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# **Use of Copper To Control Aquatic Vegetation In Water Conveyances**

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## **California Environmental Quality Act Initial Study And Mitigated Negative Declaration**

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**June 19, 2014**

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# Use of Copper To Control Aquatic Vegetation In Water Conveyances

## CEQA Initial Study & Mitigated Negative Declaration

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## 1.0 PROJECT DESCRIPTION

### 1.1 *Introduction and Environmental Setting*

Reclamation District 1000 (herein referred to as the “District”) operates over 180 miles of stormwater canals and drains within its 55,000 acre jurisdiction. The District is located in northern Sacramento and southern Sutter counties. The District is bordered by the Sacramento River to the west and the American River to the south. The District includes an area of Sacramento generally referred to as Natomas. Refer to **Figure 1** and **Figure 2**.

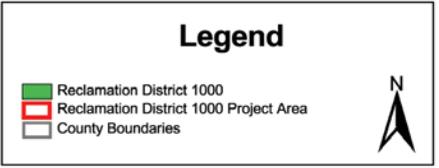
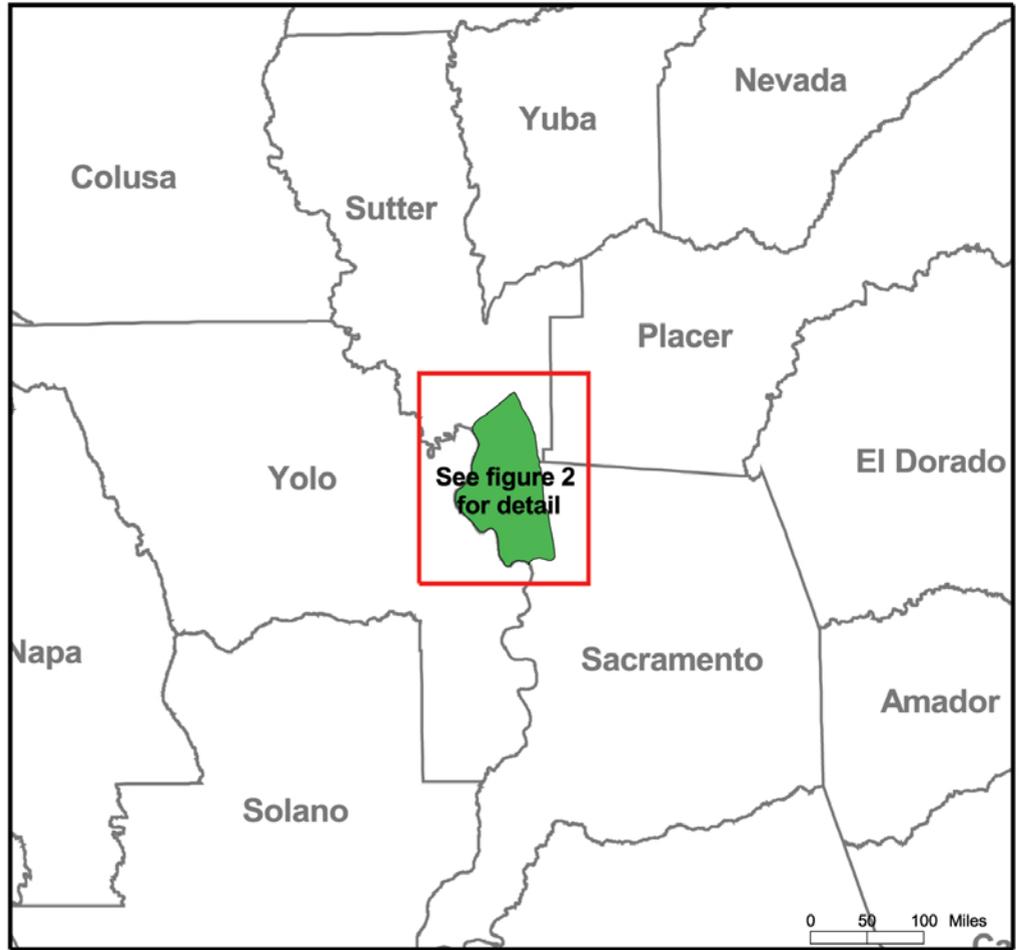
The District’s mission is public safety. It is responsible, per the State Water Code, for providing flood protection to the properties in the District. Though much of the northern part of the District is agriculture, the southern one-third of the District is highly urbanized with over 100,000 residents, numerous businesses, and schools. In addition, the District’s flood control system protects Sacramento International Airport. The District is responsible for collecting the stormwater and agricultural runoff from the entire basin and safely discharging it back into the adjacent rivers and streams through a system of pumping plants.

Nuisance algae and aquatic vegetation, including a growing number of non-native invasive plants, grow in and along the District’s flood control facilities. The presence of algae and aquatic weeds in these facilities adversely impacts District operations by impeding stormwater flows during a flood event and/or blocking culvert crossings at roadways with the potential to cause overtopping and flooding of adjacent property. During the non-flood season these aquatic weeds adversely impact water conservation efforts through the re-use of tailwater and urban runoff by agriculture and restrict agricultural drainage capacity potentially flooding planted fields. As such, the District has determined the need to use algaecides and aquatic herbicides to control problem aquatic vegetation and algae. Without this tool, the District would have to increase its maintenance activities including more frequent cleanouts of the canals using mechanical equipment.

Using Integrated Pest Management (IPM) techniques, the District plans to use a variety of aquatic herbicides, including herbicides containing copper on an “as-needed” basis to achieve aquatic weed control necessary for efficient water conveyance.

Depending on weed presence and density, aquatic herbicides containing copper may be applied at locations throughout the District’s conveyance system. Applications may be made if the District’s IPM thresholds are met, or are expected to be met, based on the weather, weed density, weed growth or predicted growth, water demand, or water level in the system. Some years, aquatic herbicides may not be used if thresholds are not met. Applications of aquatic herbicides are typically made between March and November. Applications may be made throughout the District’s water conveyance system. There would be no aquatic herbicide applications directly to the Sacramento River. Water must be actively pumped from the conveyance system before entering the Sacramento River. Pumping of water to the River does not typically occur.

The “Project” is defined as the District’s short-term or seasonal applications of aquatic herbicides that contain copper to water conveyances to control a variety of aquatic vegetation as needed for the efficient movement of stormwater and reclaimed water.



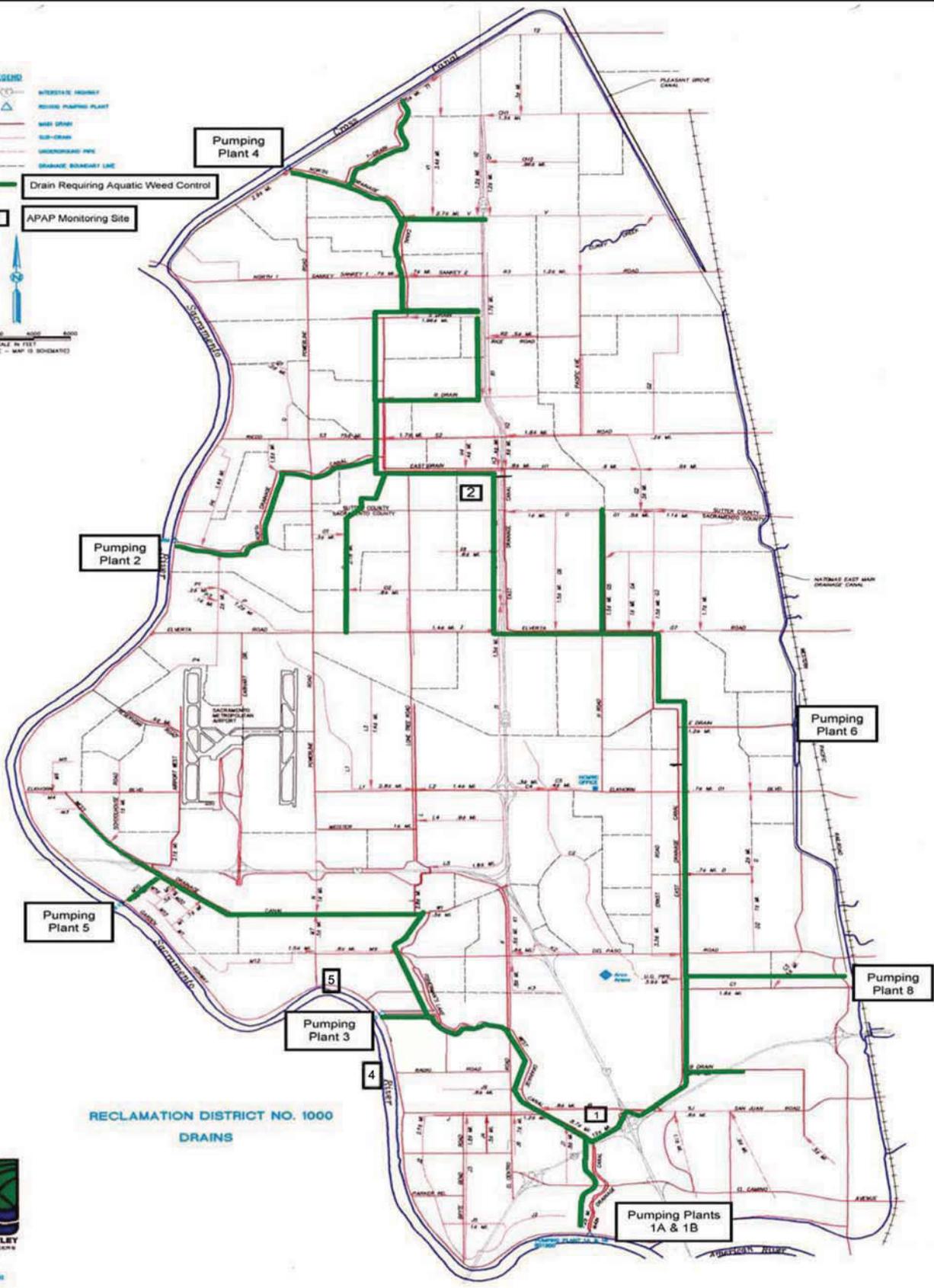
**LEGEND**

- INTERSTATE HIGHWAY
- REGULATED PUMPING PLANT
- MAJOR DRAIN
- MINOR DRAIN
- UNDERGROUND PIPE
- DRAINAGE BOUNDARY LINE

Drain Requiring Aquatic Weed Control

1 APAP Monitoring Site

SCALE IN FEET  
(APPROXIMATE - MAP IS SCHEMATIC)



**Blankinship & Associates, Inc.**  
Agricultural & Environmental  
Scientists & Engineers

**Reclamation District  
1000  
Project Detail Map**

**Figure  
2**

## 1.2 Regulatory Setting

On June 4, 2004, The State Water Resources Control Board (SWRCB) released the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States, #CAG990005. This permit expired in May 2009, but was administratively continued until November 30, 2013. The Statewide General National Pollutant Discharge Elimination System (NPDES Permit for Residual Aquatic Pesticide Discharges to Water of the United States from Algae and Aquatic Weed Control Applications (“Permit”) was adopted on March 5, 2013 and became available on December 1, 2013 (SWRCB 2013). 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, 2005)
- The California Toxics Rule (CTR) (CTR, 2000)
- Applicable Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (WQOs) (RWQCB, 2003)

The SIP assigns effluent limitations for CTR priority pollutants, including the aquatic herbicide copper. Further, the SIP prohibits discharges of priority pollutants in excess of applicable water quality criteria outside the mixing zone.<sup>1</sup>

Although the SIP prohibits the discharge of copper in excess of applicable water quality criteria into receiving waters, Section 5.3 of the SIP allows for short-term or seasonal exceptions if determined to be necessary to implement control measures either (1) for resource or pest management conducted by public entities to fulfill statutory requirements, or (2) regarding drinking water conducted to fulfill statutory requirements under the federal Safe Drinking Water Act or the California Health and Safety Code. Exceptions may also be granted for draining water supply reservoirs, canals, and pipelines for maintenance, for draining municipal storm water conveyances during cleaning or maintenance, or for draining water treatment facilities during cleaning or maintenance. The District has concluded that it meets one or more of the criteria for gaining a Section 5.3 SIP exception.

Permittees who elect to use a SIP exception must satisfactorily complete several steps, including preparation and submission of an application and California Environmental Quality Act (CEQA) document to SWRCB. Consistent with Section IX.C.1.a. of the Permit, entities may be added to Attachment G of the Permit if they have qualified for a SIP Section 5.3 exception<sup>2</sup>. Accordingly, when the application and CEQA process is complete, and a short-term or seasonal exemption from meeting the receiving water limit for copper is granted, Attachment G of the Permit will be revised to list RD 1000's exemption and RD 1000 may apply aquatic

<sup>1</sup> 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.”

<sup>2</sup> The SWRCB has indicated that the Permit may be re-opened for additional CEQA document submission on an as-needed basis.

herbicides in accordance with the Permit as revised. This document must be submitted to the SWRCB for the permittee to place on Attachment G of the Permit, and subsequently be afforded coverage.

### **1.3 Required Approvals**

The SWRCB must approve the District's application for a SIP Section 5.3 exception to the CTR criterion for copper. The District will submit the following documents to the SWRCB for acceptance:

- a. A detailed description of the proposed action;
- b. The proposed method of completing the action;
- c. A time schedule;
- d. A discharge and receiving water quality monitoring plan (before project initiation, during project implementation, and after project completion, with the appropriate quality assurance and quality control procedures);
- e. Contingency plans (to the extent applicable);
- f. CEQA documentation and notification of potentially affected agencies; and

Upon completion of each seasonal or short-term application of aquatic herbicides that contain copper, the District shall provide certification by a qualified biologist that the receiving water beneficial uses have been restored.

### **1.4 Required Notifications**

#### **1.4.1 California Department of Fish and Wildlife**

At the beginning of each season, prior to applications of copper, the District will send a written notification of intent to use copper to the California Department of Fish and Wildlife (CDFW).

#### **1.4.2 NPDES Aquatic Pesticide Permit Notifications**

Every calendar year, at least 15 days prior to the first application of copper-containing aquatic herbicide, the District will notify potentially affected public agencies. The District may post the notification on its website if possible. The notification must include the following information:

1. A statement of the District's intent to apply algaecide or aquatic herbicide(s);
2. Name of algaecide and aquatic herbicide(s);
3. Purpose of use;
4. General time period and locations of expected use;
5. Any water use restrictions or precautions during treatment; and
6. A phone number that interested persons may call to obtain additional information from the District.

### **1.5 Standard Operating Procedures**

Farms and other users within the District are provided with water from the Natomas Mutual Water Company (NMWC), which draws water from the Sacramento River. Generally, water within the District drains from north to south. During the irrigation season, the NMWC installs a system of water control structures and pumps at various locations in the District's canal system to return water to the north end of the District for reuse in the agricultural fields as a water conservation measure. The District operates a closed system during herbicide application events as water transfer within the District is entirely contained and does not leave the District without the assistance of pumps.

As noted above, the District's sole responsibility is flood control and the District cooperates with the City of Sacramento, and the Counties of Sacramento and Sutter for the management of stormwater. Stormwater is captured in a network of drains as shown on Figure 2. These drains transfer water to pumping plants that return water to either the Natomas Cross Canal leading to the Sacramento River, the Sacramento River, or the Natomas East Main Drainage Canal (NEMDC) which leads to the American River. Typically during storm events, pump plants operate in the following order of priority: Plant #8, Plant #4, Plant #1B, and Plant #3. The other pumping plants shown on Figure 2 are used if the capacity of the primary plants is exceeded.

Refer to **Figure 1** and **Figure 2**.

The District implements an Integrated Pest Management (IPM) program for aquatic weed control pursuant to the applicable NPDES permit. 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 herbicides on an "as-needed" basis to achieve the aquatic weed control in its conveyances necessary to move water.

Prior to application of aquatic herbicides, including herbicides containing copper, the following tasks will be 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 D**.
2. All District personnel applying herbicides review and strictly adhere to the aquatic herbicide product label that has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label for an herbicide that contains copper is included in **Appendix E**.
3. All District personnel applying herbicides review and consult the aquatic herbicide Material Safety Data Sheet (MSDS) (an example is provided in **Appendix E**), 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 herbicide.
4. The condition of water conveyances being treated is field-evaluated to ensure that the application is necessary, feasible, and can be conducted safely and according to label. This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of aquatic herbicide to be applied.
5. Notifications, as needed, are sent to the potentially affected public agencies and the California Department of Fish and Wildlife (CDFW).
6. Prior to an application, District personnel inspect and seal any emergency spill structures with boards and plastic, as necessary if control structures are leaking.

During and after an aquatic herbicide application, the following task will be accomplished:

1. Control small leaks (< 1 gallon per minute) that may develop at control structures with sand bags, installation of additional plastic around boards, temporary dikes, pumps, or by lowering the level of treated water below the elevation of the leak if necessary or practicable.

This action will effectively prevent the release of water treated with aquatic herbicide from leaving a water conveyance.

## 2.0 INITIAL STUDY

This document was prepared in a manner consistent with Section 21064.5 of the California Public Resources Code 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 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 less-than-significant levels.

## ***2.1 CEQA Initial Study & Environmental Check List Form***

- 1. Project Title:** Use of Copper to Control Aquatic Vegetation in Water Conveyances
- 2. Lead Agency Name and Address:** Reclamation District 1000  
1633 Garden Highway  
Sacramento, California 95833
- 3. Contact Person & Phone Number:** Paul Devereux, General Manager  
(916) 922-1449
- 4. Project Location:** Sacramento and Sutter Counties, California
- 5. Project Sponsor’s Name and Address:** See #2. above
- 6. General Plan Land Use Designation:** Agriculture/Airport/Residential/Flood Control/  
Commercial (SAFCA, 2009)
- 7. Zoning:** Agriculture/Commercial/Residential (SAFCA, 2009)
- 8. Description of Project:** See Section 1.0
- 9. Surrounding Land Uses and Setting:** Agriculture/Airport/Residential/Commercial (SAFCA,  
2009)
- 10. Other Agencies Whose Approval is Required:** See Sections 1.3 and 1.4

**2.2 Environmental Factors Potentially Affected**

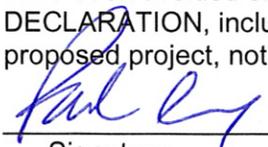
The environmental factor checked below would be potentially affected by the proposed Project, involving at least one impact that is a ‘Potentially Significant Impact’ as indicated by the checklist on the following pages:

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

06/21/2014  
 \_\_\_\_\_  
 Date

\_\_\_\_\_  
 Paul Devereux  
 Printed Name

\_\_\_\_\_  
 Reclamation District 1000  
 For

**3.0 EVALUATION OF ENVIRONMENTAL IMPACTS**

**3.1 Aesthetics**

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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**Would the Project:**

a) Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially degrade the existing visual character or quality of the site and its surrounding?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Discussion**

Items a) & b): **No Impact.** There are no designated scenic vistas, state scenic highways, or scenic resources in the vicinity of the Project sites, therefore no impact would occur.

Item c): **No Impact.** The Project involves the short-term or seasonal application of aquatic herbicides that contain copper to water conveyances in the District to control a variety of aquatic vegetation. These weeds are typically at or below the water surface. Upon control, the removal of these weeds would be unnoticed and would 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
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**Would the Project:**

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

#### Discussion

Items a) through c): **No Impact.** The Project will not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use, conflict with existing zoning or agricultural use, or a Williamson Act contract, or otherwise result in the conversion of Farmland to non-agricultural use. To the contrary, the Project accomplishes objectives that maintain and enhance agricultural land use by efficiently moving water and preventing or mitigating potential flood damage.

### 3.3 Air Quality

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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**Would the Project:**

a) Conflict with or obstruct implementation of the applicable air quality plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal and state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Create objectionable odors affecting a substantial number of people?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

### Discussion

Items a) & b): **No Impact.** The Project requires the use of pick-up and flatbed trucks for purposes of transporting aquatic herbicides to locations where they are needed. Pick-up trucks are also used for purposes of site reconnaissance before, during, and after application of aquatic herbicides. Short-term vehicle emissions will be generated during aquatic herbicide application; however, they will be minor and only be applied on an “as-needed” basis throughout the year. To minimize impacts, all equipment will be properly tuned and muffled and unnecessary idling will be minimized. Generally one or two vehicles are used for the transport and application of the herbicide. As needed, the District may use a small generator or gas-powered pump during the course of application. The District may also use a watercraft with a small outboard motor in some locations where application from the banks is not feasible. Boat based applications are generally limited to one or two days per year. None of the above vehicles or application equipment is expected to conflict with air quality plans or violate air quality standards.

The District is located in the Sacramento Valley Air Basin (SVAB), which includes the following counties: Butte, Colusa, East Solano, Glenn, Placer, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba. The application of aquatic herbicides does not conflict with the NSVAB 2009 Air Quality Attainment Plan, violate any air quality standards, or contribute to

an existing or projected violation based on data available from the Yolo-Solano Air Quality Management District and Sacramento Metropolitan Air Quality Management District.

