FINAL

Use of Copper To Control Aquatic Weeds In Antioch Municipal Reservoir

California Environmental Quality Act Initial Study And Mitigated Negative Declaration

March 23, 2005

Project Sponsor and Lead Agency:
Antioch Public Works Department
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1.0 PROJECT DESCRIPTION

1.1 Introduction

The City of Antioch (herein referred to as the "City") provides water service and serves a suburban population of approximately 100,000 people situated in and about the City of Antioch which is located in Contra Costa County along the San Joaquin River near its confluence with the Sacramento River. The City's primary objective is to provide municipal water to Antioch and nearby rural areas in northern Contra Costa County.

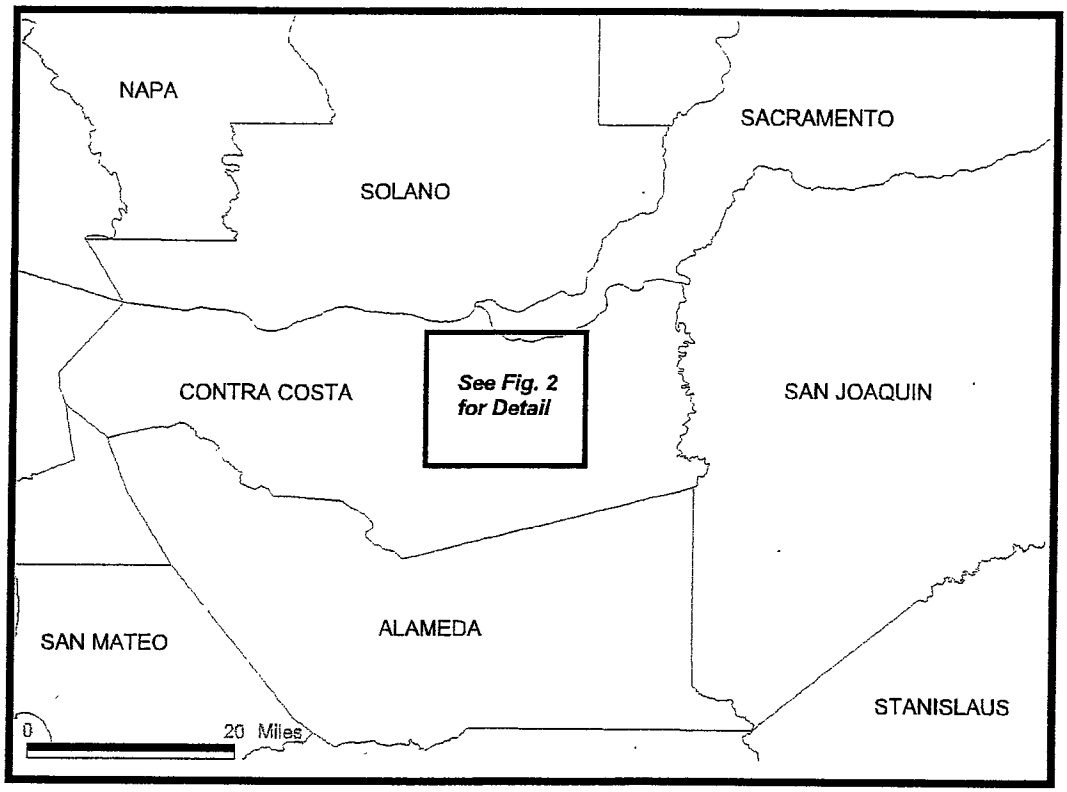
The City owns and operates the Antioch Municipal Reservoir. The Municipal Reservoir is located adjacent to the Lone Tree Golf Course, along Golf Course Road in the southwestern part of the city. All of the Municipal reservoir and the Lone Tree Golf Course and the land immediately adjacent to the shoreline are owned by the City of Antioch. North and east of the reservoir is primarily low to medium density residential with small commercial areas interspersed. The reservoir allows the City to deliver water to the Water Treatment Plant at a uniform rate from either the San Joaquin River or the Contra Costa Canal, with excess water stored in the reservoir to be used to meet periods of fluctuating demand. Water from the San Joaquin River is pumped to the reservoir prior to being fed to the treatment plant, but water from the Contra Costa Canal can be delivered directly to the treatment plant or diverted to the Municipal Reservoir. River water is used during the fall, winter and spring while the salt content of the river is low. Canal water is used primarily during the summer.

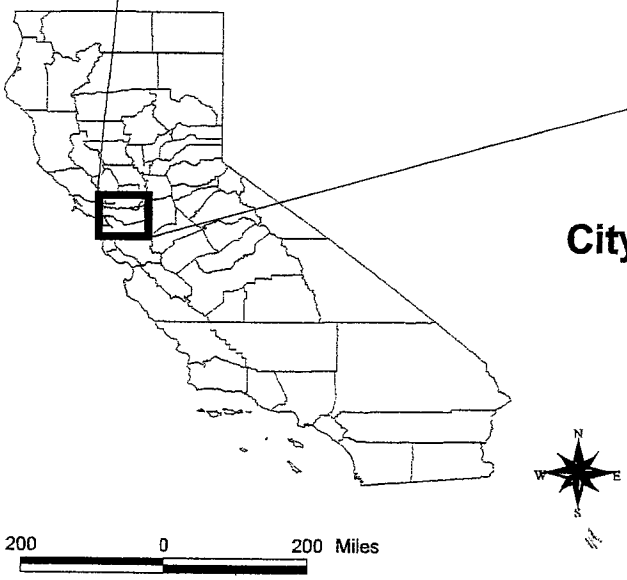
The Municipal Reservoir provides supply reliability and volume for the City of Antioch's municipal water supply program. The reservoir collects runoff from a small (1300 acres) watershed located around the reservoir. Water from the Municipal Reservoir is fed by gravity into the treatment plant located on Putnam Street.

Additional beneficial uses of the reservoir include recreation and open space. The Lone Tree Golf Course (open to public) is adjacent to the reservoir, however, no swimming, fishing, or boating are allowed at the lake as a protective measure.

Aquatic pesticides applications consist of a combination of copper sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$) and Cutrine Plus containing 9% copper as mixed copper-ethanolamine complexes. The target water concentration during each treatment from the combination of copper-containing herbicides is 0.2 ppm. Aquatic herbicide treatments are performed by certified pesticide applicators. Water is held in the reservoir for 3 to 5 days following an aquatic pesticide treatment. Generally, each treatment consists of two applications, separated by three days with the reservoir being treated two to five times during May through September.

As part of the City's Integrated Pest Management (IPM) program, submerged aquatic vegetation is harvested using an Aquamarine TC-200 harvester and emergent aquatic vegetation along the edges of the reservoir is cut by hand.





200 0 200 Miles

City of Antioch Municipal Reservoir

Project Location Map

Legend

- Project Area
- California County Boundaries

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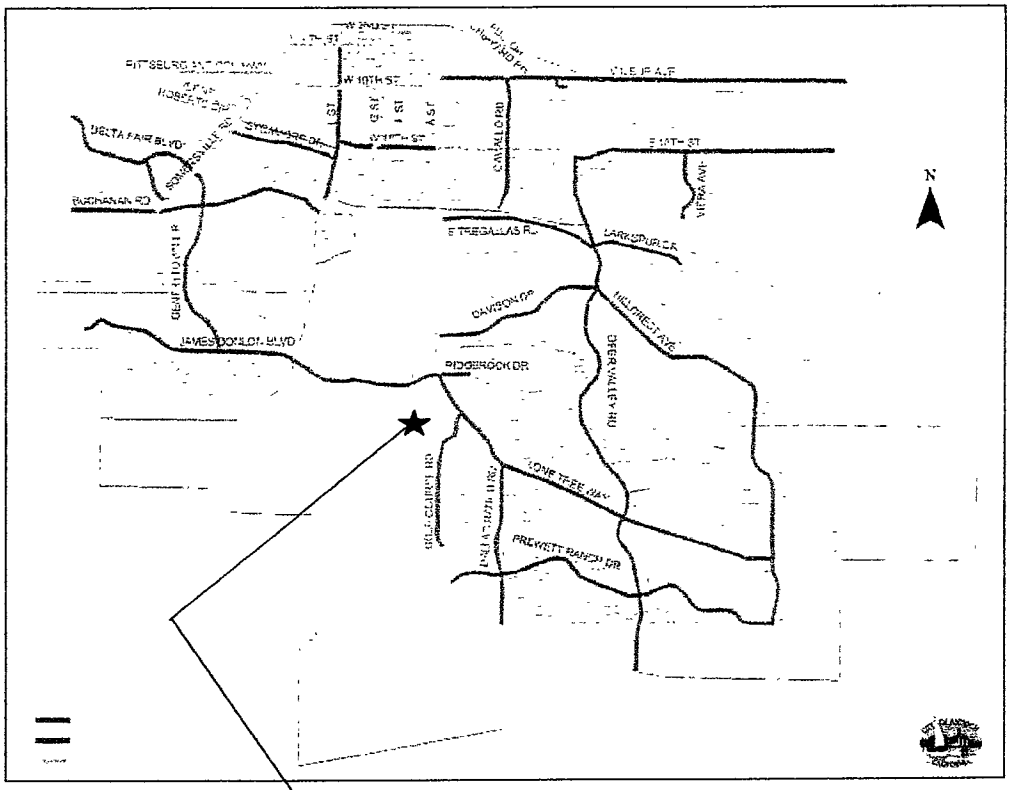
Figure 1



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Project	Figure
Project Detail Map	**2**
Date: January 2005	
Scale: As Shown	

1.2 Regulatory Setting

The emergency NPDES permit used by the City for the application of aquatic pesticides expired on January 31, 2004. The State Water Resources Control Board (SWRCB) has released a draft general permit (Permit) to replace the emergency 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 City 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 adopted the Permit on May 20, 2004 and has suggested that the Permit may be re-opened for additional CEQA document submission in 6 months.

