ultrasonic device in a limited area.

Another aquatic pesticide treatment option being explored is sodium carbonate peroxyhydrate, marketed as PAK 27® by Solvay Chemicals. Though approved in many States, California does not yet allow use of this aquatic pesticide for algae control. The Department is currently exploring whether it can get State Department of Pesticide Regulation (CDPR) approval for a trial of this aquatic pesticide at the reservoir.

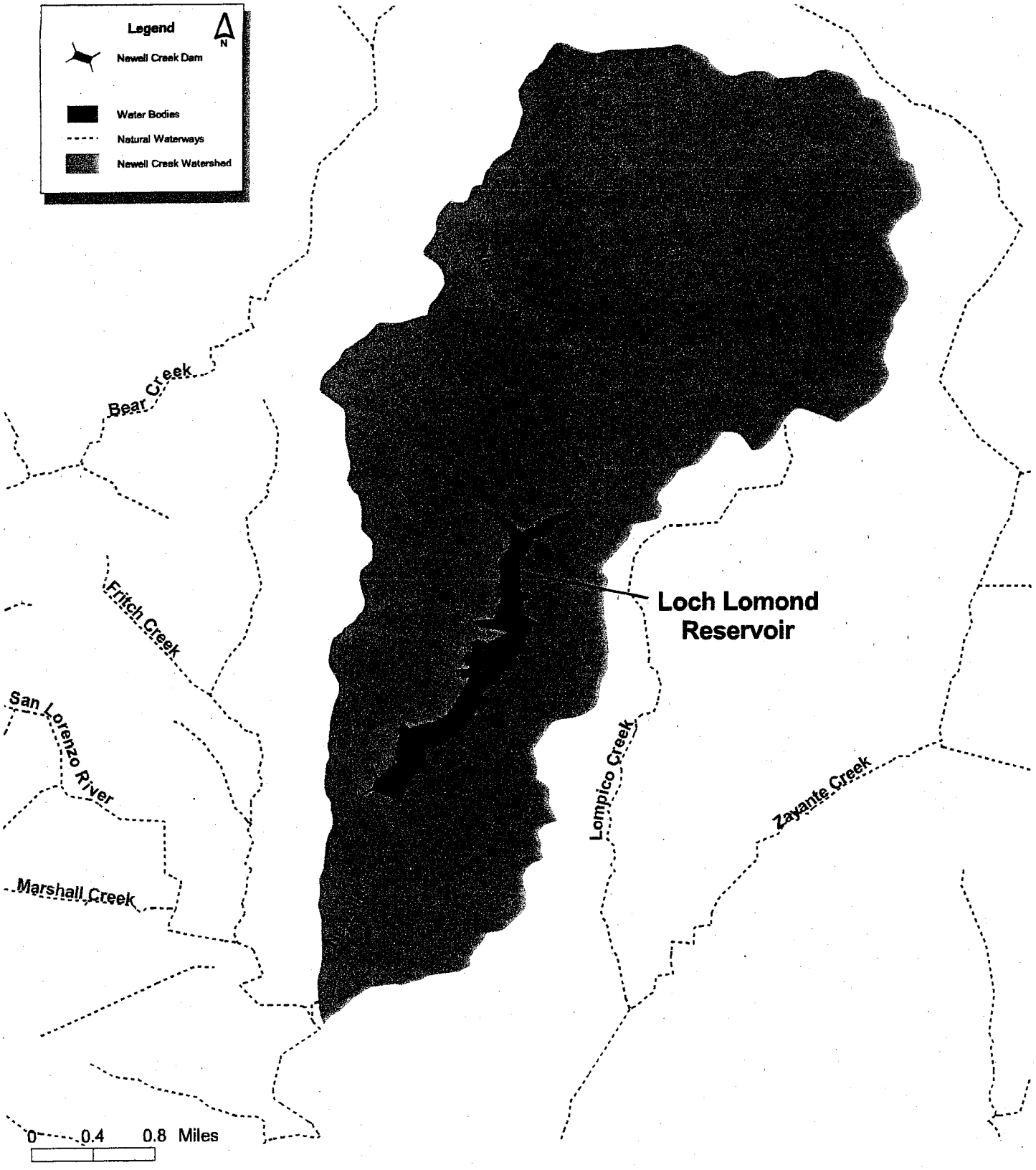


Blankinship & Associates
Scientists & Engineers
Agricultural & Environmental
2840 Spafford St., Suite 110
Davis, CA 95616
Ph: (530) 757-0941
Fax: (530) 757-0840

City of Santa Cruz

Project Location Map

Figure 1



Blankinship & Associates
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Ph: (530)757-0941
Fax: (530) 757-0940

City of Santa Cruz

Project Detail Map

Figure 2

1.2 Regulatory Setting

On June 4, 2004, The State Water Resources Control Board (SWRCB) released the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States, CAG 990005 (hereafter referred to as the "Permit"). The Permit requires compliance with the following:

- The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California (aka the State Implementation Plan, or SIP) (SWRCB, 2000)
- The California Toxics Rule (CTR) (CTR, 2000)
- Applicable Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (WQOs). (RWQCB-SFB, 1995)

The SIP assigns effluent limitations for CTR priority pollutants, including the aquatic pesticide copper. Further, the SIP prohibits discharges of priority pollutants in excess of applicable water quality criteria outside the mixing zone[1].

The SIP does, however, allow categorical exceptions if determined to be necessary to implement control measures either for resource or pest management conducted by public entities to fulfill statutory requirements, or regarding drinking water conducted to fulfill statutory requirements under the federal Safe Drinking Water Act or the California Health and Safety Code. Such categorical exceptions may also be granted for draining water supply reservoirs, canals, and pipelines for maintenance, for draining municipal storm water conveyances for cleaning or maintenance, or for draining water treatment facilities for cleaning or maintenance. The Department has concluded that they meet one or more of the criteria for gaining a SIP exception.

Permittees who elect to use a SIP categorical exception must satisfactorily complete several steps, including preparation and submission of a California Environmental Quality Act (CEQA) document. This document must be submitted to the SWRCB for the permittee to be placed on Attachment E of the Permit and subsequently be afforded coverage.

The SWRCB has suggested that the Permit may be re-opened for additional CEQA document submission as needed.

[1] Mixing Zone is defined in the SIP as "a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall waterbody."

1.3 Required Approvals

To obtain approval of an exception under Section 5.3 of the SIP to the CTR criterion for copper, the Department will submit the following documents to the SWRCB and RWQCB for acceptance:

a. A detailed description of the proposed action, including the proposed method of completing the action;
b. A time schedule;
c. A discharge and receiving water quality monitoring plan (before project initiation, during the project, and after project completion, with the appropriate quality assurance and quality control procedures);
d. CEQA documentation;
e. Contingency plans (to the extent applicable);
f. Identification of alternate water supply (if needed and to the extent applicable);
g. Residual waste disposal plans (to the extent applicable); and
h. Upon completion of the project, the discharger shall provide certification by a qualified biologist that the receiving water beneficial uses have been restored.

1.4 Required Notifications

1.4.1 Santa Cruz County Agricultural Commissioner's Office

Following each application, the Department notifies the Santa Cruz County Agricultural Commissioner.

1.5 Standard Operating Procedures

The Department implements an Integrated Pest Management (IPM) program for aquatic weed control. The IPM program involves the scouting of aquatic weed locations and densities, establishment of thresholds above which control is needed, and making applications of aquatic pesticides on an "as-needed" basis to achieve the aquatic weed control necessary to maintain beneficial uses, especially municipal and domestic drinking water supply, non-contact recreation, and fish habitat.

Prior to application, the following tasks are accomplished:

1. A written recommendation is prepared by a DPR-licensed Pest Control Advisor (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, health and environmental hazards and restrictions, and a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted.

2. Under the Department's present operating plan, management of algaecide application is overseen by staff possessing both a Pest Control Advisor's (PCA) license and a Qualified Applicator Certificate (QAC). This requirement extends to any contractor the Department may hire to complete this work as well. The PCA prepares a written Pest Control Recommendation, which includes location and area to be treated, the pesticide to be used, the concentration of the pesticide and total amount of the pesticide to be used, the acreage to be treated, the date, the schedule, safety precautions and biological mitigations. The PCA provides safety training for all involved in the application. The QAC oversees the staff performing the application. The QAC maintains records of the pesticide application, reporting to County Agricultural Commissioner (CAC) as required.
3. All Department personnel and their contractors review and strictly adhere to the aquatic pesticide product label that has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label is included in **Appendix A**.

4. All Department personnel and their contractors review and consult the aquatic pesticide Material Safety Data Sheet (MSDS) in **Appendix A**, and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and MSDS have specific information that describes precautions to be taken during the use of the aquatic pesticide.

5. The condition of the water being treated is field evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of aquatic pesticide(s) to be applied.

6. Because the reservoir holds different amounts of water depending on the elevation of water (McPherson and Harmon 1998), and typically only the top 10 feet of water column are treated, Department staff calculates the amount of reservoir water being treated prior to adding copper-containing aquatic pesticides so that the resulting copper concentration is accurate.

7. City staff prepares maps of the treatment area(s) before and after treatment, collects data on copper concentration at different reservoir depths, creek locations, and times after treatment, and continually makes observations of special status species and habitat throughout the year.

2.0 INITIAL STUDY

This document was prepared in a manner consistent with Section 21064.5 of the California Public Resources Code (CEQA) and Article 6 of the State CEQA Guidelines (14 California Code of Regulations).

This Initial Study, Environmental Checklist, and evaluation of potential environmental effects were completed in accordance with Section 15063(d) of the *State CEQA Guidelines* to determine if the proposed Project could have any potentially significant effect on the physical environment, and if so, what mitigation measures would be imposed to reduce such impacts to less-than-significant levels.

An explanation is provided for all determinations, including the citation of sources as listed in Section 5. A "No Impact" or a "Less-than-Significant Impact" determination indicates that the proposed Project would not have a significant effect on the physical environment for that specific environmental category.

Mitigation measures will be implemented to reduce the potentially significant impacts to a less-than-significant level. No other environmental categories for this evaluation were found to be potentially affected in a significant manner by the proposed Project.

2.1 CEQA Initial Study & Environmental Check List Form

1. Project Title:	Use of Copper to Control Aquatic Weeds in Loch Lomond Reservoir
2. Lead Agency Name and Address:	City of Santa Cruz Water Department 809 Center Street, Room 102 Santa Cruz, California 95060
3. Contact Person & Phone Number:	Bob Barrett (831) 420-5485
4. Project Location:	Santa Cruz County, California
5. Project Sponsor's Name and address:	Bill Kocher City of Santa Cruz Water Department 809 Center Street, Room 102 Santa Cruz, California 95060
6. General Plan Land Use Designation:	Lake/Reservoir/Lagoon/Recreational Area
7. Zoning:	Timber Harvest and Parks & Recreation
8. Description of Project:	See Section 1.5
9. Surrounding Land Uses and Setting:	Timber/Recreation/Mountain Residential

10. Other Agencies Whose Approval is Required: As Listed in Section 1

2.2 Environmental Factors Potentially Affected

The environmental factor checked below would be potentially affected by the proposed Project, involving at least one impact that is a 'Potentially Significant Impact" as indicated by the checklist on the following pages:

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

2.3 Determination (To be completed by lead agency)

On the basis of this initial evaluation:

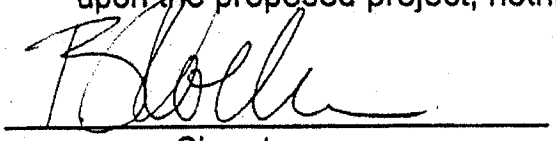
☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed Project could have a significant effect on the environment, there will not be a significant effect because appropriate mitigation measures are in place. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT (EIR) is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An EIR is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.



Signature

5/9/05

Date

B. KOCHER

Printed Name

Bill Kocher
Director of The Water Department

3.0 EVALUATION OF ENVIRONMENTAL IMPACTS

3.1 Aesthetics

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surrounding?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** No designated scenic vistas or state scenic highways overlook the project site, therefore no impact would occur.

Item c): ***No Impact.*** The project involves the application of aquatic pesticides to the reservoir to control a variety of aquatic weeds, primarily algae. These weeds are typically at or below the water surface. Upon control, the removal of these weeds would be unnoticed and as a result not degrade the visual character of the project site.

Item d): ***No Impact.*** The project is done during the daylight hours, therefore no light sources are needed and no light or glare is produced.

3.2 Agriculture Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

Discussion

Items a) through c): ***No Impact.*** The project involves the application of aquatic pesticides to the reservoir to control a variety of aquatic weeds, primarily algae. The reservoir is a municipal water source and will not alter or influence the local agricultural practices or farmlands.

3.3 Air Quality

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:					
a)	Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b)	Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒
c)	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal and 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?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** The project requires the use of pick-up trucks for purposes of transporting aquatic pesticides and a small boat to the boat launching area. The boat is used for purposes of site reconnaissance before, during, and after application of aquatic pesticides. The boat is also used for the application of the aquatic pesticide following the instructions from the Department's annual aquatic pesticide application plan (APAP). Short-term vehicle and motor emissions will be generated during aquatic pesticide application; however, they will be minor and last only from April to October. To minimize impacts, all equipment will be properly tuned and muffled and unnecessary idling will be minimized.

The Department is located in the Monterey Bay Unified Air Pollution Control District (MBUAPCD) which includes the following counties: Monterey, San Benito, and Santa Clara. The application of aquatic pesticides does not conflict with the MBUAPCD 2004 Air Quality Management Plan, violate any air quality standards, or contribute to an existing or projected violation.

Item c.) ***Less Than Significant Impact.*** The air basin is a nonattainment area for the State Ambient Air Quality Standards for ozone and inhalable particulate matter (PM10). Based on existing and projected air quality and requirements of the California Clean Air Act to adopt all feasible control measures, the 2004 AQMP includes adoption of the control measures for the following sources: 1) Solvent Cleaning Operations, 2) Spray Booths - Misc. Coatings and Cleaning Solvents, 3) Degreasing Operations, 4) Adhesives and Sealants, and 5) Natural Gas-Fired Fan-Type Central Furnaces and Residential Water Heaters. Project activities will produce minor amounts of carbon monoxide and suspended

matter from running pick-up trucks and inboard motors and will not contribute significantly to nonattainment.

Items d) & e): ***No Impact.*** Aquatic pesticides are applied by Department personnel or their contractors on the reservoir away from people. Applications are not made near, schools, playgrounds, health care facilities, day care facilities, and athletic facilities, thereby eliminating exposure to these sensitive receptors and creating no impact. The public cannot be exposed to aquatic pesticides because swimming is not permitted in the reservoir. Boating on the reservoir is temporarily suspended for one to two days during and immediately following the application of aquatic pesticides. Recreational use of the reservoir can resume after completion of aquatic pesticide application.

3.4 Biological Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
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?	☐	☐	☐	☒

Discussion

Items a) & b): **Potentially Significant Unless Mitigation Incorporated.** A list of current special status species was compiled from the California Department of Fish and Game (CDFG) California Natural Diversity Database (CNDDB) and the U.S. Fish and Wildlife Service (USFWS), Sacramento and Ventura Offices. Once this list was compiled, a preliminary assessment of the project area was performed to characterize the actual habitats present on-site and the likelihood of special status species occurrence.

A summary of the listed species with habitat present in the project area, their designation, and whether or not they were considered for evaluation of potential impact is presented in **Table 2** at the end of this section. Species habitat and rationale for removal from further consideration is presented in **Table 2** and **Appendix B.** Physical, chemical and toxicological data on copper are presented in **Appendix C.**

A critical component of a wildlife ecological risk evaluation is the use of a quantitative measure of chemical toxicity to a specific animal. This measure is often referred to as a Toxicity Reference Value (TRV). TRVs were used to as a tool to assess the potential risk to ecological receptors in or near the reservoir.

With the exception of anadromous fish in Newell Creek and the western pond turtle in the reservoir, no special status species has habitat in or near, or is otherwise at risk from aquatic pesticides used for the project. A discussion of the risk to anadromous fish and the western pond turtle is presented below.

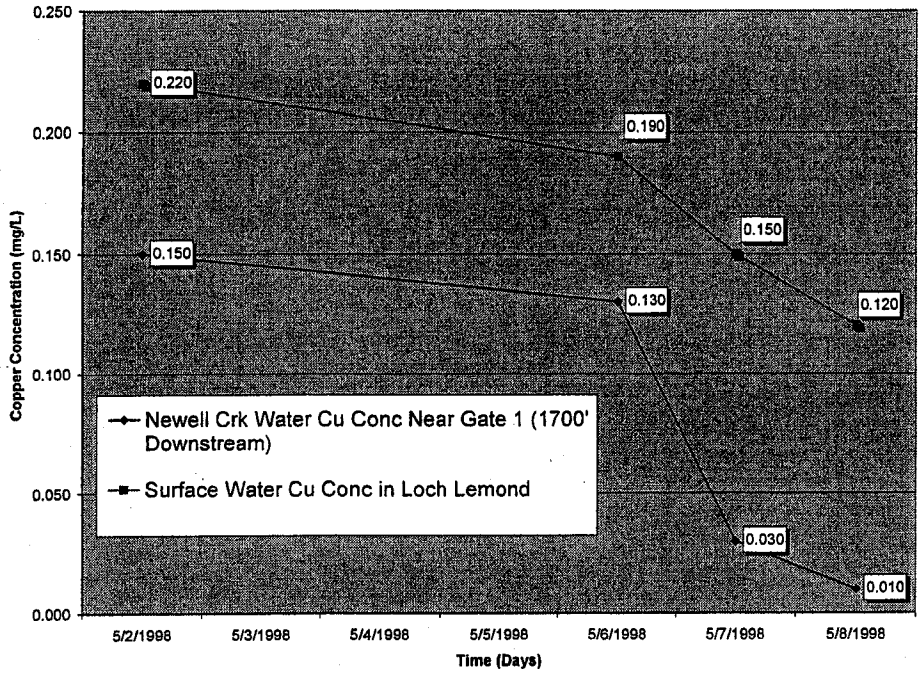
Behavior of Copper in the Reservoir and Newell Creek

In 1998, collection and analysis of water samples was done in and downstream of the reservoir after copper-treated water was spilled over the dam and is summarized in **Figure 3** below.