Item c): **No Impact.** Levels of ozone and suspended matter (PM<sub>2.5</sub>) in Sacramento County have exceeded California Clean Air standards, and therefore the area is considered a “nonattainment” area for these pollutants. Sacramento was re-designated as in attainment for PM<sub>10</sub> standards as there have been no measured violations since 1998. In Sutter County, levels of ozone and suspended matter (PM<sub>2.5</sub> and PM<sub>10</sub>) do not meet California Clean Air standards, and therefore the area is considered “nonattainment” for both. Although neither area is in attainment for both PM<sub>2.5</sub> and ozone California Clean Air standards, and Sutter County is also nonattainment for PM<sub>10</sub>, the Project will not increase either of these criteria pollutants.

Items d) & e): **No Impact.** Aquatic herbicides containing copper will be applied by District personnel or their contractors. Applications will typically take place in agricultural areas rarely frequented by people. While some applications may take place in more urban areas, these are typically brief in duration and made infrequently (i.e. one or two days per year). Applications will not be made near schools, playgrounds, health care facilities, day care facilities, and athletic facilities, thereby eliminating exposure to these sensitive receptors and creating no impact. Similarly, there will be no objectionable odors that affect a substantial number of people.

### 3.4 Biological Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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**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?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

Item a): **Less Than Significant Impact.** A list of current special status species was compiled from the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDDB), 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, 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 **Table 1** and more detailed species life history information can be found in **Appendix A**. Physical, chemical and toxicological data on copper is presented in **Appendix B**.

With two exceptions, no special status species has habitat in or near, or is otherwise expected to be exposed to aquatic herbicides used for the Project.

The two species that may be at risk are the western pond turtle (WPT) and the giant garter snake (GGS). A GGS could move from rice fields, constructed habitat, or natural water bodies within and near the District, and enter treated canals. WPTs may bask on the shore of conveyances, or on logs or other floating structures in slow moving or static parts of canals; they may enter the water when startled or to forage for prey. Once in a treated conveyance, a WPT or GGS may be exposed to copper through contact with treated water, ingestion of treated water, or consumption of prey items that may have had contact with treated water.

**Table 1. Species and Habitat Summary**

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
<b>AMPHIBIAN</b>						
California tiger salamander	<i>Ambystoma californiense</i>	FT, SCSC	Herbaceous wetland, temporary pool; Grassland/herbaceous, Savanna, Woodland - Hardwood; Benthic, Burrowing in or using soil		X (1)	
western spadefoot toad	<i>Spea hammondi</i>	SCSC	Lowlands to foothills; grasslands, open chaparral, pine-oak woodlands. Prefers shortgrass plains, sandy or gravelly soil. Fossorial. Breeds in temporary rain pools and slow-moving streams		X (2)	

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
<b>BIRD</b>						
Cooper's hawk	<i>Accipiter cooperii</i>	WL	Woodland, chiefly of open, interrupted, or marginal type; nest sites mainly in riparian growths of deciduous trees		X (3)	
tricolored blackbird	<i>Agelaius tricolor</i>	SCSC	Fresh-water marshes of cattails, tule, bulrushes and sedges; Cropland/hedgerow, Grassland/herbaceous		X (4)	
Grasshopper sparrow	<i>Ammodramus savannarum</i>	SCSC	Dense grasslands on rolling hills, lowland plains, in valleys & on hillsides on lower mountain slopes	X		
Golden eagle	<i>Aquila chrysaetos</i>	SFP	Rolling foothills, mountain areas, sage-juniper flats, and desert	X		
Great egret	<i>Ardea alba</i>	None	Colonial nester in large trees; rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes		X (5)	
Great blue heron	<i>Ardea Herodias</i>	None	Colonial nester in tall trees, cliffsides, and sequestered spots on marshes		X (5)	
burrowing owl	<i>Athene cunicularia</i>	SCSC	Agriculture/Rangeland, Grassland		X (4)	
Ferruginous hawk	<i>Buteo regalis</i>	WL	Open grasslands, sagebrush flats, desert scrub, low foothills & fringes of Pinyon-Juniper habitats	X		
Swainson's hawk	<i>Buteo swainsoni</i>	ST	Cropland/hedgerow, Desert, Grassland/herbaceous, Savanna, Woodland - Mixed		X (4)	
western snowy plover	<i>Charadrius alexandrinus nivosus</i>	SCSC	Sandy beaches, alkali lakeshores and dry evaporation ponds; un-vegetated open areas, primarily in sand dunes, for nest sites	X		
mountain plover	<i>Charadrius montanus</i>	SCSC	Recently plowed fields, sparsely vegetated fields, and pastureland with little to no vegetative growth	X		
western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	FC, SE	Open woodland parks, deciduous riparian woodland; requires patches of at least 10 hectares (25 acres) of dense riparian forest with a canopy cover of at least 50 percent in both the understory and overstory	X		
Snowy egret	<i>Egretta thula</i>	None	Colonial nester, with nest sites situated in protected beds of dense tules		X (5)	
White-tailed kite	<i>Elanus leucurus</i>	SFP	Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland		X (3)	
Merlin	<i>Falco columbarius</i>	WL	Seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands and deserts, farms and ranches	X		
Song sparrow ("Modesto" population)	<i>Melospiza melodia</i>	SCSC	Fresh-water marshes and riparian thickets	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
Black-crowned night heron	<i>Nycticorax nycticorax</i>	None	Colonial nester, usually in trees, occasionally in tule patches		X (5)	
Double-crested cormorant	<i>Phalacrocorax auritus</i>	WL	Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state		X (5)	
White-faced ibis	<i>Plegadis chihi</i>	WL	Shallow fresh-water marsh	X		
Purple martin	<i>Progne subis</i>	SCSC	Inhabits woodlands, low elevation coniferous forest of douglas-fir, ponderosa pine, & Monterey pine	X		
bank swallow	<i>Riparia riparia</i>	ST	riparian and other lowland habitats; requires vertical banks/cliffs with fine soils		X (5)	
Least Bell's vireo	<i>Vireo bellii pusillus</i>	FE, SE	Summer resident of southern California in low riparian in vicinity of water or in dry river bottoms; below 2000 feet		X (4)	
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	SCSC	Nests in freshwater emergent wetlands with dense vegetation and deep water; often along borders of lakes or ponds		X (3)	
<b>FISH</b>						
Sacramento perch	<i>Archoplites interruptus</i>	SCSC	Historically found in the sloughs, slow-moving rivers, and lakes of the central valley	X		
chinook salmon spring run	<i>Oncorhynchus tshawytscha</i> spring run	FT, ST	Sacramento River and Tributaries	X		
chinook salmon winter run	<i>Oncorhynchus tshawytscha</i> winter run	FE, SE	Sacramento River and Tributaries	X		
Sacramento splittail	<i>Pogonichthys macrolepidotus</i>	SCSC	Lakes, Slow-moving Rivers with Vegetated Floodplain, Tidal Estuarine Marsh	X		
Longfin smelt	<i>Spirinchus thaleichthys</i>	ST, SCSC	Euryhaline, nektonic, and anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column	X		
Eulachon	<i>Thaleichthys pacificus</i>	FT, SCSC	Found in Klamath river, Mad River, Redwood creek & in small numbers in Smith river & Humboldt Bay tributaries	X		
<b>MAMMAL</b>						
pallid bat	<i>Antrozous pallidus</i>	SCSC	Deserts, grasslands, shrublands, woodlands & forests. Most common in open, dry habitats with rocky areas for roosting		X (3)	
Silver-haired bat	<i>Lasiorycteris noctivagans</i>	None	Primarily a coastal and montane forest dweller feeding over streams, ponds, & open brushy areas		X (4)	
western red bat	<i>Lasiurus blossevillii</i>	SCSC	Along riparian and agricultural areas in broadleaf tree communities throughout the Central Valley		X (3)	

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
hoary bat	<i>Lasiurus cinereus</i>	None	Prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding		X (3)	
American badger	<i>Taxidea taxus</i>	SCSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats. Preys on burrowing rodents; digs burrows for dens and during foraging activities	X		
<b>REPTILE</b>						
Western pond turtle	<i>Emys marmorata</i>	SCSC	Thoroughly aquatic turtle of ponds, marshes, rivers, streams & irrigation ditches, usually with aquatic vegetation			X
giant garter snake	<i>Thamnophis gigas</i>	FT, ST	prefers freshwater marsh and low gradient streams, has adapted to drainage canals and irrigation ditches			X
<b>INVERTEBRATE</b>						
Vernal pool andrenid bee	<i>Andrena subapasta</i>	None	Collects pollen primarily from <i>arenaria californica</i> but also <i>orthocarpus erianthus</i> & <i>lasthenia</i> sp.	X		
Antioch Dunes anthicid beetle	<i>Anthicus antiochensis</i>	None	Extirpated from Antioch dunes but present in several localities along the Sacramento and Feather Rivers	X		
Sacramento anthicid beetle	<i>Anthicus sacramento</i>	None	Restricted to sand dune areas	X		
Conservancy fairy shrimp	<i>Branchinecta conservatio</i>	FE	Vernal Pools	X		
vernal pool fairy shrimp	<i>Branchinecta lynchi</i>	FT	Vernal Pools	X		
Midvalley fairy shrimp	<i>Branchinecta mesoallensis</i>	None	Vernal pools in the Central Valley	X		
Sacramento Valley tiger beetle	<i>Cicindela hirticollis abrupta</i>	None	Sandy floodplain habitat in the Sacramento valley	X		
valley elderberry longhorn beetle	<i>Desmocerus californicus dimorphus</i>	FT	Riparian areas; on valley elderberry plants		X (6)	
Hairy water flea	<i>Dumontia oregonensis</i>	None	Vernal pools. In California, known only from Mather field.	X		
Ricksecker's water scavenger beetle	<i>Hydrochara rickseckeri</i>	None	Aquatic, vernal pool habitat	X		
vernal pool tadpole shrimp	<i>Lepidurus packardii</i>	FE	Vernal Pools	X		
California linderiella	<i>Linderiella occidentalis</i>	None	Seasonal pools in unplowed grasslands with old alluvial soils underlain by hardpan or in sandstone depressions	X		
Antioch multillid wasp	<i>Myrmosula pacifica</i>	None		X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
<b>PLANT</b>						
Ferris's milk-vetch	<i>Astragalus tener</i> var. <i>ferrisiae</i>	CNPS-1	Grassland	X		
alkali milk-vetch	<i>Astragalus tener</i> var. <i>tener</i>	CNPS-1	Alkali areas of floodplains; Vernal Pools	X		
heartscale	<i>Atriplex cordulata</i>	CNPS-1	Alkali Scrub or Grassland	X		
brittlescale	<i>Atriplex depressa</i>	CNPS-1	Alkali Scrub or Grassland, Vernal Pools	X		
San Joaquin spearscale	<i>Astragalus tener</i> var. <i>tener</i>		Alkali scrub, grasslands	X		
Big-scale balsamroot	<i>Balsamorhiza macrolepis</i>	CNPS-1	Chaparral, valley and foothill grassland, cismontane woodland	X		
Bristly sedge	<i>Carex comosa</i>	CNPS-2	Marshes and swamps		X (7) (8)	
Hispid salty bird's-beak	<i>Chloropyron molle</i> ssp. <i>hispidum</i>	CNPS-1	Meadows and seeps, playas, valley and foothill grassland	X		
palmate-bracted salty bird's-beak	<i>Chloropyron palmatum</i>	FE, SE, CNPS-1	Chenopod scrub, valley and foothill grassland	X		
Peruvian dodder	<i>Cuscuta obtusiflora</i> var. <i>glandulosa</i>	CNPS-2	Marshes and swamps (freshwater)		X (7) (9)	
dwarf downingia	<i>Downingia pusilla</i>	CNPS-2	Valley and foothill grassland (Mesic sites), vernal pools	X		
Boggs Lake hedge-hyssop	<i>Gratiola heterosepala</i>	SE, CNPS-1	Marshes and swamps (freshwater), vernal pools		X (7) (8)	
wooly rose-mallow	<i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i>	CNPS-1	Freshwater Marsh		X (7)	
Northern California black walnut	<i>Juglans hindsii</i>	CNPS-1	Riparian forest, riparian woodland.	X		
Ahart's dwarf rush	<i>Juncus leiospermus</i> var. <i>ahartii</i>	CNPS-1	Vernal pools, valley and foothill grassland	X		
Red Bluff dwarf rush	<i>Juncus leiospermus</i> var. <i>leiospermus</i>	CNPS-1	Chaparral, valley and foothill grassland, cismontane woodland, vernal pools, meadows and seeps	X		
Legenere	<i>Legenere limosa</i>	CNPS-1	Vernal pools	X		
Heckard's pepper-grass	<i>Lepidium latipes</i> var. <i>heckardii</i>	CNPS-1	Grassland, Vernal Pools	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
Mason's lilaepsis	<i>Lilaeopsis masonii</i>	CNPS-1	Freshwater and brackish marshes, riparian scrub	X		
Baker's navarretia	<i>Navarretia leucocephala ssp. bakeri</i>	CNPS-1	Grassland, Coniferous Forest, Oak Woodland, Vernal Pools	X		
pincushion navarretia	<i>Navarretia myersii ssp. myersii</i>	CNPS-1	Vernal pools	X		
Colusa grass	<i>Neostapfia colusana</i>	FE, SE, CNPS-1	Vernal pools	X		
slender Orcutt grass	<i>Orcuttia tenuis</i>	FT, SE, CNPS-1	Vernal pools	X		
Sacramento Orcutt grass	<i>Orcuttia viscida</i>	FE, SE, CNPS-1	Vernal pools	X		
bearded popcornflower	<i>Plagiobothrys hystriculus</i>	CNPS-1	Vernal pools, valley and foothill grassland	X		
Sanford's arrowhead	<i>Sagittaria sanfordii</i>	CNPS-1	Marshes and swamps		X (7) (8)	
Suisun Marsh aster	<i>Symphotrichum lentum</i>	CNPS-1	Marshes and swamps (brackish and freshwater)		X (7) (8)	
saline clover	<i>Trifolium hydrophilum</i>	CNPS-1	Marshes and swamps, valley and foothill grassland, vernal pools		X (7) (9)	
Crampton's tuctoria or Solano grass	<i>Tuctoria mucronata</i>	FE, SE, CNPS-1	Vernal pools, valley and foothill grassland	X		

**Table 1 Numbered Notes:**

- (1) Species not present in water during application due to aestivation (summer-time dormancy).
- (2) This is a terrestrial species that is known to enter water only during parts of its' reproductive cycle. This period of time does not coincide with the application period of aquatic herbicides.
- (3) Species not likely to have any exposure as its target prey base consists of terrestrial species.
- (4) Species forage for emergent aquatic insects over water. But, given the large amount of potential foraging area, the emergent aquatic insects from water conveyances treated with aquatic herbicides would likely only contribute an insignificant percentage of the total diet. Therefore, no risk due to exposure to aquatic herbicides containing copper is anticipated.
- (5) Species may forage in the shallow water at the margins of District conveyances. Given the large amount of potential foraging area, the food items from water conveyances treated with aquatic herbicides would likely only contribute an insignificant percentage of the total diet. Therefore, no risk due to aquatic herbicides containing copper is anticipated.

- (6) The habitat of the valley elderberry longhorn beetle is limited exclusively to elderberry bushes (*Sambucus* spp.). Elderberry bushes are terrestrial species. Accordingly, irrigation water containing aquatic herbicides is unlikely to come into contact with these plants. Therefore, no risk is present to elderberry bushes or valley elderberry longhorn beetles.
- (7) Species is not an emergent plant and therefore is not expected to grow in standing water but may grow on moist banks of canals or ditches. Exposure to water in District conveyances containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of plants. As such, the copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.
- (8) According to The CalFlora Database, no reported occurrences of these species exist within the Project area.
- (9) According to The CalFlora Database, no reported occurrences of these species exist within any of the counties in the Project area.

**Table 1 Status Abbreviation:**

FC = Federally Listed Candidate Species  
FE = Federally Listed as Endangered  
FT = Federally Listed as Threatened  
SCSC = State Listed Species of Concern  
SE = State Listed as Endangered  
SFP = State Listed as Fully Protected  
ST = State Listed as 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  
WL= Department of Fish and Game Watch List

*(Continued Item a): Discussion)*

**Methods for Estimating Risk**

The United States Environmental Protection Agency (USEPA) has developed Toxicity Reference Values (TRVs) for many chemicals. However, published TRVs generally do not exist for herbicides. Therefore, herbicide-specific TRVs were derived as part of this document (USEPA 1999). Endpoints from studies available from the published literature or government reports and databases can be used to establish TRVs. The endpoints used to estimate risk of copper to the giant garter snake (GGS) and western pond turtle (WPT) were found in USEPA's OPP database (2014).

The USEPA (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.

Often, no herbicide-specific toxicity results are available for various taxonomic groups. For example, database and literature searches for copper toxicity testing of reptiles did not yield any useable studies. In this case, avian (bird) toxicity endpoints were used in place of specific toxicity values for the GGS and WPT. The uncertainty involved with using avian

endpoint data to estimate risk to a reptile species does not require the application of an additional safety factors (EPA 2004).

Once a TRV has been derived, it may be compared to an exposure estimate to evaluate whether an adverse effect for a given species is likely to occur. Exposures are estimated using parameters from the Wildlife Exposure Factors Handbook (1993). If an estimated exposure is lower than the derived TRV, the exposure scenario is not considered to pose a risk.

Risk is estimated by comparing the estimated environmental concentration (EEC) an organism may be exposed to to the derived TRV to estimate a risk. Risk may be present when the EEC divided by the TRV is greater than or equal to 1.0. Risk is likely not present if the result is less than 1.0.

$$\text{Risk} = \text{EEC}/\text{TRV}$$

Where:

EEC = Estimated Environmental Concentration

TRV = derived Toxicity Reference Value

### **Copper Discussion**

Since no useable published TRVs for copper was available for the GGS or WPT, the approach used here was to select the most sensitive avian endpoint found in the USEPA's OPP database. The most sensitive endpoint for birds is 340 mg copper/kg body weight (OPP 2000). This endpoint was used for derivation of a reptilian TRV by applying the recommended 10X safety factor for threatened terrestrial species. The derived reptilian TRV of 34 mg copper/kg body weight was used to determine if the exposure to copper-treated water presents a risk to the GGS or WPT.

Use of a standard water intake factor (multiplier used to estimate water intake based on metabolic need and body weight), and an estimate of the concentration of copper in water the GGS or WPT might drink or indirectly consume was calculated. Indirect consumption includes, but is not limited to dietary intake of fish and aquatic invertebrates. The methodology for estimating this value is contained in USEPA's Wildlife Factors Handbook (1993). From this, the amount of copper consumed per kg of body weight per day was calculated and compared to the TRV to assess the extent of risk.

It was estimated that applications of copper at the maximum label application rate (2.0 mg/L) will not lead to a dietary exposure greater than or equal to the dietary TRV for GGS or WPT of 34 mg copper/kg body weight/day. Thus, copper applied to the conveyance system canals for aquatic weed and algae control does not appear to pose risk to the GGS or WPT.

A literature search was done to assess the impacts, if any, of fish toxicity on a loss of prey for the GGS. Acute copper toxicity data to aquatic species is summarized in **Appendix B**. Mortality data to fish is varied depending on form of copper, species of fish, and study details. LC<sub>50</sub> data for the fish studies reviewed indicates a wide range of values, from 26

ppb to 57,000 ppb. Given the wide range of available data it is difficult to estimate the potential risk to fish in District canals. However, given the species of fish anticipated to be present in District conveyances, the most sensitive relevant fish (bluegill) LC<sub>50</sub> is 1300 ppb. The District's typical target copper application rate or water concentration of 1000 ppb suggest it is unlikely that fish mortality will occur. Given the short-term duration of bioavailable dissolved copper in the water column and the infrequent (i.e., once per year) use of copper-containing herbicide applications, impacts to fish, if any, are not likely to affect the feeding of a GGS.

Item b): **No Impact.** The Project will take place in the District's water conveyances and, therefore, will not impact any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service. A list of current special status communities was compiled from the CDFW CNDDDB. Once this list was compiled, a preliminary assessment of the Project area was performed to characterize the whether or not the special status communities were present. None of the listed communities are within the Project area.

Item c): **No Impact.** The Project will take place in the District's water conveyances and, therefore, will not impact any upland habitat or wetlands. However, the assessment of risk for species that live in these areas was considered. Specifically, the risk to GGS and WPT was assessed and it was concluded that the use of aquatic herbicides containing copper does not pose an unacceptable risk to either species.

Item d): **No Impact.** Water for the District is comprised of stormwater, irrigation, and urban runoff. The District's water conveyances are not directly connected to natural watercourses; Project activities will not adversely influence movement of any native, resident or migratory fish.

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

### 3.5 Cultural Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

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

### Discussion

Items a) through d): **No Impact.** The Project is confined to the District's water conveyances. 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
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Would the Project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Strong seismic-related ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

Items a) through e): **No Impact.** The Project consists of applying aquatic herbicides that contain copper to water conveyances within the jurisdiction of the District. 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.

### 3.7 Hazards and Hazardous Materials

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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**Discussion**

Items a & b): **Less Than Significant Impact.** The Project would involve handling aquatic herbicides which are regulated hazardous materials. Acute exposure to humans of the undiluted, formulated product can cause eye, skin, and respiratory irritation, and can be harmful if swallowed. Refer to the representative MSDS presented in **Appendix E**. 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 District facilities, at the point of application, or during transport.