1.3 Required Approvals

To obtain approval of an exception under Section 5.3 of the SIP to the CTR criterion for copper, the City 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;

[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."

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 Contra Costa County Agricultural Commissioners

Prior to the start of every season, the City obtains a Restricted Materials permit from the appropriate County Agricultural Commissioner (CAC).

1.5 Standard Operating Procedures

The City 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 convey water.

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. Refer to Appendix A.

2. All City 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 specific product labels is included in Appendix B.

3. All City personnel and their contractors review and consult the aquatic pesticide Material Safety Data Sheet (MSDS) in Appendix B, 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.

4. 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 chemical to be applied.

During and after the start of application, the City accomplishes the following:

1. Water will be held in the reservoir for three to five days following any aquatic pesticide application.

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 Antioch Municipal Reservoir
2. Lead Agency Name and Address:	Antioch Public Works Department City Hall Third and H Streets P.O. Box 5007 Antioch, CA 94531-5007
3. Contact Person & Phone Number:	Phil Hoffmeister 925.779.7035
4. Project Location:	Antioch, Contra Costa County, California
5. Project Sponsor's Name and Address:	See #2. above
6. General Plan Land Use Designation:	Open Space/Medium Low Density Residential
7. Zoning:	Open Space/Medium Low Density Residential
8. Description of Project:	See Section 1.5
9. Surrounding Land Uses and Setting:	Open Space/Recreation/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 Date

Phil Hoffmeister Antioch Public Works Department

Printed Name For

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 Antioch Municipal 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 Antioch Municipal 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. A boat is used for purposes of site reconnaissance before, during, and after application of aquatic pesticides. 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 City is located in the Bay Area Air Quality Management District (BAAQMD) which includes the following counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara, and portions of two others - southwestern Solano and southern Sonoma. The application of aquatic pesticides does not conflict with the BAAQMD 2000 Clean Air Plan, violate any air quality standards, or contribute to an existing or projected violation.

Item c.) ***No Impact.*** Levels of ozone, carbon monoxide, and suspended matter (PM-10) in the Bay Area have exceeded California Clean Air Act standards, and therefore the area has been considered a "nonattainment area" for these pollutants. BAAQMD's Bay Area Clean Air Plan contains districtwide control measures to reduce carbon monoxide and ozone precursor emissions (City of Antioch, 2003). However, in April 2004, U.S. EPA made a final finding that the Bay Area has attained the national 1-hour ozone standard. Because of this finding, the previous planning commitments in the 2001 Ozone Attainment Plan are no longer required (BAAQMD, 2004). Project activities will produce minor amounts of carbon monoxide and suspended matter from running pick-up trucks and outboard motors and will not contribute to nonattainment.

Items d) & e): ***No Impact.*** Aquatic pesticides are applied by City personnel or their contractors on the lake 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.

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 Office. 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 1.** Species habitat and rationale for removal from further consideration is presented in **Appendix C.** Physical, chemical and toxicological data on copper are presented in **Appendix D.**

With three (3) exceptions, no special status species has habitat in or near, or is otherwise at risk from aquatic pesticides used for the project.

The three (3) species that may be at risk are the giant garter snake, western pond turtle (including the 2 subspecies northwestern and southwestern pond turtle), and eel-grass pondweed because they could live within the lake margins and shoreline habitats. The estimated exposure of the giant garter snake and western pond turtle due to exposure to copper at the target application rate of 0.2 ppm would diminish to concentrations not estimated to pose a risk after approximately 0.5 days for copper. For eel-grass pondweed, the water concentrations would diminish to a level that no longer poses a risk after 2 days.

BIO-1: Mitigation for potential exposure of giant garter snake, western pond turtle, and eel-grass pondweed will be to have qualified personnel survey for their presence prior to the first treatment of the year by qualified personnel. Since the Antioch Municipal Reservoir is an isolated water body with its only water source being that which is pumped into it, no further action is required if the reservoir is determined to be clear of these species at the beginning of the project. If any individuals are present, the following procedures will be followed for each species.

No mitigation for potential exposure of western pond turtle will be required unless initial water concentrations of elemental copper exceed 0.17 ppm. No mitigation for potential exposure of giant garter snake will be required unless initial water concentrations of elemental copper exceed 0.15 ppm. No mitigation for potential exposure of eel-grass pondweed will be required unless initial water concentrations of elemental copper exceed 0.06 ppm.

Western Pond Turtle: If the lake volume is at or in excess of its average volume of 675 acre-ft, up to one-half the lake can be treated with up to 1050 lb $CuSO_4 \cdot 5H_2O$ when applied alone, or up to 290 gallons of Cutrine-Plus when applied alone. These scenarios will achieve 0.5 ppm in the upper 7.5 ft of the water column within the portion of the lake where $CuSO_4$ is applied and will not exceed 0.17 ppm Cu throughout the lake. If a combination of $CuSO_4 \cdot 5H_2O$ and Cutrine-Plus is applied, the amounts of both products must be adjusted so the combined copper concentration in the upper 7.5 ft of the half the reservoir receiving the application does not exceed 0.5 ppm and the copper concentration in the entire reservoir does not exceed 0.17 ppm.

Giant Garter Snake: If the lake volume is at or in excess of its average volume of 675 acre-ft, up to one-third the lake can be treated with up to 800 lb $CuSO_4 \cdot 5H_2O$ when applied alone, or up to 220 gallons of Cutrine-Plus when applied alone. These scenarios will achieve 0.5 ppm in the upper 7.5 ft of the water column within the portion of the lake where $CuSO_4$ is applied and will not exceed 0.15 ppm Cu throughout the lake. If a combination of $CuSO_4 \cdot 5H_2O$ and Cutrine-Plus is applied, the amounts of both products must be adjusted so the combined copper concentration in the upper 7.5 ft of the third of the reservoir receiving the application does not exceed 0.5 ppm and the copper concentration in the entire reservoir does not exceed 0.15 ppm.

Eel-grass Pondweed: If the lake volume is at or in excess of its average volume of 675 acre-ft, up to one-third the lake can be treated with up to 450 lb $CuSO_4 \cdot 5H_2O$ when applied alone, or up to 125 gallons of Cutrine-Plus when applied alone. These scenarios will achieve 0.3 ppm in the upper 7.5 ft of the water column within the portion of the lake where $CuSO_4$ is applied and will not exceed 0.06 ppm Cu throughout the lake. If a combination of $CuSO_4 \cdot 5H_2O$ and Cutrine-Plus is applied, the amounts of both products must be adjusted so the combined copper concentration in the upper 7.5 ft of the third of the reservoir receiving the application does not exceed 0.3 ppm and the copper concentration in the entire reservoir does not exceed 0.06 ppm.

Item c): ***No Impact.*** The project takes place in the City'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**.