It should be noted that except for the highly unusual circumstances in May 1998, there has never been a release of copper-treated water over the spillway. In the 1998 incident, unanticipated rain that caused the spillway release came almost immediately after the completion of copper aquatic pesticide application and there was no time for the copper to mix throughout the top 10 feet of the lake.

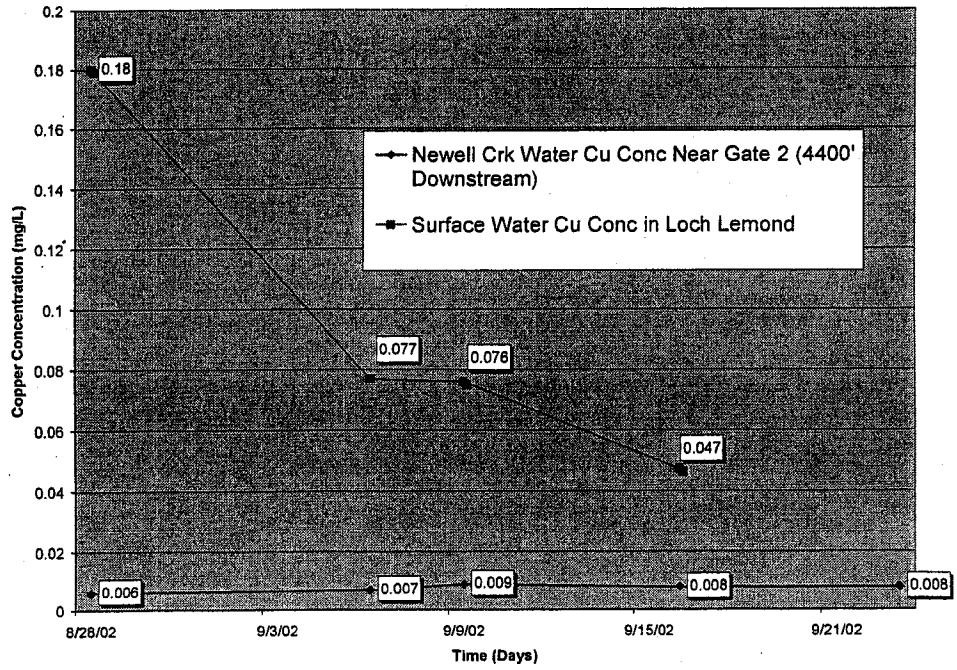
As **Figure 3** Indicates, the surfacewater copper concentration in the reservoir drops rapidly and the initial copper concentration in Newell Creek downstream of the lake is slightly less than the reservoir concentration. Note that the assimilatory capacity of Newell Creek rapidly reduces the concentration of copper in the creek.

Figure 3. Graph of Copper Data vs. Time at Different Locations (1998)



In 2002 and numerous other years, collection and analysis of water samples was done in and downstream of the reservoir when copper-treated water was released from the reservoir through the creek flow maintenance system. Refer to **Figure 4**.

Figure 4. Graph of Copper Data vs. Time at Different Locations (2002)



The creek flow maintenance system delivers a minimum of 1 cubic foot per second (cfs) through a metered release to Newell Creek for the support of native species in the creek. The system draws water from deep within the reservoir (usually either elevation 490 or 510 ft). This elevation is between 60-70 feet below the 10 foot layer of reservoir water treated with aquatic pesticides.

Weekly monitoring for copper concentrations at the surface and 20' depth intervals down to elevation 490 gives City staff advance knowledge of the expected copper levels in the creek flow maintenance system water well before it is released to Newell Creek. If an inappropriate copper concentrations are present at the intake to creek flow maintenance system, Department staff shift the system intake to a deeper depth where copper concentrations are lower.

As **Figure 4** Indicates, the surfacewater copper concentration in the reservoir drops rapidly and the initial and subsequent copper concentrations in Newell Creek downstream of the lake are significantly less than the reservoir concentration. This is due primarily to the relatively low concentration of copper in the water column at the depth where the creek flow maintenance system water is drawn.

Anadromous Fish

EPA (EPA 1999, see **Appendix C**) has established a hardness-adjusted freshwater copper TRV of 0.013 ppm (part per million or milligram per Liter or mg/L). As **Figure 4** indicates, anadromous fish in Newell Creek are not at risk from exposure to copper-containing aquatic pesticide treated water coming from the creek flow maintenance system.

However, when reservoir water treated with copper-containing aquatic pesticides is spilled over the dam into Newell Creek (refer to **Figure 3**), the TRV for anadromous fish is likely exceeded at the Newell Creek Drop which is a shale rock structure located approximately 2500 ft downstream of the reservoir. This shale rock structure prevents fish from going any further upstream Newell Creek towards the reservoir. Fish can only pass this barrier at high flows of 200 - 300 cfs (Alley et al. 2004)

BIO-1 MITIGATION: The concentration of copper in water spilled from the reservoir after copper-containing aquatic pesticide treatment may exceed the freshwater fish TRV and as a result anadromous fish listed in **Table 2** may be at risk. Mitigation for this potential risk is to not allow treated water to spill from the reservoir. This will be accomplished by:

1. Lowering the lake level prior to application of copper-containing aquatic pesticides if there is a risk of rain by drawing more water to the plant for treatment, releasing reservoir water from the deluge valve, and/or increasing release through the creek flow maintenance system.
2. In a case where reservoir overflow cannot be prevented or is imminent, allow algae to bloom and do not apply copper-containing aquatic pesticides.
3. If treated water must be spilled, do one or both of the following:

a) Wait approximately 50 days after initial application prior to spilling treated water. This is the amount of time required for the copper concentrations listed **Table 1 to drop below the** fish TRV;
b) Release additional water from the creek flow maintenance system or from a deluge valve at the base of the dam. This would essentially dilute any copper in the creek.

TABLE 1: Summary of Estimated Acceptable Copper Concentrations Based on % of Reservoir Treated

% of Reservoir Treated	Acceptable Target Copper Concentration* (ppm)
15 – 25	0.74 – 1.00
35 – 45	0.40 - 0.46
45 – 55	0.32 – 0.36
55 – 65	0.27 – 0.30
75 – 85	0.20 – 0.22
95 - 100	0.16 – 0.18

Assumes complete dilution in the targeted treatment zone (surface to 10 ft depth).

Western Pond Turtle

The western pond turtle, including its subspecies the southwestern pond turtle, may be at risk because it could live within the reservoir margins and shoreline habitats. The western pond turtle's copper-specific TRV is 0.17 ppm.

Historic control of algae in the reservoir has been shown to be effective at approximately 0.2 ppm copper in the upper 10 feet of water. Because the concentration of copper that is effective in controlling algae exceeds the western pond turtle TRV, it is recommended that less than 100% of the reservoir is treated at any time to allow for dilution of copper throughout the reservoir and to prevent reductions in dissolved oxygen. By treating less than 100 % of the reservoir at one time, dissolved oxygen problems are minimized and because of dilution, the acceptable target copper concentration can exceed the TRV. Refer to **Table 1** above.

BIO-2 MITIGATION: Because the initial concentration of copper during treatment of the reservoir in the upper 10 feet of water column may exceed the western pond turtle copper-specific TRV of 0.17 ppm, mitigation for potential exposure of western pond turtles may be required as follows:

1. Given an area of the reservoir requiring treatment, the target concentration of copper in the upper 10 feet of the reservoir shall not exceed values presented in **Table 1**. For example, when 80% of the reservoir is treated, the target concentration of copper shall not exceed 0.21 ppm.

2. If the target concentration of copper or the area treated needs to exceed values presented in **Table 1**, Department staff shall scout areas of the reservoir that are

intended for treatment. If western pond turtles are found, then treatment will be postponed in that area until the turtles are either relocated or move from the area. If pond turtles are not found, then treatment can proceed as planned.

Item c): ***No Impact.*** The project takes place in the Department's reservoir and, therefore, will not impact any upland habitat or wetlands. However, the assessment of risk for species that live in these areas was considered. Risks to these species are adequately mitigated with **BIO-1** and **BIO-2**.

Item d): ***No Impact.*** Water for the Department is derived from the Newell Creek and other minor tributaries in the watershed as well as periodic inputs pumped into the reservoir from the Felton Diversion. Migrating fish are prevented from entering the reservoir by the Newell Creek Dam. Fish screens exist at the Felton Diversion to prevent fish being drawn into the pumps. Accordingly, project activities will not adversely influence movement of any native resident or migratory fish.

Items e) & f): ***No Impact.*** The project does not conflict with, and has no impact to any local policies or ordinances protecting biological resources.

TABLE 2. Special status species known to occur in the project vicinity and that have habitat requirements met in the project vicinity and during the project duration.

Scientific Name	Common Name	Status	Habitat	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Species at Risk
Amphibian					
Rana aurora draytonii	California red-legged frog	FT, SCSC	Lowlands & foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation.	X (1)	
Rana boylii	foothill yellow-legged frog	FSC, SCSC	Partly-shaded, shallow streams & riffles with a rocky substrate in a variety of habitats.	X (1)	
Bird					
Chaetura vauxi	Vaux's swift	FSC, SCSC	(Nesting) redwood, Douglas fir, & other coniferous forests. Nests in large hollow trees & snags. Often nests in flocks.	X (2)	
Cypseloides niger	black swift	FSC, SCSC	(Nesting) coastal belt of Santa Cruz & Monterey co; central & southern Sierra Nevada; San Bernardino & San Jacinto Mtns.	X (2)	
Brachyramphus marmoratus	marbled murrelet	FT, SE	(Nesting) feeds near-shore; nests inland along coast, from Eureka to Oregon border & from Half Moon Bay to Santa Cruz.	X (4)	
Falco peregrinus anatum	American peregrine falcon	FD, SCSC	(Nesting) near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures.	X (3)	
Haliaeetus leucocephalus	Bald Eagle	FT, SE	(Nesting & wintering) ocean shore, lake margins, & rivers for both nesting & wintering. Most nests within 1 mi of water.	X (4)	
Pandion haliaetus	osprey	SCSC	(Nesting) ocean shore, bays, fresh-water lakes, and larger streams.	X (4)	

Scientific Name	Common Name	Status	Habitat	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Species at Risk
Selasphorus rufus	rufous hummingbird	FSC	(Nesting) breeds in transition life zone of northwest coastal area from Oregon border to southern Sonoma county.	X (3)	
Fish					
Lampetra tridentata	Pacific lamprey	FSC	Estuaries, rivers and creeks with fine gravel substrate	X (5)	
Oncorhynchus kisutch	Coho salmon - central California esu	FT, SE	Federal listing = pops between Punta Gorda & San Lorenzo river. State listing = pops south of Punta Gorda.	X (5)	
Oncorhynchus mykiss irideus	steelhead-central California coast esu	FT	From Russian River, south to Soquel Cr & to, but not including, Pajaro River. Also San Francisco & San Pablo Bay basins.	X (5)	
Invertebrate					
Polyphylla barbata	Mount Hermon (=barbate) june beetle	FE	Known only from sand hills at mt. Hermon, anta Cruz county (type locality).	X (3)	
Mammal					
Corynorhinus townsendii townsendii	Pacific (Townsend's) western big-eared bat	FSC, SCSC	Humid coastal regions of northern & central California. Roost in limestone caves, lava tubes, mines, buildings etc.	X (2)	
Eumops perotis californicus	greater western mastiff-bat	FSC, SCSC	Many open, semi-arid to arid habitats, including conifer & deciduous woodlands, coastal scrub, grasslands, chaparral etc	X (2)	
Myotis evotis	long-eared myotis bat	FSC	Found in all brush, woodland & forest habitats from sea level to about 9000 ft. Prefers coniferous woodlands & forests.	X (2)	
Myotis thysanodes	fringed myotis bat	FSC	In a wide variety of habitats, optimal habitats are pinyon-juniper, valley foothill hardwood & hardwood-conifer.	X (2)	

Scientific Name	Common Name	Status	Habitat	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Species at Risk
Myotis volans	long-legged myotis bat	FSC	Most common in woodland & forest habitats above 4000 ft. Trees are important day roosts, caves & mines are night roosts.	X (2)	
Myotis yumanensis	Yuma myotis bat	FSC	Optimal habitats are open forests and woodlands with sources of water over which to feed.	X (2)	
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	FSC, SCSC	Forest habitats of moderate canopy & moderate to dense understory. Also in chaparral habitats.	X (3)	
Taxidea taxus	American badger	FSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	X (3)	
Reptile					
Emys (=Clemmys) marmorata	western pond turtle	SCSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams & irrigation ditches with aquatic vegetation.		X
Emys (=Clemmys) marmorata pallida	southwestern pond turtle	FSC, SCSC	Inhabits permanent or nearly permanent bodies of water in many habitat types; below 6000 ft elev.		X
Plants - Aquatic					
Carex comosa	bristly sedge	CNPS-2	Lake margins, wet places; marshes and swamps. Fairly widely distributed, but apparently rarely collected.	X (7)	
Plants Terrestrial					
Arctostaphylos andersonii	Santa Cruz manzanita	CNPS-1B	Broadleaved upland forest, chaparral, north coast coniferous forest. Known only from the Santa Cruz Mtns.	X (6)	

Scientific Name	Common Name	Status	Habitat	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Species at Risk
Arctostaphylos silvicola	Bonny Doon manzanita	CNPS-1B	Chaparral, closed-cone coniferous forest, lower montane coniferous forest. Endemic to Santa Cruz County.	X (6)	
Collinsia multicolor	San Francisco collinsia	CNPS-1B	Closed-cone coniferous forest, coastal scrub.	X (6)	
Penstemon rattanii var. kleei	Santa Cruz Mountains beardtongue	CNPS-1B	Chaparral, lower montane coniferous forest. Known only from Santa Clara and Santa Cruz Counties.	X (6)	

Table 2 Numbered Notes:

(1) Species does not occur in reservoir (Dana Bland & Associates).

(2) These species forage for emergent aquatic insects over water. These insects may bioaccumulate copper. However, the levels of copper applied to the reservoir to control algae are also acutely toxic to the aquatic stages of emergent insects, so risk from exposure via consumption of emergent insects is insignificant.

(3) Species not likely to have any exposure as its target prey base or plant food resources consist of terrestrial species.

(4) The dissipation of copper, limited uptake in fish, along with a time-dependent bioconcentration factor for copper in aquatic invertebrates (see **Appendix B**) will limit dietary exposure to an insignificant level.

(5) These anadromous fish cannot enter the reservoir because their entry is blocked by the reservoir dam. Additionally, they are blocked from approaching the reservoir due to a barrier created by a fish barrier in the Newell Creek approximately 2500 ft downstream from the reservoir dam. Fish can only pass the barrier at high flows of 200-300 cfs (Alley *et al.* 2004) which typically occurs once or twice a year (pers. comm. C. Berry, City of Santa Cruz Water Department Water Resources Manager). Anadromous fish are not at risk from creek flow maintenance system water, but may be at risk from treated water spilled from the reservoir. See discussion above.

(6) Terrestrial plants will not be exposed to aquatic pesticides applied at or below the water surface.

(7) Emergent plants are only common at the very north end of the reservoir where aquatic pesticide treatments will not occur.

Table 2 Status Codes:

FE = Federally Listed as Endangered
FT = Federally Listed as Threatened
FPE = Federally Proposed Endangered
FPT = Federally Proposed Threatened
FPD = Federally Proposed Delisted
FSC = Federally Listed Species of Concern
FC = Federally Listed Candidate Species
FD = Federally Delisted
SCSC = State Listed Species of Concern
SE = State Listed as Endangered
SFP = State Listed as Fully Protected
ST = State Listed as Threatened
SR = State Listed as Rare
SCE = State Candidate Endangered
SCT = State Candidate Threatened
CNPS-1A = California Native Plant Society Listed: Plants presumed extinct in California
CNPS-1B = California Native Plant Society Listed: Rare, Threatened, or Endangered in CA & Elsewhere
CNPS-2 = California Native Plant Society Listed: Rare, Threatened, or Endangered, but more common elsewhere
CNPS-3 = California Native Plant Society Listed: Plants about which more information is needed- a review list
CNPS-4 = California Native Plant Society Listed: Plants of limited distribution - a watch list

3.5 Cultural Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

Discussion

Items a) through d): ***No Impact.*** The project is confined to the Department's reservoir. No known historical or archaeological resource, unique paleontological resource, unique geologic feature, or human remains in or out of formal cemeteries will be impacted.

3.6 Geology and Soils

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic-related ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

Discussion

a) through e): ***No Impact.*** The project consists of applying aquatic pesticides to the reservoir within the jurisdiction of the Department. The project does not include any new structures, ground disturbances, or other elements that could expose persons or property to geological hazards. There would be no risk of landslide or erosion of topsoil. The Project would not require a septic or other wastewater system, as workers would use existing facilities in the operation areas of the reservoirs.

3.7 Hazards and Hazardous Materials

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code 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?	☐	☐	☐	☒

Discussion

Items a) & b): **Less Than Significant Impact.** The project would involve handling aquatic pesticides which are regulated hazardous materials. Refer to the representative MSDS presented in **Appendix A**. Use of this material would create a potential for spills that could affect worker safety and the environment. The spills could occur potentially at the Department facility, at the point of application, or during transport. The public cannot be exposed to aquatic pesticides because swimming is not permitted in the reservoir. Boating on the reservoir is temporarily suspended for one to two days during and immediately following the application of aquatic pesticides. Recreational use of the reservoir can resume after completion of aquatic pesticide application.

The Department and contractors handle aquatic pesticides in accordance with federal, state, and county requirements and manufacturer's recommendations. This approach is supplemented by the following components of the Department's aquatic weed management program:

1. Department personnel and their contractors that make aquatic pesticide applications are under the direct supervision of a Qualified Applicator Certificate or Qualified Applicator License holder. Expertise and training used by these personnel result in mitigating potentially significant impacts. Also note that aquatic pesticides are stored off-site until immediately prior to use to eliminate risk of having such aquatic pesticides in the watershed except when needed. The Department's contractor transports aquatic pesticides to the site and disposes of containers.

2. A written recommendation is prepared by a DPR-licensed Pest Control Advisor (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, health and environmental hazards and restrictions, and a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted.

3. All Department personnel and their contractors review and strictly adhere to the aquatic pesticide product label that has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label is included in **Appendix A**.