The District handles, stores, and transports aquatic herbicides 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 District’s aquatic vegetation management program, which would be applied to the use of herbicides that include copper:

1. District personnel and their contractors that make aquatic herbicide applications are themselves, or under the direct supervision of, a DPR-licensed Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel mitigate 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, and health and environmental hazards and restrictions, and include 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 D**.
3. All District personnel applying herbicides and their contractors review and strictly adhere to the aquatic herbicide 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 E**.
4. All District personnel applying herbicides and their contractors review and consult the aquatic herbicide Material Safety Data Sheet (MSDS) (an example is provided in **Appendix E**), 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 herbicides.
5. District personnel’s familiarity with and implementation of 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 herbicides, including goggles, disposable coveralls, gloves and respirators.

6. The condition of the water conveyance(s) being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of aquatic herbicide to be applied.
7. Prior to an application, the water operator will confirm no water is being pumped out of the District to the Sacramento River or NEMDC.
8. The location(s) at which the aquatic herbicide is introduced into the District water is continuously staffed until the application is complete. District staff performing conveyance inspections are in continuous cell phone or radio contact with staff at the head of the conveyance where the aquatic herbicide is being introduced into the water conveyance. In the event that a spill or leak is discovered, addition of aquatic herbicide stops and water delivery to the conveyance is reduced or stopped to increase freeboard to lessen subsequent leakage if necessary or practicable. Not until the leak is fixed does aquatic herbicide application resume.

Item c): **Less Than Significant Impact.** There are schools located within ¼ mile of locations where applications may be made. However, applicators will be present at the herbicide application sites and will not let unauthorized people (including students) near herbicide application equipment. Herbicide applications do not result in a release of copper to the air so no airborne risk is present. Once copper has been applied to the water, there are no restrictions on contact with the water.

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

Items e) & f): **No Impact.** Sacramento International Airport, Spowith Farm Airport, Riego Flight Strip, and Lauppes Strip Airport are located within the District boundaries. The Project does not result in a safety hazard for people working in any of these areas.

Item g): **No Impact.** The Project will not impact emergency evacuation routes because public roadways are not be 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
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Would the Project:

a) Violate any water quality standards or waste discharge requirements?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (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)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Otherwise substantially degrade water quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Place housing within 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
j) Inundation by seiche, tsunami, or mudflow?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Discussion**

The District implements an Integrated Pest Management (IPM) program for aquatic weed control pursuant to the applicable NPDES permit. 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 herbicides on an “as-needed” basis to achieve the aquatic weed control necessary to convey water.

Depending on weed presence, aquatic herbicides containing copper may be applied as necessary at different locations in the District between the months of March and November. Generally, aquatic herbicide applications are made between May and October. Some years, no copper-containing aquatic herbicides will be used. Treatments may be made to only a section of or throughout the District’s water conveyance system.

Copper-containing aquatic herbicide applications will be done over a short duration (typically less than approximately 36 hours per location) and not all water conveyances will be treated at the same time, for the same length of time, or treated every year. Depending on weed presence, some water conveyances may not get treated at all while others may require multiple treatments the same season. Copper-based herbicides 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 herbicide applications, the following tasks will be 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, and health and environmental hazards and restrictions, and include 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 D**.
2. All District personnel applying herbicides and their contractors review and strictly adhere to the aquatic herbicide 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 E**.
3. All District personnel applying herbicides and their contractors review and consult the

aquatic herbicide Material Safety Data Sheet (MSDS) (an example is provided in **Appendix E**), 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 herbicide.

4. The condition of the water conveyance being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of aquatic herbicide to be applied.
5. Prior to an application, District personnel inspect and seal any emergency spill structures with boards and plastic, as necessary if control structures are leaking.
6. The location at which the aquatic herbicide is introduced into the water conveyance is continuously staffed until the application is complete. District staff who are performing a water conveyance inspection are in continuous cell phone or radio contact with staff at the head of the water conveyance where the aquatic herbicide is being introduced into the system. In the event that a spill or leak is discovered, the addition of aquatic herbicide stops and water delivery to the conveyance is reduced to create freeboard which will lessen subsequent leakage if necessary or practicable. Not until the leak is fixed does aquatic herbicide application resume.

### **Overview of Aquatic Herbicide Use**

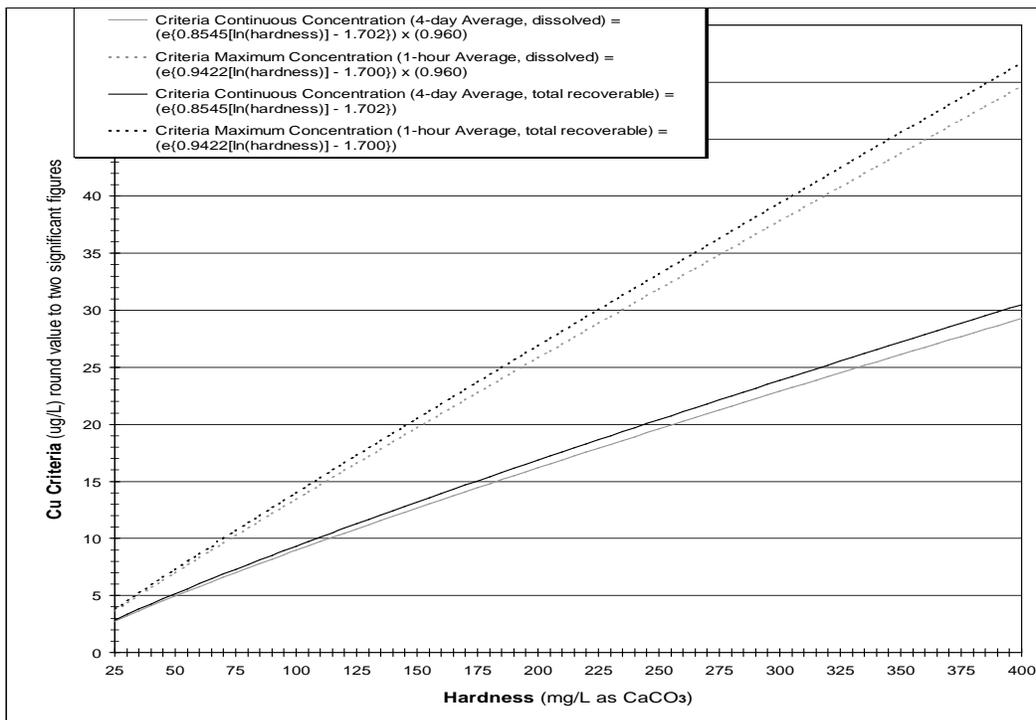
Depending on weed presence, aquatic herbicides containing copper may be applied as necessary at different locations between the months of March and November. Applications most years will be made between May and October. Some years, no copper-containing aquatic herbicides will be applied.

Item a): **Potentially Significant Unless Mitigation Incorporated.** As presented in Section 1.2, the District intends to obtain coverage under the 2013 General Permit that requires compliance with the SIP and the CTR. The District is also requesting an exception under Section 5.3 of the SIP to allow short-term or seasonal applications of aquatic herbicides that contain copper.

### **Copper Discussion**

Applications of copper-based aquatic herbicides according to label direction typically require concentrations of copper between 500 and 2,000 µg/L. Water quality criteria for copper as described in the CTR and by the Central Valley RWQCB (RWQCB 2003) are hardness-dependent. Refer to **Figure 3**. District water varies in hardness throughout the season.

Figure 3. Cu Criteria Dependence on Hardness



Based on the relation of copper criteria to hardness, the Permit defined copper concentration criteria for a continuous dissolved concentration (4 day average) would be:

$$\text{Continuous Dissolved Copper Concentration} = e^{(0.8545[\ln(\text{hardness})] - 1.702)} \times (0.960)$$

For example, if a lateral has a hardness of 100 mg CaCO<sub>3</sub>/L, the continuous dissolved concentration (4 day average) water quality criteria for copper in District conveyances will be the following:

Continuous Dissolved Concentration (4 day Average)                      8.96 µg/L

These water quality criteria may be exceeded downstream of the point of aquatic herbicide use (i.e., outside of the treatment area or in “receiving waters”) when applied at labeled rates. Accordingly, because label application rates may exceed the CTR water quality criteria, the District is obtaining a SIP exception.

As a result of both dilution and uptake, copper-containing aquatic herbicides, as they will be applied in District water conveyances, rapidly dissipate and/or become permanently insoluble and as a result are not bioavailable 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, absorption by biota, adsorption by particulate matter, and adsorption or complexation with organic matter. Refer to **Appendix C**.

Given a starting concentration of 2000 µg/L and a conservative half-life of 19 hours, soluble copper in the water column can reasonably be expected to decrease according to **Table 2**

below:

**Table 2. Anticipated Rate of Dissolved Copper Removal from the Water Column**

Time (Hours)	Time (Days)	Copper Concentration (µg/L)
0	0	2,000
6	0.25	1,607
12	0.5	1,291
24	1	833
48	2	347
72	3	145
96	4	60
120	5	25
144	6	10
168	7	4.4
192	8	1.8
216	9	0.76
240	10	0.32
264	11	0.13
288	12	0.05
312	13	0.02

As **Table 2** shows, only a short-term (less than 7 days) copper water quality criteria exceedance is expected to occur in District canals.

In addition to using a hardness based approach to quantifying copper water quality criteria, the USEPA suggests the use of another model, described below, to analyze and/or predict toxicity of bioavailable copper in the water column. In the 2007 revision of Aquatic Life Ambient Freshwater Quality Criteria-Copper (EPA 2007), the USEPA recommended the Biotic Ligand Model (BLM) as a more accurate approach for assessing toxicity and deriving freshwater quality criteria for copper. The BLM supplements USEPA's previously published recommendation of using the hardness-based estimation and better accounts for the reduction in copper bioavailability that results from competitive binding of copper to other molecules in the water column.

The BLM was developed to predict copper toxicity to aquatic organisms in relation to water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC). According to the BLM, copper bioavailability is strongly influenced by these parameters. The free cupric ion ( $\text{Cu}^{2+}$ ) is the primary driver of copper bioavailability and toxicity in aquatic ecosystems (EPA 2007).

In order to derive freshwater quality criterion for copper, the BLM uses ten water quality inputs: temperature; pH; dissolved organic carbon (DOC); major cations including calcium (Ca), magnesium (Mg), sodium (Na), potassium (K); major anions including sulfate ( $\text{SO}_4$ ), chloride (Cl); and alkalinity. Copper may be measured for comparison with site-specific

criteria, but it is not required as an input to the model to determine copper freshwater quality criteria. The BLM-based water quality criterion for copper may be more or less stringent than the hardness-based criteria depending on the water quality parameters. However, it is a more accurate than hardness-based criteria because it is based on copper bioavailability to aquatic species.

The BLM may also be used to predict copper toxicity and speciation in varying water conditions. When the model is run in toxicity prediction mode, it predicts the concentration of dissolved copper that produces a particular endpoint (e.g. NOAEL, LOAEL, or LC<sub>50</sub>) for the selected aquatic species. When run in speciation prediction mode, the model can determine the various forms (e.g. CuCO<sub>3</sub>, Cu<sup>2+</sup>, copper bound to DOC) and concentrations of copper in the water when known copper concentration in water is input in the model.

Using the Biotic Ligand Model in copper speciation prediction mode, a total of 27 graphs have been generated to illustrate how variations in water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC) influence the concentration of bioavailable Cu<sup>2+</sup> (see **Appendix C**). Generally, an increase in one or more of the four water parameters lowers the concentration of the Cu<sup>2+</sup> species, thereby lowering the bioavailability of copper.

When used according to label directions by qualified personnel, impacts of copper-containing aquatic herbicides have no significant impact. The District will implement the following mitigation measure for applications of copper to reduce any potentially significant impacts to less than a significant level: These mitigation measures for applications of copper are:

**HWQ-1.** As required by the SIP and the SWRCB general permit for the application of aquatic herbicides, the District will prepare and execute an Aquatic Pesticide Application Plan (APAP). The APAP calls for surfacewater sampling and analysis before, during, and after aquatic herbicide application to assess the impact, if any, that the Project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, the District will arrange for a qualified biologist to assess receiving water beneficial uses.

Item b): **No Impact.** The Project will not involve any construction activities or require the use of groundwater and therefore 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 will not increase erosion or siltation on- or off-site. No streambeds will be altered. No increase in drainage capacity of local storm sewers will be required.

Item f): See response to item a).

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

### 3.9 Land Use Planning

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### Discussion

Item a): **No Impact.** The Project will be implemented within the District’s existing water conveyances. Nearby housing will not be affected. The Project will 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). The Project does not conflict with any known plans.

### 3.10 Mineral Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### Discussion

Items a) & b): **No Impact.** The Project involves the addition of aquatic herbicides to the District’s water conveyances and has no impact on the availability of any known mineral resource recovery or locally-important mineral resource recovery site.

### 3.11 Noise

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### Discussion

Items a) through d): **No Impact.** Project activity primarily occurs in rural and agricultural areas that commonly have machinery operating that include tractors, generators, large groundwater and irrigation pumps and heavy trucks. Project activity in urban areas is consistent with ambient noise from adjacent roads and other typical urban activities.

Application equipment includes the use of one or two pick-up trucks, and occasionally a small generator and an outboard boat motor. The incidental noise and vibration generated by the use of small engines or pick-up trucks is temporary and inconsequential and thus will have no impact.

Items e) & f): **No Impact.** Sacramento International Airport, Spowith Farm Airport, Riego Flight Strip, and Laupes Strip Airport are located within the District boundaries. However, the Project will not result in excessive noise levels for people working or living within these areas.

### 3.12 Population and Housing

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

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

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

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

**Discussion**

Items a) & b): **No Impact.** The Project will take place in the District’s water conveyances. District policy strictly prohibits swimming and fishing in its water conveyances. Treatment of aquatic vegetation improves the ability of the District to transport water for efficient conveyance of irrigation, urban and stormwater drainage purposes and will have no impact on recreational activities.

### 3.15 Transportation/Traffic

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

#### Discussion

Items a) & b): **No Impact.** The Project involves the use of light duty trucks that will not cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the county roads in the Project area. Generally, activity related to the Project is limited to one or two vehicles at any given time.

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
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Would the Project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Comply with federal, state, and local statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### Discussion

Items a) & b), and e) through g): **No Impact.** The Project will not discharge to a wastewater treatment plant and does not generate any solid waste. All containers used to store and transport aquatic herbicides are typically returned to the vendor for reuse.

Item c): **No Impact.** The Project will not require the construction of new storm water drainage facilities or expansion of existing facilities.

Item d): **No Impact.** The Project involves the treatment of aquatic vegetation in water conveyances used to transport irrigation, urban runoff and stormwater drainage and has no known influence on the entitlements or resources utilized by the District.

### 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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Does the project have impacts that are individually limited, but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Item a): **Potentially Significant Unless Mitigation Incorporated.** The Project involves the use of copper-based aquatic herbicides introduced into the District’s water conveyances at concentrations that may temporarily exceed CTR water quality objectives. Significant evidence suggests that when used according to label directions by qualified personnel, any CTR exceedance will likely be short-term and impacts of these aquatic herbicides are less than significant.

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

Although copper containing aquatic herbicides are a hazardous material, under the standard operating procedures that will be used by District personnel and their contractors, there is a

less than a significant potential for impact.

Item b): **Less Than Significant Impact.** The cumulative impacts of continued application of copper-based herbicides is not known. Specifically, the extent to which copper accumulates and is bioavailable, if at all, is not clear. Mitigation has been incorporated into the Project (**HWQ-1**). This mitigation reduces the impact to a less than a significant.

Item c): **Less Than Significant Impact.** As a result of implementation of District 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 MITIGATION MEASURES

### *4.1 Hydrology & Water Quality*

**HWQ-1.** As required by the SIP and the SWRCB general permit for the application of aquatic herbicides, the District will revise its Aquatic Pesticide Application Plan (APAP) to reflect the use, monitoring and reporting of copper-containing aquatic herbicides upon being listed on the SIP Exception list of the permit. The APAP 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 District will arrange for a qualified biologist to assess receiving water beneficial uses.

### *4.2 Mitigation Monitoring and Reporting Program*

Mitigation HWQ-1 is the implementation of the District's Aquatic Pesticide Application Plan (APAP) that requires surfacewater sampling, analysis, visual monitoring, and reporting as a condition of the NPDES Aquatic Permit issuance. The District's APAP has been reviewed and approved by the SWRCB and reporting to them is done annually by March 1. Execution of the APAP mitigates any significant environmental effects of aquatic herbicide use.

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**6.0 PERSONS AND AGENCIES CONTACTED**

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# Appendix A

(Species Descriptions)

## Approach

A Habitat Assessment of the Reclamation District 1000 project site was conducted by Blankinship & Associates, Inc. staff 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 (CNDDDB), 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 CNDDDB database was queried using the boundary map for the District, and selecting all 6 quads that intersect with the District's boundaries. In addition, a buffer area made up of the outlying quads adjacent to the original 6 quads was selected for the query, resulting in a total of 19 quads. This approach was used to identify species that might be located in the surrounding areas, but not necessarily reported to CNDDDB as a sighting event within the District boundaries.

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 Tiger Salamander (*Ambystoma californiense*)

California tiger salamanders are restricted to the Central Valley of California and to lower elevations to the west. Some populations have been extirpated due to urbanization and conversion of native grasslands and wetlands to agriculture (Fisher and Shaffer 1996 in Petranka 1998). They breed in fish-free, seasonally ephemeral ponds. Juveniles and adults are fossorial and are rarely seen other than during the winter breeding season. Breeding migrations occur from November to March (Storer 1925 in Petranka 1998). They commonly use California ground squirrel (*Spermophilus beecheyi*) or valley pocket gopher (*Thomomys bottae*) burrows for summer aestivation. During the summer when herbicide applications will be made, adults will be underground aestivating, and irrigation canals would be not suitable habitat for developing tadpoles, so exposure to herbicides introduced to conveyances is unlikely.

### 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 irrigation canals, it is not likely that they would be exposed to herbicides introduced to conveyances for the control of aquatic weeds.

## Birds

### Cooper's Hawk (*Accipiter cooperii*)

Cooper's Hawks inhabit various types of mixed and deciduous forests and open woodlands, including small woodlots, riparian woodlands in dry country, open and pinyon woodlands, and forested mountainous regions (GRIN, 2014), but they can also be found in leafy suburbs of cities (Cornell, 2014). Cooper's Hawks typically build their nests 25-50 feet high in trees, such as pines, oaks, Douglas-firs, beeches, and spruces, on flat ground or in dense woods. These hawks are mainly aerial foragers, most commonly feeding on a variety of medium-sized birds such as European starlings, mourning doves, and rock pigeons. In western habitats, Cooper's Hawks

are known to include chipmunks, hares, mice, squirrels, bats, and other mammals in their diets (Cornell, 2014). Because Cooper's Hawks' target prey base consists of terrestrial species, the risk posed by treating irrigation canals with aquatic herbicides is considered insignificant.

**Tricolored Blackbird (*Agelaius tricolor*)**

Breeding habitat of tricolored blackbirds includes large marshes (Payne 1969 in Beedy and Hamilton 1999). Nesting colonies are generally in emergent aquatic vegetation, but may also be found in trees along streams, weed patches, and grain and alfalfa fields, mustard, safflower, thistle, along an irrigation ditch, or in trees along a river (Orians 1960, 1961). In the Central Valley of California, breeding colonies were described where nests were placed in cattail-bulrush in dry and irrigated pasture; cattail in dry grassland, along a creek, rice and wheat fields, or dry and irrigated pasture; and in blackberry in dry grassland and along a creek (Crane and DeHaven 1977). Tricolored blackbirds forage in cultivated row crops, orchards, vineyards, and heavily grazed rangelands, but these are considered low-quality forage habitats. High quality forage areas included irrigated pastureland, lightly grazed rangeland, dry seasonal pools, mowed alfalfa fields, feedlots, and dairies (Beedy and Hamilton 1997 in Beedy and Hamilton 1999). In the Central Valley of California, nestling tricolored blackbirds were fed 86% animal matter on a volumetric basis, 11.2% plant matter, and 2.7% grit. The animal matter was primarily insects (79% of total diet) with the majority being beetles (61% of total diet). Plant matter was split evenly between cultivated grains such as oats, wheat and miscellaneous plant matter (Crane and DeHaven 1977). Since tricolored blackbirds are unlikely to feed directly from the treated canals, the risk posed by treating conveyances for the control of aquatic weeds is insignificant.

**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 conveyances 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. They 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 irrigation canals, so the risk posed by treating conveyances for the control of aquatic weeds is 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 ungrazed 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 ungrazed 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, white-tailed kites are not likely to be exposed to herbicides applied to conveyances for control of aquatic weeds.