Item d): ***No Impact.*** Water for the City is derived almost exclusively from the San Joaquin River and Contra Costa Canal. Migrating fish do not have access to the Municipal Reservoir because no streams connect the reservoir to any other water body containing migratory fish. 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 1. Special status species known to occur in 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
Amphibians					
Rana aurora aurora	Northern red-legged frog	FSC	Found in humid forests, woodlands, grasslands, and streamsides in northwestern California. Generally near permanent water, but can be found far from water, in damp woods and meadows, during non-breeding season.	X (1)	
Rana aurora draytonii	California red-legged frog	FT, SCSC	Vernal Pool and other Seasonal Pools	X (2)	
Spea hammondii	western spadefoot toad	FSC	Grasslands, open chaparral, pine-oak woodlands	X (3)	
Birds					
Aquila chrysaetos	golden eagle	SCSC, SFP	Rolling foothills, sage-juniper flats, desert	X (4)	
Athene cunicularia	burrowing owl	SCSC	Grassland, rangeland	X (4)	
Athene cunicularia hypugaea	western burrowing owl	FSC	See burrowing owl	X (4)	
Baeolophus inornatus	oak titmouse	FSLC	Forest - Hardwood, Forest - Mixed, Shrubland/chaparral, Suburban/orchard, Woodland - Hardwood, Woodland - Mixed	X (4)	
Buteo swainsoni	Swainson's hawk	ST	Cropland/hedgerow, Desert, Grassland/herbaceous, Savanna, Woodland - Mixed	X (4)	
Carduelis lawrencei	Lawrence's goldfinch	FSC	Oak woodland, chaparral, riparian woodland, pinyon-juniper association, and weedy areas in arid regions but usually near water	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
Elanus leucurus	white-tailed kite	FSC, SFP	Savanna, open woodland, marshes, partially cleared lands and cultivated fields, mostly in lowland situations	X (4)	
Falco peregrinus anatum	American peregrine falcon	FD, SE, SFP	Herbaceous wetland, lagoon, river mouth/tidal river, tidal flat/shore, bare rock/talus/scree, cliff, shrubland/chaparral, urban/edificarian, woodland	X (4)	
Lanius ludovicianus	loggerhead shrike	FSC, SCSC	Open country with scattered trees and shrubs, savanna, desert scrub, and, occasionally, open woodland	X (4)	
Phalacrocorax auritus	double-crested cormorant	SCSC	(Rookery site) colonial nester on coastal cliffs, offshore islands, & along lake margins in the interior of the state.	X (5)	
Picoides nuttallii	Nuttall's woodpecker	FSLC	Riparian; Forest - Hardwood, Shrubland/chaparral, Woodland - Hardwood	X (4)	
Selasphorus sasin	Allen's hummingbird	FSC	Chaparral, thickets, brushy hillsides, open coniferous woodlands	X (4)	
Invertebrates					
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	FSC	Usually found in relatively calm, shallow water of ponds, streams, marshes, or lakes	X (6)	
Mammals					
Corynorhinus (=Plecotus) townsendii townsendii	Pacific western big-eared bat	FSC	In California, solitary males and small groups of females are known to hibernate in buildings in the central part of the state; known from limestone caves, lava tubes, and human-made structures in coastal lowlands, cultivated valleys, and nearby hills covered with mixed vegetation	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
Eumops perotis californicus	greater western mastiff-bat	FSC	Bare rock/talus/scree, Cliff, Desert, Grassland/herbaceous, Savanna, Shrubland/chaparral, Suburban/orchard, Woodland	X (4)	
Myotis evotis	long-eared myotis bat	FSC	Mostly forested areas, especially those with broken rock outcrops; also shrubland, over meadows near tall timber, along wooded streams, over reservoirs	X (4)	
Myotis thysanodes	fringed myotis bat	FSC	Primarily at middle elevations of 1,200-2,150 m in desert, grassland, and woodland habitats	X (4)	
Myotis volans	long-legged myotis bat	FSC	Primarily in montane coniferous forests; also riparian habitats; roosts in abandoned buildings, rock crevices, under bark etc.,in some areas hollow trees are the most common nursery sites, but buildings and rock crevices are also used	X (4)	
Myotis yumanensis	Yuma myotis bat	FSC	Found in a wide variety of upland and lowland habitats, including riparian, desert scrub, moist woodlands and forests, but usually found near open water; flies low; nursery colonies usually are in buildings, caves and mines, and under bridges	X (7)	
Vulpes macrotis mutica	San Joaquin kit fox	FE, ST	Grassland, Rangeland with Scattered Shrubby Vegetation	X (4)	
Plants					
Aster lentus	Suisun Marsh Aster	CNPS-1B	Brackish Marsh, Freshwater Marsh	X (8)	
Hibiscus lasiocarpus	rose-mallow	CNPS-2	Freshwater marsh	X (9)	

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
Lathyrus jepsonii var. jepsonii	Delta tule pea	CNPS-1B	Freshwater and brackish marshes. Most of distribution restricted to the Sacramento/San Joaquin River delta. Often found w/*Typha*, *Aster lentus*, rosa calif., *Juncus* spp., *Scirpus*, etc. Usually on marsh and slough edges.	X (8)	
Potamogeton zosteriformis	eel-grass pondweed	CNPS-2	Marshes and swamps. Ponds, lakes, streams. 0-1860m.		X
Scutellaria lateriflora	blue skullcap	CNPS-2	Meadows and seeps, marshes and swamps. Wet meadows and marshes. -3-500m.	X (8)	
Reptiles					
Clemmys marmorata marmorata	northwestern pond turtle	FSC, SCSC	Permanent and intermittent waters of rivers, creeks, small lakes and ponds, marshes, irrigation ditches, and reservoirs		X
Clemmys marmorata pallida	southwestern pond turtle	FSC, SCSC	Permanent and intermittent waters of rivers, creeks, small lakes and ponds, marshes, irrigation ditches, and reservoirs		X
Emys (=Clemmys) marmorata	western pond turtle	FSC, SCSC	Marsh, Rivers, Irrigation Ditches with Aquatic Vegetation		X
Thamnophis gigas	giant garter snake	FT, ST	Prefers freshwater marsh and low gradient streams, has adapted to drainage canals and irrigation ditches		X

Table 1 Numbered Notes:

(1) Species occurs only along northern California coastline (Jennings and Hayes 1994).
(2) Only adult or juvenile California red-legged frogs will possibly be present during the summer months when aquatic pesticide applications are made. The Toxic Reference Value for adult frogs is 0.6 ppm. As long as no application is made that will exceed 0.5 ppm, no apparent risk will be present for the red-legged frog.
(3) This is a terrestrial species that is known to enter water only during part of its' reproductive cycle. This period of time does not coincide with the application period of aquatic pesticides.
(4) Species not likely to have any exposure as its target prey base or plant food resources consist of terrestrial species.
(5) The dissipation of copper, limited uptake in fish, along with a time-dependent bioconcentration factor for copper in aquatic invertebrates (see **Appendix C**) will limit dietary exposure to an insignificant level.
(6) Spends summer burrowed into soil at water's edge (pers. comm. Christopher Rogers, Ecoanalysts, Inc).
(7) These species forage for emergent aquatic insects over water. These insects may bioaccumulate copper. But since the copper concentrations that could be harmful to aerially feeding insectivores is also harmful to aquatic invertebrates, few if any aquatic insects are likely to emerge that contain harmful levels of copper. Therefore, no risk due to copper exposure is anticipated.
(8) These species are emergent plants that might occur along the reservoir margins interspersed with tules and cattails. Since the tules and cattails are thriving, they would prevent substantial intrusion of treated water. Therefore the copper concentrations within the stands of emergent vegetation are unlikely to exceed the TRV or 0.06 ppm for vascular aquatic plants.
(9) Rose-mallow is not an emergent plant and therefore does not grow in standing water but may grow on moist banks of canals or ditches. Its' exposure to canal water containing aquatic pesticides is indirect, if any. Exposure will only occur through root uptake of soil water. Aquatic pesticide concentration in root zone water is not expected to be sufficient to cause risk.

Table 1 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-1 = California Native Plant Society Listed, Rare, Threatened, or Endangered in CA only
CNPS-2 = California Native Plant Society Listed Rare, Threatened, or Endangered
CNPS-3 = California Native Plant Society Listed Presumed Extinct in CA

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 City'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

Items a) through e): ***No Impact.*** The project consists of applying aquatic pesticides to Antioch Municipal Reservoir within the jurisdiction of the City. 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. Acute exposure to humans can cause eye, skin, and respiratory irritation, and can be harmful if swallowed. Refer to the representative MSDS presented in **Appendix B**. 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 City facility, at the point of application, or during transport.

The City handles, stores, transports aquatic pesticides and disposes of containers in accordance with federal, state, and county requirements and manufacturer's recommendations. This approach is supplemented by the following components of the City's aquatic weed management program:

1. City 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.

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. Refer to **Appendix A.**

3. All City 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 B**.

4. All City personnel and their contractors review and consult the aquatic pesticide Material Safety Data Sheet (MSDS) in **Appendix B**, 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. City 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 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 chemical to be applied.

6. Water in the reservoir will be held for 3 to 5 days following a treatment with aquatic pesticides.

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.*** The Antioch Municipal Airport is within a half mile of the Municipal Reservoir. All project activities occur on the reservoir surface. No project activities would interfere with activities in and around the airport, and likewise, no activities in and around the airport would interfere with project activities.

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. Acute exposure to humans can cause eye, skin, and respiratory irritation, and can be harmful if swallowed. Refer to the representative MSDS presented in **Appendix B.** Use of this material would create a potential for spills that could affect worker

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 application sites 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 City 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 City's IPM program, the application of aquatic pesticides is done infrequently (2-5 times per year) and over a short duration (one to 1 ½ hours per application).

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. Refer to **Appendix A.**

2. All City 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 B**.

3. All City personnel and their contractors review and consult the aquatic pesticide Material Safety Data Sheet (MSDS) in **Appendix B**, 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.