4. All Department personnel and their contractors review and consult the aquatic pesticide Material Safety Data Sheet (MSDS) in **Appendix A**, and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the MSDS have specific information that describes precautions to be taken during the use of the aquatic pesticide. Department personnel's familiarity with the DPR PSIS series mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of aquatic pesticides, including goggles, disposable coveralls, gloves and respirators.

5. The condition of the reservoir is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of aquatic pesticides to be applied.

6. Water quality monitoring of the pesticide application will be conducted as described in the Hydrology and Water Quality Section.

Item c): ***No Impact.*** No known, existing or proposed schools are located within ¼ mile of locations were applications are made.

Item d): ***No Impact.*** The project site is not listed on any hazardous waste site lists compiled in Government Code Section *65962.5.*

Items e) & f): ***No Impact.*** No airports are located within a 2 mile range of the project.

Item g): ***No Impact.*** The proposed Project would not impact emergency evacuation routes because public roadways are not affected by the Project.

Item h): ***No Impact.*** The project will not increase fire hazards at the project sites. Truck access and parking near the boat launch is done in such a manner so as to minimize muffler contact with dry grass.

3.8 Hydrology and Water Quality

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:					
a)	Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐
b)	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e)	Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f)	Otherwise substantially degrade water quality?	☐	☐	☐	☒
g)	Place housing within100-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?	☐	☐	☐	☒

General Discussion

The Department implements an Integrated Pest Management (IPM) program for aquatic weed control. The IPM program involves the scouting of aquatic weed locations and densities, establishment of thresholds above which control is needed, and making applications of aquatic pesticides on an "as-needed" basis to achieve the aquatic weed control necessary to provide safe municipal water.

Consistent with the Department's IPM program, the application of aquatic pesticides is done infrequently (1-2 times per year) and over a short duration (1 to 2 days per treatment).

Copper-based pesticides will be discussed for checklist item a.) above. All other checklist items will be discussed together at the end of this section.

Prior to aquatic pesticide applications, the following tasks are accomplished:

1. A written recommendation is prepared by a DPR-licensed Pest Control Advisor (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, health and environmental hazards and restrictions, and a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted.
2. All Department or other personnel involved with the application of aquatic pesticides to the reservoir shall be trained and under the direction of DPR-licensed Pest Control Advisor (PCA). This requirement will also be required for any contractor hired to perform this work as well.
3. All Department personnel and their contractors review and strictly adhere to the aquatic pesticide product label that has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label is included in **Appendix A.**
4. All Department personnel and their contractors review and consult the aquatic pesticide Material Safety Data Sheet (MSDS) in **Appendix A**, and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the MSDS have specific information that describes precautions to be taken during the use of the aquatic pesticide.
5. The condition of the reservoir being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of aquatic pesticides to be applied.
6. Water quality monitoring of the aquatic pesticide application will be conducted as follows:

Reservoir staff:

a. On the first day of aquatic pesticide application, collect one surface sample before application from the area to be treated and a second surface sample from the same location after treatment
b. If the treatment extends to a second day, on the second day of aquatic pesticide application, collect one surface sample before application from the area to be treated and a second surface sample

from the same location after treatment. Also collect one surface sample from the area treated on the previous day.

c. Collect a sample from the fish water release* below the dam prior to the first application and another on the next day of application. Continue to collect samples from the fish water release each Monday and Thursday for two weeks thereafter, then weekly for 2 weeks more. The sampling period may be extended by the Water Quality Manger. If water is going to the creek over the spillway as well as through the fish release, a sample of spill water and downstream samples of the mixed discharges must be collected also.
d. Samples will be picked up by lab staff and analyzed for copper.

Lab staff:

e. On Mondays following application, collect samples at the reservoir sampling site no. 2, at the surface and at each GHWTP intake level at site no. 2. Also collect a surface sample at site no. 4.
f. Samples will be analyzed for copper, pH, turbidity, temperature, color, odor, specific conductance, dissolved oxygen, and algae count. Monitoring shall continue for one month or until copper levels decrease below the level of concern, as determined by the Water Quality Manager. Thereafter monitoring frequencies will return to the regular monitoring schedule.

Plant staff:

g. Beginning on the day of application, when Newell Creek water is being used, collect one sample of Newell Creek raw water daily at approximately 24-hour intervals.
h. If the Newell Creek water has not been in use, collect the sample after the source has been turned on for 2 to 3 hours.
i. Continue sampling daily for two weeks after application, thereafter reducing sampling frequency to Monday and Thursday for two more weeks, or until copper levels decrease below the level of concern, as determined by the Water Quality Manager.
j. Notify the lab when samples are ready to be picked up for copper analysis.

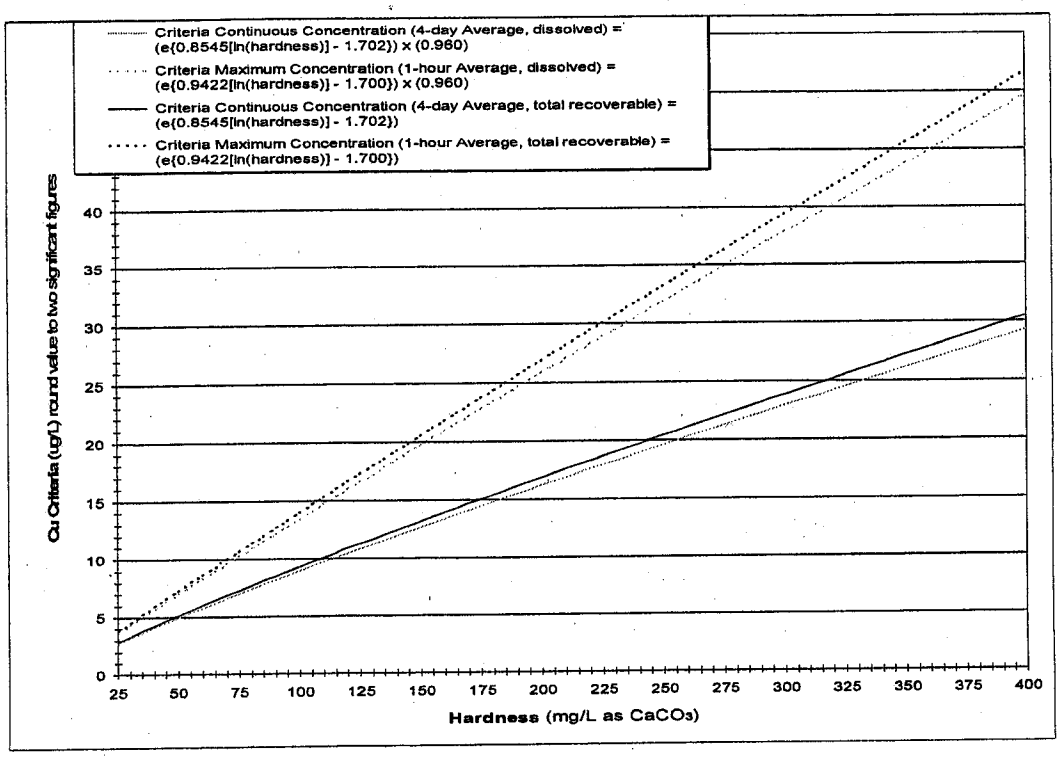
7. The Department has developed a reservoir staged-capacity table that gives the amount of water in the reservoir from corresponding reservoir elevations. Dosage for the application will consider the volume of water and the impact the dose will have on the calculated volume of water to be treated. This will be calculated from the daily reservoir elevation readings with the corresponding water volume readings.

Copper Discussion

Item a): **Potentially Significant Unless Mitigation Incorporated**. As presented in Section 1.2, the Department intends to obtain coverage under the Permit that requires compliance with the SIP and the CTR.

Application of copper-based aquatic pesticides according to label direction typically result in concentrations of copper in the reservoir water of approximately 0.2 ppm. Applications to municipal water reservoirs cannot exceed 1.3 ppm (CalEPA, 2003). Water quality criteria for copper as described in the CTR and by the Central Coast RWQCB (RWQCB, 1994) are hardness-dependent. Refer to **Figure 5.** From 1995 to 2002, reservoir water varied in hardness between approximately 108 and 200 ppm $CaCO_3$ (City of Santa Cruz Water Department, Unpublished data).

Figure 5. Copper Criteria vs. Hardness Graph



Based on the relation of copper criteria to hardness, the applicable water quality criteria for copper in the reservoir have the following ranges:

Continuous Dissolved Concentration (4 day Average):	9-17 µg/L
Continuous Total Concentration (4 day Average):	9.5-17.5 µg/L
Maximum Dissolved Concentration (1 Hour Average):	13–26 µg/L
Maximum Total Concentration (1 Hour Average):	14–27 µg/L

[**Note**: A ug/L (microgram/Liter) is the same as a part per billion (ppb). A ppb is 1/1000th of a ppm. For example, 1 ppm is equal to 1000 ppb]

These copper water quality criteria are exceeded in the reservoir water during and after the application. Accordingly, because label application rates exceed the CTR water quality criteria, the Department is obtaining a SIP exception.

Once introduced into the reservoir, copper immediately dilutes and then undergoes a combination of precipitation, adsorption by biota and particulate matter, and complexation with organic matter. Numerous literature sources strongly suggest that copper-containing aquatic pesticides applied in reservoirs dissipate and/or become permanently insoluble shortly after application (CDFA 2002; Trumbo 1997, 1998; WA DOE 2004). Since 1995, significant data has been collected by the Department on copper concentrations at different times, depths, and locations after application of copper-containing aquatic pesticides to the reservoir. Consistent with this the aforementioned literature, copper applied to the reservoir exhibits a reservoir-specific half-life of approximately 400 hours.

Given a starting concentration of 0.2 ppm (200 ppb) and a half-life of approximately 400 hours, copper can reasonably be expected to dissipate according to the table below:

TABLE 3. Estimated Rate of Copper Dissipation in the Reservoir

Time (hours)	Time (Days)	Cu Concentration ppm	Cu Concentration ppb
0	0	0.20	200
120	5	0.16	160
240	10	0.14	140
360	15	0.11	110
480	20	0.091	91
600	25	0.075	75
720	30	0.061	61
840	35	0.050	50
960	40	0.041	41
1080	45	0.034	34
1200	50	0.028	28
1320	55	0.023	23
1440	60	0.019	19
1560	65	0.016	16
1680	70	0.013	13

As **Table 3** shows, a medium-term (50-70 day) CTR copper water quality criteria exceedance occurs in the reservoir.

Assuming typical label rate starting concentrations and the previously mentioned half-life, the risk to species shown in **Table 2** from copper was estimated. Species exposure was conservatively assumed to occur immediately after introduction of copper into the reservoir. With the possible exception of the western pond turtle and fish in Newell Creek, the use of copper-containing aquatic pesticides does not pose a risk. This is consistent with the fact that Department personnel have not reported adverse impacts to aquatic, avian, terrestrial or benthic organisms as a result of using copper-containing aquatic pesticides.

In spite of significant evidence that suggests that when used according to label directions by qualified personnel, impacts of copper-containing aquatic pesticides have no significant impact, the Department will implement the following mitigation measures to continue operating without a significant impact and reduce any future potentially significant impacts to less than a significant level: These mitigation measures are:

HWQ-1 MITIGATION: As required by the SIP and the Permit, the Department will prepare and execute an Aquatic Pesticide Application Plan (APAP). The plan will call for surface water sampling and analysis before, during, and after project completion to assess the impact, if any, that the project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, the Department will arrange for a qualified biologist to assess the extent of restoration of receiving water beneficial uses after the use of copper-containing aquatic pesticides.

BIO-1 MITIGATION: The concentration of copper in water spilled from the reservoir after copper-containing aquatic pesticide treatment may exceed the freshwater fish copper-specific TRV and as a result anadromous fish listed in **Table 2** may be at risk. Mitigation for this potential risk is described in the Biological Resources Section.

BIO-2 MITIGATION: Because the initial concentration of copper during treatment of the reservoir in the upper 10 feet of water column may exceed the western pond turtle copper-specific TRV, mitigation for potential exposure of western pond turtles may be required and is described in the Biological Resources Section.

Item b): ***No Impact.*** The project would not involve any construction activities or require the use of groundwater, so there is no impact on groundwater recharge or supplies.

Items c), d), & e): ***No Impact.*** The project will not involve construction of any structures that would alter drainage patterns or increase storm water runoff. The Project would not increase erosion or siltation on- or off-site.

Item f): See response to item a).

Items g), h), i), & j): ***No Impact.*** Since the project would involve no new construction, no housing or other structures would be placed within a designated 100-year floodplain. The project would not alter the floodplain or have the potential to redirect flood flows. The Project would not be subject to tsunami or inundation due to mudflows. Nor would the Project expose personnel to a substantial risk due to seiche waves or from flooding as a result of a catastrophic dam failure.

3.9 Land Use Planning

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Discussion

Item a): ***No Impact.*** The project will be implemented within the Department's existing reservoir. Nearby housing is rural and will not be affected. The proposed Project would not result in any division of an established community.

Item b): ***No Impact.*** The project will not create any new land uses or alter any existing uses and would not conflict with any applicable land use plan, policy or agency regulation.

Item c): ***No Impact.*** Refer to Section 3.4, item f). No known plan conflicts with the project.

3.10 Mineral Resources

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:					
a)	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b)	Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan other land use plan?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** The project involves the addition of aquatic pesticides to the Department's reservoir and has no impact on the availability of any known mineral resource recovery site.

3.11 Noise

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion

Items a) through d): ***No Impact.*** Project activity occurs in a recreational area. The incidental noise and vibration generated by the use of pick-up trucks and a small inboard motor will have a less than significant impact.

Items e) & f): ***No Impact.*** No airports are located within a 2-mile range of the project.

3.13 Public Services

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☒

Discussion

Item a): ***No Impact.*** The project will not alter or require the construction of new schools, parks, or other public facilities, nor will it increase the need for police and fire services beyond existing conditions.

3.14 Recreation

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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 effect on the environment?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** The project takes place in the Department's reservoir. Swimming is not permitted in the reservoir. Boating on the reservoir is temporarily suspended for one to

two days during and immediately following the application of aquatic pesticides. Recreational use of the reservoir can resume after completion of aquatic pesticide application. No permanent alterations to current recreational use are anticipated.

3.15 Transportation/Traffic

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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 on roads, or congestion at intersections)?	☐	☐	☐	☒
b)	Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c)	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d)	Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e)	Result in inadequate emergency access?	☐	☐	☐	☒
f)	Result in inadequate parking capacity?	☐	☐	☐	☒
g)	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** The project involves the use of pick-up trucks and a small boat with an inboard motor that will not cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the county roads in the project area.

Item c): ***No Impact.*** The project has no influence on air traffic.

Items d) through g): ***No Impact.*** The project does not involve changes in road design or encourage incompatible road or highway uses. Further, the project does not impact emergency access or parking. Lastly, the project does not impact or conflict with adopted policies, plans, or programs supporting alternative transportation.

3.16 Utilities and Service Systems

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:					
a)	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b)	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c)	Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d)	Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e)	Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f)	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g)	Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Discussion

Items a) & b), and e) through g): ***No Impact.*** The project does not discharge to a wastewater treatment plant and does not generate any solid waste. All aquatic pesticide containers will be properly disposed according to label instructions (See **Appendix A**).

Item c): ***No Impact.*** The project does not alter storm water flow or impact storm water drainage systems.

Item d): ***No Impact.*** The project involves the treatment of aquatic weeds in the Department's existing reservoir and has no known influence on the entitlements or resources utilized by the Department.

3.17 Mandatory Findings of Significance

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a)	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b)	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☒	☐	☐
c)	Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

Discussion

Item a): **Potentially Significant Unless Mitigation Incorporated.** The project involves the use of copper-containing aquatic pesticides introduced into the Department's reservoir at concentrations that temporarily exceed CTR water quality objectives. Significant evidence suggests that when used according to label directions by qualified personnel, CTR exceedance is not long-term and impact of the use of aquatic pesticides is less than significant.

However, the Department will implement mitigation (**BIO-1, BIO-2 and HWQ-1**) to reduce any future potential impacts to less than a significant level.

Item b): **Potentially Significant Unless Mitigation Incorporated.** The cumulative impacts of continued application of copper-based aquatic pesticides are not known.

Specifically, the extent to which copper accumulates, becomes bioavailable, and subsequently creates a significant impact, if at all, is not clear at this time. Potential cumulative impacts, if any, are addressed through mitigation **HWQ-1**. This mitigation reduces the impact to a less than significant level.

Item c): **Less Than Significant Impact.** As a result of implementation of Department standard procedures as described in the Hazards and Hazardous Materials section, any hazard/hazardous material impacts to the human beings is reduced to a less than a significant level.

4.0 LIST OF MITIGATION MEASURES

4.1 Biological Resources

BIO-1 MITIGATION: The concentration of copper in water spilled from the reservoir after copper-containing aquatic pesticide treatment may exceed the freshwater fish TRV and as a result anadromous fish listed in **Table 2** may be at risk. Mitigation for this potential risk is to not allow treated water to spill from the reservoir. This will be accomplished by:

1. Lowering the lake level prior to application of copper-containing aquatic pesticides if there is a risk of rain by drawing more water to the plant for treatment, releasing reservoir water from the deluge valve, and/or increasing release through the creek flow maintenance system.
2. In a case where reservoir overflow cannot be prevented or is imminent, allow algae to bloom and do not apply copper-containing aquatic pesticides.
3. If treated water must be spilled, do one or both of the following:
    a. Wait approximately 50 days after initial application prior to spilling treated water. This is the amount of time required for the copper concentrations listed **Table 1** to drop below the fish TRV;
    b. Release additional water from the creek flow maintenance system or from a deluge valve at the base of the dam. This would essentially dilute any copper in the creek.

TABLE 1: Summary of Estimated Acceptable Copper Concentrations Based on % of Reservoir Treated

% of Reservoir Treated	Acceptable Target Copper Concentration* (ppm)
15 – 25	0.74 – 1.00
35 – 45	0.40 - 0.46
45 – 55	0.32 – 0.36
55 – 65	0.27 – 0.30
75 – 85	0.20 – 0.22
95 - 100	0.16 – 0.18

Assumes complete dilution in the targeted treatment zone (surface to 10 ft depth).