**Double-crested Cormorant (*Phalacrocorax auritus*)**

Double-crested Cormorants are colonial waterbirds that seek aquatic bodies big enough to support their mostly fish diet, but may also form breeding colonies on smaller lagoons or ponds up to 40 miles away from their feeding area. This cormorants' habitat must include access to high, airy perches, such as rocks, wires, and tops of dead trees, in order to dry off their feathers after fishing. Nesting colonies are typically formed in clusters of trees near water, either on the ground or in the trees. Double-crested Cormorants hunt while swimming on the surface of the water, then diving and chasing fish underwater using their webbed feet. Their diet is almost exclusively fish, with few insects, crustaceans, or amphibians (Cornell, 2014). Although the Double-crested Cormorant may forage in the shallow water of some District conveyances, given the large amount of potential foraging area, the food items from treated conveyances would likely only contribute an insignificant percentage of the total diet. Therefore, risk due to copper exposure is anticipated to be insignificant.

**Bank Swallow (*Riparia riparia*)**

Bank swallows breed along ocean coasts, rivers, streams, lakes, reservoirs, and wetlands (Cramp *et al.* 1988 in Garrison 1999, Turner and Rose 1989 in Garrison 1999, American Ornithologists' Union 1998 in Garrison 1999). They require vertical banks, cliffs, and bluffs in alluvial, friable soils for nesting. Bank swallows forage while flying and consume flying or jumping insects and occasionally eat terrestrial and aquatic insects or larvae (Garrison 1999). They feed over lakes, ponds, rivers and streams, meadows, fields, pastures, and bogs. They occasionally feed over forests and woodlands (Stoner 1936 in Garrison 1999, Gross 1942 in Garrison 1999, Turner and Rose 1989 in Garrison 1999). During the breeding season, they generally forage within 200 m of their nests for feeding the nestlings (Mead 1979 in Garrison 1999, Turner 1980 in Garrison 1999). The only area where bank swallows might nest is along the Sacramento River. They generally forage within 200 m of nesting areas while they have young in June and July (Garrison 1999). Bank swallows could feed on emergent insects over district conveyances near the Sacramento River. The comparative quality and quantity of foraging habitat immediately along and over the river is much greater than that along the treated conveyance. It is unlikely for bank swallows to gather the majority of their prey from treated conveyances, so the risk to bank swallows from treating conveyances with herbicides for the control of aquatic weeds would be insignificant.

**Least Bell's Vireo (*Vireo bellii pusillus*)**

Least Bell's Vireos inhabit riparian vegetation along meandering rivers and are typically found throughout the Sacramento and San Joaquin Valleys. They breed among fairly dense riparian shrubbery, preferably where flowing water is present. Least Bell's Vireos favor willow, wild rose, and other dense vegetation for nesting. Nests are typically build about 1 m above the ground (CDPR, 2003). The Least Bell's Vireo forages by gleaning and hovering (Salata, 1983), and its diet consists of a wide variety of insect types including bugs, beetles, grasshoppers, moths, and particularly caterpillars (Chapin 1925; Bent 1950). Although the Least Bell's Vireo forages for emergent aquatic insects over water, given the large amount of potential foraging area, the emergent aquatic insects from treated conveyances would likely contribute an insignificant percentage of the total diet. Therefore, risk due to copper exposure is anticipated to be insignificant.

**Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)**

Yellow-headed Blackbirds breed in prairie wetlands, mountain meadows, quaking aspen parklands, and shallow areas of marches, ponds, and rivers. They attach their nests to vegetation overhanging water. Typical vegetation includes cattails, bulrushes, and reeds. The Yellow-headed Blackbirds will commonly feed on insects near their breeding area in the summer. Outside of the breeding season, they form flocks and forage in uplands, eating grains and weed seeds from farm fields. The Yellow-headed Blackbird's diet can consist of beetles, grasshoppers, dragonflies, caterpillars, flies, ants, spiders, grains, and seeds (Cornell, 2014). Although, the Yellow-headed Blackbird forages for emergent aquatic insects over water, given the large amount of potential foraging area, the emergent aquatic insects from treated canals would likely contribute an insignificant percentage of the total diet. Therefore, risk due to copper exposure is anticipated to be insignificant.

## Fish

Reclamation District 1000 conveyances are not directly connected to natural watercourses. District water is comprised of irrigation and urban runoff. As such, project activities will not adversely influence movement of any native resident or migratory fish.

## Mammals

### **Pallid Bat (*Antrozous pallidus*)**

Pallid bats inhabit arid deserts and grasslands, often near rocky outcrops and water. They are less abundant in evergreen and mixed-conifer woodland. They usually roost in a rock crevice or building, less often in cave, tree hollow, mine, etc. (NatureServe 2004). In Oregon, night roosts were in buildings, under rock overhangs, and under bridges; bats generally were faithful to particular night roosts both within and between years (Lewis 1994 in NatureServe 2004). They prefer narrow crevices in caves as hibernation sites (Caire *et al.* 1989 in NatureServe 2004). The primary diet is arthropods which are captured on the ground, after an aerial search. They also capture some food (large insects) in flight, within a few meters of ground vegetation. Food items include flightless arthropods, Jerusalem crickets, moths, beetles, etc.; may eat small vertebrates (NatureServe 2004). Since the diet consists of mostly terrestrial insects, the exposure to copper-containing aquatic herbicides introduced into conveyances for control of aquatic weeds or algae would not be significant.

### **Western Red Bat (*Lasiurus blossevillii*)**

The western red bat inhabits grasslands, shrublands, open woodlands, and riparian areas. They typically roost in forests or woodlands, showing a preference for edge habitat (NatureServe 2004, Zeiner *et al.* 1988). Western red bats often roost in tree foliage along edge habitat, with preference given to sites with protection from above and below. They feed on moths, crickets, beetles and flying ants (Zeiner *et al.* 1988). The diet of the western red bat is made up of terrestrial insects; therefore the exposure to aquatic herbicides in water would not be significant.

### **Hoary bat (*Lasiurus blossevillii*)**

The hoary bat is the most widespread bat in the United States. The bat winters along the coast of California and breeds inland. The bat tends to roost in dense foliage of trees and cavities, such as woodpecker holes (Shump and Shump 1982). They forage in open areas within forest, woodland riparian, and wetland habitats primarily after sundown (Shump and Shump 1982). The primary food source for hoary bats are moths, but they also eat other insects including beetles, flies, grasshoppers, and dragonflies (Shump and Shump 1982). Since their diet consists of mostly terrestrial insects, the risk posed from aquatic herbicides for the control of aquatic weeds in irrigation canals is insignificant.

## Reptiles

### **Western Pond Turtle (*Emys marmorata*)**

The Western Pond turtle historically existed from western Washington and British Columbia to northern Baja California, west of the Cascade-Sierra crest (Ernst et al 1994). They occupy a wide variety of wetland habitats including lakes, ponds, reservoirs, rivers and streams, stock ponds, and sewage treatment lagoons (Holland 1994). Optimal habitat has adequate emergent basking sites, emergent vegetation, refugia in the form of banks, submerged vegetation, mud, rocks, and logs (Holland 1994). Populations are in decline mainly due to habitat destruction. The species diet consists of a variety of food items including algae, various plants, snails, crustaceans, isopods, insects, fish, and frogs (Bury, 1986). Their habitat requirements and feeding habits indicate western pond turtle may be exposed to herbicide-treated water. Refer to **Appendix B** for a summary of exposure and risk analysis for the western pond turtle.

### **Giant Garter Snake (*Thamnophis gigas*)**

Giant garter snakes occur in streams and sloughs, usually with mud bottoms (Stebbins 1985 in NatureServe 2004). 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 (CDFG 1990 in NatureServe 2004) and ponds and small lakes (USFWS 1993 in NatureServe 2004). Usually in areas of permanent water, sometimes in areas of temporary water such as irrigation/drainage canals and (less often) rice fields (Biosystems Analysis, Inc. 1989 in NatureServe 2004, USFWS 1993 in NatureServe 2004). 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. Refer to **Appendix B** for a summary of exposure and risk analysis for the giant garter snake.

## Invertebrates

### **Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)**

The valley elderberry longhorn beetle occurs throughout California's Central Valley and associated foothill areas (U.S. Fish and Wildlife Service 1999). This species of insect is completely dependent upon its host plant, elderberry (*Sambucus* spp.). The beetle spends most of its larval stage within the stems of the elderberry plant, and emerges after a two-year period during mid-March through mid-May (U.S. Fish and Wildlife Service 1999). Adult males live for only a few days after emergence, while adult females will live for approximately 3 or 4 weeks (PlacerData 2003). Valley elderberry longhorn beetles feed exclusively on the stems, leaves and flowers of elderberry plants (PlacerData 2003). The project area is located in an area that is potential habitat for the valley elderberry longhorn beetle, however, no risk is anticipated given that this species lives and forages on a terrestrial plant, and copper-containing aquatic pesticides will not be applied to terrestrial areas. In addition, the adult stage of the beetle is brief and little time over-lap exists between their emergent life span and the typical application period for aquatic herbicides in the District.

## Plants

### **Bristly sedge (*Carex comosa*)**

Bristly sedge is a monocot, perennial sedge that is about 2-3.5' tall and forms a large tuft of leaves and flowering culms and is native to California (Hilty, J 2013). The species is native to California and is also found throughout North America. It is included in the CNPS Inventory of Rare and Endangered Plants on list 2.1 (rare, threatened, or endangered in CA; common elsewhere). According to the CalFlora Database there are no reported occurrences of this species within the project area (CalFlora 2014). Furthermore the species is not an emergent plant and is not expected to grow in standing water, but may grow on moist banks of District conveyances. Exposure of bristly sedge to water in District conveyances containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of

the plant. As such, the copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.

**Peruvian dodder (*Cuscuta obtusiflora* var. *glandulosa*)**

The Peruvian dodder is a dicot, annual herb or vine that is native to California (CalFlora 2014). It is included in the CNPS Inventory of Rare and Endangered Plants on list 2,2 (rare, threatened, or endangered in CA; common elsewhere). Its habitat is freshwater marshes and swamps (CNPS 2012). The plant blooms July through October (CalFlora 2014). According to the CalFlora Database, there are no reported occurrences of Peruvian dodder within any of the counties in the project area (CalFlora 2014). Additionally, Peruvian dodder is not an emergent plant and therefore is not expected to grow in standing water, but may grow on moist banks of District conveyances. Exposure of Peruvian dodder to water in District conveyances containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, the copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.

**Boggs Lake hedge-hyssop (*Gratiola heterosepala*)**

Boggs Lake hedge-hyssop is a California endangered semi-aquatic plant species. The species mostly occurs in the Central Valley, inner north coast range, Sierra Nevada foothills, and Modoc Plateau (CDFW 2013). It also occurs within the Southern Sierra Foothills, Solano-Colusa, Lake-Napa, and Northwestern Sacramento Valley Vernal Pool regions. The plant is restricted to clay soils in or near shallow water like lakes and vernal pools (CDFW 2013). It blooms April through September. Major threats to the species include habitat loss from development, invasion by exotic weeds, livestock, and road erosion (CDFW 2013). It is included in the CNPS Inventory of Rare and Endangered Plants on list 1 (rare, threatened, or endangered in CA only). According to the CalFlora Database no reported occurrences of this species exist within the project area (CalFlora 2014). Additionally, the plant is not expected to grow in standing water, but may grow on moist banks of District conveyances. Exposure of the species to water in District conveyances containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, the copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.

**Woolly Rose-mallow (*Hibiscus lasiocarpus* var. *occidentalis*)**

Rose-mallow is a rhizomatous dicot in the Malvaceae family (CalFlora 2014). 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 (CNDDDB 2005). Potential habitat for this species is present in the project area, however according to the CalFlora Database, no reported occurrences of the species exist within the project area (CalFlora 2014). Exposure of the species to water in District conveyances containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, the copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.

**Sanford's Arrowhead (*Sagittaria sanfordii*)**

Sanford's arrowhead is a rhizomatous monocot that is native and endemic to California (CalFlora 2014). It is an aquatic perennial herb that occurs in freshwater wetlands, marshes, swamps, and other assorted shallow freshwater (CNPS 2012). Sanford's arrowhead is a member of the Water Plantain family; it is an obligate wetland plant. Its habitat includes the margins of wetland areas such as streams, rivers, ponds, drainage channels, or irrigation canals. It is native to California and is endemic (limited) to California alone. It is included in the CNPS Inventory of Rare and Endangered Plants on list [1B.2](#) (rare, threatened, or endangered in CA and elsewhere). Potential habitat for the species is in the project area, however according to the CalFlora Database there are no reported occurrences of the species within the project area (CalFlora 2014). Furthermore, since Sanford's arrowhead is not an emergent plant it does not grow in standing water, but may grow on moist banks of canals or ditches, exposure to canal water containing aquatic herbicides is indirect, if any. Exposure

will only occur through root uptake of soil water. The chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, the copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.

**Suisun Marsh Aster (*Symphyotrichum lentum*)**

The Suisun Marsh aster is a dicot, perennial herb that is native and endemic to California (CalFlora 2014). It is included in the CNPS Inventory of Rare and Endangered Plants on list 1B.2 (rare, threatened, or endangered in CA and elsewhere). The species grows in brackish or freshwater marshes along the banks of sloughs typically in the Suisun Bay and Sacramento-San Joaquin river delta. The plant flowers May through November (CalFlora 2014). According to the CalFlora Database there are no reported occurrences of the species within the project area (CalFlora 2014). The species is not an emergent plant so it does not grow in standing water, but may grow on moist banks of canals or ditches. Exposure of Suisun Marsh aster to water in District conveyances containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, the copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.

**Saline Clover (*Trifolium hydrophilum*)**

Saline clover is an annual dicot in the Fabaceae family (CNPS 2012). This native herb can be found in freshwater marshes and swamps, Valley and foothill grassland, and along the margins of vernal pools (CNDDDB 2012). Saline clover has potential habitat in the project area, however according to the CalFlora Database, no reported occurrences of this species exist within any of the counties in the project area (CalFlora 2014). Exposure of the species to water in District conveyances containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, the copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.

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# Appendix B

(Copper Species-Specific Risk and Ecological Toxicity Data)

### Toxicity Reference Values and Risk

For contaminants frequently considered ecological risk assessments, regulatory agencies, such as USEPA, have developed Toxicity Reference Values (TRVs) for each contaminant. However, published TRVs generally do not exist for pesticides. Therefore, pesticide-specific TRVs were derived as part of this document (USEPA 1999). Endpoints from studies available from the published literature or government reports and databases can be used to establish TRVs. The endpoints used to estimate risk of copper to the giant garter snake and western pond turtle were found in USEPA's OPP database.

The U.S. EPA (1989) suggests applying a 20X safety factor to median toxicity values for aquatic threatened or endangered species and a 10X safety factor for terrestrial threatened or endangered species. In this analysis, safety factors to all species regardless of their specific designation.

For certain pesticides, no toxicity results were available for various taxonomic groups. For example, database and literature searches for copper toxicity testing of reptiles did not yield any useable studies. In this case, avian (bird) toxicity endpoints were used in place of specific toxicity values for reptile species and terrestrial-phase amphibians. The uncertainty involved with using avian endpoint data to estimate risk to a reptile species does not require the application of an additional safety factors (EPA 2004).

Once a TRV has been derived, it may be compared to an exposure estimate to evaluate whether an adverse effect for a given species is likely to occur. Exposures may be estimated using parameters from the Wildlife Exposure Factors Handbook (1993). If an estimated exposure is lower than the derived TRV, the exposure scenario is not considered to pose a risk.

Risk is estimated by comparing the estimated environmental concentration (EEC) an organism may be exposed to the derived TRV to calculate a risk. Risk is present when the EEC divided by the TRV is greater than or equal to 1.0. There is no risk given the scenario and assumptions if the result is less than 1.0.

$$\text{Risk} = \text{EEC}/\text{TRV}$$

Where:

EEC = Estimated Environmental Concentration

TRV = derived Toxicity Reference Value

### Copper

Since no adequate published TRVs for copper was available for reptiles such as turtles and snakes, the approach used here was to select the most sensitive avian endpoint found in the USEPA's OPP database. The most sensitive endpoint for birds is 340 mg copper/kg body weight (OPP 2000). This endpoint was used for derivation of a reptilian TRV by applying recommended 10X safety factor for threatened terrestrial species for a total safety factor of 10X. The derived reptilian TRV of 34 mg copper/kg body weight was used to determine if the exposure to copper-treated water presents a risk to the giant garter snake or western pond turtle.

Use of a standard water intake factor (multiplier used to water intake based on metabolic need and body weight), and an estimate of the concentration of copper in water the snake or turtle might drink or indirectly consume was calculated. The methodology for estimating this value is contained in USEPA's Wildlife Factors Handbook (1993). From this, the amount of copper consumed per kg of body weight per day was calculated and compared to the TRV to assess the extent of risk.

It was estimated that applications of copper at the maximum label application rate (2.0 mg/L) will not lead a dietary exposure greater than or equal to the dietary TRV for reptiles of 34 mg copper/kg body weight/day. Thus, copper applied to conveyance system for aquatic weed and algae control does not appear to pose risk to the giant garter snake or western pond turtle. In support of this statement, the California Department of Fish and Wildlife conducted a study on the effects of oral and dermal exposure to copper (ethylenediamine complex) on two species of garter snakes and did not observe any acute adverse effects (2004).

### Copper Ecological Toxicity Studies Used to Evaluate Risk

Species (Common Name)	Species (Scientific Name)	Exposure Method	Purity (% A.I.)	Study Duration	Endpoint	Endpoint Estimate	Source
Bobwhite quail	<i>Colinus virginianus</i>	Administration of the toxicant ad libitum in the diet	99%	8 day	Oral LC50 (ppm)	>1,000	(1)
Bobwhite quail	<i>Colinus virginianus</i>	Oral gavage or capsule administration of the toxicant	99%	14 day	Oral LD50 (mg/kg-bw)	357.9	(2)
<b>Bobwhite quail</b>	<b><i>Colinus virginianus</i></b>	<b>Oral gavage or capsule administration of the toxicant</b>	<b>99%</b>	<b>14 day</b>	<b>Oral LD50 (mg/kg-bw)</b>	<b>340</b>	<b>(3)</b>
Mallard duck	<i>Anas platyrhynchos</i>	Administration of the toxicant ad libitum in the diet	99%	8 day	Oral LC50 (ppm)	>1,000	(4)
Ring-necked pheasant	<i>Phasianus colchicus</i>	Administration of the toxicant ad libitum in the diet	NR	8 day	Oral LC50 (ppm)	>40,000	(5)

#### General Notes:

The bolded study endpoint estimate was used for derivation of a reptilian TRV.

#### Abbreviations:

A.I. - Active Ingredient

LC50 - Median Lethal Concentration

LD50 - Median Lethal Dose

OPP - Office of Pesticide Programs

NR - Not Reported

#### References:

(1) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012):

<http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3837>

(2) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012):

<http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3840>

(3) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012):

<http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3836>

(4) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012):

<http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3838>

(5) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012):

<http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3839>

**Exposure Assessment**

For terrestrial wildlife species, we used the procedures suggested in the U.S. EPA's Wildlife Exposure Factors Handbook (1993). We used uptake rates or equations to calculate uptake rates published by the U.S. EPA (1999 and 1993).

**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, and consuming exposed prey items or vegetation were included in the exposure estimate.

## 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
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### 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 3<sup>rd</sup> 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*) ( $2.2 \pm 0.2$  µg/g dry weight) collected from Thermaikos Gulf, Greece were less than seawater concentrations ( $1.5 \pm 0.08$  µg/L) and sediment ( $2.7 \pm 0.5$  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  $815 \pm 117$  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,  $t_{1/2-1} = 0.36$  d and  $t_{1/2-2} = 37$  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  $\geq 900$  mg/kg after 10 weeks and at dietary concentrations  $\geq 700$  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  $\mu\text{g/g}$  dry weight and water concentrations of up to 127  $\mu\text{g/L}$ , 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  $\mu\text{g}$  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  $\geq 8$  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  $\mu\text{g/L}$  Cu, 1.1  $\mu\text{g/L}$  Cd, 3.2  $\mu\text{g/L}$  Pb, and 50  $\mu\text{g/L}$  Zn. Cu concentrations in the shrimp were 20, 40, and 80  $\mu\text{g/g}$  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  $\mu\text{g/g}$  wet weight). Adult fish received invertebrates containing 3.20 As, 0.24 Cd, 26.13 Cu, 1.77 Pb, 68.99 Zn (all  $\mu\text{g/g}$  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  $\mu\text{g}$  Cd/L, 24  $\mu\text{g}$  Cu/L, 6.4  $\mu\text{g}$  Pb/l and 100  $\mu\text{g}$  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 ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) at concentrations of 0.0001 to 0.01 ppm in the laboratory.

Folmar 1978

Mayfly nymphs (*Ephemerella walkeri*) showed strong avoidance to copper ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) at a concentration of 0.1 ppm but not 0.001 or 0.01 ppm in the laboratory.