4. 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 chemical to be applied.

5. Water in the reservoir will be held for 3 to 5 days following a treatment with aquatic pesticides.

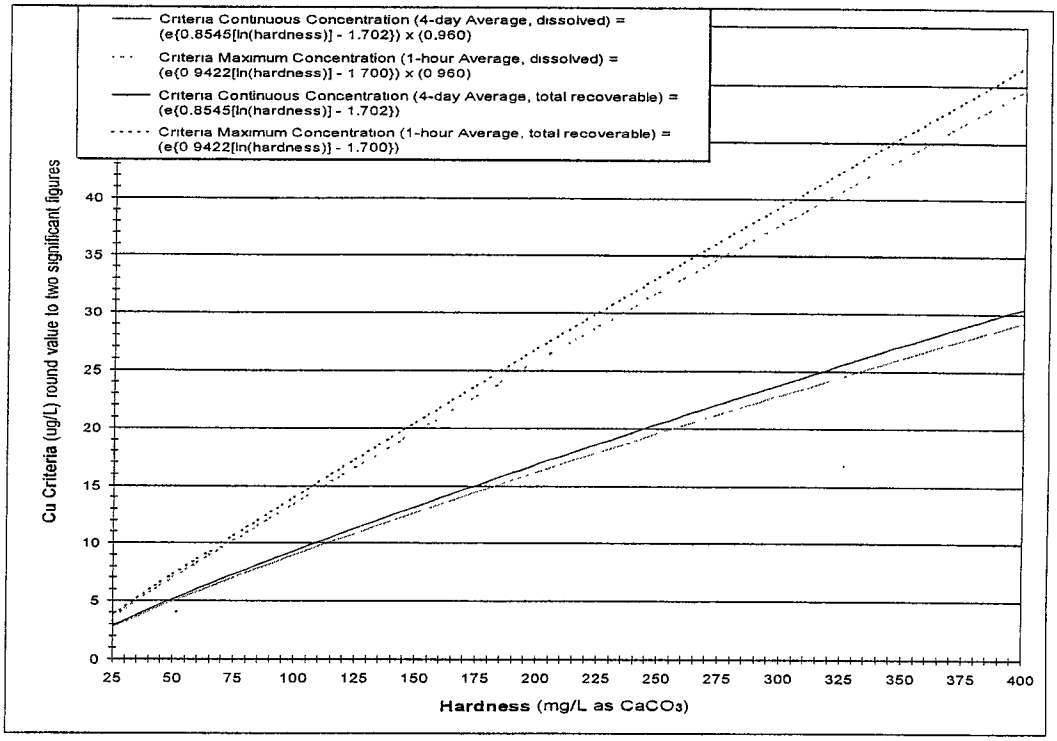
Copper Discussion

Item a): **Potentially Significant Unless Mitigation Incorporated**. As presented in Section 1.2, the existing interim emergency NPDES permit used by the City has expired. The City intends to obtain coverage under the new 2004 general permit that requires compliance with the SIP and the CTR.

Application of copper-based aquatic pesticides according to label direction typically requires concentrations of copper between 500 and 2,000 µg/L. The concentration of copper in 10% of samples collected from house tap sources has a Maximum Contaminant Level (MCL) of 1300 µg/L (CalEPA, 2004). Water quality criteria for copper as described in the CTR and by the RWQCB

(CalEPA 2004) are hardness-dependent. Refer to **Figure 3.** A sample collected on 1 June, 2004, water in the Antioch Municipal Reservoir had a total hardness of 88 mg/L. The typical range of values for total hardness in the reservoir is 80 to 100 mg/L (V. Darone, pers. comm.).

Figure 3. Cu Criteria Dependence on Hardness



Based on the relation of copper criteria to hardness, the applicable water quality criteria for copper in Antioch Municipal Reservoir have the following values:

Continuous Dissolved Concentration (4 day Average):	7 – 9 µg/L
Continuous Total Concentration (4 day Average):	7.5 – 9.5 µg/L
Maximum Dissolved Concentration (1 Hour Average):	11 – 14 µg/L
Maximum Total Concentration (1 Hour Average):	12 – 15 µg/L

These water quality criteria are exceeded in the lake water at the time of application. Accordingly, because label application rates exceed the CTR water quality criteria, the City is obtaining a SIP exception.

Copper-containing aquatic pesticides applied to the Antioch Municipal Reservoir dissipate and/or become permanently insoluble shortly after application (CDFA 2002; Trumbo 1997, 1998; WA DOE 2004). When copper is applied according to label direction, its half-life is between 3 and 19 hours due to a combination of precipitation, adsorption by biota and particulate matter, and complexation with organic matter.

Given a starting concentration of 500 µg/L and a half-life of 19 hours, copper can reasonably be expected to dissipate according to the table below:

Table 2. Anticipated Rate of Copper Dissipation

Time (Hours)	Time (Days)	conc. (µg/L)
0	0	500.00
6	0.25	401.71
12	0.50	322.73
24	1.00	208.32
48	2.00	86.79
72	3.00	36.16
96	4.00	15.07
120	5.00	6.28
144	6.00	2.62
168	7.00	1.09
192	8.00	0.45
240	10.00	0.08
288	12.00	**0.01**

As **Table 2** shows, only a short-term (i.e., less than 96 hour) CTR copper water quality criteria exceedance will occur in Antioch Municipal Reservoir.

Assuming typical label rate starting concentrations and the previously mentioned half-life, the risk to species shown in **Table 1** from copper was estimated. Species exposure was conservatively assumed to occur immediately after introduction of copper into the reservoir. With the exception of the giant garter snake, western pond turtle, and eel-grass pondweed the concentration of copper in Antioch Municipal Reservoir does not pose a risk. This is consistent with the fact that City personnel have not reported adverse impacts to aquatic, avian, terrestrial or benthic organisms as a result of using copper-based 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 City 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. As required by the SIP and the SWRCB general permit for the application of aquatic pesticides, the City will prepare and execute an Aquatic Pesticide Application Plan (APAP). The plan will call for surfacewater 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 City will arrange for a qualified biologist to assess reservoir water beneficial uses.

BIO-1. See Biological Resources Section. City staff will implement mitigation measure **BIO-1** to address potential risks to the giant garter snake, western pond turtle, and eel-grass pondweed. With this mitigation, a less than significant impact exists to this species. By

regularly monitoring and reporting the presence/absence of these species in its reservoir, the City will be able to identify problems with water quality and take corrective action if necessary.

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 City's existing reservoir. Nearby housing 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.

Given a starting concentration of 500 µg/L and a half-life of 19 hours, copper can reasonably be expected to dissipate according to the table below:

Table 2. Anticipated Rate of Copper Dissipation

Time (Hours)	Time (Days)	conc. (µg/L)
0	0	500.00
6	0.25	401.71
12	0.50	322.73
24	1.00	208.32
48	2.00	86.79
72	3.00	36.16
96	4.00	15.07
120	5.00	6.28
144	6.00	2.62
168	7.00	1.09
192	8.00	0.45
240	10.00	0.08
288	12.00	**0.01**

As **Table 2** shows, only a short-term (i.e., less than 96 hour) CTR copper water quality criteria exceedance will occur in Antioch Municipal Reservoir.

Assuming typical label rate starting concentrations and the previously mentioned half-life, the risk to species shown in **Table 1** from copper was estimated. Species exposure was conservatively assumed to occur immediately after introduction of copper into the reservoir. With the exception of the giant garter snake, western pond turtle, and eel-grass pondweed the concentration of copper in Antioch Municipal Reservoir does not pose a risk. This is consistent with the fact that City personnel have not reported adverse impacts to aquatic, avian, terrestrial or benthic organisms as a result of using copper-based 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 City 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. As required by the SIP and the SWRCB general permit for the application of aquatic pesticides, the City will prepare and execute an Aquatic Pesticide Application Plan (APAP). The plan will call for surfacewater 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 City will arrange for a qualified biologist to assess reservoir water beneficial uses.

BIO-1. See Biological Resources Section. City staff will implement mitigation measure **BIO-1** to address potential risks to the giant garter snake, western pond turtle, and eel-grass pondweed. With this mitigation, a less than significant impact exists to this species. By

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 City'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 on the reservoir surface and along its border where the boat is launched. The incidental noise and vibration generated by the use of pick-up trucks and an outboard motor is temporary and inconsequential and thus will have no impact.

Items e) & f): ***No Impact.*** The Antioch Municipal Airport is within a half mile of the Municipal Reservoir. All project activities occur on the reservoir surface. No project activities would interfere with activities in and around the airport, and likewise, no activities in and around the airport would interfere with project activities.

3.12 Population and Housing

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing units, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion

Items a) through c): ***No Impact.*** No new homes, roads or other infrastructure will be required. No displacement of existing homes or people will occur.