BIO-2 MITIGATION: Because the initial concentration of copper during treatment of the reservoir in the upper 10 feet of water column may exceed the western pond turtle copper-specific TRV of 0.17 ppm, mitigation for potential exposure of western pond turtles may be required as follows:

1. Given an area of the reservoir requiring treatment, the target concentration of copper in the upper 10 feet of the reservoir shall not exceed values presented in **Table 1**. For example, when 80% of the reservoir is treated, the target concentration of copper shall not exceed 0.21 ppm.

2. If the target concentration of copper or the area treated needs to exceed values presented in **Table 1**, Department staff shall scout areas of the reservoir that are intended for treatment. If western pond turtles are found, then treatment will be postponed in that area until the turtles are either relocated or move from the area. If pond turtles are not found, then treatment can proceed as planned.

4.2 Hydrology & Water Quality

HWQ-1 MITIGATION. As required by the SIP and the Permit, the Department will prepare and execute an APAP. The APAP requires surface water sampling and analysis before, during, and after project completion to assess the impact, if any, that the project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, the Department will arrange for a qualified biologist to assess receiving water beneficial uses.

5.0 MITIGATION MONITORING AND REPORTING

Implementation of the mitigation measures as described above, the completion of and compliance with the APAP, submission of the NPDES aquatic pesticide general permit annual report, and the assessment of biological resources according to SIP requirements meets the CEQA mitigation monitoring and reporting requirements as described in California Public Resources Code § 21081.6.

6.0 REFERENCES

Alley, D., J. Dvorsky, J. Ricker, K. Schroeder, J. Smith. 2004. SAN LORENZO RIVER SALMONID ENHANCEMENT PLAN: Fisheries Enhancement Strategy for the San Lorenzo River. submitted to Santa Cruz County Environmental Health Services.

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California EPA. 2003. Regional Water Quality Control Board Compilation of Water Quality Goals.

California Toxics Rule (CTR), May 18, 2000. 65 Federal Register 31682-31719 (Adds Section 131.38 to 40 CFR).

Dana Bland & Associates. 2001. Surveys for California Red-Legged Frog At City Of Santa Cruz Watershed Lands. Submitted to City of Santa Cruz Water Department December 2001.

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McPherson, K.R. and J.G. Harmon. 1998. Storage Capacity and Sedimentation of Loch Lomond Reservoir, Santa Cruz, California, 1998. U.S. Geological Survey Water-Resources Investigations Report 00-4016.

SWRCB, 2000. The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California (the State Implementation Plan, or SIP)

WA DOE 2003. Washington Department of Ecology SEIS for Aquatic Herbicides Vol 6, Section 3, Copper Environmental Fate Table 3.5

7,0 PERSONS AND AGENCIES CONTACTED

1.) Robert Barrett, City of Santa Cruz Water Department
2.) Terrill Tompkins , City of Santa Cruz Water Department
3.) Christopher Berry, City of Santa Cruz Water Department

8.0 LIST OF PREPARERS

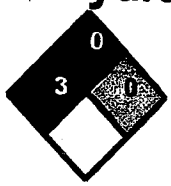
1.) Michael S. Blankinship, PE, PCA, Blankinship & Associates
2.) Sara Castellanos, Staff Scientist, Blankinship & Associates
3.) Joseph P. Sullivan, Ph.D., Certified Wildlife Biologist, Ardea Consulting

Appendix A

Copper Sulfate Pentahydrate

Date Prepared: April 11, 2000

MATERIAL SAFETY DATA SHEET



NFPA RATING

HEALTH	3
FLAMMABILITY	0
REACTIVITY	0
PROTECTIVE EQUIPMENT	

HMIS RATING

SECTION I. PRODUCT IDENTIFICATION

Product Name: Copper Sulfate Pentahydrate

Manufacturer/Vendor Information: PHELPS DODGE REFINING CORP.
P.O Box 20001
El Paso, Texas

24-Hour Emergency Phone: (800)424-9300
Chemtrec
Other Information Phone: (915)778-9881

SECTION II. COMPOSITION / INFORMATION ON INGREDIENTS

CAS No.	Chemical Name	Exposure Limits	% by wt.
7758-99-8	Copper sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$), (Cupric sulfate), (Blue Vitriol), (Bluestone)	ACGIH TLV TWA: 1.0 mg/m^3 (as copper dust/mist) OSHA PEL TWA: 1.0 mg/m^3 (as copper dust/mist)	99

Anhydrous Cupric Sulfate (CAS# 7758-98-7)

Phelps Dodge Triangle Brand Copper Sulfate

Copper Sulfate Pentahydrate (CAS 7758-99-8)	*=99%*
Contains copper sulfate	*=63.3%*
Contains water of crystallization	*=35.7%*
Metallic copper equivalent	*=25.2%*

SECTION III. HAZARDS IDENTIFICATION

Emergency Overview: Odorless, transparent blue crystals, granules or powder. Can cause irreversible eye damage and severe skin irritation. Harmful if swallowed or absorbed through the skin. Avoid breathing mist or dust and contact with skin, eyes or clothing. May cause skin sensitization reactions in certain individuals.
Route(s) of Entry: Inhalation, eye, skin and ingestion.
Acute Exposure: Can cause skin, eye and respiratory irritation.
Chronic Exposure: Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis.
Carcinogenicity (NTP) (IARC) (OSHA): Not listed.
Eye: Can cause severe eye irritation and may result in irreversible eye damage.
Skin Contact: Can cause severe skin irritation. May cause localized discoloration of the skin.
Inhalation: Can result in irritation of the upper respiratory tract and in excessive quantities may cause ulceration and perforation of the nasal septum.
Ingestion: Can result in digestive tract irritation with abdominal pain.

SECTION IV. FIRST AID MEASURES

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention.
Skin: Remove contaminated clothes and shoes; immediately wash skin with soap and plenty of water and get medical attention.
Ingestion: Drink promptly a large quantity of milk, egg white, gelatin solution, or if they are not available, large quantities of water. Avoid alcohol. Do not give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention.

SECTION V. FIRE FIGHTING MEASURES

Flash Pt:	Not available
Flammable Limits in Air-Lower:	Not available
Flammable Limits in Air – Upper:	Not available
Auto Ignition Temperature:	Not available
Fire Fighting Extinguishing Media:	Does not burn or support combustion. Use extinguishing media appropriate for surrounding fire (CO_2, dry chemical or water).
Fire Fighting Equipment:	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
Fire Fighting Instructions:	Evacuate area and fight fire from a safe distance.
Fire and Explosion Hazards:	Sealed containers may rupture when heated due to release of water from crystals.
Unusual Hazards:	Material is acidic when dissolved in water, contact with magnesium metal may evolve hydrogen gas. Anhydrous cupric sulfate formed on water loss (white color). Anhydrous salt will ignite hydroxylamine, if present.

SECTION VI. ACCIDENTAL RELEASE MEASURES

Accidental Release Measures: Use clean-up methods that avoid dust generation (vacuum, wet). Wear a NIOSH or MSHA approved respirator if dust will be generated in clean-up. Use protective clothing if skin contact is likely. If spilled solution is in a confined area, introduce lime or soda ash to form insoluble copper salts and dispose of by approved method. Prevent accidental entry of solution into streams and other water bodies. Shovel any spills into plastic bags and seal with tape. Copper sulfate solution may deteriorate concrete.

SECTION VII. HANDLING AND STORAGE

Signal Word: Danger.

Handling Information: Avoid breathing dust or solution mist. Sweep up crystals or powder, vacuum is preferred. Eye wash stations should be available in work areas. Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Storage Information: Store in closed containers in a cool, dry, well-ventilated area away from heat sources and reducing agents. Store copper sulfate in stainless steel, fiberglass, polypropylene, PVC's or plastic equipment. Keep away from galvanized pipe and nylon equipment. If container or bag is damaged, place the container or bag in a plastic bags. Use good housekeeping practices to prevent dust accumulation.

SECTION VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: Use adequate general or local ventilation to keep airborne concentrations below the exposure limits.

Eye Protection: Use safety glasses with side-shields or goggles.

Skin Protection: Use protective clothing to prevent repeated or prolonged skin contact. Applicators and other handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks, and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with product's concentrate. Do not reuse them. Keep and wash PPE separately from other laundry.

Respiratory Protection: A respiratory protection program that meets OSHA 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant respirator use. For concentrations up to 10 times the exposure limit, use NIOSH or MSHA approved half- or full-face, air-purifying respirator. For higher concentrations, consult a professional industrial hygienist.

SECTION IX. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Transparent blue crystals, granules or powder.
Melting Point:	Decomposition above 110 °C with –4 H_2O
Boiling Point:	-5H2O @ 150 °C (760 mmHg)
Decomposition Temperature:	Not available
Density/Specific Gravity:	2.284 @ 15.6 °C
Vapor Pressure:	Not applicable
Vapor Density:	Not applicable
Solubility in Water:	83.1 g/100 cc water @ 30 °C
Molecular Weight:	249.68

SECTION X. STABILITY AND REACTIVITY

Stability: Stable.
Incompatibility: Acetylene gas, aluminum powder, hydroxylamine, magnesium, moist air. Contact with magnesium metal can generate dangerous levels of hydrogen gas.
Hazardous Decomposition Products: At temperatures >600 °C material decomposes to cupric oxide and sulfur dioxide.
Hazardous Polymerization: Will not occur.

SECTION XI. TOXICOLOGICAL INFORMATION

Toxicology Tests: (Triangle Brand Copper Sulfate Crystal)

Test: 1
LD/LC: LD_{50}
Test Type: Acute
Test Route: Percutaneous
Test Species: Rabbit
Results Amounts: >8.0 g/kg

Test: 2
LD/LC: LD_{50}
Test Type: Acute
Test Route: Oral
Test Species: Rat
Results Amounts: 472.5 mg/kg

Test: 3
LD/LC: LC_{50}
Test Type: Acute
Test Route: Inhalation
Test Species: Rats
Results Amounts: >2.95 mg/L

Primary Eye Irritation: Corrosive, irreversible eye damage
Primary Skin Irritation: No skin irritation.
Subacute dietary LC_{50}: >10,000 ppm (quail and duck).
96 hr acute toxicity LC_{50}: 0.65 ppm (bluegill), 0.056 ppm (trout), 16 ppm (pink shrimp)
48 hr EC_{50}: 54 ppb (eastern oysters)
48 hr LC_{50}: 17 ppm (pink shrimp), 600 ppb (daphnia)
24 hr LC_{50}: 6.9 ppm (blue crab), 600 ppb (daphnia)
Carcinogenic: Not listed by NTP, IARC or OSHA.

Additional Information: Inhalation of dust and mists of copper salts can result in irritation of nasal mucous membranes, sometimes of the pharynx and, on occasion ulceration with perforation of the nasal septum. Exposure to copper dust causes discoloration of the skin.
Note to Physician: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsions may be needed. Wilson's disease or G6PD deficiency (individual who absorbs, retains and stores copper) can be aggravated by excessive exposure. Symptoms may include nausea, vomiting, epigastric pain, diarrhea, dizziness, jaundice, and general debility.

SECTION XII. DISPOSAL CONSIDERATIONS

Waste Disposal Method: Waste must be disposed of in accordance with federal, state and local environmental control regulations. Improper disposal is a violation of Federal law. Do not reuse empty container. If allowed by State and local authorities, dispose of container in a sanitary landfill or by incineration.

SECTION XIII. TRANSPORT INFORMATION

	Proper Shipping Name:	Technical Name (If N.O.S.):	Hazard Class:	ID:	PG:
DOT:	*Environmentally Hazardous Substance, Solid, n.o.s., (Cupric Sulfate)**		9	UN3077	III

Reportable Quantity (RQ) = 10 pounds (4.54 kg)

*Applicable when product is shipped in packaging of 10 pounds or greater. If shipped in less than 10 pound packaging it is not regulated by DOT Hazardous Material Regulations.

SECTION XIV. REGULATORY INFORMATION

US Federal

Federal Drinking Water Standards: *(Copper)* EPA 1300µg/L (action level), 1000 µg/L

Clean Water Act: *(Copper)* 5.6 µg/L as a 24-hour average in freshwater; *(Copper)* 4.0 µg/L as a 24-hour average and not in excess of 23 µg/L at any time in saltwater.

TSCA: Listed

EPCRA, SARA Title III, Section 313 (40 CFR 372) Chemicals subject to reporting requirements (see Section II for CAS number and percentage in mixture): *(Copper)* >1%.

CERCLA Hazardous Substances: RQ is not assigned to the broad class of copper compounds.

DOT: RQ 10 pounds (4.54 kg), See Section XIII TRANSPORT INFORMATION

SECTION XV. OTHER INFORMATION

Prepared By:	Department of Occupational Health and Safety Phelps Dodge Corporation
Reason for Revision:	Revised statements in SECTION I; minor formatting changes

Disclaimer: This information is based on available scientific evidence known to the Phelps Dodge Corporation. It is provided solely for compliance to the Hazard Communication Standard. This information is furnished without warranty, expressed or implicit.

TRIANGLE BRAND COPPER SULFATE CRYSTAL

Not for medicinal use

ACTIVE INGREDIENT:	
Copper sulfate pentahydrate*	99.0%
INERT INGREDIENTS:	1.0%
TOTAL	100.0%

*Metallic copper equivalent 25.2%

KEEP OUT OF REACH OF CHILDREN

DANGER/PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand this label, find someone to explain it to you in detail.)

Information for Right-to-Know States:
Copper sulfate pentahydrate/CAS Reg. No. 7758-99-8: sulfuric acid, copper (2+) salt (1:1)/ CAS Reg. No. 7758-98-7; Water/CAS Reg. No. 7732-18-5

STATEMENT OF PRACTICAL TREATMENT

IF SWALLOWED: Drink promptly a large quantity of milk, egg white, gelatin solution, or if these are not available, large quantities of water. Avoid alcohol. Do not give anything by mouth to an unconscious person.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsions may be needed.

IF IN EYES: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention.

IF ON SKIN: Remove contaminated clothes and shoes; immediately wash skin with soap and plenty of water and get medical attention.

See side panel for additional precautionary statements.

EPA Reg. No. 1278-8

EPA Est. No. 1278-TX-1

Manufactured by
Phelps Dodge Refining Corporation
El Paso, Texas 79998

Net Weight
50 Lbs./22.68 Kg.

PRECAUTIONARY STATEMENTS
DANGER
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Causes severe eye and skin irritation. Harmful if swallowed or absorbed through the skin. Avoid breathing mist or dust and contact with skin, eyes, or clothing. Causes substantial but temporary eye injury. May cause skin sensitization reactions in certain individuals.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks, and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and aquatic organisms. For terrestrial uses, do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Drift and runoff from treated areas may be hazardous to fish and aquatic organisms in adjacent sites. Direct application of copper sulfate to water may cause a significant reduction in populations of aquatic invertebrates, plants, and fish. Do not treat more than one-half of lake or pond at one time to avoid depletion of oxygen levels due to decaying vegetation. Allow one to two weeks between treatments for oxygen levels to recover.

Trout and other species of fish may be killed at application rates recommended on this label, especially in soft or acid waters. However, fish toxicity generally decreases when the hardness of water increases. Do not contaminate water when disposing of equipment washwaters. Consult your State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

STORAGE AND DISPOSAL
STORAGE

Do not contaminate water, food, or feed by storage or disposal. Store unused product in original container only in a cool, dry area out of reach of children and animals. If container or bag is damaged, place the container or bag in a plastic bag. Shovel any spills into plastic bags and seal with tape.

DISPOSAL

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance. Open dumping is prohibited.
CONTAINER DISPOSAL: Do not reuse empty container. Completely empty container by shaking and tapping sides and bottom to loosen clinging particles. Place the pesticide into application equipment. Then dispose of container in a sanitary landfill or by incineration if allowed by State and local authorities. If burned, stay out of smoke.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forest, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment(PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.
Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours.
PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is coveralls, waterproof gloves, shoes plus socks, and protective eyewear.

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.
Protective clothing, including goggles, should be worn.

FORMULATION OF PESTICIDES

This product is suitable for use in the manufacturing of algaecides, fungicides, mildewcides, herbicides, wood preservatives, including CCA, ACA, and ACZA compounds and tanning and preserving agents for leather and hides.

It is the responsibility of formulators using this product to register all pesticidal formulations made from it with the EPA.

CONTROL OF ALGAE AND TADPOLE SHRIMP (TRIOPS LONGICAUDATUS) IN RICE FIELDS (DOMESTIC AND WILD)

Tadpole shrimp in rice fields may be effectively controlled by the prompt and proper use of Copper Sulfate Crystal. After the rice field has been flooded to a depth of 6 to 8 inches, the Copper Sulfate Crystal should be uniformly applied at a rate of 10 to 15 pounds per acre at the first sign of infestation. Following these directions carefully should keep the concentration of copper sulfate less than 10 ppm. The "Diamond" size crystals are especially graded for maximum solubility.

POTATOES (Except California)

To enhance vine-kill and suppress late blight, apply 10 lbs. per acre in 10 to 100 gallons of water (ground equipment) or in 5 to 10 gallons (aerial equipment) with Diquat at vine-kill to enhance vine desiccation and suppress late blight. Additional applications can be made with Diquat if needed within 7 days of harvest. Triangle Brand Copper Sulfate Crystal may be applied alone until harvest to suppress late blight. NOTE: This product can be mixed with Diquat for use on potatoes in accordance with the most restrictive of label limitations and precautions. No label dosage rates should be exceeded.

SEWER TREATMENT FOR ROOT AND FUNGUS CONTROL*

Copper Sulfate Crystal is effective in keeping sewer lines free of roots.

FOR PARTIAL STOPPAGE: Add 1/2 pound of Copper Sulfate Crystal to sewer or drain and flush toward blockage with 5 gallons of water. Repeat at 6 month intervals to prevent growth of new roots.

FOR COMPLETE STOPPAGE: Physically remove the root blockage and repeat as above.

FOR HOUSEHOLD SEWERS: Use 2 to 6 lbs. Copper Sulfate Small Crystal twice yearly in spring and early fall. Apply in toilet bowl near sewer line. Flush 1/2 lb. portions at a time. Or, remove the clean-out plug and pour entire quantity directly into sewer line and flush with water. **Do not use in septic tank systems.**

FOR COMMERCIAL, INSTITUTIONAL AND MUNICIPAL USE

SEWERS: Use 2 lbs. of Copper Sulfate Small Crystal each 6 to 12 months, applied to each junction or terminal manhole.