## Copper Ecological Aquatic Toxicity Studies

Chemical	Species Name	Common Name	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper ethanolamine complex	<i>Egeria densa</i>	Brazilian waterweed	1	Biochemical	LOEL	None	1000	ug/L	USEPA, 2013
Copper ethanolamine complex	<i>Egeria densa</i>	Brazilian waterweed	1	Biochemical	NOEL	None	1000	ug/L	USEPA, 2013
Copper ethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	NOEL	None	2000	ug/L	USEPA, 2014
Copper ethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	LC50	None	42000	ug/L	USEPA, 2014
Copper ethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	LC50	None	1500	ug/L	USEPA, 2014
Copper ethylenediamine complex	<i>Landoltia punctata</i>	Duckweed	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2013
Copper ethylenediamine complex	<i>Landoltia punctata</i>	Duckweed	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2013
Copper triethanolamine complex	<i>Landoltia punctata</i>	Duckweed	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2013
Copper triethanolamine complex	<i>Landoltia punctata</i>	Duckweed	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2013
Copper triethanolamine complex	<i>Anas platyrhynchos</i>	Mallard Duck	9	Mortality	NOEL	>	5000	mg/kg	USEPA, 2014

Chemical	Species Name	Common Name	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper triethanolamine complex	<i>Anas platyrhynchos</i>	Mallard Duck	9	Mortality	LC50	>	5000	mg/kg	USEPA, 2014
Copper triethanolamine complex	<i>Colinus virginianus</i>	Northern Bobwhite Quail	8	Mortality	LC50	>	5000	mg/kg	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	LC50	None	17600	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	NOEL	None	18500	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	LC50	None	51000	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	LC50	None	57000	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis cyanellus</i>	Green sunfish	4	Mortality	LC50	None	1300	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	LC50	None	840	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	NOEL	None	100	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	2	Mortality	LC50	None	790	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	LC50	None	26	ug/L	USEPA, 2014

Chemical	Species Name	Common Name	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper sulfate pentahydrate	<i>Anabaena flos-aquae</i>	bluegreen algae	5	Population	NOEL	None	20	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Selenastrum capricornutum</i>	Green algae	5	Population	NOEL	None	2	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lemna minor</i>	Duckweed	5	Growth	NOEL	None	100	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lemna minor</i>	Duckweed	5	Growth	EC50	None	2300	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Colinus virginianus</i>	Northern Bobwhite Quail	14	Mortality	LC50	None	340	mg/kg b.w.	USEPA, 2014
Copper sulfate pentahydrate	<i>Colinus virginianus</i>	Northern Bobwhite Quail	14	Mortality	LC50	None	357.9	mg/kg b.w.	USEPA, 2014
Copper sulfate pentahydrate	<i>Colinus virginianus</i>	Northern Bobwhite Quail	14	Mortality	NOEL	None	120	mg/kg b.w.	USEPA, 2014
Copper sulfate pentahydrate	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	LC50	None	2870	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	LC50	None	1300	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	NOEL	None	650	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	NOEL	None	1000	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	NOEL	None	1960	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	LC50	None	3580	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	NOEL	None	56	ug/L	USEPA, 2014

Chemical	Species Name	Common Name	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper sulfate pentahydrate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	LC50	None	130	ug/L	USEPA, 2014
Copper (II) sulfate	<i>Microcystis aeruginosa</i>	bluegreen algae	1	Biochemical	NOEC	None	250	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Euglenophyceae</i>	Euglenoid Class	27	Population	NOEL	None	65.3	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Chlorella sp.</i>	Green Algae	3	Population	NOEC	None	2.3	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Chlorella sp.</i>	Green Algae	3	Population	LOEC	None	7.9	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pseudokirchneriella subcapitata</i>	Green Algae	3	Population	NOEC	None	4.2	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Chlorella sp.</i>	Green Algae	2	Population	LOEL	None	0.4	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Xenopus laevis</i>	African Clawed Frog	4	Mortality	LC50	None	1370	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Xenopus laevis</i>	African Clawed Frog	4	Growth	NOEC	None	100	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Bufo boreas</i>	Boreal Toad	4	Mortality	LC50	None	120	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Epidalea calamita</i>	Natterjack toad	4	Mortality	LC50	None	80	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Epidalea calamita</i>	Natterjack toad	4	Growth	NOEC	None	100	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Epidalea calamita</i>	Natterjack toad	4	Growth	LOEC	None	50	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Gammarus balcanicus</i>	Amphipod	4	Biochemical	NOEL	None	10000	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Tetrahymena sp.</i>	Ciliate Protozoan	1	Mortality	LC50	None	3300	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Mesocyclops pehpeiensis</i>	Copepod	2	Mortality	LC50	None	75	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Mesocyclops pehpeiensis</i>	Copepod	9	Growth	EC50	None	25	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Barytelphusa cunicularis</i>	Crab	4	Mortality	LC50	None	215000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Cherax destructor</i>	Crayfish	4	Mortality	LC50	None	379	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Cherax destructor</i>	Crayfish	4	Mortality	LC50	None	379	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Astacus leptodactylus</i>	Crayfish	14	Biochemical	LOEL	None	10	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Orconectes immunis</i>	Crayfish	5	Physiology	LOEL	None	160	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Astacus leptodactylus</i>	Crayfish	14	Biochemical	NOEL	None	10	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Cherax destructor</i>	Crayfish	3	Mortality	LC50	None	509	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Orconectes immunis</i>	Crayfish	5	Mortality	LC50	None	20000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Spiralothelphusa hydrodroma</i>	Freshwater Field Crab	15	Biochemical	LOEC	None	25460	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium dayanum</i>	Freshwater Prawn	2	Cellular	NOEC	None	418	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium dayanum</i>	Freshwater Prawn	4	Mortality	LC50	None	418	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Macrobrachium dayanum</i>	Freshwater Prawn	1	Cellular	LOEC	None	418	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium rosenbergii</i>	Giant River Prawn	7	Biochemical	NOEC	None	10	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium rosenbergii</i>	Giant River Prawn	7	Biochemical	LOEC	None	50	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium rosenbergii</i>	Giant River Prawn	4	Mortality	LC50	None	452	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Hydra viridissima</i>	Hydra	4	Mortality	LC50	None	28	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Chasmagnathus granulata</i>	Neohelice Crab	14	Growth	NOEL	None	100	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Hyalella sp.</i>	Scud	4	Mortality	LC50	None	170	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	8	Biochemical	NOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	4	Biochemical	NOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	8	Biochemical	LOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	4	Biochemical	LOEC	None	1000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	2	Biochemical	LOEC	None	5000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Ceratophyllum demersum</i>	Coontail	1	Physiology	LOEC	>	2500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Ceratophyllum demersum</i>	Coontail	1	Physiology	LOEC	>	100	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Lemna gibba</i>	Duckweed	14	Growth	NOEC	None	100	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna gibba</i>	Duckweed	14	Growth	LOEC	None	250	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	10	Growth	EC50	None	470	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	4	Biochemical	LOEC	None	5000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	4	Biochemical	NOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	4	Biochemical	LOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	4	Biochemical	NOEC	None	50	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	4	Biochemical	NOEC	None	50	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Cabomba aquatica</i>	Fanwort	4	Physiology	LOEC	None	12	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Elodea canadensis</i>	Pondweed	4	Physiology	LOEC	None	12	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Eichhornia crassipes</i>	Water Hyacinth	14	Biochemical	NOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Eichhornia crassipes</i>	Water Hyacinth	14	Biochemical	LOEC	None	1000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Gallus domesticus</i>	Domestic Chicken	12	Growth	NOEC	None	2	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Gallus domesticus</i>	Domestic Chicken	15	Biochemical	LOEL	None	20	mg/kg	USEPA, 2013

Chemical	Species Name	Common Name	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Lepomis macrochirus</i>	Bluegill sunfish	4	Mortality	LC50	None	2640	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Ictalurus punctatus</i>	Channel catfish	4	Mortality	LC50	None	710	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pimephales promelas</i>	Fathead Minnow	2	Mortality	LC50	None	7.2	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pimephales promelas</i>	Fathead Minnow	2	Mortality	LC50	None	5.9	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pimephales promelas</i>	Fathead Minnow	4	Mortality	LC50	None	96.6	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Gambusia affinis</i>	Mosquitofish	4	Mortality	LC50	None	250	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	LC50	None	94	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	7	Biochemical	NOEC	None	41.06	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	4	Mortality	LC50	None	80	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pelodiscus sinensis</i>	Chinese Softshell Turtle	112	Growth	NOEC	None	10.9	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Pelodiscus sinensis</i>	Chinese Softshell Turtle	112	Growth	LOEC	None	20.4	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Pelodiscus sinensis</i>	Chinese Softshell Turtle	112	Biochemical	NOEC	None	41.8	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Pelodiscus sinensis</i>	Chinese Softshell Turtle	112	Biochemical	LOEC	None	78.6	mg/kg	USEPA, 2013

**Notes:**

EC50 - Effective concentration for 50% of the population

LC50 - Lethal concentration for 50% of the population

LD50 - Lethal dose for 50% of the population

LOEC - Lowest Observable Effect Concentration

LOEL - Lowest Observable Effect Level

NOEC - No Observable Effect Concentration

NOEL - No Observable Effect Level

Biochemical - Measurement of biotransformation or metabolism of chemical compounds, modes of toxic action, and biochemical responses in plants and animals. Examples of biochemical effects include changes in enzyme or hormonal activity.

Behavior - Overt activity measurement of an organism including but not limited to avoidance, aggression, and feeding behavior.

Cellular - Measurements regarding changes in structure and chemical composition of cells and tissues of plants or animals as related to their functions.

Growth - Measurements that include changes in body weight, morphology, and development.

Mortality - Measurements where the cause of death can be attributed to the chemical.

Physiology - Measurement regarding basic activity within tissues and cells of plants or animals. Effects include physiological responses such as injury, immunity, and intoxication.

Population - Measurements related to changes in a group of organisms of the same species occupying the same area at a given time.

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# Appendix C

(Copper Speciation Graphs from the Biotic Ligand Model)

## Biotic Ligand Model Copper Speciation Graphs for Varying Water Parameters

In addition to using a hardness based approach to quantifying copper water quality criteria, the USEPA suggests the use of another model, described below, to analyze and/or predict toxicity of bioavailable copper in the water column. In the 2007 revision of Aquatic Life Ambient Freshwater Quality Criteria-Copper (EPA 2007), the USEPA recommended the Biotic Ligand Model (BLM) as a more accurate approach for assessing toxicity and deriving freshwater quality criteria for copper. The BLM supplements USEPA's previously published recommendation of using the hardness-based estimation and better accounts for the reduction in copper bioavailability that results from competitive binding of copper to other molecules in the water column.

The BLM was developed to predict copper toxicity to aquatic organisms in relation to water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC). According to the BLM, copper bioavailability is strongly influenced by these parameters. The free cupric ion ( $\text{Cu}^{2+}$ ) is the primary driver of copper bioavailability and toxicity in aquatic ecosystems (EPA 2007).

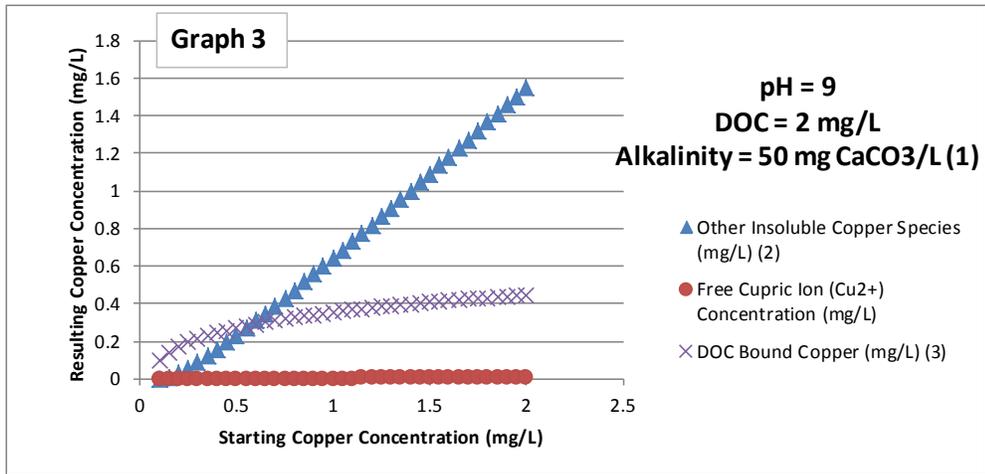
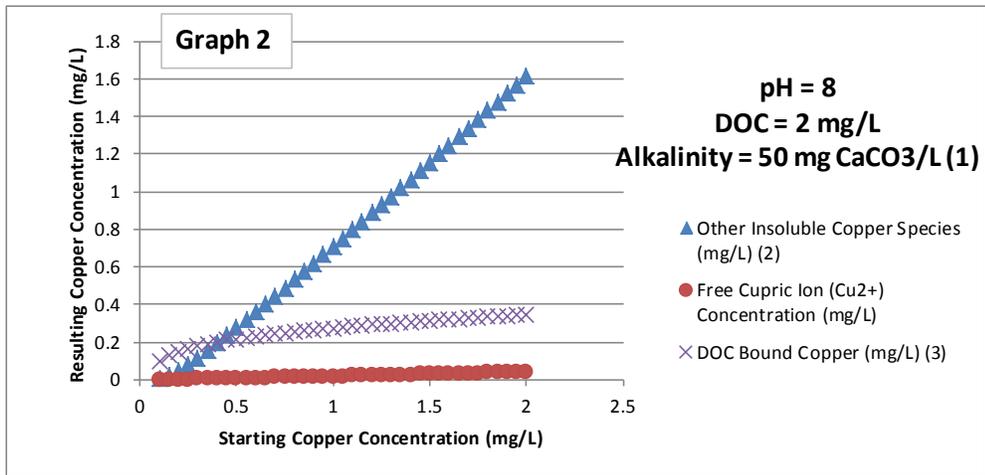
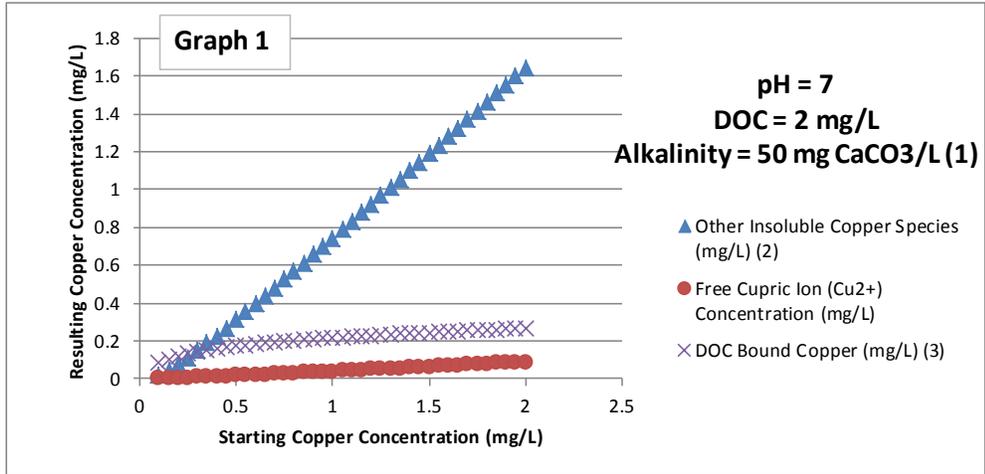
In order to derive freshwater quality criterion for copper, the BLM uses ten water quality inputs: temperature; pH; dissolved organic carbon (DOC); major cations including calcium (Ca), magnesium (Mg), sodium (Na), potassium (K); major anions including sulfate ( $\text{SO}_4$ ), chloride (Cl); and alkalinity. Copper may be measured for comparison with site-specific criteria, but it is not required as an input to the model to determine copper freshwater quality criteria. The BLM-based water quality criterion for copper may be more or less stringent than the hardness-based criteria depending on the water quality parameters. However, it is a more accurate than hardness-based criteria because it is based on copper bioavailability to aquatic species.

The BLM may also be used to predict copper toxicity and speciation in varying water conditions. When the model is run in toxicity prediction mode, it predicts the concentration of dissolved copper that produces a particular endpoint (e.g. NOAEL, LOAEL, or  $\text{LC}_{50}$ ) for the selected aquatic species. When run in speciation prediction mode, the model can determine the various forms (e.g.  $\text{CuCO}_3$ ,  $\text{Cu}^{2+}$ , copper bound to DOC) and concentrations of copper in the water when known copper concentration in water is input in the model.

Using the Biotic Ligand Model in copper speciation prediction mode, a total of 27 graphs have been generated to illustrate how variations in water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC) influence the concentration of bioavailable  $\text{Cu}^{2+}$ . See the tables and graphs below. Generally, an increase in one or more of the four water parameters lowers the concentration of the  $\text{Cu}^{2+}$  species, thereby lowering the bioavailability of copper.

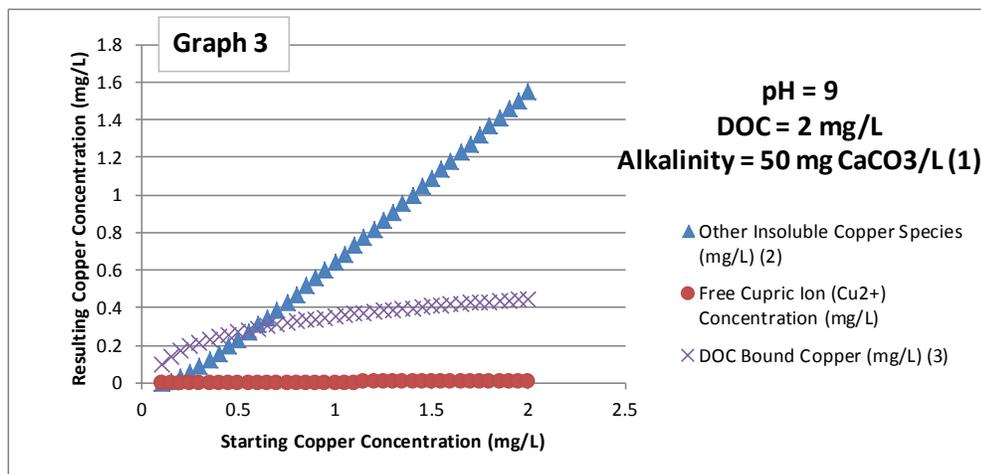
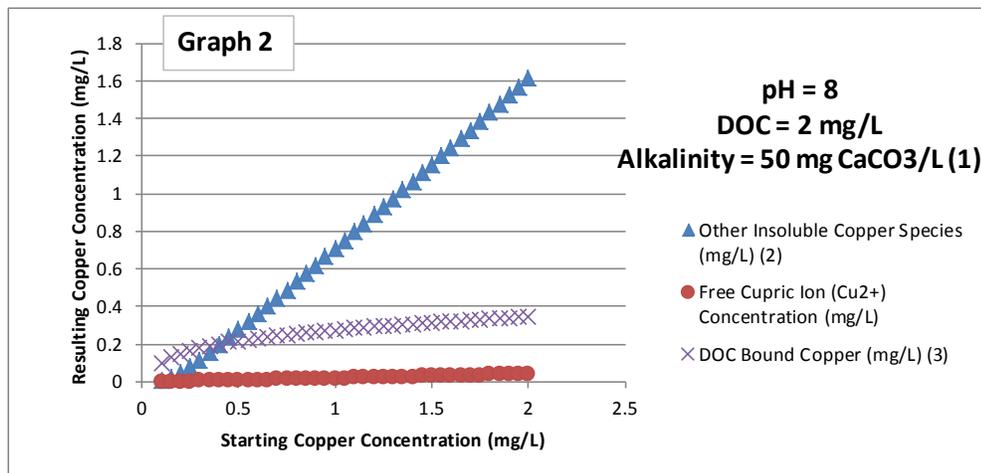
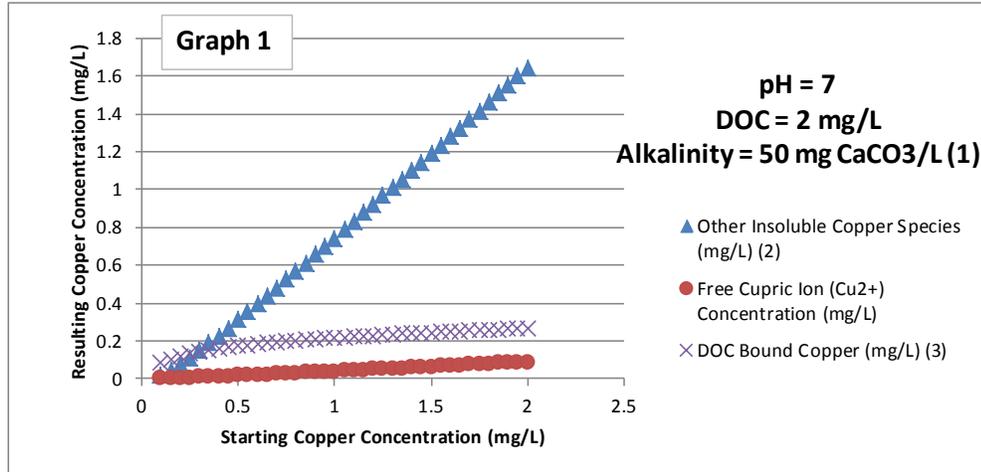
APPENDICES