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 City's reservoir. No recreational activities are permitted in the reservoir. No 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 outboard motor that will not cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the 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 bags or containers from pesticides will be properly disposed according to label instructions (See **Appendix B**).

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 City's existing reservoir and has no known influence on the entitlements or resources utilized by the City.

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?	☐	☐	☒	☐

Item a): **Potentially Significant Unless Mitigation Incorporated.** The project involves the use of copper aquatic pesticides introduced into the City'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 exceedence is short-term and impacts of these aquatic pesticides are less than significant.

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

Although copper is a hazardous material, under the standard operating procedures used by City personnel and their contractors, a less than significant impact exists.

Item b): **Potentially Significant Unless Mitigation Incorporated.** The cumulative impacts of continued application of copper-based 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 a significant level.

Item c): **Less Than Significant Impact.** As a result of implementation of City 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 for potential exposure of giant garter snake, western pond turtle, and eel-grass pondweed will be to have qualified personnel survey for their presence prior to the first treatment of the year by qualified personnel. Since the Antioch Municipal Reservoir is an isolated waterbody with its only water source being that pumped into it, no further action is required if the reservoir is determined clear of these species at the beginning of the project. If any individuals are present, the following procedures will be followed for each species.

No mitigation for potential exposure of western pond turtle will be required unless initial water concentrations of elemental copper exceed 0.17 ppm. No mitigation for potential exposure of giant garter snake will be required unless initial water concentrations of elemental copper exceed 0.15 ppm. No mitigation for potential exposure of eel-grass pondweed will be required unless initial water concentrations of elemental copper exceed 0.06 ppm.

Western Pond Turtle: If the lake volume is at or in excess of its average volume of 675 acre-ft, up to one-half the lake can be treated with up to 1050 lb $CuSO_4 \cdot 5H_2O$ when applied alone, or up to 290 gallons of Cutrine-Plus when applied alone. These scenarios will achieve 0.5 ppm in the upper 7.5 ft of the water column within the portion of the lake where $CuSO_4$ is applied and will not exceed 0.17 ppm Cu throughout the lake. If a combination of $CuSO_4 \cdot 5H_2O$ and Cutrine-Plus is applied, the amounts of both products must be adjusted so the combined copper concentration in the upper 7.5 ft of the half the reservoir receiving the application does not exceed 0.5 ppm and the copper concentration in the entire reservoir does not exceed 0.17 ppm.

Giant Garter Snake: If the lake volume is at or in excess of its average volume of 675 acre-ft, up to one-third the lake can be treated with up to 800 lb $CuSO_4 \cdot 5H_2O$ when applied alone, or up to 220 gallons of Cutrine-Plus when applied alone. These scenarios will achieve 0.5 ppm in the upper 7.5 ft of the water column within the portion of the lake where $CuSO_4$ is applied and will not exceed 0.15 ppm Cu throughout the lake. If a combination of $CuSO_4 \cdot 5H_2O$ and Cutrine-Plus is applied, the amounts of both products must be adjusted so the combined copper concentration in the upper 7.5 ft of the third of the reservoir receiving the application does not exceed 0.5 ppm and the copper concentration in the entire reservoir does not exceed 0.15 ppm.

Eel-grass Pondweed: If the lake volume is at or in excess of its average volume of 675 acre-ft, up to one-third the lake can be treated with up to 450 lb $CuSO_4 \cdot 5H_2O$ when applied alone, or up to 125 gallons of Cutrine-Plus when applied alone. These scenarios will achieve 0.3 ppm in the upper 7.5 ft of the water column within the portion of the lake where $CuSO_4$ is applied and will not exceed 0.06 ppm Cu throughout the lake. If a combination of $CuSO_4 \cdot 5H_2O$ and Cutrine-Plus is applied, the amounts of both products must be adjusted so the combined copper concentration in the upper 7.5 ft of the third of

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?	☐	☐	☒	☐

Item a): **Potentially Significant Unless Mitigation Incorporated.** The project involves the use of copper aquatic pesticides introduced into the City'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 exceedence is short-term and impacts of these aquatic pesticides are less than significant.

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

Although copper is a hazardous material, under the standard operating procedures used by City personnel and their contractors, a less than significant impact exists.

Item b): **Potentially Significant Unless Mitigation Incorporated.** The cumulative impacts of continued application of copper-based 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 a significant level.

the reservoir receiving the application does not exceed 0.3 ppm and the copper concentration in the entire reservoir does not exceed 0.06 ppm.

As required by the SIP, an assessment of the biological resources at the reservoir will be made at the completion of the application season to evaluate if beneficial uses of receiving waters have been restored.

4.2 Hydrology & Water Quality

HWQ-1. As required by the SIP and the SWRCB general permit for the application of aquatic pesticides, the City will prepare and execute an Aquatic Pesticide Application Plan (APAP). The plan will call for surfacewater 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 City 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

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CalEPA, 2004. A Compilation of Water Quality Goals. Regional Water Quality Control Board, Central Valley Region. May 2004. See footnote 111.

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

City of Antioch. 2003. City of Antioch General Plan. Adopted November 24, 2003.

Jennings, M.R. and M.P. Hayes. 1994. Amphibian and reptile species of special concern in California. The California Department of Fish and Game, Inland Fisheries Division. 260 pp.

Regional Water Quality Control Board—San Francisco Bay. 1995. Basin Plan.

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)

Trumbo, J. 1997. Environmental monitoring of hydrilla eradication activities in Clear Lake, 1996. State of California, The Resources Agency, Department of Fish and Game. Rancho Cordova, California.

Trumbo, J. 1998. Environmental monitoring of hydrilla eradication activities in Clear Lake, 1997. State of California, The Resources Agency, Department of Fish and Game. Rancho Cordova, California.

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.) Wayne Sobieralski, SWRCB
2.) Jim Maughn, SWRCB
3.) Phillip Isorena, SWRCB
4.) Joel Trumbo, CDFG
5.) Patricia Anderson, CDFG
6.) Christopher Rogers, Ecoanalysts, Inc.
7.) Vince Darone, City of Antioch
8.) Kory Bennett, City of Antioch

8.0 LIST OF PREPARERS

1.) Michael S. Blankinship, PE, PCA, Blankinship & Associates
2.) Joshua M. Owens, Staff Scientist, Blankinship & Associates
3.) Sara Castellanos, Staff Scientist, Blankinship & Associates
4.) Joseph P. Sullivan, Ph.D., Certified Wildlife Biologist, Ardea Consulting
5.) Phil Hoffmeister, City of Antioch

Appendix A

Pest Control Recommendation

1. Operator of the Property

2. Recommendation Expiration Date

Address | City | County

3. Location to be Treated

4. Commodity to be Treated

5. Acres or Units to be Treated

6. Method of Application:
☐ Air ☐ Ground ☐ Fumigation ☐ Other _____

7. Pest(s) to be Controlled

8. Name of Pesticide(s)	Rate Per Acre or Unit	Dilution Rate	Volume Per Acre or Unit

9. Hazards and/or Restrictions:
- ☐ 1. Highly toxic to bees
- ☐ 2. Toxic to birds, fish and wildlife
- ☐ 3. Do not apply during irrigation or when run-off is likely to occur
- ☐ 4. Do not apply near desirable plants
- ☐ 5. Do not allow to drift onto humans, animals, desirable plants or property
- ☐ 6. Keep out of lakes, streams and ponds
- ☐ 7. Birds feeding on treated area may be killed
- ☐ 8. Do not apply when foliage is wet (dew, rain, etc.)
- ☐ 9. May cause allergic reaction to some people
- ☐ 10. This product is corrosive and reacts with certain materials (see label)
- ☐ 11. Closed system required
- ☐ 12. Restricted use pesticide (California and/or Federal)
- ☐ 13. Hazardous area involved (see map and warnings)
- ☐ 14. Other (see attachment)

10. Schedule, Time or Conditions

11. Surrounding Crop Hazards

12. Proximity of Occupied Dwellings, People, Pets or Livestock

13. Non-Pesticide Pest Control, Warnings and Other Remarks

14. Criteria Used for Determining Need for Pest Control Treatment:
☐ Sweep Net Counts ☐ Leaf or Fruit Counts ☐ Preventive
☐ Field Observation ☐ Pheromone or Other Trap ☐ Soil Sampling
☐ History ☐ Other

15. Crop and Site Restrictions:
- ☐ 1. Worker reentry interval _____ days
- ☐ 2. Do not use within ____ days of harvest/slaughter
- ☐ 3. Posting required ☐ Yes ☐ No _____ days
- ☐ 4. Do not irrigate for at least _____ days after application
- ☐ 5. Do not apply more than _____ application(s) per season
- ☐ 6. Do not feed treated foliage or straw to livestock
- ☐ 7. Plantback restrictions (see label)
- ☐ 8. Other (see attachment)