STORM DRAINS: Use 2 lbs. of Copper Sulfate Small Crystal per drain per year. Apply during period of light flow. In dry weather, induce a flow with hose. If storm drains become almost plugged, repeat treatment 3 or 4 times at two week intervals.

SEWER PUMPS AND FORCE MAINS: Place 2 lbs. of Copper Sulfate Small Crystal in a cloth bag at the storage wall inlet. Repeat as needed.

***State laws prohibit the use of this product in sewage systems in Connecticut and in the following nine counties in California: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.**

CONTROLLING WEEDS, ALGAE, AND MICROSCOPIC ORGANISMS IN IMPOUNDED WATERS, LAKES, PONDS, AND RESERVOIRS

It is a violation of New York State Law for anyone to apply this product to surface waters unless he is either privately or commercially certified in category 5 (aquatic), or possesses a purchase permit for the specific application proposed.

PRECAUTION CONCERNING FISH: The treatment of algae with Copper Sulfate Crystal can result in oxygen loss in the water from decomposition of dead algae. This can cause the fish to suffocate. Care should be taken when water temperature exceeds 85°F. At this water temperature, aquatic plants treated with copper sulfate decompose rapidly causing an increase in oxygen depletion. Therefore, to minimize this hazard, treat 1/3 to 1/2 of the water area in a single operation. Wait 7 to 14 days between treatments. Begin treatments along the shore and proceed outwards in bands to allow fish to move into untreated water.

APPLICATION BY DRAGGING COPPER SULFATE CRYSTAL UNDER WATER: Large or small sized Copper Sulfate Crystal is placed in burlap bags or baskets and dragged through the water by means of a boat. Begin treatment along the shoreline and proceed outward until 1/3 to 1/2 of the total area has been treated. The path of the boat should insure a distribution that is even. In large lakes, the boat should move in parallel lines about 60 feet apart. Continue dragging until all of the weighed Copper Sulfate Crystal is dissolved.

APPLICATION BY SPRAYING COPPER SULFATE SOLUTION ON WATER SURFACE: A solution can be made with Copper Sulfate Powder or Fine Crystal which dissolve easily in water. This solution can then be sprayed on the pond or lake surface from a boat. When using this method, the wind direction is important as well as the operation of the boat. Do not endanger people or animals in the boat with the copper sulfate spray.

APPLICATION BY INJECTING COPPER SULFATE SOLUTION IN WATER: A solution can be made with Copper Sulfate Powder or Crystal. This solution can then be injected into the water via a piping system.

APPLICATION BY BROADCASTING DRY COPPER SULFATE CRYSTAL: Crystals may be broadcast directly on the water surface from the shore or from a properly equipped boat. Triangle Brand Crystals ranging from $\pm$10 mesh to $\pm$1/2 inch are preferred for this method of application. A specifically equipped air blower can be used to discharge these size crystals at a specific rate over the surface of the water. When using this method, the wind direction is an important factor. Do not use this method unless completely familiar with this type of application.

APPLICATION BY SPRAYING DRY COPPER SULFATE CRYSTAL FROM AIRPLANES AND HELICOPTERS: Professional personnel licensed by the State Agricultural Extension Service are allowed to apply Copper Sulfate Crystal in some states.

If treated water is to be used as a source of potable water, the metallic residual must not exceed 1 ppm copper. This equals 10.64 pounds per acre foot of water or 4 ppm of this product.

HOW TO FIND THE POUNDS OF COPPER SULFATE TO ADD TO WATER

To find acre-feet of water in a body of water, measure the body of water in feet. Calculate the surface area in square feet, divided by 43,560 (sq. ft./acre) times the average depth in feet.

1 acre-foot of water = Water measuring 208.7 ft. long by 208.7 ft. wide by 1 ft. deep.
1 acre-foot of water = 43,560 cubic feet of water.
1 cubic foot of water = 62.4 pounds.
1 acre-foot of water = (43,560)(62.4) = 2,720,000 pounds.

COPPER SULFATE PENTAHYDRATE IN WATER

POUNDS OF COPPER SULFATE CRYSTAL PER ACRE-FOOT OF WATER	=	PARTS (BY WEIGHT) COPPER SULFATE CRYSTAL PER MILLION PARTS (BY WEIGHT) OF WATER	=	PARTS (BY WEIGHT) COPPER PER MILLION PARTS (BY WEIGHT) OF WATER
0.67#/acre-foot	=	1/4 ppm	=	0.0625 ppm
1.3#/acre-foot	=	1/2 ppm	=	0.125 ppm
2.6#/acre-foot	=	1 ppm	=	0.25 ppm
5.32#/acre-foot	=	2 ppm	=	0.50 ppm

TREATMENT OF SOME ALGAE WITH COPPER SULFATE CRYSTAL

Dosage is in ppm of Copper Sulfate Crystal. A higher concentration is required if the water is hard. Consult with the State Fish and Game Agency before applying product in municipal waters.

0.25 to 0.50 ppm	0.50 to 1.00 ppm	1.00 to 1.50 ppm	1.50 to 2 ppm
CYANOPHYCEAE ORGANISM (BLUE GREEN)			
Anabaena	Cylindrospermum	Nostoc	Calothrix
Anacystis	Oscillatoria	Phormidium	Symploca
Aphanizomenon	Plectonema		
Gloeotrichia			
Gomphosphaeria			
Polycystis			
Rivularia			
CHLOROPHYCEAE ORGANISM (GREEN)			
Closterium	Botryococcus	Chlorella	Ankistrodemus
Hydrodictyon	Cladophora	Crucigenia	Chara*
Spirogyra	Coelastrum	Desmidium*	Nitella*
Ulothrix	Draparnaldia	Golenkinia	Scenedesmus
	Enteromorpha	Oocystis	
	Gloeocystis	Palmella	
	Microspora	Pithophora*	
	Tribonema	Staurastrum	
	Zygnema	Tetraedron	
DIATOMACEAE ORGANISM (DIATOMS)			
Asterionella	Gomphonema	Achnanthes	
Fragilaria	Nitzschia	Cymbella	
Melorias*	Stephanodiscus	Neidium	
Navicula	Synedra		
	Tabellaria		
PROTOZOA ORGANISM (FLAGELLATES)			
Dinobryon	Ceratium	Chlamydomonas	Eudorina*
Synura	Cryptomonas	Hawmatococcus*	Pandorina*
Uroglena*	Euglena	Peridinium	
	Glenodinium		
	Mallomonas		

*Not for use in California.

CONTROL OF WEEDS AND ALGAE IN FLOWING WATER

Potamogeton pondweeds, leafy and sago, in irrigation conveyance systems: Use the continuous application method, selecting proper equipment to supply Copper Sulfate Crystal at 0.25 to 0.5 pounds per hour for each cubic foot per second of flow for 12 hours of each 24 hours. For best control, begin copper sulfate additions when water is first turned into system to be treated and continue throughout the irrigation season. Copper Sulfate Crystal becomes less effective for mature plants. Copper Sulfate Crystal becomes less effective as the bicarbonate alkalinity increases and is substantially reduced above 150 ppm as $CaCO_3$. Mechanical or other means may then be required to remove excess growth.

Algae (such as filamentous green, pigmented flagellates, diatoms) in irrigation conveyance systems: Begin continuous addition when water is first turned on, using suitable equipment to uniformly deliver 0.1 to 0.2 pounds of Copper Sulfate Crystal per hour per cubic foot per second of flow for 12 of each 24 hours. (Note: Copper Sulfate Crystal comes in several "free flowing" crystal sizes but should be selected to match requirements of your feeder.)

Algae and weeds in irrigation systems by "slug" method of addition: Make a dump of Copper Sulfate Crystal into the irrigation ditch or lateral at 1/2 to 2 pounds per second of water per treatment. Repeat about every 2 weeks as needed. A dump is usually necessary every 5 to 30 miles depending on water hardness, alkalinity and algae concentration.

CONTROL OF ALGAE AND BACTERIAL ODOR IN SEWAGE LAGOONS AND PITS (Except California)

Application rates may vary depending on amounts of organic matter in effluent stream or retention ponds. Use 2 lbs. of Copper Sulfate Crystal in 60,000 gals. (8,000 cu. ft.) of effluent to yield 1 ppm of dissolved copper. Dosage levels may vary depending upon organic load.

Other Organic Sludges: Copper Sulfate Crystal solution must be thoroughly mixed with sludge. Dissolve 2 lbs. in 1-2 gals. of water and apply to each 30,000 gals. of sludge.

Useful formulas for calculating water volume and flow rates: Multiply the water volume in cu. ft. times 7.5 to obtain gallons.

Note: 1 C.F.S./Hr. = 27,000 Gals.
1 Acre Foot = 326,000 Gals.

NOTICE TO BUYER

Seller makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Buyer assumes all risk of use and/or handling of this material when such use and/or handling is contrary to label instructions.

DOT Hazard Class
RQ, Environmentally Hazardous Substances,
Solid, n.o.s. (Cupric Sulfate) 9, UN 3077, III

Appendix B

A limited Habitat Assessment of the Loch Lomond Recreation Area project site was conducted by Ardea Consulting personnel to characterize the habitats present on-site and the likelihood of special status species (i.e., federally-listed or proposed to be listed as endangered, threatened, species of concern, or candidate species; and state-listed as species of concern, endangered, threatened, fully protected, rare, candidate endangered, or candidate threatened) occurring on the project site.

A list of these special species was compiled using a records search of the California Natural Diversity Database (CNDDB), and current species information from the U.S. Fish and Wildlife Service Ventura Office, as well as the Sacramento Office website. Location specific species data is available from both of these sources, and organized geographically into 7.5 minute U.S.G.S. quads. In addition, a buffer area made up of the outlying quads adjacent to the primary quad containing the reservoir was selected for the query, resulting in a total of 8 quads that were queried in the CNDDB database. This approach was used to identify species that might be located in the surrounding areas, but not necessarily reported to CNDDB as a sighting event within the District boundaries.

The approach used for the internet query of the U.S. Fish and Wildlife Service local office website, was somewhat different given that their data is not organized geographically based on reported occurrences of species. The U.S. Fish and Wildlife Service Sacramento Office was queried using the boundary map for the District, and the one quad that intersects with the District's boundaries and fell within the jurisdiction of the Sacramento Office. A request was sent to the Ventura Office for a list of the species list for Santa Cruz County. This approach was appropriate for this database due to the fact that the geographical designation provided by the website is conservative in nature and includes all species in the selected area and surrounding areas.

Habitat requirements of each of the species were reviewed to determine whether habitat existed within the project area that would meet that species' needs. The breeding or foraging habitat of animals and the habitat requirements of plant species likely to occur in the project area are described below.

Amphibians

California Red-legged Frog (*Rana aurora draytonii*)

California red-legged frogs occur in dense, shrubby riparian vegetation associated with deep (< 0.7 m), still or slow-moving water (Jennings 1988 in Jennings and Hayes 1994, Hayes and Jennings 1988 in Jennings and Hayes 1994). The shrubby riparian vegetation that structurally seems to be most suitable for California red-legged frogs is that provided by arroyo willow (*Salix lasiolepis*), and cattails (*Typha* sp.) and bulrushes (*Scirpus* sp.) also provide suitable habitat (Jennings 1988 in Jennings and Hayes 1994). Juvenile frogs seem to favor open, shallow aquatic habitats with dense submergents (pers. observ. in Jennings and Hayes 1994). Postmetamorphs have a highly variable animal food diet (Hayes and Tennant 1986 in Jennings and Hayes 1994). Frogs and small mammals may contribute significantly to the diet of adults and subadults (Arnold and Halliday 1986 in Jennings and Hayes 1994, Hayes and Tennant 1986 in Jennings and Hayes 1994). The movement ecology of California red-legged frogs is not well understood (Jennings and Hayes 1994). California red-legged frogs are not likely to be present in a reservoir with populations of predatory fish such as largemouth bass (pers. comm. Bill Cox,

CDFG Fisheries Biologist). Additionally, no California red-legged frogs were found in a 2001 survey of the reservoir (Dana Bland & Associates 2001).

Foothill Yellow-legged Frog (*Rana boylii*)
Foothill yellow-legged frogs occur in partially shaded, rocky streams at low to moderate elevations, in areas of chaparral, open woodland, and forest. (Nussbaum et al. 1983 in NatureServe 2004, Hayes and Jennings 1988 in NatureServe 2004). They seek cover at pool bottoms when startled. They breed in pools of streams and attach their eggs to gravel or rocks at edge of pools or streams (Nussbaum et al. 1983 in NatureServe 2004). Tadpoles seem to be capable of growing much more rapidly on epiphytic diatoms than other types of algae, and have been observed to preferentially graze on this algal type (S. Kupferberg, pers. comm. in Jennings and Hayes 1994). Upon metamorphosis, juveniles show a marked differential movement in an upstream direction (Twitty et al. 1967 in Jennings and Hayes 1994). Postmetamorphs probably eat both aquatic and terrestrial insects, but few dietary data exist for this species (see Storer 1925 in Jennings and Hayes 1994, Fitch 1936 in Jennings and Hayes 1994). No foothill yellow-legged frogs were found in a 2001 survey of the reservoir (Dana Bland & Associates 2001).

Birds

Marbled Murrelet (*Brachyramphus marmoratus*)
Marbled murrelets nest in mature and old-growth coniferous forests. They generally feed in protected coastal water, but also feed on freshwater lakes up to 75 km inland. They feed entirely on fish (Nelson 1997). For the marbled murrelet, an average water copper concentration of 0.5 ppm was used to represent the exposure in excess of what would be possible during the first day following application. This concentration could lead to a dietary concentration of 14.01 mg/kg/day that would not exceed the TRV of 46.97 mg/kg/day (see Appendix B). The risk of applying copper to reservoirs for the control of aquatic weeds is insignificant.

Vaux's Swift (*Chaetura vauxi*)
Vaux's swifts nest in late stages of coniferous forests and deciduous forests mixed with coniferous trees. They feed in the air feeding on insects over the forest canopy, grasslands, and open water (Bull and Collins 1993). Hazard from copper-containing aquatic pesticides is negligible because insects emerging from the treated areas would be unavailable through direct toxicity to immature life stages.

Black Swift (*Cypseloides niger*)
Black swifts nest on ledges or shallow caves in steep rock faces and canyons (Lowther and Collins 20002). They feed at great heights in fair weather, often at the limit of our sight from the ground. In cold, rainy or gloomy weather, they are more likely to feed over water (Rathbun 1925 in Lowther and Collins 20002, Burleigh 1929 in Lowther and Collins 20002). Hazard from copper-containing aquatic pesticides is negligible because insects emerging from the treated areas would be unavailable through direct toxicity to immature life stages.

American Peregrine Falcon (*Falco peregrinus anatum*)
The habitat of peregrine falcons generally includes cliffs, for nesting, with open areas of air and generally open landscapes for foraging. In addition to natural habitats peregrine falcons also use urban, human-built environments such as towers, buildings, etc.). Most prey is captured in the air while in flight, but they also capture prey from the surface of water or the ground. The most common prey include birds, from song birds to small geese, occasionally mammals, and

rarely amphibians, fish, and insects (White *et al.* 2002). Since peregrine falcons feed almost exclusively on birds and mammals, the risk posed by treating reservoirs for the control of aquatic weeds is insignificant.

Bald Eagle (*Haliaeetus leucocephalus*)
Bald eagles use open water habitats with adjacent large trees throughout the year. In a study in northern California, eagles breeding along the Pit River fed mostly on fish (88%) along with birds (9%), and mammals (4%). The Sacramento sucker dominated the diets of all pairs contributing over 60% of the total biomass (Hunt and others 1992). For the bald eagle, an average water copper concentration of 0.5 ppm was used to represent the exposure in excess of what would be possible during the first day following application. This concentration could lead to a dietary concentration of 13.07 mg/kg/day that would not exceed the TRV of 46.97 mg/kg/day (see Appendix B). The risk of applying copper to reservoirs for the control of aquatic weeds is insignificant.

Osprey (*Pandion haliaetus*)
Osprey feed along rivers, marshes, reservoirs, and natural ponds and lakes, where individuals feed in both shallow littoral zones as well as deeper water (Poole et al. 2002). They do not favor foraging in water with thick emergent and submerged vegetation (Postupalsky and Stackpole 1974 in Poole et al. 2002, Prevost 1977 in Poole et al. 2002). Live fish constitute 99% of prey (Poole et al. 2002), and it is possible for osprey to forage over reservoirs treated with aquatic pesticides and consume fish. For the osprey, an average water copper concentration of 0.5 ppm was used to represent the exposure in excess of what would be possible during the first day following application. This concentration could lead to a dietary concentration of 18.01 mg/kg/day that would not exceed the TRV of 46.97 mg/kg/day (see **Appendix B**). The risk of applying copper to reservoirs for the control of aquatic weeds is insignificant.

Rufous Hummingbird (*Selasphorus rufus*)
Rufous hummingbirds breed in secondary succession communities and openings, forested, and brushy habitats. They feed on floral nectar and small insects (Calder 1993). Since rufous hummingbirds feed exclusively in terrestrial areas away from water, the risk posed by treating reservoirs for the control of aquatic weeds is insignificant.

Fish

Pacific Lamprey (*Lampetra tridentata*)
Pacific lampreys spend the predatory phase of the their life in the ocean. Adults move up stream to spawn between early March and late June. Hatchlings become washed downstream to suitable areas of soft sand or mud and develop there as filter feeders (Moyle 2002). Most fish are essentially blocked from gaining access to Newell Creek immediately below the dam by a shale fish barrier approximately 2500 to 2800 downstream from the base of the dam. Fish can only pass the barrier at high flows of 200-300 cfs (Alley *et al.* 2004).

Coho Salmon - Central California ESU (*Oncorhynchus kisutch*)
Young spend a few weeks to 2 years (varies geographically) in freshwater before migrating to sea; spawns in just about any accessible coastal stream, generally in forested areas, usually at 12-14 °C in loose coarse gravel at head of riffle (or tail of pool) where water is 10-54 cm deep; fry feed on a variety of small invertebrates; parr feed on aquatic insects and their larvae, terrestrial insects, and some small fishes (Moyle 2002).. Anadromous fish are essentially

blocked from gaining access to Newell Creek immediately below the dam by a shale fish barrier located approximately 2500 to 2800 feet downstream from the base of the dam. Fish can only pass the barrier at high flows of 200-300 cfs (Alley *et al.* 2004).