<b>Graph #</b>	<b>Dissolved Organic Carbon (mg/L)</b>	<b>pH (unitless)</b>	<b>Alkalinity &amp; Hardness (mg CaCO3/L)</b>
1	2	7	50
2	2	8	50
3	2	9	50
4	2	7	100
5	2	8	100
6	2	9	100
7	2	7	200
8	2	8	200
9	2	9	200
10	4	7	50
11	4	8	50
12	4	9	50
13	4	7	100
14	4	8	100
15	4	9	100
16	4	7	200
17	4	8	200
18	4	9	200
19	6	7	50
20	6	8	50
21	6	9	50
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23	6	8	100
24	6	9	100
25	6	7	200
26	6	8	200
27	6	9	200



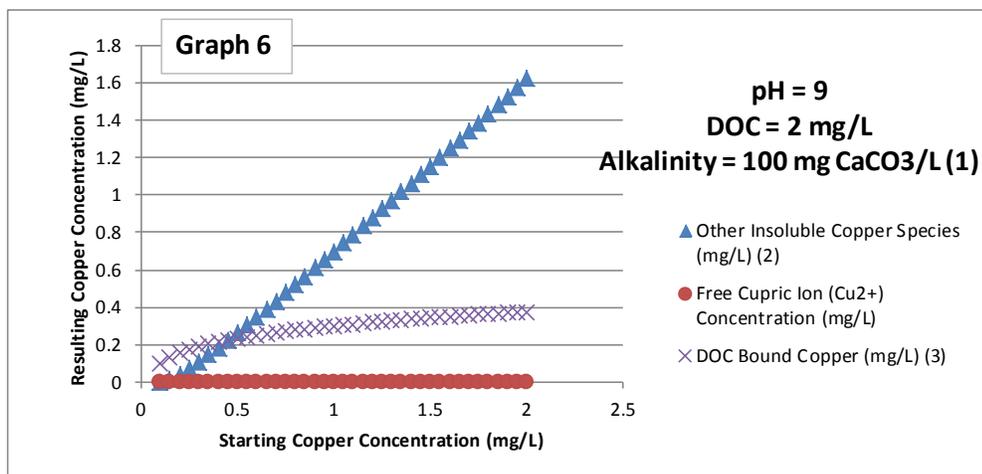
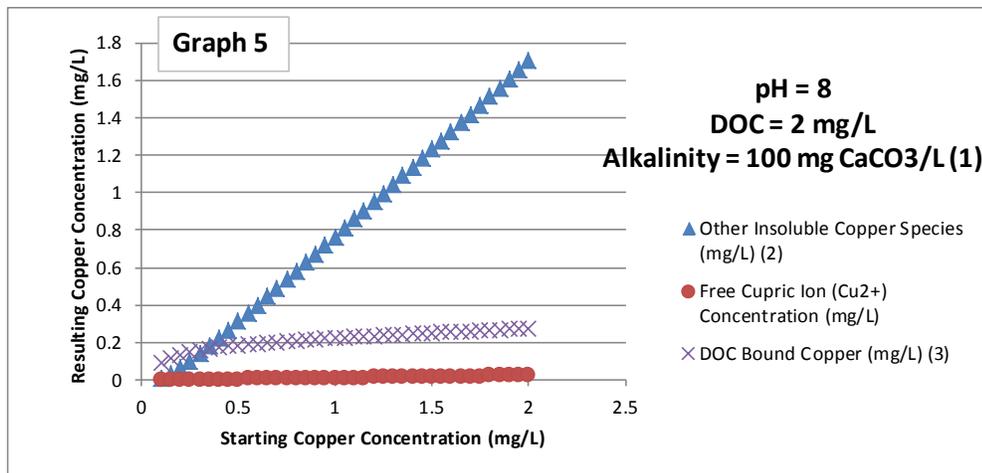
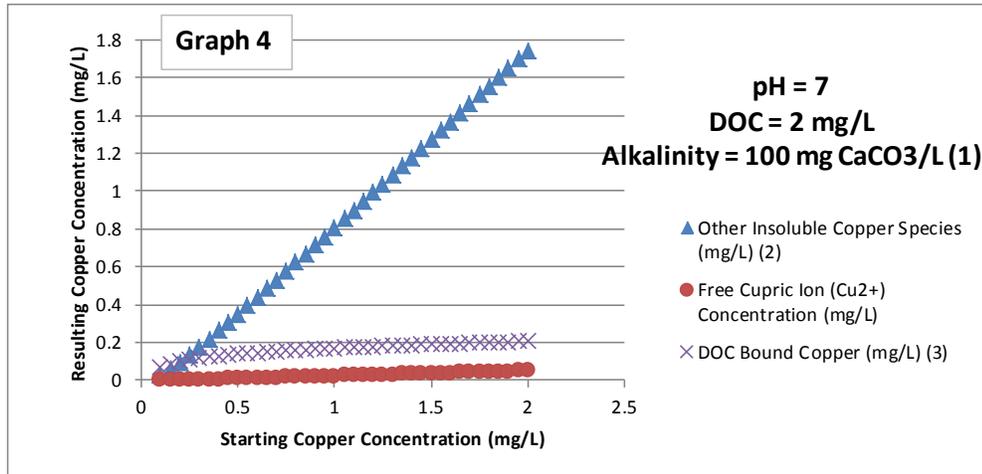
**Notes:**

- (1) Hardness and Alkalinity are both expressed as CaCO<sub>3</sub> and are assumed equal.
- (2) "Other Insoluble Copper Species" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: CuCO<sub>3</sub>, CuHCO<sub>3</sub><sup>+</sup>, and Cu(OH)<sub>2</sub>.
- (3) DOC is the dissolved organic carbon content capable of complexing with copper cations, rendering them non-bioavailable. The humic acid content of the DOC was assumed to be 10%.



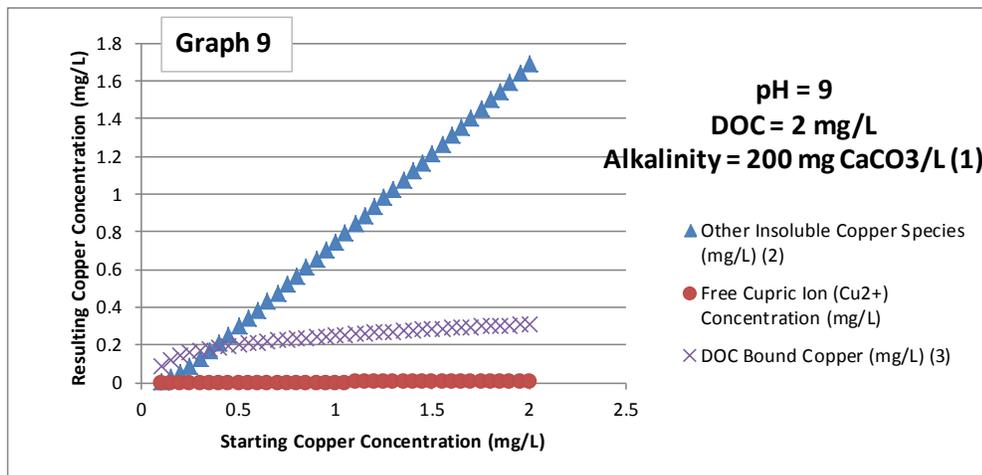
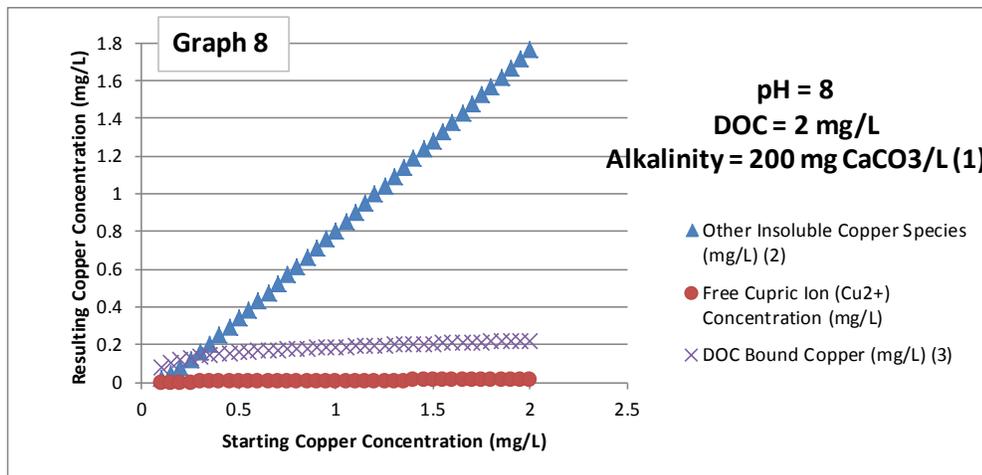
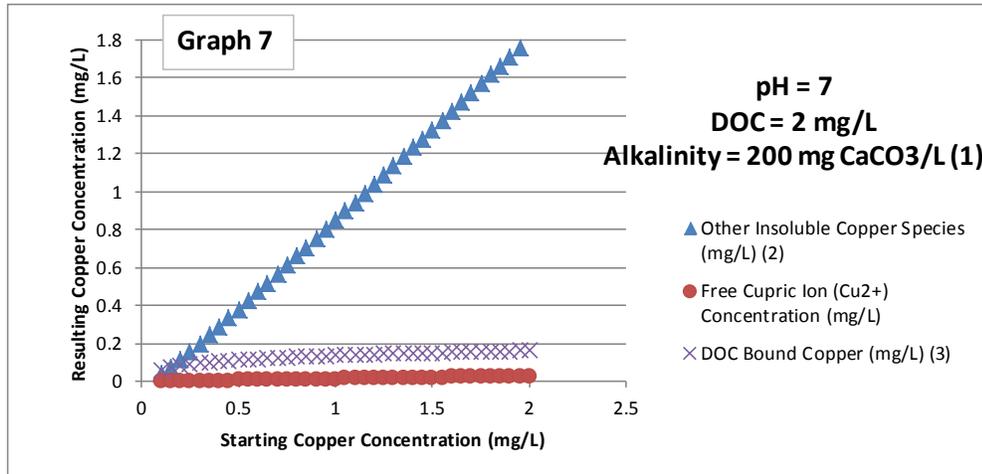
**Notes:**

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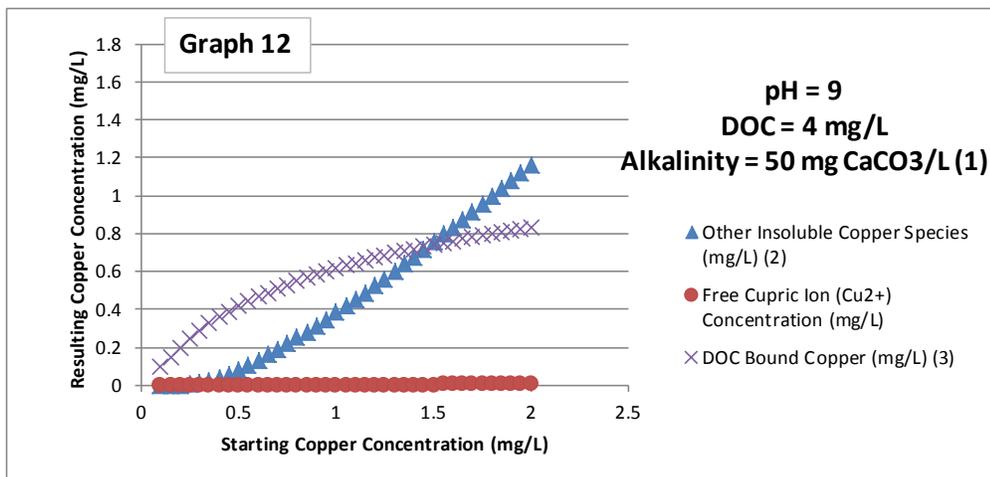
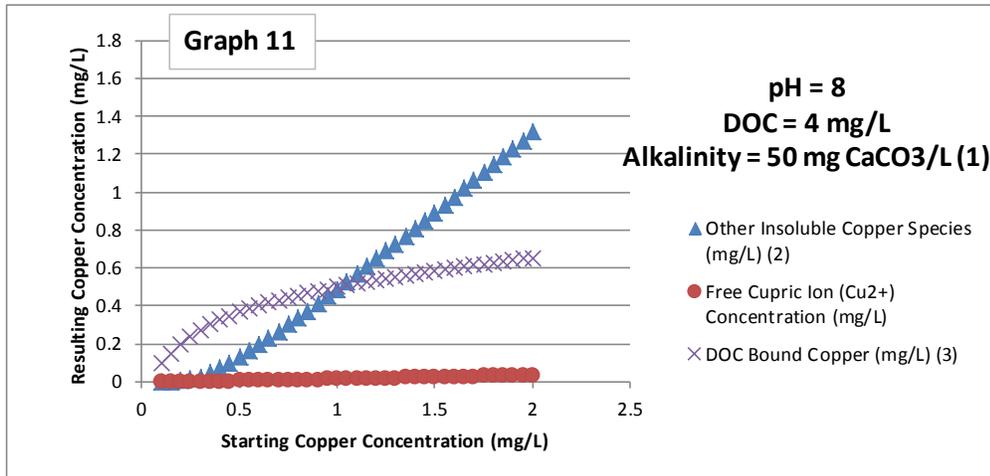
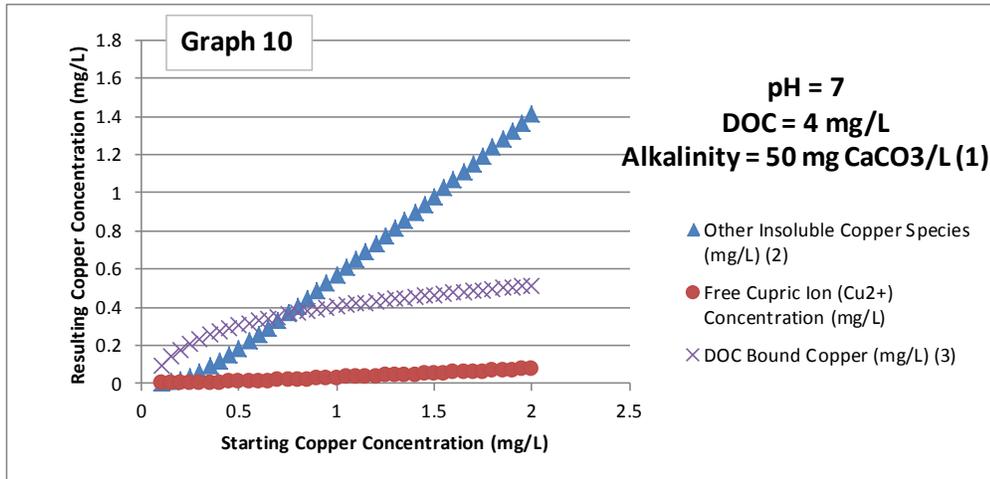
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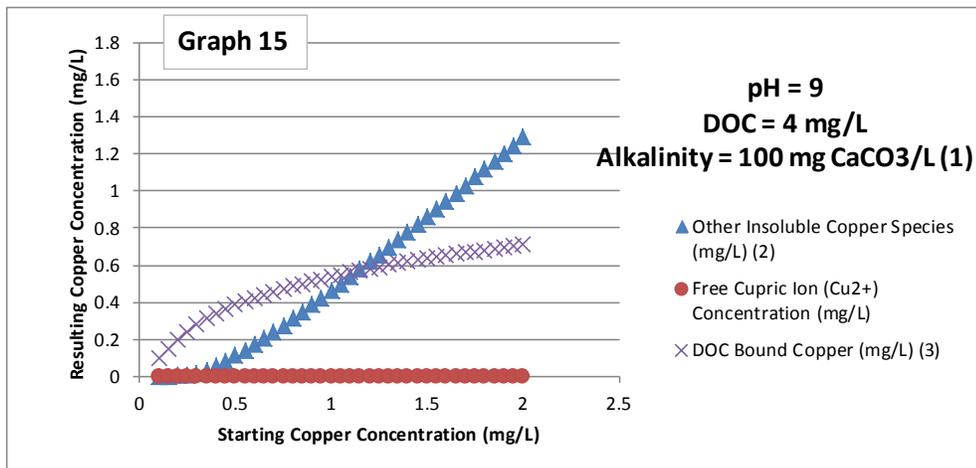
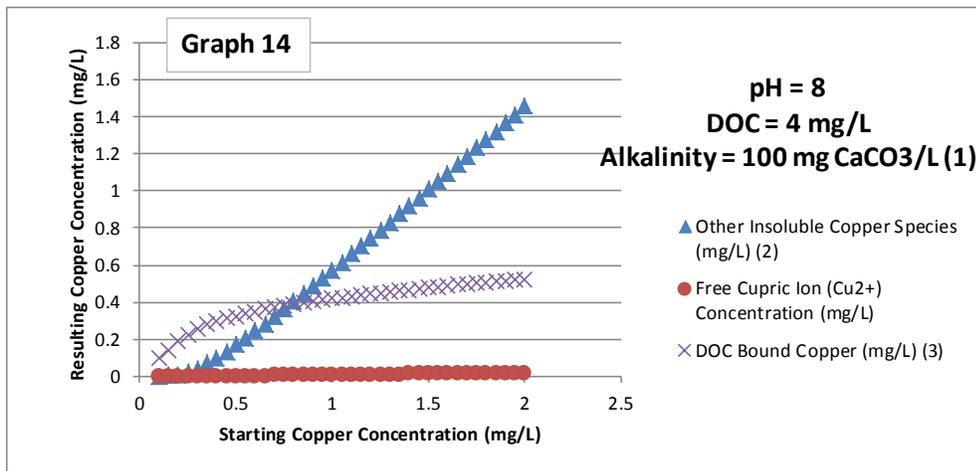
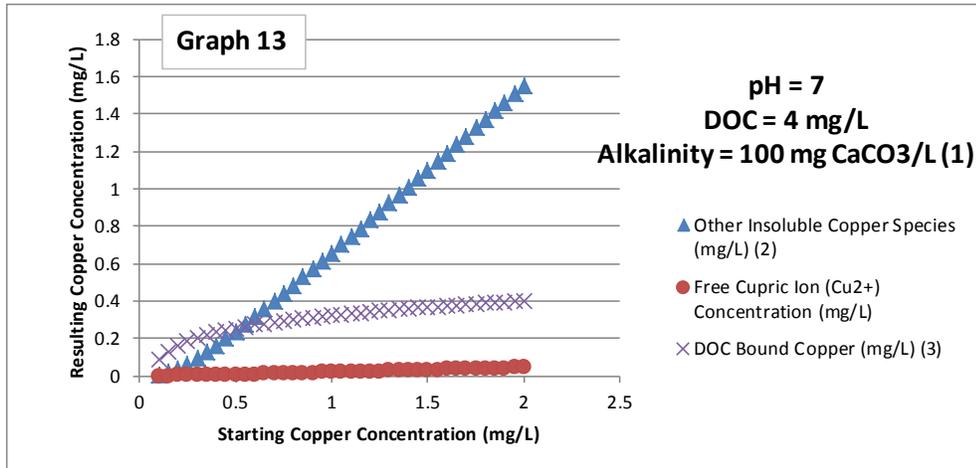
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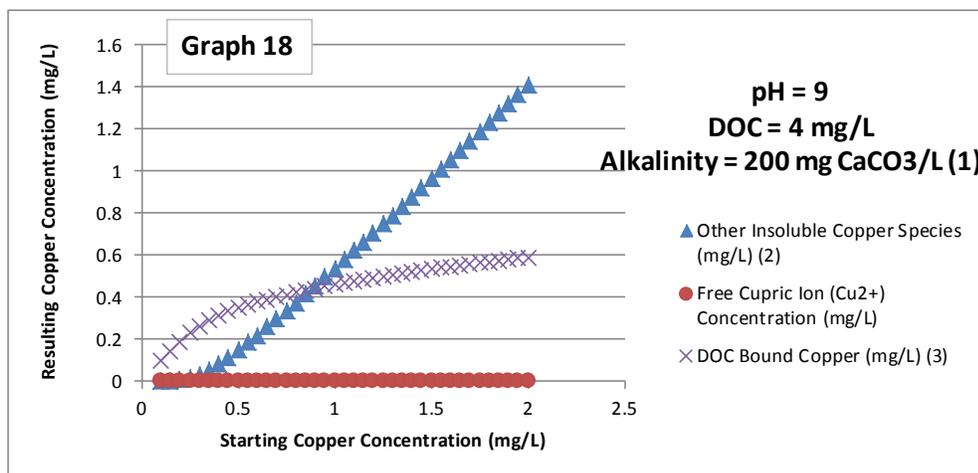
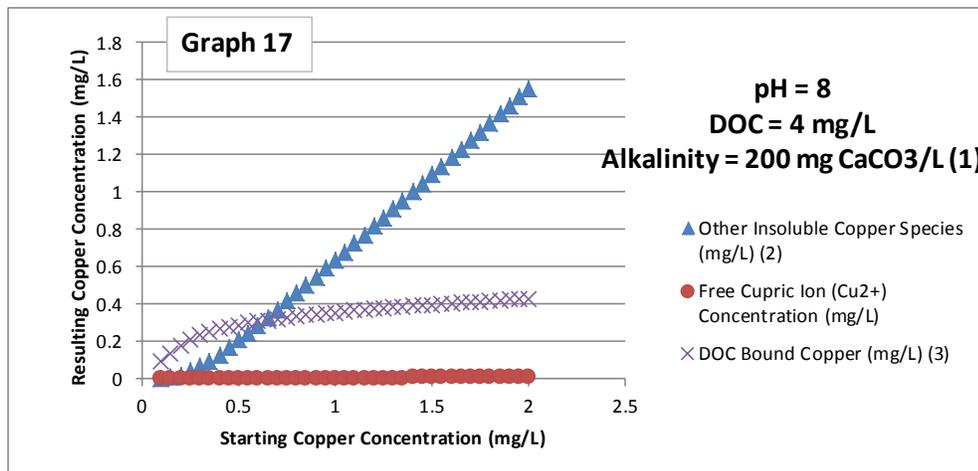
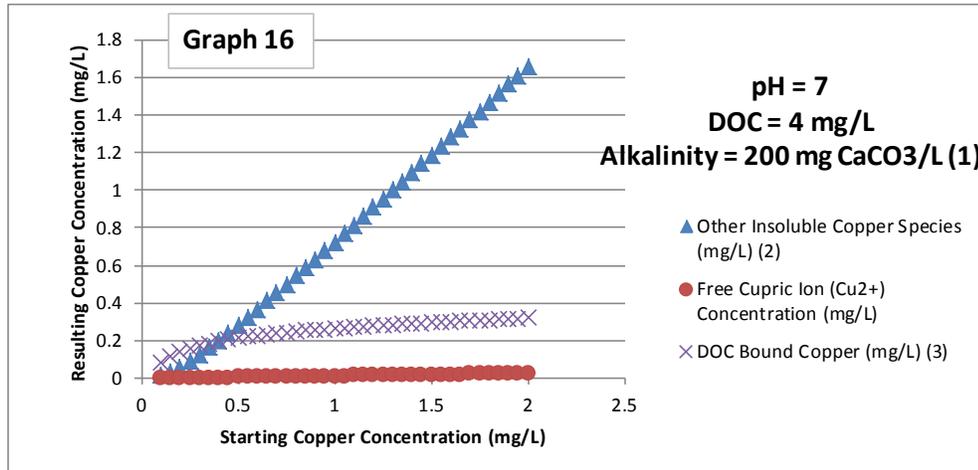
**Notes:**

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- (3) DOC is the dissolved organic carbon content capable of complexing with copper cations, rendering them non-bioavailable. Dissolved organic carbon was modeled with 10% humic acid content.