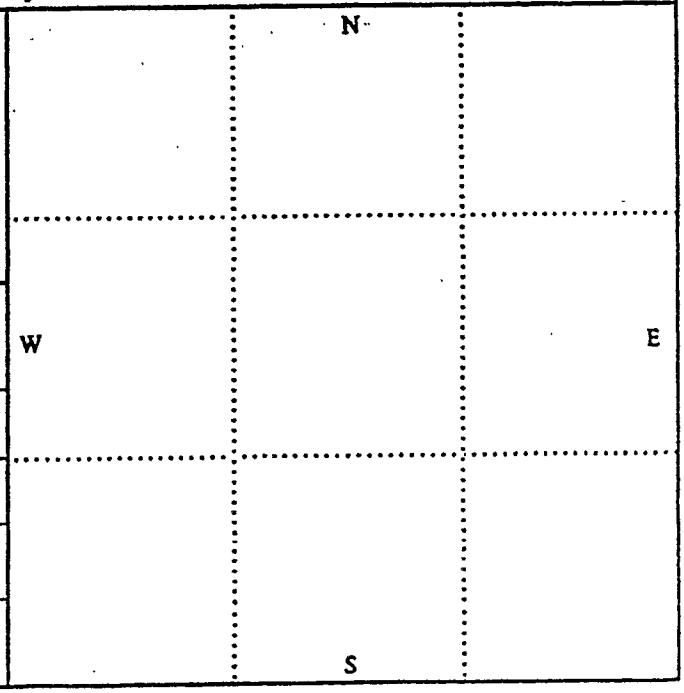
16. I certify that alternatives and mitigation measures that would substantially lessen any significant adverse impact on the environment have been considered and, if feasible, adopted.

Adviser Signature | Date

Adviser License Number

Employer

Employers Address



Explanation and Instructions For Completing the Written Recommendation

1. Include the name and address of the grower, agency or firm for whom the recommendation is written.
2. Include the date the recommendation expires.
3. Provide information on how to locate the property or site to be treated.
4. Indicate the commodity, crop or site to be treated.
5. Indicate the total acres or units to be treated.
6. Check the box adjacent to the method of application.
7. Identification of pest or pests to be controlled by recognized common name.
8. Name of pesticide (common name or trade name), dosage rate per acre or other units, dilution rate and volume per acre.
9. Check the box adjacent to the applicable hazard(s) and/or restriction(s).
10. Indicate the schedule, time or conditions for the application in relation to temperature, time of day, irrigation, etc. Also, include any label restrictions on use or disposition of crop or crop by-product.
11. Indicate any surrounding crops that may be sensitive to the recommended treatment.
12. Identify any occupied dwellings, fieldworkers, pets or livestock in the proximity of the treatment area.
13. Indicate any non-pesticide substance, pest control method or device that will be used to control pest(s). Warning of the possibility of damages by the pesticide applicator that reasonable should have been known to exist at the time of the recommendation.
14. Check the box adjacent to the criteria used for determining need for pest control treatment.
15. Check the box adjacent to the applicable crop and site restrictions.
16. Signature of the licensed pest control adviser or person acting in the capacity of a pest control adviser in accordance with the licensing exemption under Section 12001 of the California Food and Agriculture Code, the date the recommendation was made, and if applicable the adviser's license number. Also, include the name and address of the adviser's employer.

Map -Sketch the property or site to be treated and any surrounding hazards that are known to exist.

Appendix B

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

NOTES TO THE FILE

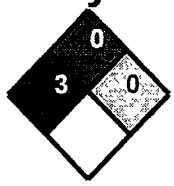
June 14, 1999: Revised "slug" application method by Notification.

Copper Sulfate Pentahydrate

phelps dodge Corporation

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)* *Contains copper sulfate* *Contains water of crystallization* *Metallic copper equivalent*	 *=99%* *=63.3%* *=35.7%* *=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_20
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.

Appendix C

A Habitat Assessment of the Antioch Municipal Reservoir project site was conducted by Ardea Consulting personnel to characterize the habitats present on-site and the likelihood of special status species 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, 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. The U.S. Fish and Wildlife Service was queried using the boundary map for the City, and selecting all 4 quads that intersect with the City's boundaries. In addition, a buffer area made up of the outlying quads adjacent to the original 4 quads was selected for the query, resulting in a total of 16 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 City 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 quads selected in this query were the quads that represented the largest overall percentage of the City's area. 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 fully 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 could possibly occur in Antioch Municipal Reservoir (P. Anderson, CDFG Fisheries Biologist, pers. comm.). A water concentration of greater than 0.015 ppm would pose a risk of mortality to red-legged frog embryos. This is determined by adding a safety factor of 10X to the LC_{50} of 0.15 ppm for leopard frog tadpoles (*Rana pipiens*) (Lande and Guttman 1973 *in* Linder and Grillitsch 2000). However, the LC_{50} for adult leopard frogs is 6.4 ppm (Kaplan and Yoh 1961 *in* Linder and Grillitsch 2000) making the TRV 0.64 ppm. Since only adult or late stage juveniles could be present at the time of aquatic herbicide applications, and the maximum application rate will be 0.5 ppm, the water concentrations of copper will not exceed the TRV 0.64 for adult or late juvenile frogs.

Western Spadefoot Toad (*Spea (=Scaphiopus) hammondii*)

Western spadefoot toads are almost completely terrestrial, entering water only to breed (see Dimmitt and Ruibal 1980 in Jennings and Hayes 1994). Western spadefoots become surface active following relatively warm (> 10.0-12.8°C) rains in late winter-spring and fall, emerging from burrows in loose soil to a depth of at least 1 m (Stebbins 1972 in Jennings and Hayes 1994, A. McCready, pers. comm. in Jennings and Hayes 1994), but surface activity may occur in any month between October and April if enough rain has

fallen (Morey and Guinn 1992 in Jennings and Hayes 1994, S. Morey, pers. comm. in Jennings and Hayes 1994). Since western spadefoot toads are not likely to enter water during the season when aquatic weeds will need to be controlled in reservoirs, it is not likely that they would be exposed to herbicides introduced to a reservoir for the control of aquatic weeds.

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 herbicides 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 to drainage canals.

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 non-flying 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 treating reservoir with herbicides would be 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. Their ings 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 treating reservoir with herbicides would be insignificant.

Long-Legged Myotis Bat (*Myotis volans*)
Long-legged myotis bats are primarily found in montane coniferous forests in the south, most often at 2000-3000 m and also in riparian and desert (Baja California) habitats. May change habitats seasonally. Uses caves and mines as hibernacula, but winter habits are poorly known. These bats roost in abandoned buildings, rock crevices, under bark, etc.,but during summer months they apparently do 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). They feed primarily on moths and also consume a wide variety of invertebrates: fleas, termites, lacewings, wasps, small beetles, etc. (Warner and Czaplewski 1984 in NatureServe 2004). They are known to follow prey for relatively long distances around, through, over forest canopy, forest clearings, and over water. In New Mexico, foraging takes place primarily in open areas where they feed mainly on small moths (Black 1974 in NatureServe 2004). The diet of long-legged myotis consists of mostly terrestrial insects, so the exposure to herbicides introduced to 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 is negligible because at rates potentially harmful to Yuma myotis, insects emerging from the treated areas would be unavailable through direct toxicity to immature life stages.

San Joaquin Kit Fox (*Vulpes macrotis mutica*)
Alkali sink, valley grassland, foothill woodland. Hunts in areas with low sparse vegetation that allows good visibility and mobility (Biosystems Analysis 1989 in NatureServe 2004). Multiple underground dens are used throughout the year. Sometimes uses pipes or culverts as den sites (Biosystems Analysis 1989 in NatureServe 2004). Primary food item usually is the most abundant nocturnal rodent or lagomorph in the area (*e.g.*, *Dipodomys* spp.); also feeds opportunistically on carrion, birds, reptiles, insects, and fruits (NatureServe 2004). The terrestrial nature of their foraging habitats and prey base indicate that exposure to herbicides applied to reservoirs will be insignificant.

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 herbicide-treated water. Following the procedures provided by U.S. EPA (1993), a water concentration of 0.17 ppm is required to produce dietary exposure equal to 1.2 mg copper/kg/day. The risk to western pond turtles

can be mitigated as long as the water concentration in the entire reservoir does not exceed 0.17 ppm and this can be accomplished by applying copper to one-half the reservoir to achieve a targeted concentration of 0.5 ppm in the upper 7.5 ft of that portion of the reservoir.