Steelhead - Central California Coast ESU (*Oncorhynchus mykiss irideus*)
Steelhead have two basic life history patterns, winter and summer. Winter steelhead enter streams from the ocean when winter rains provide large amounts of cold water for migration and spawning. For the first year or two, trout may be found in cool, clear, fast-flowing permanent streams and rivers where riffles predominate, where there is ample cover from riparian vegetation or undercut banks, and where invertebrate life is diverse and abundant (Moyle 2002). Anadromous fish are essentially blocked from gaining access to Newell Creek immediately below the dam by a shale fish barrier located approximately 2500 to 2800 feet downstream from the base of the dam. Fish can only pass the barrier at high flows of 200-300 cfs (Alley *et al.* 2004).

Invertebrates

Mount Hermon (=barbate) June Beetle (*Polyphylla barbata*)
The habitat of the Mount Hermon June beetle is described as "sand parkland and other sandy areas within chaparral and ponderosa pine stands" (USFWS, 1997 in NatureServe 2005). The habitat is further described as sparsely vegetated. Adult females are fossorial and larvae occur underground among roots (NatureServe 2005). The terrestrial nature of the Mount Hermon June beetle precludes exposure to copper used as an aquatic pesticide.

Mammals

Pacific Western (Townsend's) Big-Eared Bat (*Corynorhinus (Plecotus) townsendii townsendii*)
Townsend's big-eared bats live in a variety of communities, including coastal conifer and broad-leaf forests, oak and conifer woodlands, arid grasslands and deserts, and high-elevation forests and meadows. Throughout most of its geographic range, it is most common in mesic sites (Kunz and Martin 1982 in Williams 1986). Known roosting sites in California include limestone caves, lava tubes, mine tunnels, buildings, and other human-made structures (Dalquest 1947 in Williams 1986, Graham 1966 in Williams 1986, Pearson *et al.* 1952 in Williams 1986). Both sexes hibernate in buildings, caves, and mine tunnels, either singly (males) or in small groups (Pearson *et al.*, 1952 in Williams 1986). They feed on various flying insects near the foliage of trees and shrubs and may feed primarily on moths (Barbour and Davis 1969 in NatureServe 2004). Since the feeding habits do not focus on emergent insects or other aquatic prey items, the risk to big-eared bats from treatment of a reservoir with aquatic pesticides would not be significant.

Greater Western Mastiff-Bat (*Eumops perotis californicus*)
Mastiff bats favor rugged, rocky areas where suitable crevices are available for day-roosts. Characteristically, day-roosts are located in large cracks in exfoliating slabs of granite or sandstone. The crevices must open downward, be at least 5 cm wide and 30 cm deep, and narrow to at least 2.5 cm at their upper end (Vaughan 1959 in Williams 1986). Mastiff bats also frequently roost in buildings, provided these have sheltering spaces with conditions similar to those described above. Vaughan (1959 in Williams 1986) estimated that they foraged as much as 2000 ft above the ground. He noted that in some places they regularly foraged at 100 to 200 ft over the substrate. They probably forage for considerable distances from their roosting sites.

The foraging height of these bats precludes any exposure from applications of copper-containing aquatic pesticides.

Long-eared Myotis Bat (*Myotis evotis*)
Long-eared myotis bats occur mostly in forested areas, especially those with broken rock outcrops, but they also occur in shrubland, over meadows near tall timber, along wooded streams, and over reservoirs. Often roosts in buildings, also in hollow trees, mines, caves, fissures, etc. (Barbour and Davis 1969 in NatureServe 2004). They forage over water or among trees and usually feed by picking prey from surface of foliage, tree trunks, rocks, or ground; may fly slowly around shrub searching for emerging moths or perhaps nonflying prey (Manning and Jones 1989 in NatureServe 2004). Since the feeding habits do not focus on emergent insects or other aquatic prey items, the risk from copper-containing aquatic pesticides is insignificant.

Fringed Myotis Bat (*Myotis thysanodes*)
Fringed myotis bat inhabit cliffs, deserts, grassland/herbaceous areas, suburban/orchard areas, urban areas, and coniferous and mixed woodland; primarily at middle elevations of 1,200-2,150 m in desert, grassland, and woodland habitats. They have been recorded at low elevations along Pacific Coast. They roost in caves, mines, rock crevices, buildings, and other protected sites. Nursery colonies occur in caves, mines, and sometimes buildings (NatureServe 2004). They are insectivorous with beetles as a common prey item. Wings have a high puncture strength, which is characteristic of bats that forage by gleaning from the ground or near thick or thorny vegetation (O'Farrell and Studier 1980 in NatureServe 2004). Since the feeding habits do not focus on emergent insects or other aquatic prey items, the risk from copper-containing aquatic pesticides is insignificant.

Long-Legged Myotis Bat (*Myotis volans*)
Primarily in montane coniferous forests, in the south most often at 2000-3000 m; also riparian and desert (Baja California) habitats. May change habitats seasonally. Uses caves and mines as hibernacula, but winter habits are poorly known. Roosts in abandoned buildings, rock crevices, under bark, etc. In summer, apparently does not use caves as daytime roost site. In some areas hollow trees are the most common nursery sites, but buildings and rock crevices are also used (NatureServe 2004). Feeds primarily on moths. Also consumes a wide variety of invertebrates: fleas, termites, lacewings, wasps, small beetles, etc. (Warner and Czaplewski 1984 in NatureServe 2004). Follows prey for relatively long distances around, through, over forest canopy, forest clearings, and over water. In New Mexico, forages primarily in open areas, feeds mainly on small moths (Black 1974 in NatureServe 2004). The diet of long-legged myotis consists of mostly terrestrial insects, so the exposure to copper-containing aquatic pesticides introduced into a reservoir for control of aquatic weeds would not be significant.

Yuma Myotis Bat (*Myotis yumanensis*)
Yuma myotis bats inhabit deserts, coniferous and mixed forests, grassland/herbaceous areas, shrubland/chaparral, suburban/orchard, urban, and coniferous and mixed woodlands. They are more closely associated with water than most other North American bats, but are also found in a wide variety of upland and lowland habitats, including riparian, desert scrub, moist woodlands and forests. Nursery colonies usually are in buildings, caves and mines, and under bridges. Yuma myotis bats are insectivorous, with small moths believed to be the primary food source in some areas; dipterans and ground beetles are other common prey items. They often feed over ponds and streams, flying just above the water surface (NatureServe 2004). Hazard to copper-

containing aquatic pesticides is negligible because insects emerging from the treated areas would be unavailable through direct toxicity to immature life stages.

San Francisco Dusky-footed Woodrat (*Neotoma fuscipes annectens*)
These woodrats live in heavy chaparral; hardwood, conifer, and mixed forests, typically in densely wooded areas with heavy undergrowth; riparian woodlands. They builds houses of debris on ground or in tree; houses tend to be in situations that are shaded, relatively cool, and in good cover, and they may be used by many generations over several years. After breeding, males live in tree dens apart from females. They eat a wide variety of plants and feed on seeds, nuts, acorns, fruits, green vegetation, inner bark, and fungi (NatureServe 2005). The terrestrial nature of the San Francisco Dusky-footed woodrat precludes exposure to copper used as an aquatic pesticide.

American Badger (*Taxidea taxus*)
Badgers prefer open areas and may also frequent brushlands with little groundcover. When inactive, occupies underground burrow. Feeds primarily on small rodents usually captured by digging out burrow. Ground squirrels often major item in diet, as are pocket gophers, kangaroo rats, priairie dogs, and mice; also eats scorpions, insects, snakes, lizards, and birds, especially when ground squirrel population is low (Messick and Hornocker 1981 in NatureServe 2005). Hazard to copper-containing aquatic pesticides is negligible because insects emerging from the treated areas would be unavailable through direct toxicity to immature life stages.

Reptiles

Western Pond Turtle (*Clemmys marmorata*)
The western pond turtle is primarily riparian, most often living in sloughs, streams (both permanent and intermittent), and large rivers, although some may inhabit impoundments, irrigation ditches, and other artificial water bodies. In streams, pools are preferred over shallow reaches (Bury 1972 in Ernst *et al.* 1994). Habitats may be either rocky or mud bottomed, but usually contain some aquatic vegetation and basking sites (Ernst *et al.* 1994). Western pond turtles are opportunistic feeders and eat a variety of food items including carrion, aquatic invertebrates, insects and worms (Larsen 1997). Their habitat requirements and feeding habits indicate western pond turtles may be exposed to pulses of aquatic pesticide-treated water. Following the procedures provided by U.S. EPA (1993), the estimated exposure of the western pond turtle from a water concentration of 2.0 ppm is 22.3 mg copper/kg diet. Concentrations over 3.5 days would diminish to a copper concentration no longer deemed to pose a risk to ponds turtles.

Southwestern Pond Turtle (*Clemmys marmorata pallida*)
See Western Pond Turtle

Plants – Aquatic

Bristly Sedge (*Carex comosa*)
Bristly sedge occur in coastal prairies, marshes and swamps including lake margins. It also occurs in valley and foothill grasslands (CNPS 2005). The terrestrial nature of the bristly sedge precludes exposure to copper used as an aquatic pesticide.

Plants – Terrestrial

Santa Cruz Manzanita (*Arctostaphylos andersonii*)
Broadleafed upland forest, chaparral, North Coast coniferous forest; openings, edges (NatureServe 2005). The terrestrial nature of the Santa Cruz manzanita precludes exposure to copper used as an aquatic pesticide.

Bonny Doon Manzanita (*Arctostaphylos silvicola*)
Inland marine sands in chaparral and ponderosa pine wood- lands (NatureServe 2005). The terrestrial nature of the Bonny Doon manzanita precludes exposure to copper used as an aquatic pesticide.

San Francisco Collinsia (*Collinsia multicolor*)
San Francisco collinsia occurs in closed-cone coniferous forest, coastal scruband sometimes serpentinite areas (CNPS 2005). The terrestrial nature of the San Francisco collinsia precludes exposure to copper used as an aquatic pesticide.

Santa Cruz Mountains Beardtongue (*Penstemon rattanii var. kleei*)
Santa Cruz Mountains beardtongue occurs in chaparral, lower montane coniferous forest, and North Coast coniferous forest (CNPS 2005). The terrestrial nature of the Santa Cruz Mountains beardtongue precludes exposure to copper used as an aquatic pesticide.

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Appendix C

Toxic Reference Values
The U.S. EPA (1989) suggests applying a 20X safety factor to median toxicity values for aquatic threatened or endangered species and a 10X safety factor for terrestrial threatened or endangered species. In this analysis, safety factors were applied to all species regardless of their designation. Therefore, species listed as California species of special concern received similar consideration in the analyses as federally threatened or endangered species.

Since no published TRVs for available for reptiles for copper, the approach used here was to select the most sensitive available TRV from either birds or mammals, and apply a safety factor of 10X. The published TRV for mammals of 12.0 mg copper/kg diet is lower than that for birds of 46.97 mg copper/kg diet (EPA 1999), and applying the safety factor provides a reptilian TRV of 1.20 mg copper/kg diet.

Exposure Assessment
For terrestrial wildlife species, the procedures suggested in the U.S. EPA's Wildlife Exposure Factors Handbook (1993) were used. These procedures entailed determining the dietary habits of each species from published literature, determining food intake levels using body weights and metabolic rates, and pesticide uptake values for each dietary component. Uptake rates or equations to calculate uptake rates published by the U.S. EPA (1999) were used. For fish, exposure to contaminated water was the primary route considered and dietary exposure. For terrestrial plants, exposure only to incidental drift during aquatic pesticide application was considered.

For copper exposure to aquatic invertebrates, we were able to calculate a bioconcentration factor (BCF) adjusted for dissipation through time. Rodgers *et al.* (1992 in Washington Department of Ecology 2004) provides the body burdens and water concentrations in mollusks following an application of Komeen® (0.4 ppm Cu) to Guntersville Reservoir in Alabama. They report that the concentration in water returns to its pretreatment concentration of 0.015 ppm by 21 hours post-treatment. The body burden of mollusks increased to 82.667 mg/kg from a pretreatment level of 37.867 mg/kg—a change of 44.8 mg/kg. Using an average concentration of 0.2 ppm for this period, a 21-hr BCF is 224. Since this work was done with Komeen rather than copper sulfate and using mollusks to represent all aquatic invertebrates, we applied a 10X safety factor to arrive a BCF for our exposure assessments of 2240 for aquatic invertebrates. Uptake of copper for all other dietary items used the more conservative approach of instantaneous uptake.

Risk Assessment
To determine whether adverse effects were likely, the anticipated exposure was compared to the TRV. Whenever the exposure estimate exceeded the TRV, we concluded a potential risk was present. For terrestrial animals, exposure to drinking the treated water, consuming treated sediments, and consuming exposed prey items or vegetation were included in the exposure estimate. For fish, only exposure to treated water was considered. The only aquatic pesticide with available dietary toxicity data for fish was copper.

COPPER

Persistence:	Hydrolysis – Not Available Photodegradation in water – Not Available Photodegradation on soil – Not Available Aerobic soil metabolism – Not Available Anaerobic aquatic metabolism – Not Available Terrestrial Field Dissipation – Not Available

Physical Properties

Water Solubility:	Copper Sulfate: 230.5 g/kg (25°C) (Tomlin 2002)
Volatility:	Not Volatile (Tomlin 2002)
Octanol/Water Partitioning Coefficient (K_{ow})	Not Available (K_{ow} > 100 indicates EPA may require Fish Bioaccumulation Test)

Bioaccumulation

Edwards *et al.* 1998

The uptake of copper in common nettle (*Urtica dioica*) and earthworms (*Eisenia fetida*) from a contaminated dredge spoil was measured. In the aerial portions of the common nettle, the biological absorption coefficient (concentration in plant tissue ÷ concentration in soil) was 0.072 to 0.265. In root tissue, the biological absorption coefficient was 0.075 to 0.303. To determine the uptake of copper in earthworms, contaminated soil was brought into the laboratory and earthworms introduced for 28 days. Soil copper levels were 16 times higher in the contaminated soil than in control soil, but the concentrations in the earthworms only differed by 2.6 times. The earthworms did absorb copper from the contaminated soils, but not to an extent reflecting the level of contamination.

Gintenreiter *et al.* 1993

Copper concentrations in the tissues of the gypsy moth (*Lymantria dispar*) increased from earlier to later developmental stages, but the trend was not smooth. Fourth instars showed a decrease when compared to 3rd instars, and adults had lower concentrations than pupae. Concentration factors were 2 to 5. Copper concentrations were passed from one generation to the next.

Gomot and Pihan 1997

Bioconcentration of copper was evaluated in two subspecies of land snails, *Helix aspersa aspersa* and *Helix aspersa maxima*. These snails showed a tendency to accumulate copper in excess of the amount available from its diet. The subspecies exhibited different bioconcentration factors for different tissues. For the foot, *H. a. aspersa* had factors ranging from 2.3 to 13.2, whereas *H. a. maxima* had factors ranging from 1.7 to 10.2. For the viscera, *H. a. aspersa* had factors ranging from 2.1 to 9.1, whereas *H. a. maxima* had factors ranging from 1.9 to 9.0. Differences in the bioconcentration factor appear to be more related to the other components of the diet, not the copper concentration in the diet.

Gomot de Vaufleury and Pihan 2000

Copper concentrations were measured in terrestrial snails (*Helix aspersa*). Differences were demonstrated among laboratory and field values. However, no soil or vegetation samples for the laboratory and field sites were analyzed for copper, so it is not possible to determine whether copper was accumulated at rates above background or whether they reflect some fraction of background levels.

Han *et al.* 1996
Shellfish accumulated copper in natural and aquaculture ponds in Taiwan. The sediments in the aquaculture ponds were finer grain and contained 4X concentrations of copper. Five mollusks were collected, but only purple clams (*Hiatula diphos*) and hard clams (*Meretrix lusoria*) were collected from both environments. The relative accumulation in each environment did not show a consistent pattern for both species indicating that the concentration in the shellfish was not controlled only by total copper concentrations in the sediments.

Haritonidis and Malea 1999
Copper concentrations in green algae (*Ulva rigida*) (2.2 ± 0.2 µg/g dry weight) collected from Thermaikos Gulf, Greece were less than seawater concentrations (1.5 ± 0.08 µg/L) and sediment (2.7 ± 0.5 µg/g dry weight). This suggests that copper will not bioconcentrate in algae.

Harrahy and Clements 1997
Bioaccumulation factors were calculated for the benthic invertebrate, *Chironomus tentans,* to be 16.63 and 12.99 during two uptake tests. Depuration was rapid. Copper concentrations were similar to background within four days. The authors caution that the bioaccumulation factors presented may be related to bioavailability that is driven by sediment characteristics.

Hendriks *et al.* 1998
Bioaccumulation ratios were determined for zebra mussels (*Dreissena polymorpha*) from the Rhine-Meuse Delta in the Netherlands. For copper, the ratio between mussels and suspended solids was 0.31 indicating tissue concentrations did not exceed environmental concentrations and that copper had not bioaccumulated

Janssen and Hogervorst 1993
Concentration factors were calculated for nine arthropod species inhabiting the forest litter layer in a clean reference site and a polluted site in The Netherlands: pseudoscorpion (*Neobisium muscorum*), harvestman (*Paroligolophus agrestis*), carabids (*Notiophilus biguttatus* and *Calathus melanocephalus*), mites (*Pergamasus crassipes*, *P. robustus*, and *Platynothrus peltifer*), dipluran (*Campodea staphylinus*), and collembolan (*Orchesella cincta*). Copper concentration factors for the eight species ranged from 0.85 – 4.08 in the reference site versus 0.40 – 1.62 in the polluted site. Copper was concentrated more when copper leaf litter concentrations were lower.

Khan *et al.* 1989
Bioconcentration factors in grass shrimp (*Palaemonetes pugio*) were determined for two populations, one from an industrialized site and another from a relatively pristine site. Levels of copper measured in shrimp from the industrialized site were greater than from the pristine site, but the industrialized site showed a concentration factor of 0.07, whereas the pristine site showed a concentration factor of 1.1 when compared to sediment concentrations.