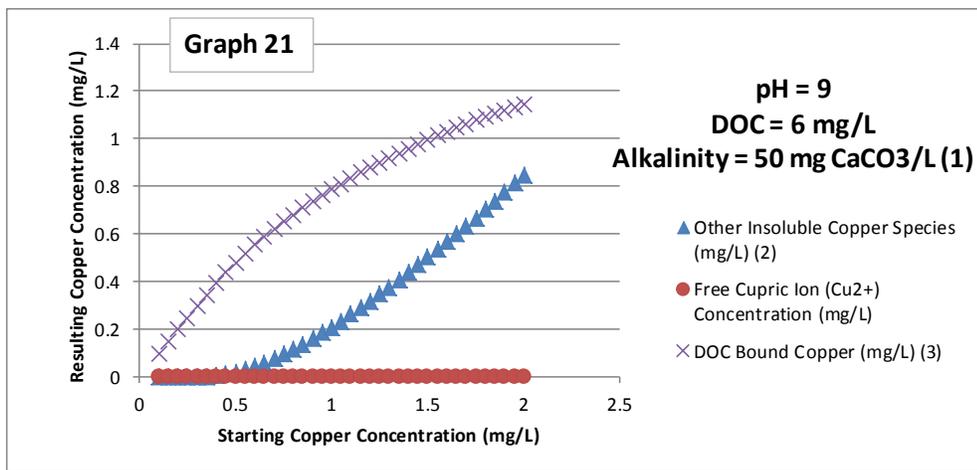
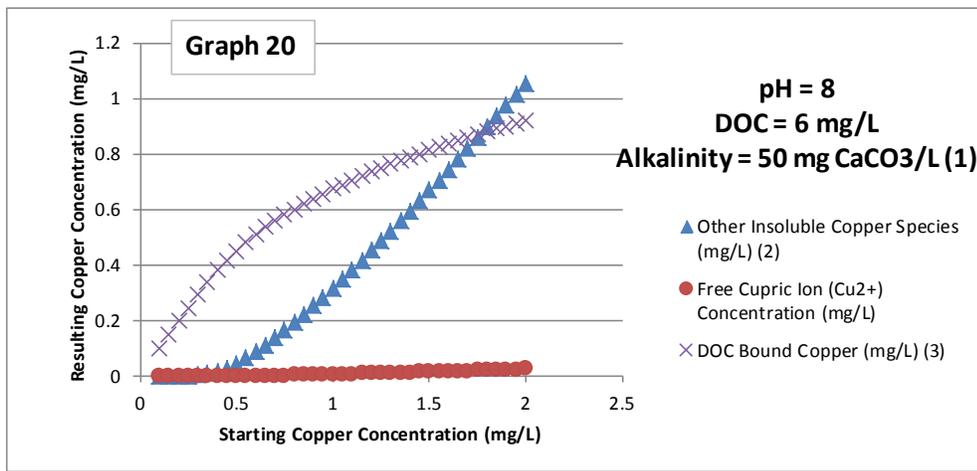
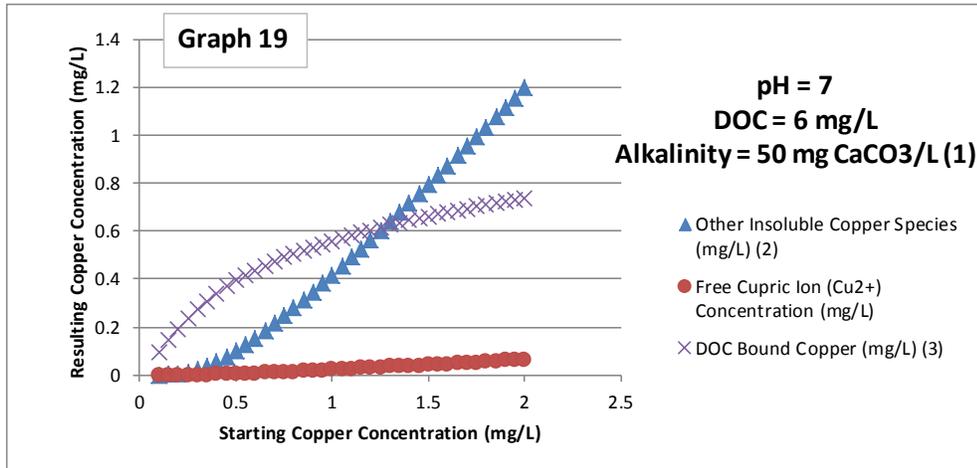
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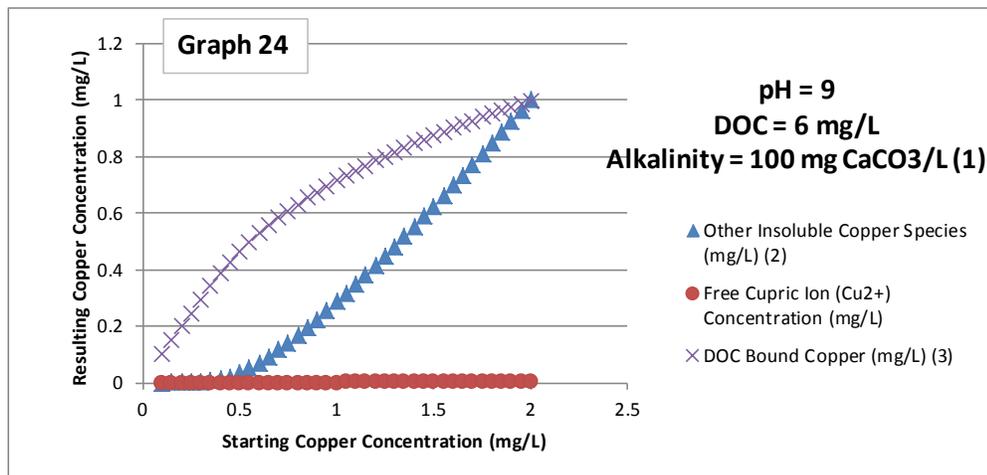
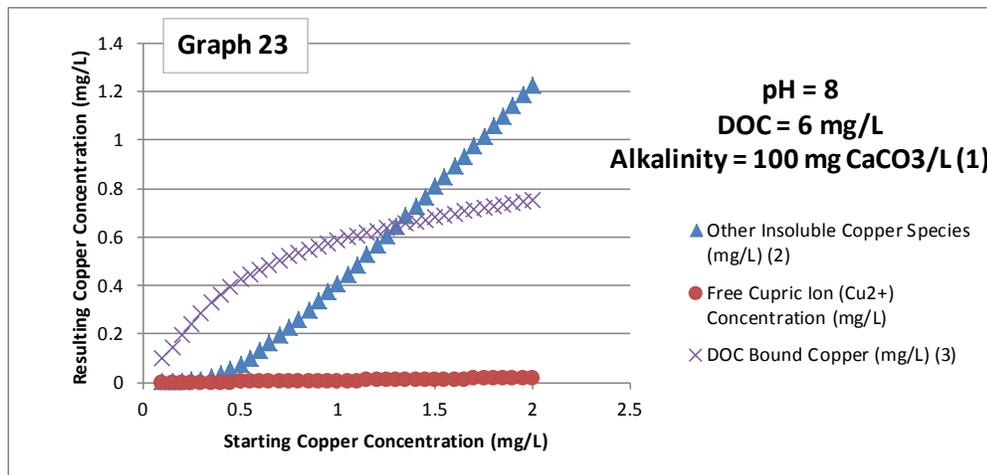
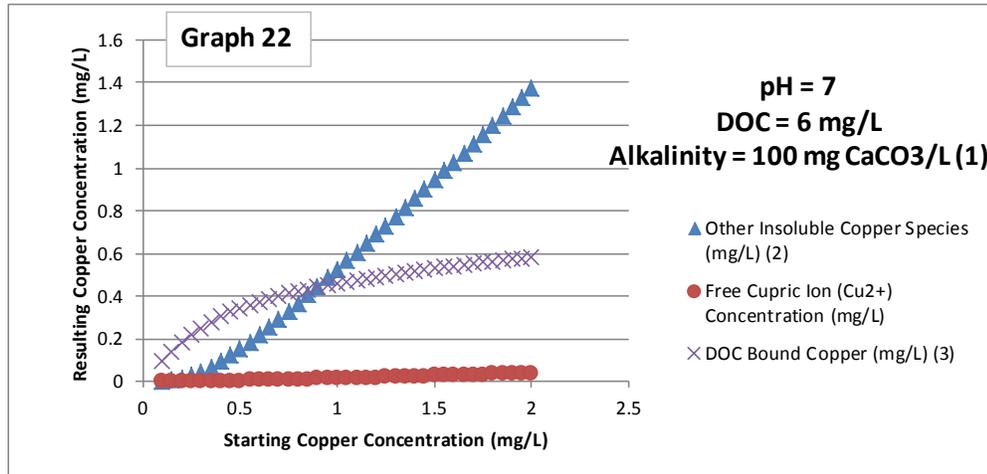
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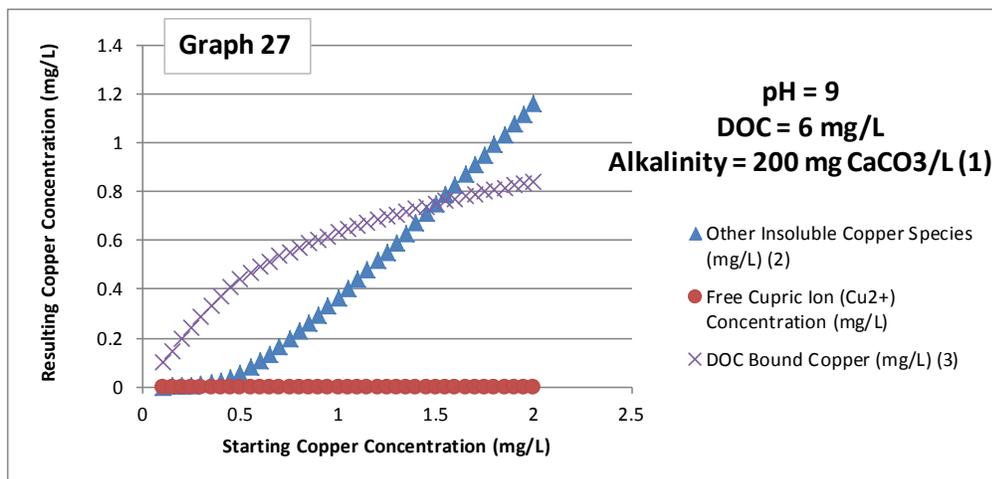
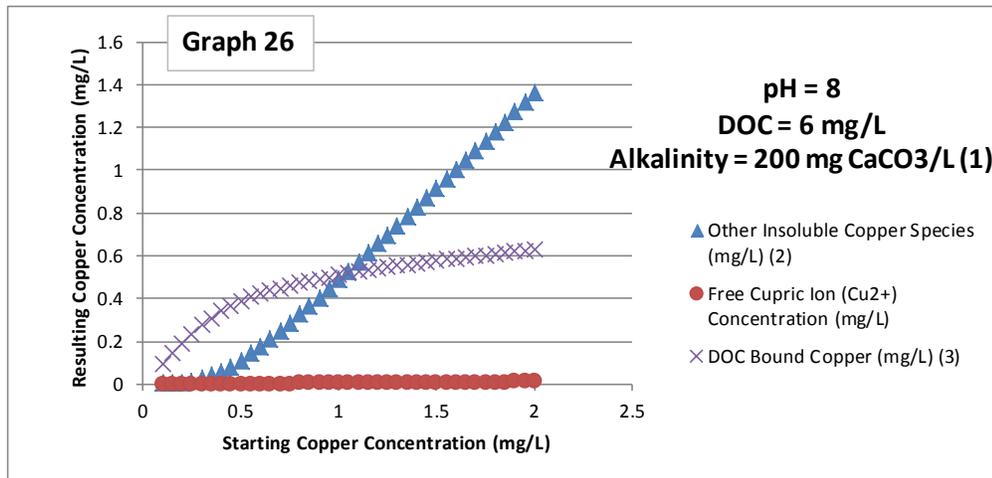
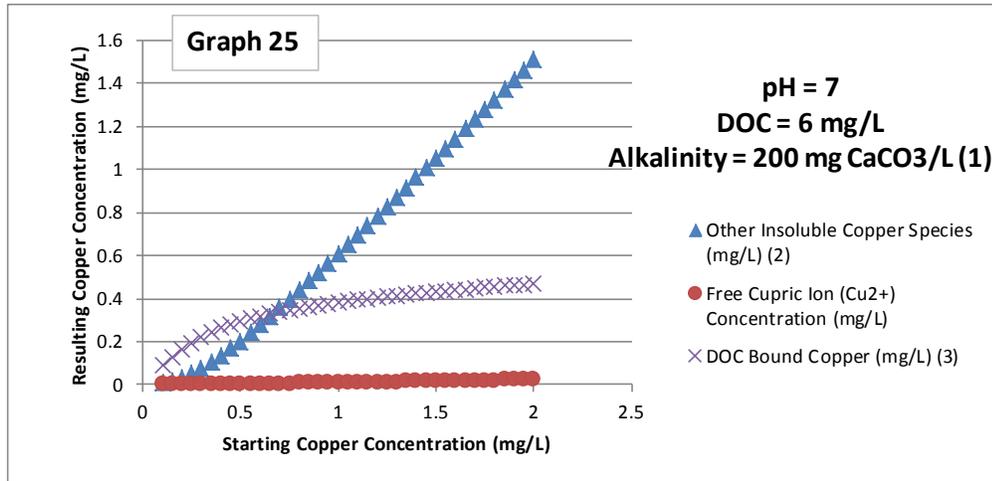
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# Appendix D

(DPR PCA Recommendation Form)

### 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: <input type="checkbox"/> Air <input type="checkbox"/> Ground <input type="checkbox"/> Fumigation <input type="checkbox"/> 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: <input type="checkbox"/> 1. Highly toxic to bees. <input type="checkbox"/> 2. Toxic to birds, fish and wildlife. <input type="checkbox"/> 3. Do not apply when irrigation or run-off is likely to occur. <input type="checkbox"/> 4. Do not apply near desirable plants. <input type="checkbox"/> 5. Do not allow to drift onto humans, animals, or desirable plants. <input type="checkbox"/> 6. Keep out of lakes, streams, and ponds. <input type="checkbox"/> 7. Birds feeding on treated area may be killed. <input type="checkbox"/> 8. Do not apply when foliage is wet (dew, rain, etc.). <input type="checkbox"/> 9. May cause allergic reaction to some people. <input type="checkbox"/> 10. This product is corrosive and reacts with certain materials (see label). <input type="checkbox"/> 11. Closed system required. <input type="checkbox"/> 12. Restricted use pesticide (California and/or EPA). <input type="checkbox"/> 13. Hazardous area involved (see map and warnings) <input type="checkbox"/> 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: <input type="checkbox"/> Sweep Net Counts <input type="checkbox"/> Leaf or Fruit Counts <input type="checkbox"/> Preventative <input type="checkbox"/> Field Observation <input type="checkbox"/> Pheromone or Other Trap <input type="checkbox"/> Soil Sampling <input type="checkbox"/> Other	
15. Crop and Site Restrictions: <input type="checkbox"/> 1. Worker reentry interval _____ days. <input type="checkbox"/> 2. Do not use within _____ days of harvest/slaughter. <input type="checkbox"/> 3. Posting required? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 4. Do not irrigate for at least _____ days after application. <input type="checkbox"/> 6. Do not feed treated foliage or straw to livestock. <input type="checkbox"/> 7. Plantback restrictions (see label) <input type="checkbox"/> 8. Other ( see attachment )		N	
16. I certify that I have considered alternatives and mitigation measures that would substantially lessen any significant impact on the environment, and have adopted those feasible.		W	E
Adviser Signature _____ Date _____			
Adviser License Number _____			
Employer _____			
Employer's Address _____			
		S	

# Appendix E

(Example Product Labels and MSDS Sheets)

50 LBS. NET WEIGHT (22.7 KILOS)

## COPPER SULFATE CRYSTALS

ACTIVE INGREDIENT	BY WEIGHT
COPPER SULFATE PENTAHYDRATE.....	99.0%
OTHER INGREDIENTS.....	1.0%
TOTAL .....	100.0%

CAS #7758-99-8

COPPER AS METALLIC NOT LESS THAN 25%

See back panel for specific pesticidal use directions.

Also for non-pesticidal uses of copper sulfate including but not limited to:

- For Non-Pesticidal Manufacturing and Industrial Uses.
- For manufacturing, repackaging, formulation of algaecides and fungicides.
- For use as foot baths to control hoof rot in cattle.
- For use in preparing Bordeaux mixture.
- For use as a trace mineral for mixing in animal feeds at levels in accord with good feeding and feed manufacturing practices.
- For use as a fertilizer trace mineral for plant growth and used in accord with recommended agronomic practices.

(NOTE: For the states of Wisconsin, California, Oregon and Washington fertilizer recommendations and information, refer to back panel.)

When this product is used as a feed or fertilizer ingredient:

Guaranteed Analysis: Copper (Cu) = 25.0% Derived from Copper Sulfate

### 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 the label, find someone to explain it to you in detail.)

FIRST AID	
If on skin or clothing:	Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
If inhaled:	Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible. Call a poison control center or doctor for further treatment advice.
If in eyes:	Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue to rinse eye. Call a poison control center or doctor for treatment advice.
If swallowed:	Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.
Notes:	Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In the event of a medical emergency, you may also contact the National Pesticide Information Center at 1-800-858-7378.

→ CHEM ONE LTD. →

This product manufactured for  
CHEM ONE LTD.  
HOUSTON, TEXAS 77040-6519  
TEL. (713) 896-9966

EPA REG. NO. 56576-1  
EPA EST. NO. 52117-MX-001

**PRECAUTIONARY STATEMENTS  
HAZARDS TO HUMANS AND DOMESTIC ANIMALS  
DANGER - PELIGRO**

**CORROSIVE:** Causes eye damage and irritation to the skin and mucous membranes. Harmful or fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not breathe dust or spray mist. May cause skin sensitization reactions to certain individuals.

**PERSONAL PROTECTIVE EQUIPMENT**

Applicators and other handlers must wear: Long-sleeved shirt and long pants, chemical-resistant gloves made of any waterproof material, shoes plus socks, and protective eyewear. Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category A on an EPA chemical resistance category selection chart. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this 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 clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. 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 product is toxic to fish. 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 in order to avoid depletion of oxygen from decaying vegetation. Allow 1 to 2 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 by cleaning of equipment or disposal of wastes. Consult your local State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

**STORAGE AND DISPOSAL**

**PROHIBITIONS:** Do not contaminate water, food or feed by storage or disposal. Open burning and dumping is prohibited. Do not re-use empty container.

**STORAGE:** Keep pesticide in original container. Do not put concentrate or dilutions of concentrate in food or drink containers.