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

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

Giant Garter Snake (*Thamnophis gigas*)
Giant garter snakes occur in streams and sloughs, usually with mud bottoms. One of the most aquatic of garter snakes; usually in areas of freshwater marsh and low-gradient streams with emergent vegetation, also drainage canals and irrigation ditches and ponds and small lakes. Usually in areas of permanent water, sometimes in areas of temporary water such as irrigation/drainage canals and (less often) rice fields. Adult and immature snakes eat small mammals, invertebrates, and fish (NatureServe 2004). Their habitat requirements and feeding habits indicate giant garter snakes may be exposed to pulses of herbicide-treated water. Since no TRVs are available for reptiles, 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 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. Following the procedures provided by U.S. EPA (1993), a water concentration of 0.15 ppm is required to produce dietary exposure equal to 1.2 mg copper/kg/day. The risk to giant garter snakes can be mitigated as long as the water concentration in the entire reservoir does not exceed 0.15 ppm and this can be accomplished by applying copper to one-half the reservoir to achieve a targeted concentration of 0.5 ppm in the upper 7.5 ft of that portion of the reservoir.

Birds

Golden Eagle (*Aquila chrysaetos*)
Golden eagles breed in open and semi-open habitats from near sea level to 3,630 m (Poole and Bromely 1988 in Kochert et al. 2002, G.R. Craig pers. comm. in Kochert et al. 2002) including shrublands, grasslands, woodland-brushland, and coniferous forests (Kochert 1986 in Kochert et al. 2002). They also breed in farmland and riparian habitats (Kochert 1972 in Kochert et al. 2002, Menkens and Anderson 1987 in Kochert et al. 2002). In central California, they forage in open grassland habitat (Hunt et al. 1999 in Kochert et al. 2002). Golden eagles feed mainly on mammals (80-90% of prey items), secondarily on birds, and less often on reptiles, and fish during the nesting season (Olendorff 1976 in Kochert et al. 2002). Because their prey base is almost entirely terrestrial-based, exposure of golden eagles to herbicides in irrigation canals would be very low.

Burrowing Owl (*Athene cunicularia*)
Burrowing owls inhabit dry, open, shortgrass, treeless plains, and are often associated with burrowing mammals. They can also be found at golf courses, cemeteries, road allowances within cities, airports, vacant lots in residential areas and university campuses, and fairgrounds. The presence of a nest burrow seems to be a critical requirement for western burrowing owls (Thomsen 1971 in Haug *et al.* 1993, Martin 1973 in Haug *et al.* 1993, Zarn 1974 in Haug *et al.* 1993, Wedgwood 1978 in Haug *et al.* 1993, Haug 1985 in Haug *et al.* 1993). They typically forage in shortgrass, mowed, or overgrazed pastures; golf courses and airports (Thomsen 1971 in Haug *et al.* 1993). They are opportunistic feeders, eating primarily arthropods, small mammals, and birds. Amphibians and reptiles constitute a minor component to the diet and possibly only in Florida (Wesemann and Rowe 1987 in Haug *et al.* 1993). The terrestrial nature of

their foraging habitats and prey base indicate that exposure to herbicides applied to reservoirs will be insignificant.

Western Burrowing Owl (*Athene cunicularia hypogaea*)
See Burrowing Owl.

Oak Titmouse (*Baeolophus inornatus*)
In most areas, oak titmice are closely tied to warm, dry oak or oak-pine woodlands. They may use scrub oaks or other brush as long as woodland occurs nearby (Block 1989, 1990 in Cicero 2000). Oak titmice feed mainly on seeds and terrestrial invertebrates with plant material comprising the majority of the diet in fall and winter. They feed mostly from foliage or woody surfaces, and rarely from the ground (Hertz *et al.* 1976 in Cicero 2000, Root 1964 in Cicero 2000). The terrestrial nature of their foraging habitats and prey base indicate that exposure to herbicides applied to reservoirs will be insignificant.

Swainson's Hawk (*Buteo swainsoni*)
Swainson's hawks forage in open stands of grass-dominated vegetation, sparse shrublands, and small, open woodlands. They have adapted well to foraging in agricultural areas (*e.g.*, wheat and alfalfa), but cannot forage in most perennial crops or in annual crops that grow much higher than native grasses (Bechard 1982 in England et al. 1997, Estep 1989 in England et al. 1997, Woodbridge 1991 in England et al. 1997). In Central Valley, CA, they forage in row, grain, and hay crop agriculture, particularly during and after harvest, when prey are both numerous and conspicuous. The also are attracted to flood irrigation, primarily in alfalfa fields, when prey take refuge on field margins, and to field burning, which forces prey to evacuate (J.A. Estep per. comm. in England et al. 1997). During breeding season, Swainson's hawks mainly feed on vertebrates, including mammals, birds, and reptiles (Schmutz et al. 1980 in England et al. 1997, Bednarz 1988 in England et al. 1997). Invertebrates (especially grasshoppers and dragonflies) are commonly eaten at other times (McAtee 1935 in England et al. 1997, Sherrod 1978 in England et al. 1997, Jaramillo 1993 in England et al. 1997). Swainson's hawks do not prey on species likely to be exposed to herbicides in reservoirs, so they not likely to be exposed.

Lawrence's Goldfinch (*Carduelis lawrencei*)
Lawrence's goldfinches are typically found in arid and open woodlands near chaparral or other brushy areas; tall annual weed fields; and a water source such as a stream, small lake, or farm pond. Live oak and blue oak are predominant trees where this species nests (Linsdale 1950 in Davis 1999, Coutlee 1968 in Davis 1999). To a lesser extent, they also nest in riparian woodlands; chaparral, coastal scrub, open coniferous and broadleaf evergreen forests; pinyon-juniper woodlands; plantings of cypress, cedars, or junipers; and ranches or other rural residential areas near weedy fields and water sources (Grinnell and Miller 1944 in Davis 1999, Rosenberg *et al.* 1991 in Davis 1999). They mainly eat seeds of annual plants and some perennials. They are almost entirely granivorous, occasionally consuming fruit pulp and herbaceous materials. They rarely eat animal matter (Ortega 1945 in Davis 1999, Culbertson 1946 in Davis 1999, Linsdale 1957 in Davis 1999, Coutlee 1968 in Davis 1999). The terrestrial nature of their foraging habitats indicate that exposure to herbicides applied to reservoirs will be insignificant.

White-Tailed Kite (*Elanus leucurus*)
White-tailed kites inhabit low elevation grassland, agricultural, wetland, oak-woodland, or savannah habitats. Riparian areas adjacent to open areas are also used. Lightly grazed or un-grazed fields generally support larger prey populations, and are therefore preferred. Intensively cultivated areas are also used (Dunk 1995). Nests in trees (Stendell 1972 in Dunk 1995). They prefer to forage in un-grazed grasslands (Bammann 1975 in Dunk 1995). Wetlands dominated by grasses, and fence rows and irrigation ditches with residual vegetation adjacent to grazed lands (Bammann 1975 in Dunk 1995). They primarily eat

small mammals (Dunk 1995). Because they prey mostly on small mammals, the risk posed by treating reservoirs for the control of aquatic weeds is insignificant.

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.

Loggerhead Shrike (*Lanius ludovicianus*)
Loggerhead shrikes breed in open country with short vegetation, including pastures with fence rows, old orchards, mowed roadsides, cemeteries, golf courses, agricultural fields, riparian areas, and open woodlands (Yosef 1994 in Yosef 1996). They feed in open habitats characterized by well-spaced, often spiny, shrubs and low trees, usually interspersed with short grasses, forbs, and bare ground, including scrub lands, steppes, deserts, savannas, prairies, agricultural lands (particularly pastures and meadows with hedges or shrubs), and some suburban areas (Yosef 1996). They focus on arthropods, amphibians, small to medium-sized reptiles, small mammals and birds (Yosef 1996). Insects generally make the majority of the diet (up to 68%, Bent 1950 in Yosef 1996). Vertebrates are favored in the winter (Graber *et al.* 1973 in Yosef 1996, Kridelbaugh 1982 in Yosef 1996). Since insects such as beetles and grasshoppers are the major insect prey (Kridelbaugh 1982 in Yosef 1996), the risk posed by treating reservoirs for the control of aquatic weeds is insignificant.

Double-crested Cormorant (*Phalacrocorax auritus*)
Cormorants occupy a wide variety of aquatic habitats. In addition to feeding habitats, they require suitable places for daytime resting nighttime roosts. They perch on exposed sites such as rocks or sandbars, pilings, or trees near favored fishing sites. They forage in shallow water (< 8 m deep), typically less than 30 km from colony or roost. They occur on ponds, lakes, artificial impoundments, slow-moving rivers, lagoons, estuaries, and open coastlines (Hatch and Weseloh 1999). They consume almost entirely fish, in the size range of 3 – 40 cm, but mostly < 15 cm. Less frequently, they consume other aquatic prey, including insects, crustaceans, and amphibians (Palmer 1962 in Hatch and Weseloh 1999). Cormorants feeding on fish from the reservoir following treatment of copper for control of algae could be exposed to risk from the application of copper.