Marinussen *et al* 1997a
Earthworms (*Dendrobaena veneta*) were exposed to soils containing various levels of copper. Earthworm tissue concentrations increased proportionally to the soil copper concentrations up to 150 ppm. Above 150 ppm in the soils, tissue concentrations leveled off at about 60 ppm.

Marinussen *et al* 1997b
Soil, containing 815 ± 117 ppm Cu, was collected from a contaminated site in The Netherlands. Earthworms (*Dendrobaena veneta*) were introduced to the soil in the laboratory. Earthworms appeared to reach equilibrium with the soil exhibiting tissue concentrations of *c.* 60 ppm through 56 days of exposure. At 112 days exposure, the tissue concentrations increased to *c.* 120 ppm. The authors did not have an explanation for this anomaly. After being transferred to uncontaminated soil, the earthworms eliminated the copper according to a two-compartment model with the half-life times being, $t_{1/2\text{-}1}$ = 0.36 d and $t_{1/2\text{-}2}$ = 37 d.

Morgan and Morgan 1990
Earthworms (*Lumbricus rubellus*) were collected from an uncontaminated site and four metalliferous mine sites. Copper concentrations in soil and in tissues were measured. The worms were held under clean conditions to allow eliminate soil from their alimentary canal. The concentrations of copper in earthworm tissues reflected the concentrations in the soil. The authors conclude that there was no evidence that copper was sequestered in earthworms.

Morgan and Morgan 1999
Copper concentrations in earthworm (*Aporrectodea caliginosa* and *Lumbricus rubellus*) tissue were lower than in their ingesta. This suggests that copper does not bioaccumulate in earthworms.

Neuhauser *et al.* 1995
Overall, copper did not bioconcentrate in earthworm in contaminated soil, but showed a slight tendency to bioconcentrate when soil copper concentrations were low.

Pyatt *et al.* 1997
Appreciable concentrations (0.3 – 4.6%) of copper were measured in all tissues of the freshwater snail (*Lymnaea stagnalis*), whereas no measurable quantities of copper were found in food or water. The authors conclude that bioaccumulation occurred.

Svendsen and Weeks 1997a,b
There is an inverse relationship between the bioconcentration factors and soil concentrations under laboratory conditions for the earthworm *Eisenia andrei* and under field conditions for the earthworm *Lumbricus rubellus.* Bioconcentration factors ranged from 4.0 using control soil and 0.30 using soil amended with 339 ppm Cu under laboratory conditions. Bioconcentration factors in the field ranged from 4.1 under control conditions to 0.4 when the soil plots contained 231 ppm Cu.

Fresh Water Fish Toxicity Reference Value (TRV)
U.S. EPA 1999
The EPA-accepted freshwater chronic TRV is 0.009 ppm dissolved copper based on a water hardness value of 100 mg/L. When this TRV is adjusted for the median hardness of Loch Lomond Reservoir of approximately 150 mg/L, it becomes 0.013 ppm dissolved copper.

Fish Dietary Toxicity
Berntssen *et al.* 1999
Laboratory tests were conducted to determine the effects of dietary copper on Atlantic salmon (*Salmo salar*). Dietary concentrations were 0, 35, and 700 mg Cu/kg diet for an experiment lasting 28 days. Addition of the copper supplemented diet did not cause an increase in the

water concentrations of copper. Dietary exposure significantly increased intestinal cell proliferation and apoptosis (degeneration of cells into membrane-bound particles that are then phagocytosed by other cells). The copper exposed groups did not grow during the trial.

Lundebye *et al.* 1999
Laboratory tests were conducted to determine the effects of dietary copper on Atlantic salmon (*Salmo salar*). Dietary concentrations were 0, 35, and 700 mg Cu/kg diet for an experiment lasting 28 days, and 5, 35, 500, 700, 900, and 1750 mg Cu/kg diet in an experiment lasting 12 weeks. Mean weights of fish used in the tests were 72 and 0.9 g in the first and second experiments, respectively. No mortality was observed in the first experiment, and only 2% died in the second experiment. Food consumption was not altered in either experiment at any dietary concentration. Cells of the intestinal lining were damaged in fish at both dietary concentrations in the first experiment. Growth of fish in the second experiment was reduced at dietary concentrations ≥900 mg/kg after 10 weeks and at dietary concentrations ≥700 mg/kg after 12 weeks.

Miller *et al.* 1993
When rainbow trout (*Oncorhynchus mykiss*) were exposed in the laboratory simultaneously to dietary Cu concentrations of up to 684 µg/g dry weight and water concentrations of up to 127 µg/L, no overt signs of toxicity were noted. Fish were fed to satiation three times daily. Dietary exposure was the principal source of tissue Cu, but as water concentrations were increased, uptake from water increased. However, exposure to waterborne Cu was more effective at inducing tolerance to subsequent exposure to toxic concentrations of Cu.

Handy 1993
Rainbow trout (*Oncorhynchus mykiss*) were fed commercial trout chow with and without 10 mg Cu/kg dry weight for 28 days. The water concentrations of Cu remained below 1 ppb. Fish were hand-fed to satiation daily. No outward signs of toxicity were noted and a single mortality occurred in the Cu-treated fish on day 6 of treatment. Despite some regurgitation of diet pellets, no body weight loss was noted. Dietary copper increased tissue concentrations at day 28 to 2.52, 72.66, and 0.636 µg Cu/g weight in the gills, liver and muscle. Concentration in the kidneys were not elevated.

Murai *et al.* 1981
Channel catfish were provided diets containing supplemental copper at concentrations of 0, 2, 4, 8, 16, and 32 mg/kg for 16 weeks. At the end of 4 weeks, average weight gain had been reduced in the group receiving 32 mg/kg in the diet. After 16 weeks, average weight gain was reduced in the group receiving 16 mg/kg also. Weight gain/diet consumed was reduced for catfish receiving ≥ 8 mg/kg dietary Cu after 16 weeks. Packed cell volume in the blood and hemoglobin were not adversely affected, but the number of erythrocytes was reduced in the group receiving 16 mg/kg.

Mount *et al.* 1994
Rainbow trout (*Oncorhynchus mykiss*) were fed brine shrimp (*Artemia* sp.) enriched with Cu, Cd, Pb, and Zn alone or as a mixture along with As for 60 days. The water contained 12 µg/L Cu, 1.1 µg/L Cd, 3.2 µg/L Pb, and 50 µg/L Zn. Cu concentrations in the shrimp were 20, 40, and 80 µg/g fresh weight when trout were exposed to Cu alone. Survival of trout was decreased in the medium and high Cu treatments with 69 and 72% survival, respectively. Weight and length of trout were not impacted by feeding on brine shrimp containing Cu. Cu concentrations in whole

fish were elevated as compared to controls either in clean water or metal-containing water, but the Cu concentrations did not differ among dietary treatment levels. No detrimental impacts were observed in the exposures to multiple metals via the diet. In that exposure scenario, concentrations in the diet were 0.5, 1, 1.5 and 2X the low concentrations from the first scenario.

Farag *et al.* 1994
Rainbow trout were fed invertebrates collected from the Clark Fork River, Montana and from an uncontaminated reference site for 21 days. Juvenile fish received invertebrates containing 1.54 As, 0.10 Cd, 18.57 Cu, 0.86 Pb, 32.09 Zn (all µg/g wet weight). Adult fish received invertebrates containing 3.20 As, 0.24 Cd, 26.13 Cu, 1.77 Pb, 68.99 Zn (all µg/g wet weight). Water was either standard laboratory water or contained metal concentrations based on the U.S. EPA's water-quality criteria with concentrations of 2.2 µg Cd/L, 24 µg Cu/L, 6.4 µg Pb/l and 100 µg Zn/L. Mortality of juveniles was significantly greater in tanks with metal-treated water regardless of whether the dietary invertebrates contained metals. Mortality was slightly increased in juveniles in laboratory water that received invertebrates with metals. No differences in growth were observed in any treatment. No mortality was observed in adult trials. Exposure to metals either in the water or via diet caused scale loss in adults. Juveniles were too small to evaluate scale loss. Physiological condition of fish fed invertebrates containing metals was compromised.

Woodward *et al.* 1995
Rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) were held in standard laboratory water or contained metal concentrations based on 50% the U.S. EPA's water-quality criteria with concentrations of 1.1 µg/L Cd, 12 µg/L Cu, 3.2 µg/L Pb, and 50 µg/L Zn from hatching to 88 days of age. Three diets were provided that comprised of benthic invertebrates collected from three locations on the Clark Fork River, Montana. Fish received pelleted invertebrates containing 6.5 As, no Cd, 87 Cu, 6.9 Pb, and 616 Zn (all mg/g dry weight); 19 As, no Cd, 178 Cu, 15 Pb, and 650 Zn (all mg/g dry weight); or 19 As, 0.26 Cd, 174 Cu, 15 Pb, and 648 Zn (all mg/g dry weight). Survival was not affected for either species by any combination of water or diet. Growth of brown trout was reduced in the groups receiving the diets with higher metals concentration and by exposure to metal-containing water from day 26 onward in the test. In rainbow trout, no effects were seen on growth at day 18, but by day 53, growth was reduced in fish exposed to higher metal concentrations in diet or water. However, the rainbow trout exposed to diets with higher metals concentrations had similar growth patterns regardless of whether they were also exposed to metals-containing water. Also, the growth of the rainbow trout exposed to treated water and the diet with low metal concentrations recovered by day 88 and were no longer significantly different from fish in untreated water.

Draves and Fox 1998
In a reach of the Montreal River in northern Ontario contaminated from gold mine tailings, water concentrations were significantly higher for Cu, Cd, and Pb, but not for Zn. Juvenile yellow perch (*Perca flavescens*), a benthic feeding species, had significantly less food in their stomachs in the contaminated reach than perch in an uncontaminated reach. However, body weights of juvenile perch did not differ between the contaminated and uncontaminated reaches. Within the contaminated reach, Cu body burdens were significantly negatively correlated with body weight. Concentrations of Cu in Chironomidae, Hemiptera, Cladocera, Odonata, and Amphipoda were compared between reaches. Concentrations in Chironomidae, Hemiptera, Cladocera, and Amphipoda were greater in the contaminated reach, but Cu concentrations were greater in Odonata in the uncontaminated reach.

Sublethal Effects

Folmar 1976

Rainbow trout (*Oncorhynchus mykiss*) fry showed strong avoidance to copper ($CuSO_4 \cdot 5H_2O$) at concentrations of 0.0001 to 0.01 ppm in the laboratory.

Folmar 1978

Mayfly nymphs (*Ephemerella walkeri*) showed strong avoidance to copper ($CuSO_4 \cdot 5H_2O$) at a concentration of 0.1 ppm but not 0.001 or 0.01 ppm in the laboratory.

COPPER

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
Aquatic Plant Toxicity – Frond Count ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.8 ppm (0.7 – 0.9)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Dry Weight ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.8 ppm (0.4 – 1.2)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Root Length ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.6 ppm (0.3 – 0.8)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Growth Rate ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	1.2 ppm (1.1 – 1.3)	N.A.	N.R.	N.R.	Bishop and Perry 1981
2-day Contact toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.00198 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Chloride	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000596 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Nitrate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000429 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	638 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
14-day Soil toxicity (Copper Nitrate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000353 mg/kg (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
14-day Soil toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000522 mg/kg (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
Freshwater Acute Toxicity ($Cu(NO_3)2 \cdot 3H_2O$)	*Ceriodaphnia dubia*	Ceriodaphnia	Freshwater Crustacea	LC_{50}	*c.* 1.1 ppm (N.R.)	Moderately Toxic	N.R.	*c.* 0.1 ppm	Cowgill and Milazzo 1991

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
3-Brood Toxicity Test ($Cu(NO_3)2 \cdot 3H_2O$)	*Ceriodaphnia dubia*	Ceriodaphnia	Freshwater Crustacea	LC_{50}	*c.* 0.2 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Cowgill and Milazzo 1991
Sediment Acute Toxicity ($CuSO_4$)	*Chironomus tentans*	Midge (2nd Instar)	Aquatic Insect	LC_{50}	1.170 ppm (N.A.)	N.A.	N.A.	N.R.	Dobbs *et al.* 1994 in EPA 2003
Filter Paper Acute Toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	26.0 µg/cm^2 (17.1 – 34.9)	N.A.	N.R.	N.R.	Edwards and Bater 1992
Artificial Soil Acute Toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	1104.9 ppm (727.6 – 1482.2)	N.A.	N.R.	N.R.	Edwards and Bater 1992
Freshwater Acute Toxicity (Copper Sulfate)	*Anguilla rostrata*	American Eel	Freshwater Fish	LC_{50}	3.20 ppm (2.17 – 13.35)	Moderately Toxic	N.R.	N.R.	Hinton and Eversole 1979
Freshwater Acute Toxicity (Copper form N.R.) (24 hr static)	*Brachionus calyciflorus*	Rotifer	Freshwater Crustacea	LC_{50}	0.026 ± 0.0026 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Janssen *et al.* 1994
Chronic Life Cycle (Copper form N.R.)	*Brachionus calyciflorus*	Rotifer	Freshwater Crustacea	LOEC	0.005 ppm[1] (N.A.)	N.A.	N.A.	0.0025 ppm	Janssen *et al.* 1994
48-hr Freshwater Acute Toxicity ($Cu(NO_3)_2 \cdot 3H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.140 ppm (0.11 – 0.16)	Highly Toxic	1.47	N.R.	Joshi and Rege 1980
96-hr Freshwater Acute Toxicity ($Cu(NO_3)_2 \cdot 3H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.093 ppm (0.08 – 0.15)	Very Highly Toxic	1.56	N.R.	Joshi and Rege 1980
48-hr Freshwater Acute Toxicity ($CuSO_4 \cdot 5H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.460 ppm (0.25 – 0.83)	Highly Toxic	1.82	N.R.	Joshi and Rege 1980

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
96-hr Freshwater Acute Toxicity ($CuSO_4 \cdot 5H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.20 ppm (0.11 – 0.33)	Highly Toxic	1.70	N.R.	Joshi and Rege 1980
96-hr Freshwater Acute Toxicity (Cutrine Formulation)	*Salmo trutta*	Brown Trout	Freshwater Fish Fingerlings	LC_{50}	0.198 ppm (0.11 – 0.33)	Highly Toxic	1.70	N.R.	Simonin and Skea 1977
Sediment Acute Toxicity ($CuSO_4$)	*Tubifex tubifex*	Tubifex	Freshwater Worm	LC_{50} (Dry wt.)	> 1000 ppm (N.A.)	N.A.	N.A.	500 ppm	Meller *et al.* 1998
Sediment Acute Toxicity ($CuSO_4$)	*Limnodrilus hoffmeisteri*	Limnodrilus	Freshwater Worm	LC_{50} (Dry wt.)	516 ppm (458 – 581)	N.A.	N.R.	250 ppm	Meller *et al.* 1998
Earthworm Reproduction ($CuCl_2 \cdot H_2O$)	*Enchytraeus crypticus*	Earthworm	Terrestrial Worm	EC_{50}	477 ppm (345 – 658)	N.A.	N.R.	N.R.	Posthuma *et al.* 1997
Freshwater Acute Toxicity ($CuCl_2$)	*Balanus amphitrite*	Acorn Barnacle (nauplii)	Freshwater Crustacea	LC_{50}	0.480 ppm (0.310 – 0.740)	Highly Toxic	N.R.	N.R.	Sasikumar *et al.* 1995
Freshwater Acute Toxicity ($CuCl_2$)	*Artemia* sp.	Brine Shrimp	Freshwater Crustacea	LC_{50}	1.280 ppm (1.01 – 1.560)	Highly Toxic	N.R.	N.R.	Sasikumar *et al.* 1995
14-day Acute Toxicity [$Cu(NO_3)_2 \cdot 3H_2O$]	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	683 µg/g (570 – 812)	N.A.	N.R.	N.R.	Spurgeon *et al.* 1994
56-day Toxicity [$Cu(NO_3)_2 \cdot 3H_2O$]	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	555 µg/g (460 – 678)	N.A.	N.R.	210 µg/g	Spurgeon *et al.* 1994
56-day Cocoon Production [$Cu(NO_3)_2 \cdot 3H_2O$]	*Eisenia fetida*	Earthworm	Oligochaeta	EC_{50}	53.3 µg/g (32.5 – 186)	N.A.	N.R.	32 µg/g	Spurgeon *et al.* 1994

† No criteria for LOEC provided.

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CALIFORNIA DEPARTMENT OF FISH AND GAME

Certificate of Fee Exemption

De Minimis Impact Finding

Lead Agency: City of Santa Cruz Date: May 10, 2005

County/State Agency of Filing: Santa Cruz

Project Title: Use of Copper To Control Aquatic Weeds In Loch Lomond Reservoir

Project Applicant Name: City of Santa Cruz Phone: 420-5200
Representative: Bob Barrett Phone: 420-5485

Project Applicant Address: 809 Center St., Rm 102

Project Applicant	X Local Public Agency	☐ School District	☐ Other Special District
(Check appropriate box):		☐ State Agency	☐ Private Entity

Project Description: The City is proposing to continue treatment of Loch Lomond Reservoir to control nuisance algae growths that impair the reservoir's use as a drinking water source and public recreation facility, fulfilling statutory requirements under the federal Safe Drinking Water Act and the California Health and Safety Code.

Findings of Exemption:

1) An initial study has been conducted by the City of Santa Cruz to evaluate the potential for adverse environmental impact; and
2) The initial study and all evidence in the record indicate that the proposed mitigation measures will reduce all potential impacts to less-than-significant level and the proposed project will not have potential for an adverse effect on wildlife resources or the habitat upon which the wildlife depends; and
3) The approval of the permits will have less than significant impact on resources under the jurisdiction of the Fish and Game Department.

Certification:

I hereby certify that the lead agency has made the above findings of fact and that, based upon the initial study and comment record, the project will not individually or cumulatively have an adverse effect on wildlife resources, as defined in Section 711.2 of the Fish and Game Code.