Nuttall's Woodpecker (Picoides nuttallii)
Nuttalls' woodpecker occur primarily in oak woodlands, and are also found in riparian woodlands, but rarely in coniferous forests (Lowther 2000). In riparian areas, they are commonly found in areas with willows and sycamores (Jenkins 1979 in Lowther 2000). In Yuba County, CA, they are found at 300 to 600 m elevation and associated most often with blue oak and interior live oak, also with California black oak, gray pine, California buckeye, and valley oak (Lowther 2000). They feed on trees such as oaks, and cottonwoods and willows of riparian habitats (Short 1971 in Lowther 2000). They feed on insects and other arthropods (Lowther 2000). Since they feed on terrestrial insects in trees, their exposure to herbicides used to control aquatic weeds in irrigation canals would be very limited.

Allen's Hummingbird (*Selasphorus rufus*)
Breeding habitat in the San Francisco Bay region includes mixed evergreen, Douglas fir, redwood, and Bishop pine forests; riparian woodlands; nonnative eucalyptus and planted cypress grove; occasionally

live oaks woodlands; and coastal scrub with at least a scattering of trees, such as north-facing slopes (Pitelka 1951 in Mitchell 2000, Legg and Pitelka 1956 in Mitchell 2000, Shuford 1993 in Mitchell 2000). They consume floral nectar and small insects (Mitchell 2000). The terrestrial nature of their foraging habitats indicate that exposure to herbicides applied to reservoirs will be insignificant.

Invertebrates

Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*)

These beetles live in very dense vegetation, often in vernal pools or fishless lakes. They spend summers buried in soil near the edge of the lake or once the vernal pool has dried up. They remain in the soil until the next winter's rain (pers. comm. Christopher Rogers, Ecoanalysts, Inc.). Because they are inactive and buried in soil outside of the reservoir for the duration of the project, they would not be exposed to risk from applications of copper to the reservoir for control of algae.

Plants

Delta Mudwort (*Limosella subulata*)

The Delta mudwort is a perennial non-native species that grows on the inter-tidal mudbanks of the Delta. It is typically found in association with riparian scrub habitat species (CNDDB 2004). Its blooming period is from May through August (CNDDB 2004). The TRV for aquatic plants is 0.06 ppm. The water concentrations within stands of emergent vegetation along the edges of the reservoir are likely to be low because of limited intrusion and mixing; therefore, the risk to exposure to copper following a copper-based herbicide is insignificant.

Rose-mallow (*Hibiscus lasiocarpus*)

Rose-mallow is a rhizomatous dicot in the Malvaceae family (CalFlora 2004). This native California species can be found in freshwater marsh habitat, but has also been known to grow on moist banks of rivers, streams, canals and ditches (CNDDB 2004). Potential habitat for this species is present in the project area. However, its potential exposure to canal water, if any, is through root uptake of soil water, which is not expected to be sufficient to cause risk.

Delta Tule Pea (*Lathyrus jepsonii* var. *jepsonii*)

The Delta tule pea is a perennial herb in the family Fabaceae that is native and endemic to California. Associated habitat with this plant includes freshwater-marsh and brackishwater-marsh (CalFlora 2004). This plant is often found in association with Typha spp., Aster lentus, Rosa California, Juncus spp., and Scirpus spp. (CNDDB 2004). The distribution of the Delta tule pea is limited to the Sacramento/San Joaquin River Delta (CNDDB 2004). The TRV for aquatic plants is 0.06 ppm. The water concentrations within stands of emergent vegetation along the edges of the reservoir are likely to be low because of limited intrusion and mixing; therefore, the risk to exposure to copper following a copper-based herbicide is insignificant.

Blue Skullcap (*Scutellaria lateriflora*)

Blue skullcap inhabits marshes and wet meadows at elevations of less than 500 m (CalFlora 2004). The TRV for aquatic plants is 0.06 ppm. The water concentrations within stands of emergent vegetation along the edges of the reservoir are likely to be low because of limited intrusion and mixing; therefore, the risk to exposure to copper following a copper-based herbicide is insignificant.

Eel-grass pondweed (*Potamogeton zosteriformis*)

Eel-grass pondweed is a submersed aquatic plant that can typically be found in freshwater marsh or wetlands, usually under natural conditions (CalFlora 2004). This species is native to California, but also occurs in other locations in North America. It flowers from July to September and produces fruit from

August through October (CNDDB 2004). The TRV for aquatic plants is 0.06 ppm. Should eel-grass pondweed be exposed to concentrations of copper that exceed 0.06 ppm, there is a potential for detrimental impact to this species.

Suisun Marsh Aster (*Aster lentus*)
Suisun Marsh Aster is a perennial herb in the Asteraceae family that is native to California (CalFlora 2004). It blooms from August through November, and produces small violet-colored flowers. This species is often found in brackish-water sloughs in association with Scirpus, Typha, Phragmites, and Rubus species (CNDDB 2004). The TRV for aquatic plants is 0.06 ppm. The water concentrations within stands of emergent vegetation along the edges of the reservoir are likely to be low because of limited intrusion and mixing; therefore, the risk to exposure to copper following a copper-based herbicide is insignificant.

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Appendix D

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, we applied these safety factors 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, we used the procedures suggested in the U.S. EPA's Wildlife Exposure Factors Handbook (1993). These procedures entailed determining the dietary habits of each species from published literature, determining food intake levels using body weights and metabolic rates, and herbicide uptake values for each dietary component. We used uptake rates or equations to calculate uptake rates published by the U.S. EPA (1999). For fish, exposure to contaminated water was the primary route considered and dietary exposure. For terrestrial plants, exposure only to drift from above-water applications 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 herbicide 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.

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.

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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 $\mu g/cm^2$ (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
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

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
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

[1] No criteria for LOEC provided.

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Appendix E

STATE OF CALIFORNIA

Governor's Office of Planning and Research

State Clearinghouse and Planning Unit

Arnold Schwarzenegger
Governor

Sean Walsh
Director

March 4, 2005

RECEIVED

MAR 7 2005

CITY OF ANTIOCH
COMMUNITY DEVELOPMENT

Phil Hoffmeister
City of Antioch
Antioch Public Works Department
P.O. Box 5007
Antioch, CA 94531-5007

Subject: Use of Copper Aquatic Pesticides to Control Aquatic Weeds in the Water Conveyances and Reservoirs
SCH#: 2005022006

Dear Phil Hoffmeister:

The State Clearinghouse submitted the above named Negative Declaration to selected state agencies for review. The review period closed on March 3, 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

Document Details Report
State Clearinghouse Data Base

SCH# 2005022006
Project Title Use of Copper Aquatic Pesticides to Control Aquatic Weeds in the Water Conveyances and Reservoirs
Lead Agency Antioch, City of

Type Neg Negative Declaration
Description The use of copper to treat algae and aquatic weeds in water conveyances and reservoirs.

Lead Agency Contact

Name Phil Hoffmeister
Agency City of Antioch
Phone (925) 779-7035 **Fax**
email
Address Antioch Public Works Department
P.O. Box 5007
City Antioch **State** CA **Zip** 94531-5007

Project Location

County Contra Costa
City Antioch
Region
Cross Streets Golf Course Road, Lone Tree Road
Parcel No.
Township 1N **Range** 2E **Section** Var. **Base** MDB&M

Proximity to

Highways 4
Airports
Railways
Waterways
Schools
Land Use Residential and Open Space

Project Issues Aesthetic/Visual; Agricultural Land; Air Quality; Noise; Schools/Universities; Toxic/Hazardous; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Wildlife; Other Issues

Reviewing Agencies Resources Agency; Department of Fish and Game, Region 3; Department of Parks and Recreation; Department of Water Resources; California Highway Patrol; Caltrans, District 4; Department of Health Services; Regional Water Quality Control Board, Region 2; Regional Water Quality Control Bd., Region 5 (Sacramento); Native American Heritage Commission; Department of Pesticide Regulation

Date Received 02/01/2005 **Start of Review** 02/02/2005 **End of Review** 03/03/2005

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

State Implementation Plan (SIP) Section 5.3 Exception Information Sheet

The Control of Aquatic Weeds in Stafford Lake Using Copper

City of Antioch Public Works Department

March 23, 2005

1. **Notification.** The City of Antioch Public Works Department (Department) will notify potentially effected public and governmental agencies of the project. The project is described in the Department's Initial Study/Mitigated Negative Declaration (IS/MND) dated March 23, 2005.
2. **Description of the Proposed Action.** The proposed action is the application of copper aquatic pesticides to the city's reservoir for the purposes of controlling weeds and algae. For a more detailed description, see the Department'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 weeds equals or exceeds thresholds established by the Department.
5. **Discharge and Receiving Water Quality Monitoring Plan.** The Department 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.** In the event that the Department cannot use the SIP exception regarding the use of copper to control aquatic weeds, manual control and/or aeration may be an option in some areas.
7. **Identification of Alternate Water Supply.** The city's reservoir provides less than 20% of the city's water supply. The majority (80%) of its supply is from other sources such as the Contra Costa Water District.
8. **Residual Waste Disposal Plans.** The Department'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 Department 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.