Gene Arner, Director
(Administrator of Environmental Quality)
Department of Planning and Community Development

BY: _____
Principle Planner

Lead Agency: City of Santa Cruz

CFE D 001

STATE OF CALIFORNIA - THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME
ENVIRONMENTAL FILING FEE CASH RECEIPT
DFG 753.5a (6-01)

232324

Lead Agency: City of Santa Cruz Date: 5/16/05

County / State Agency of Filing: Santa Cruz Document No.:

Project Title: Use of Copper to Control Aquatic Weeds in Loch Lomond Reser.

Project Applicant Name: City of Santa Cruz Phone Number:

Project Applicant Address: 809 Center St. S. Cruz

Project Applicant *(check appropriate box)*: Local Public Agency [✓] School District [ ] Other Special District [ ]
State Agency [ ] Private Entity [ ]

CHECK APPLICABLE FEES:

( ) Environmental Impact Report	$850.00	$
( ) Negative Declaration	$1,250.00	$
( ) Application Fee Water Diversion *(State Water Resources Control Board Only)*	$850.00	$
( ) Projects Subject to Certified Regulatory Programs	$850.00	$
(✓) County Administrative Fee	$25.00	$ 25-00
( ) Project that is exempt from fees		
TOTAL RECEIVED		$ 25-00

Signature and title of person receiving payment: Betty Bly, Deputy Clerk

WHITE-PROJECT APPLICANT YELLOW-DFG/FASB PINK-LEAD AGENCY GOLDENROD-STATE AGENCY OF FILING

Post-it® Fax Note 7671	Date	# of pages ▶ 2
To M. Blankenship	From J. Bennett	
Co./Dept.	Co.	
Phone # 530-707-0940	Phone # 831-420-5431	
Fax #	Fax #	

WATER DEPARTMENT
Water Quality Laboratory, 715 Graham Hill Road, Santa Cruz, CA 95060
Phone (831) 420-5480 • Fax (831) 420-5481 • Email wtlab@ci.santa-cruz.ca.us

May 12, 2005

Post-it® Fax Note 7671	Date 5-15-5	# of pages ▶ 2
To Blankinship	From Bob Barrett	
Co./Dept.	Co.	
Phone #	Phone # 831-420-5480	
Fax # 530-757-6594	Fax #	

Terry Roberts, Director
State Clearing House and Planning Unit
1400 Tenth Street
P.O. Box 3044
Sacramento, CA 95812-3044

Re: Use of Copper to Control Aquatic Weeds in Loch Lomond Reservoir, SCH No. 2005032123

Dear Mr. Roberts:

Enclosed is a copy of our Notice of Determination (NOD) for the project: Use of Copper to Control Aquatic Weeds in Loch Lomond Reservoir, SCH No. 2005032123. This NOD has been filed with the Santa Cruz County Recorder's Office.

Please contact me if you have questions regarding this document.

Sincerely,

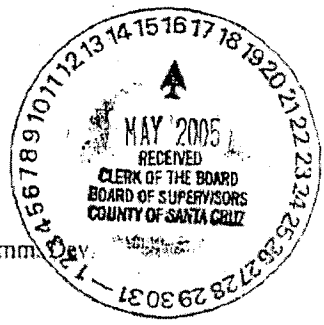
Bob Barrett

Bob Barrett
Water Quality Manager

cc:

Blankinship and Associates
Deputy Director/Operations

Notice of Determination



To: Clerk of the Board
County of Santa Cruz
Governmental Center
701 Ocean St., Rm. 510
Santa Cruz, CA 95060

From: City of Santa Cruz
Dept. of Planning & Comm. Dev.
Room 206 - City Hall
809 Center Street
Santa Cruz, CA 95060

RE: **Filing of Notice of Determination in compliance with Section 21108 or Section 21152 of the Public Resources Code**

Project Title: Use of Copper to Control Aquatic Weeds in Loch Lomond Reservoir Date: May 11, 2005

State Clearinghouse Number: 2005032123

Contact Person: Bob Barrett Telephone: (831) 420-5485

Project Location: Loch Lomond Reservoir, West and Sequoia Drives, Santa Cruz County, CA

Project Description: Copper is used to treat algae in the reservoir. The City Water Department has prepared the Initial Study/MND to meet requirements of (1) the State Implementation Plan (SIP) Section 5.3 and (2) NPDES Permit No. CAG990005

This is to inform that on May 9, 2005, the City of Santa Cruz, California, Lead Agency (__) or Responsible Agency (X), did approve the project in question and did make the following determinations:

1. ☐ The project will have a significant effect on the environment.

   ☒ The project will not have a significant effect on the environment.

2. ☐ An environmental impact report (EIR) was prepared and certified for the project pursuant to the provisions of CEQA.

   ☒ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.

The EIR or the Negative Declaration and the report of project approval may be examined at the offices of the City Planning Department, 809 Center Street.

3. ☒ Mitigation measures were made a condition of project approval.

   ☐ Mitigation measures were not made a condition of project approval.

4. ☐ A Statement of Overriding Considerations was adopted for this project.

   ☐ A Statement of Overriding Consideration was not adopted for the project.

Date Submitted to County Clerk: 5-16-5 By: Bob Barrett

FRM ENV-08-1 (12/97)

Notice of Determination

To: Clerk of the Board
County of Santa Cruz
Governmental Center
701 Ocean St., Rm. 510
Santa Cruz, CA 95060

From: City of Santa Cruz
Dept. of Planning & Comm. Dev.
Room 206 - City Hall
809 Center Street
Santa Cruz, CA 95060

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   ☐ A Statement of Overriding Consideration was not adopted for the project.

Date Submitted to County Clerk: 5-16-5 By: Bob Barrett

STATE OF CALIFORNIA

Governor's Office of Planning and Research

State Clearinghouse and Planning Unit

Arnold
Schwarzenegger
Governor

Sean Walsh
Director

April 26, 2005

COPY

Bob Barrett
City of Santa Cruz
809 Center Street, Room 102
Santa Cruz, CA 95060

Subject: Use of Copper to Control Aquatic Weeds in Loch Lomond Reservoir
SCH#: 2005032123

Dear Bob Barrett:

The State Clearinghouse submitted the above named Negative Declaration to selected state agencies for review. The review period closed on April 25, 2005, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. If you have a question about the above-named project, please refer to the ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Terry Roberts

Terry Roberts
Director, State Clearinghouse

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
TEL (916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

State Clearinghouse Data Base

SCH#	2005032123
Project Title	Use of Copper to Control Aquatic Weeds in Loch Lomond Reservoir
Lead Agency	Santa Cruz, City of

Type	Neg Negative Declaration
Description	Copper is used to treat algae in the reservoir. The City Water Dept. is preparing the Initial Study/MND to meet requirements of (1) The State Implementation Plan (SIP) Section 5.3 and (2) NPDES Permit #CAG990005.

Lead Agency Contact

Name	Bob Barrett		
Agency	City of Santa Cruz		
Phone	(831) 420-5485	*Fax*	
email			
Address	809 Center Street, Room 102		
City	Santa Cruz	*State* CA	*Zip* 95060

Project Location

County	Santa Cruz						
City	Santa Cruz						
Region							
Cross Streets	West and Sequoia Drives						
Parcel No.	Various						
Township	9S	*Range*	2W	*Section*	34	*Base*	Diablo

Proximity to:

Highways	17
Airports	
Railways	
Waterways	Newell Creek
Schools	
Land Use	Residential and Open Space

Project Issues	Aesthetic/Visual; Agricultural Land; Air Quality; Noise; Other Issues; Schools/Universities; Toxic/Hazardous; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Wildlife
Reviewing Agencies	Resources Agency; Regional Water Quality Control Board, Region 3; Department of Parks and Recreation; Native American Heritage Commission; Department of Health Services; Department of Fish and Game, Region 3; Department of Water Resources; California Highway Patrol; Caltrans, District 5; Department of Boating and Waterways; Department of Toxic Substances Control; State Water Resources Control Board, Clean Water Program

Date Received	03/25/2005	*Start of Review*	03/25/2005	*End of Review*	04/25/2005

Note: Blanks in data fields result from insufficient information provided by lead agency.

NOTICE OF INTENT

To Adopt a Mitigated Negative Declaration for the
City of Santa Cruz Water Department

Use of Copper To Control Aquatic Weeds In Loch Lomond Reservoir

The City of Santa Cruz Water Department (SCWD) is proposing to continue to use copper-based aquatic pesticides to control algae in Loch Lomond in Santa Cruz County, California.

The proposed project would include the following elements:

- Application of copper-based aquatic pesticides; and
- Monitoring and reporting to the State Water Resource Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB)

To comply with the requirements of the California Environmental Quality Act (CEQA), SCWD authorized Blankinship & Associates, Inc. to prepare an Initial Study for the proposed project. The Initial Study includes an environmental checklist that evaluates the potential environmental impacts of the proposed project. Impacts were identified in the following areas: Biology and Hydrology/Water Quality. Mitigation measures have been proposed that would reduce impacts to less-than-significant levels. Based on the results of the Initial Study, SCWD has determined that the proposed project with mitigations can be carried out without significant impacts on the environment. Therefore, SCWD proposes to adopt a Mitigated Negative Declaration in order to meet its obligation under CEQA.

Prior to taking final action on the proposed Mitigated Negative Declaration, SCWD will consider public comments on the Initial Study and proposed Mitigated Negative Declaration. All interested parties are invited to submit written comments to:

City of Santa Cruz Water Department
809 Center Street, Room 102
Santa Cruz, California 95060
Attention: Bob Barrett
(831)420-5485

The Initial Study and proposed Mitigated Negative Declaration and all documents referred to the Initial Study are available for public review at the above address during normal working hours, 8:00 a.m. to 5:00 p.m. Additionally, the Initial Study and proposed Mitigated Negative Declaration are available for review at the City of Santa Cruz Public Library, Central Branch located at 224 Church St, San Cruz, CA 95060.

The public review period begins on March 25, 2005, and ends on April 28, 2005. All written comments must be received by 4:00 p.m. on April 28, 2005. After consideration of all comments, the SCWD either certify or reject the proposed Mitigated Negative Declaration.

By: _____ Date: 3/24/05

BILL KOCHER, Director of Water Department
City of Santa Cruz, California

Form A

Notice of Completion & Environmental Document Transmittal

SCH #_____

Mail to: State Clearinghouse, PO Box 3044, Sacramento CA 95814-3044 916/445-0613

Project Title: Use of Copper To Control Aquatic Weeds In Loch Lomond Reservoir

Lead Agency: *City of Santa Cruz Water Department* Contact Person: *Bob Barrett*
Mailing Address: *809 Center Street, Room 102* Phone: *(831) 420-5485*
City: *Santa Cruz, California* Zip: *95060* County: *Santa Cruz*

Project Location:
County: *Santa Cruz* City/Nearest Community: *Santa Cruz, CA*
Cross Streets: *West and Sequoia Drives* Zip Code: *95060* Total Acres: *Approximately 15*
Assessor's Parcel No. *Various* Section: *34* Twp: *9S* Range: *2W*
Base: *Mt. Diablo*
Within 2 Miles: State Hwy #: *17* Waterways: *Newell Creek*
Airports: *None* Railways: *None* Schools: *None*

Document Type:
CEQA: ☐ NOP ☐ Supplement/Subsequent EIR NEPA: ☐ NOI Other: ☐ Joint Document
☐ Early Cons (Prior SCH No.) ☐ EA ☐ Final Document
X Neg Dec ☐ Other ☐ Draft EIS ☐ Other
☐ Draft EIR ☐ FONSI

Local Action Type:
☐ General Plan Update ☐ Specific Plan ☐ Rezone ☐ Annexation
☐ General Plan Amendment ☐ Master Plan ☐ Prezone ☐ Redevelopment
☐ General Plan Element ☐ Planned Unit Development ☐ Use Permit ☐ Coastal Permit
☐ Community Plan ☐ Site Plan ☐ Land Division (Subdivision, etc.)
X Other: *NPDES Permit and State Implementation Plan (SIP) Section 5.3 Exception*

Development Type:
☐ Residential: *Units* *Acres* ☐ Water Facilities: *Type* *MGD*
☐ Office: *Sq.ft* *Acres* *Employees* ☐ Transportation: *Type*
☐ Commercial: *Sq.ft.* *Acres* *Employees* ☐ Mining: *Mineral*
☐ Industrial: *Sq.ft.* *Acres* *Employees* ☐ Power: *Type* *Watts*
☐ Educational ☐ Waste Treatment: *Type*
☐ Recreational ☐ Hazardous Waste: *Type*
X Other: *NPDES Permit and SIP Sec 5.3 Exception*

Funding (approx.): Federal: *None* State: *None* Total: *None*

Project Issues Discussed in Document:
X Aesthetic/Visual ☐ Flood Plain/Flooding X Schools/Universities X Water Quality
X Agricultural Land ☐ Forest Land/Fire Hazard ☐ Septic Systems X Water Supply/Groundwater
X Air Quality ☐ Geologic/Seismic ☐ Sewer Capacity X Wetland/Riparian
☐ Archeological/Historical ☐ Minerals ☐ Soil Erosion/Compaction/Grading X Wildlife
☐ Coastal Zone X Noise ☐ Solid Waste ☐ Growth Inducing
☐ Drainage/Absorption ☐ Population/Housing Balance X Toxic/Hazardous ☐ Landuse
☐ Economic Jobs ☐ Public Services/Facilities ☐ Traffic/Circulation ☐ Cumulative Effects
☐ Fiscal ☐ Recreation/Parks X Vegetation X Other: *Aquatic Pesticide Applications*

Reviewing Agencies Checklist

Form A, continued

KEY
S = Document sent by lead agency
X = Document sent by SCH
Δ = Suggested distribution

Present Land Use/Zoning/General Plan Designation: *Residential and Open Space*

Project Description: Copper is used to treat algae in the reservoir. The City Water Department is preparing this Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005. See CEQA Initial Study and Mitigated Negative Declaration for details.

___**Resources Agency**
___Coastal Commission
___Colorado River Board
___Conservation
__Δ__Fish & Game
___Forestry & Fire Protection
___Office of Historic Preservation
___Parks & Recreation
__Δ__Reclamation Board
___S.F. Bay Conservation & Development Commission
__Δ__Water Resources (DWR)

Business, Transportation & Housing
___Aeronautics
___California Highway Patrol
___CALTRANS District #
___Department of Transportation Planning (headquarters)
___Housing & Community Development
__Δ__**Food & Agriculture**

Health & Welfare
___Health Services_____

State & Consumer Services
___General Services
___OLA (Schools)
___Boating & Waterways
___Coastal Conservancy

Environmental Protection Agency
___Air Resources Board
___California Waste Management Board
___SWRCB: Clean Water Grants
___SWRCB: Delta Unit
__S__SWRCB: Water Quality *(Attn: Jim Maughn, Phil Isorena)*
___SWRCB: Water Rights
__S__Regional WQCB# 2

Youth & Adult Corrections
___Corrections

Independent Commissions & Offices
___Energy Commission
___Native American Heritage Commission
___Public Utilities Commission
___Santa Monica Mountains Conservancy
___State Lands Commission
___Tahoe Regional Planning Agency

___Other_____

Public Review Period (to be filled in by lead agency) Starting Date: March 25, 2005 Ending Date: April 28, 2005

Signature_____ Date 3/22/05

Lead Agency (Complete if applicable):
Consulting Firm: *Blankinship & Associates, Inc.*
Address: *2940 Spafford Street, Suite 110*
City/State/Zip: *Davis, CA 95616*
Contact: *Michael Blankinship*
Phone: *(530) 757-0941*

Applicant: *City of Santa Cruz Water Department*
Address: *809 Center St, Room 102*
City/State/Zip: *Santa Cruz, CA 95060*
Phone: *(831) 420-5485*

For SCH Use Only:
Date Received at SCH_____
Date Review Starts_____
Date to Agencies_____
Date to SCH_____
Clearance Date_____
Notes:

State Implementation Plan (SIP) Section 5.3 Exception Information Sheet

The Control of Algae and Aquatic Weeds in Loch Lomond Using Copper

City of Santa Cruz

May 10, 2005

1. **Notification.** The City of Santa Cruz (City) will notify potentially effected public and governmental agencies of the project. The project is described in the City's Initial Study/Mitigated Negative Declaration (IS/MND) dated March 25, 2005.
2. **Description of the Proposed Action.** The proposed action is the application of copper aquatic pesticides to Loch Lomond for the purposes of controlling algae and aquatic weeds. For a more detailed description, see the City's aforementioned IS/MND.
3. **Method of Completing the Action.** The action (the application of copper aquatic pesticides) will be completed according to the copper product's label directions. Refer to the aforementioned IS/MND.
4. **Schedule.** The schedule for the action will be according to Integrated Pest Management (IPM) principles. For example, the application of aquatic pesticides will be done at times and frequencies when the concentration of algae and/or weeds equals or exceeds thresholds established by the City.
5. **Discharge and Receiving Water Quality Monitoring Plan.** The City has prepared and will use an Aquatic Pesticide Application Plan (APAP) as required in the Statewide General NPDES Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control In Waters of the United States (No. CAG 99005). The APAP describes in detail the requirements for sampling, analysis, and reporting before, during, and after the project. Further, the APAP contains a Quality Assurance Project Plan (QAPP) that describes in detail the quality assurance and quality control procedures used for the project.
6. **Contingency Plans.** The SIP exception is required because there are no known effective alternatives to copper. Alternative algae control methods are being tested but no adequately effective alternative is known at this time. Refer to the aforementioned IS/MND for a discussion of our exploration of alternative algae control methods.
7. **Identification of Alternate Water Supply.** On an annual basis, Loch Lomond provides 16% of the City's water supply. The other 84% of its supply is from the San Lorenzo River, north coast surface sources and Live Oak wells. However, during summer months when algae treatment may be required, as much as 30% of the daily demand must be drawn from Loch Lomond. The other sources are utilized to their maximum capacity with Loch Lomond being used to supply whatever is needed to bring production up to the demand. There is no alternate water supply that can meet the peak demands of the season.
8. **Residual Waste Disposal Plans.** The City's use of copper to control aquatic weeds does not create residual waste.
9. **Certification by a Qualified Biologist.** At the completion of the project, the City will provide certification by a qualified biologist that the receiving water beneficial uses have been maintained. Post-project certification will take into account natural variations in project site conditions and the influence these conditions have on beneficial uses.