**PESTICIDE DISPOSAL:** Pesticide wastes are acutely hazardous. Improper disposal of excess 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.

**CONTAINER DISPOSAL:** Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or by incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.

**If Plastic Container:** Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

**STORAGE AND DISPOSAL**

Do not contaminate water, food or feed by storage or disposal.

**STORAGE:** Store in original container and place in a locked storage area.

**PESTICIDE DISPOSAL:** Call your local solid waste agency (or 1-800-CLEANUP or equivalent organization) for disposal instructions. Unless otherwise instructed, place in the trash. Never pour unused product down the drain or on the ground.

**CONTAINER DISPOSAL:** Do not reuse this container. Do not rinse unless required for recycling. Place in trash.

**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 requirements specific to your State or Tribe, consult the agency responsible for pesticide regulations.

**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, forests, 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, chemical-resistant gloves made of any waterproof material (such as polyvinyl chloride, nitrile rubber, or butyl rubber), 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.

Applicators and other handlers who handle this pesticide for any use NOT covered by the Worker Protection Standard (40 CFR Part 170) must wear: long-sleeved shirt, chemical-resistant gloves made of any waterproof material (such as polyvinyl chloride, nitrile rubber, or butyl rubber), shoes plus socks, and protective eyewear.

## GENERAL INSTRUCTIONS FOR USE

Water hardness, temperature of the water, the type and amount of vegetation to be controlled, and the amount of water flow are to be considered in using Copper Sulfate to control algae. Begin treatment soon after plant growth has started. If treatment is delayed until a large amount of algae is present, larger quantities of Copper Sulfate will be required. Algal growth is difficult to control with Copper Sulfate when water temperatures are low or when the water conditions are hard water. Larger quantities of Copper Sulfate will be required to kill and control algae in water which is flowing than in a body of stagnant water. If possible, curtail the flow of water before treatment and hold dormant for approximately three days after treatment or until the algae have begun to die. When preparing a Copper Sulfate solution in water, the mixing container should be made of plastic or glass: or, a painted, enameled, or copper lined metal container. It is usually best to treat algae on a sunny day when the heavy mats of filamentous algae are most likely to be floating on the surface where it can be sprayed directly. If there is some doubt about the concentration to apply, it is generally best to start with a lower concentration and to increase this concentration until the algae are killed.

Treatment of algae can result in oxygen loss from decomposition of dead algae. This loss can cause fish suffocation. Therefore, to minimize this hazard, treat one-third to one-half of the water area in a single operation and wait 10 to 14 days in between treatments. Begin treatments along the shore and proceed outward in bands to allow fish to move into untreated water. NOTE: If treated water is to be used as a source of potable water, the metallic copper residual must not exceed 1 ppm (4 ppm copper sulfate pentahydrate).

**CALCULATIONS FOR THE AMOUNT OF WATER IMPOUNDED AND FOR THE AMOUNT OF COPPER SULFATE TO BE USED:** Calculate water volume as follows: (1) Obtain surface area by measuring of regular shaped ponds or mapping of irregular ponds or by reference to previously recorded engineering data or maps. (2) Calculate average depth by sounding in a regular pattern and taking the mean of these readings or by reference to previously obtained data. (3) Multiply surface area in feet by average depth in feet to obtain cubic feet of water volume. (4) Multiply surface area in acres by average depth in feet to obtain total acre-feet of water volume.

**CALCULATE WEIGHT OF WATER TO BE TREATED AS FOLLOWS:** (1) Multiply volume in cubic feet by 62.44 to obtain total pounds of water, or (2) Multiply volume in acre feet by 2,720,000 to obtain pounds of water.

**CALCULATIONS OF ACTIVE INGREDIENT TO BE ADDED:** To calculate the amount of Copper Sulfate Pentahydrate needed to achieve the recommended concentration, multiply the weight of water by the recommended concentration of Copper Sulfate. Since recommended concentrations are normally given in parts per million (ppm), it will first be necessary to convert the value in parts per million to a decimal equivalent. For example, 2 ppm is the same as 0.000002 when used in this calculation. Therefore, to calculate the amount of Copper Sulfate Pentahydrate to treat 1 acre-foot of water with 2 ppm Copper Sulfate, the calculation would be as follows:

$$0.000002 \times 2,720,000 = 5.44 \text{ lbs. Copper Sulfate Pentahydrate}$$

**CALCULATION OF WATER FLOW IN DITCHES, STREAMS, AND IRRIGATION SYSTEMS:** The amount of water flow in cubic feet per second is found by means of a weir or other measuring device.

## SPECIFIC INSTRUCTIONS

### SEWER TREATMENT – ROOT DESTROYER\*

**ROOT CONTROL GENERAL INFORMATION:** Plant roots can penetrate through small cracks and poorly sealed joints of sewer lines. If not controlled, these small roots will continue to grow larger in number causing breakage, reduced flow, and eventually, flow stoppage. Copper sulfate has been known to be an effective means to control roots in residential and commercial sewers.

#### COMMERCIAL, INSTITUTIONAL, AND MUNICIPAL SEWERS:

**ROOT CONTROL IN SEWERS:** As a preventive measure, apply into each junction or terminal manhole 2 pounds of Copper Sulfate Crystals every 6 to 12 months. At time of reduced flow (some water flow is essential), add copper sulfate. If flow has not completely stopped, but has a reduced flow due to root masses, add Copper Sulfate Crystals in the next manhole above the reduced flow area. For complete stoppage, penetrate the mass with a rod to enable some flow before treatment.

**ROOT CONTROL IN STORM DRAINS:** Apply when water flow is light. If no water flow, as in dry weather, use a hose to produce a flow. Apply 2 pounds Copper Sulfate Crystals per drain per year. It may be necessary to repeat treatments 3 to 4 times, at 2 week intervals, if drains become nearly plugged.

**SEWER PUMPS AND FORCE MAINS:** At the storage well inlet, place a cloth bag containing 2 pounds of Copper Sulfate Crystals. Repeat as necessary.

#### RESIDENTIAL OR HOUSEHOLD SEWER SYSTEMS:

When a reduced water flow is first noticed, and root growth is thought to be the cause, treat with Copper Sulfate Crystals. It is important not to wait until a stoppage occurs because some water flow is necessary to move the Copper Sulfate Crystals to the area of root growth. Usually, within 3 to 4 weeks, after roots have accumulated sufficient copper sulfate, the roots will die and begin to decay and water flow should increase. As the roots regrow, follow-up treatments with copper sulfate will be required. Applications may be made each year in the spring after plant growth begins, during late summer or early fall, or any time a reduced water flow, thought to be caused by root growth, occurs.

Apply 2-6 pounds Copper Sulfate Crystals two times a year to household sewers. Add Copper Sulfate Crystals to sewer line by pouring about ½ pound increments into the toilet bowl nearest the sewer line and flush, repeat this process until recommended dose has been added, or remove cleanout plug and pour entire recommended quantity directly into the sewer line. Replace the plug and flush the toilet several times.

#### ROOT CONTROL IN SEPTIC TANK AND LEACH LINES AND LEACH LINE PIPES:

**SEPTIC TANKS –** The majority of the copper sulfate will settle in the septic tank itself and little will pass into the leach lines. To treat leach line pipes, add 2 to 6 pounds of Copper Sulfate Crystals to the distribution box located between the septic tank and the leach lines. To achieve effective root control in the leach lines it is necessary to transfer Copper Sulfate Crystals from the septic tank to the leach lines. A cleanout plug opening may need to be installed if the distribution box does not have an opening leading to the leach lines.

\*NOTE: Do not apply Copper Sulfate Crystals through sink or tub drains as it will corrode the metal drains.

\*NOTE: Copper sulfate added to an active 300 gallon septic tank at 2, 4 and 6 pounds per treatment will temporarily reduce bacterial action, but it will return to normal approximately 15 days after treatment. Trees and shrubbery growing near a treated line normally are not affected due to only a small portion of their roots being in contact with the copper sulfate. The copper sulfate kills only those roots inside the leach line.

\*NOTE: Do not use as a sewer additive where prohibited by State law. State law prohibits the use of this product in sewage systems in the State of Connecticut. Not for sale or use in the California counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma for root control in sewers. Not for sale or use in septic systems in the State of Florida.

**TO CONTROL ALGAE AND THE POTOMOGETON POND WEEDS, LEAFY AND SAGO, IN IRRIGATION SYSTEMS:**

Once the amount of Copper Sulfate required for treating ditches or streams has been calculated, use a continuous application method, selecting proper equipment to supply Copper Sulfate granular crystals as follows:  
**FOR ALGAE CONTROL** – Begin continuous addition application of granular Copper Sulfate when water is first turned into the system and continue throughout the irrigation system, applying 0.1 to 0.2 lbs per cubic ft per second per day.  
**FOR LEAFY AND SAGO POND WEED CONTROL** – Use the same continuous feeder, applying 1.6 to 2.4 pounds Copper Sulfate Pentahydrate per cubic foot per second per day. NOTE: For best control of leafy and sago pond weed, it is essential to begin Copper Sulfate additions when water is first turned into the system or ditch to be treated and to continue throughout the irrigation system. Copper Sulfate becomes less effective as the alkalinity increases. Its effectiveness is significantly reduced when the bicarbonate alkalinity exceeds 150 ppm. Should Copper Sulfate fail to control pond weeds satisfactorily, it may be necessary to treat the ditch with either a suitable approved herbicide or use a mechanical means to remove excess growth. In either case, resume Copper Sulfate addition as soon as possible.

**TO CONTROL ALGAE IN IMPOUNDED WATERS, LAKES, PONDS AND RESERVOIRS:** There are several methods by which to apply Copper Sulfate to impounded water. Probably the most satisfactory and simplest method is to dissolve the Copper Sulfate crystals in water and to spray this water over the body of water from a boat. A small pump mounted in the boat can easily be used for this purpose. Fine crystals may be broadcast directly on the water surface from a properly equipped boat. A specially equipped air blower can be used to discharge fine crystals at a specific rate over the surface of the water. When using this method, the direction of the wind is an important factor. Do not use this method unless completely familiar with this type of application. Where the situation permits, Copper Sulfate may be applied under the water by dragging burlap bags containing Copper Sulfate. The crystals are placed in burlap bags and dragged through the water by means of a boat. Begin treatment along the shoreline and proceed outward until one-third to one-half of the total area has been treated. Care should be taken that the course of the boat is such as to cause even distribution of the chemical. In large lakes, it is customary for the boat to travel in parallel lines about 20 to 100 feet apart. Continue dragging the burlap bags over the treated area until the minimum dosage is achieved and all crystals have been dissolved. Large or medium size crystals that dissolve slowly should be used with this method.

Copper Sulfate can be applied to impounded waters by injecting a copper sulfate solution in water via a piping system.

**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 Crystals 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 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.

**TO CONTROL ALGAE IN IRRIGATION CONVEYANCE SYSTEMS USING THE SLUG APPLICATION METHOD:** Make an addition (dump) of Copper Sulfate into the irrigation ditch or lateral at 0.25 to 2.0 lbs. per cubic foot per second of water per treatment. Repeat on approximate 2-week intervals as required. Depending on water hardness, alkalinity and algae concentration, a dump is usually required every 5 to 30 miles. Effectiveness of Copper Sulfate decreases as the bicarbonate alkalinity increases and is significantly reduced when the alkalinity exceeds approximately 150 ppm as CaCO3.

**TO CONTROL ALGAE IN RICE (Domestic and Wild) FIELDS:** Application should be made when algae have formed on the soil surface in the flooded field. Applications are most effective when made prior to the algae's leaving the soil surface and rising to the water surface. Apply 10-15 pounds Copper Sulfate Crystals per acre to the water surface as either crystals or dissolve in water and make a surface spray. Apply higher rate in deeper water (6 inches or greater).

**TO CONTROL TADPOLE SHRIMP IN RICE FIELDS:** Application should be made to the flooded fields any time the pest appears from planting time until the seedlings are well rooted and have emerged through the water. Apply 5-10 pounds Copper Sulfate Crystals per acre. The use rate per acre should be determined by the water depth and flow. Use the lower rate at minimum flow and water depth and the higher rate when water depth and flow are maximum.

STATE	SPECIES	BULLETIN NO.	COUNTY
CALIFORNIA	Solano grass	EPA/ES-85-13	Solano
TENNESSEE	Slackwater Darter	EPA/ES-85-04	Lawrence Wayne Hancock
	Freshwater Mussels	EPA/ES-85-07	Claiborne Hawkins Sullivan
ALABAMA	Slackwater Darter	EPA/ES-85-05	Lauderdale Limestone Madison
VIRGINIA	Freshwater Mussels	EPA/ES-85-06	Grayson Smyth Scott Washington Lee

**ENDANGERED SPECIES RESTRICTIONS:** It is a violation of Federal Law to use any pesticide in a manner that results in the death of an endangered species or adverse modification of their habitat. The use of this product may pose a hazard to certain Federally designated endangered species known to occur in specific areas within the above counties. **\*\*\*PLEASE NOTE\*\*\*** Before using this product in the above counties you must obtain the EPA Bulletin specific to your area. This Bulletin identifies areas within these counties where the use of this pesticide is prohibited, unless specified otherwise. The EPA Bulletin is available from either your County Agricultural Extension Agent, the Endangered Species Specialist in your State Wildlife Agency Headquarters, or the appropriate Regional Office of the U.S. Fish and Wildlife Service. **THIS BULLETIN MUST BE REVIEWED PRIOR TO PESTICIDE USE.**

### COPPER SULFATE REQUIRED FOR TREATMENT OF DIFFERENT GENERA OF ALGAE

The genera of algae listed below are commonly found in waters of the United States. Use the lower recommended rate in soft waters (less than 50 ppm methyl orange alkalinity) and the higher concentration in hard waters (above 50 ppm alkalinity). Always consult State Fish and Game Agency before applying this product to municipal waters.

ORGANISM	¼ to ½ ppm*	½ to 1 ppm*	1 to 1½ ppm*	1½ to 2 ppm*
Cyanophyceae (Blue-green)	Anabaena Anacystis Aphanizomenon Gloeotrichia Gomphosphaeria Polycystis Rivularia	Cylindrospermum Oscillatoria Plectonema	Nostoc Phormidium	Calothrix Symploca
Chlorophyceae (Green)	Closterium Hydrodictyon Spirogyra Ulothrix	Botryococcus Cladophora Coelastrum Draparnaldia Enteromorpha Gloeocystis Microspora Tribonema Zygnema	Chlorella Crucigenia Desmidium Golenkinia Oocystis Palmella Pithophora Staurastrum Tetraedron	Ankistrodesmus Chara Nitella Scenedesmus
Diatomaceae (Diatoms)	Asterionella Fragilaria Melosira Navicula	Gomphonema Nitzschia Stephanodiscus Synedra Tabellaria	Achnanthes Cymbella Neidium	
Protozoa (Flagellates)	Dinobryon Synura Uroglena Volvox	Ceratium Cryptomonas Euglena Glenodinium Mallomonas	Chlamydomonas Hawmatococcus Peridinium	Eudorina Pandorina
	* ¼ - ½ ppm = .67 - 1.3 lbs/acre ft.		* 1 - 1½ ppm = 2.6-3.9 lbs/acre ft.	
	* ½ - 1 ppm = 1.3 - 2.6 lbs/acre ft.		* 1½ - 2 ppm = 3.9 - 5.32 lbs/acre ft.	

### SCHISTOSOME-INFECTED FRESH WATER SNAILS

For recreational lakes, reservoirs, and ponds, 5.32 -13.3 lbs/acre-ft Copper Sulfate Crystals (i.e., 2-5 ppm copper sulfate), is usually sufficient for treatment of Schistosome-infected fresh water snails. Use surface area in acres multiplied by average depth in feet to determine water volume and application rate. Apply only along shoreline swimming areas and/or to infected snail beds on a calm sunny day when water temp is at least 60°F. Not allowing swimming for at least 12 hrs following treatment is recommended. If this lower dosage is not sufficient, up to 32 ppm copper sulfate, i.e., 87 lbs/acre (= 2 lbs/1000 sq ft) bottom surface area can be applied. Not allowing swimming for 48 hrs is recommended. Using either dosage, a second application may be made if necessary, 10 to 14 days later. DO NOT make more than two applications a season. Broadcast application using boat, aircraft, or hand equipped with power or hand seeder or underwater dispenser. Do not exceed 1 ppm copper (4 ppm Copper Sulfate) in potable water systems. This labeling must be in the possession of the user at the time of pesticide application. **NOTE : In the State of New York** -For use in recreational lakes, reservoirs and ponds ONLY in areas where infected snail beds have been identified. Apply medium grade crystals by hand broadcast method of application only. This product is a restricted use pesticide in New York State. Pesticide applicator certification or a special use permit is required for sale, possession, or use. Each individual treatment must be approved by the Department of Environmental Conservation. Therefore, you must contact the Pesticide Control Specialist at the appropriate regional office of the Department 30 days in advance of the proposed treatment.

### FOOT BATHS FOR CATTLE

Foot baths of Copper Sulfate Crystals can be used as an aid in the treatment of hoof rot in cattle. Prior to treatment, a veterinarian should be consulted to confirm presence of hoof rot. Animals may be walked through a foot bath of 2% (add 2 lbs copper sulfate to 11.8 gals water) to 5% (add 5 lbs copper sulfate to 11.4 gals water) aqueous solution with an immersion time of 5 to 20 min twice daily for a period of time as prescribed by a veterinarian. Keep foot baths clean during treatment period. Do not allow cattle to drink from foot baths as copper sulfate is highly toxic. Follow instructions under Storage and Disposal when solutions are discarded at end of treatment period.

Crop	Pounds per Acre					
	Sands		Loams, silts, clays		Organic	
	Bdct <sup>b</sup>	Band	Bdct <sup>b</sup>	Band	Bdct <sup>b</sup>	Band
Lettuce, onion, Spinach	10	2	12	3	13	4
Carrot, cauliflower, celery, alfalfa, clover, corn, oat, radish, sudan grass, wheat	4	1	8	2	12	3
Asparagus, barley, beans, beet, broccoli, mint, pea, potato, rye, soybean	0	0	0	0	0	2

Information received by the Washington State Dept. of Agriculture regarding the components in this product is available on the internet at <http://agr.wa.gov> Information regarding the contents and levels of metals in this product is available at the Oregon Dept of Agriculture internet site: <http://oda.state.or.us/fertilizer>

<sup>a</sup>Recommendations are for inorganic sources of copper. Copper chelates can also be used at 1/6 of the rates recommended above. Do not apply copper unless a deficiency has been verified by plant analysis. <sup>b</sup>Bdct = broadcast

### BORDEAUX SPRAY MIXTURE

Understanding Bordeaux Formulations: If the Bordeaux mixture instructions read 10-10-100, the first figure indicates the number of lbs of Copper Sulfate Crystals. The second figure is the lbs of hydrated spray lime and the third figure is the gallons of water to be used. Use as a full coverage spray to point of runoff.

Preparation of Bordeaux Spray Mixture: Fill a tank 1/4 full with water. Then, with agitator running, mix in Copper Sulfate Crystals through a copper, bronze, stainless steel or plastic screen. Add water so the tank is 3/4 full. Mix in the hydrated spray lime through the screen and finish filling the tank with water.

### CROP USE RECOMMENDATIONS

**Almond, Apricot, Peach, Nectarine: Shot Hole Fungus** – Prepare a 10-10-100 Bordeaux and apply as a dormant spray in late fall or early spring.

**Almond, Apricot, Cherry, Peach, Nectarine, Plum, Prune: Brown Rot Blossom Blight** – Prepare a 10-10-100 Bordeaux and apply when buds begin to swell.

**Apple: Fireblight** – Mix 5 lbs of Copper Sulfate Crystals in 100 gals of water and spray uniformly to the point of runoff. Apply in dormant only at silver tip stage. After silver tip, severe burn will occur on any exposed green tissue. Do not mix lime to make a Bordeaux spray for this treatment.

**Blueberries: Bacterial Canker** – Prepare and apply an 8-8-100 Bordeaux mixture in the fall before heavy rains begin and again 4 weeks later.

**Bulbs (Easter Lily, Tulip, Gladiolus): Botrytis Blight** – Prepare a 10-10-100 Bordeaux mixture and apply as a foliar spray to 1 acre. Apply for thorough coverage beginning at the first sign of disease and repeat as needed to control disease at 3 to 10 day intervals. Use the shorter intervals during periods of frequent rains or when severe disease conditions persist. Avoid spray just before flower cutting season if residues are a problem.

**Caneberries: For leaf and cane spot and Pseudomonas blight**, prepare and apply an 8-8-100 Bordeaux mixture in the fall before heavy rains begin and again 4 weeks later.

**Cherry (Sweet): Dead Bud, Bacterial Canker (Pseudomonas Syringae)** – Prepare a 12-12-100 Bordeaux. Apply at leaf fall and again in late winter before buds begin to swell. In wet cool Northwest U.S. winters, a third spray may be needed between above sprays.

**Cherry (Sour): Leaf Spot** – Prepare a 10-10-100 Bordeaux. Apply as a full coverage spray after petal fall or as recommended by the State Extension Service.

### CITRUS

(NOTE: Adding foliar nutritionals to spray mixtures containing Copper Sulfate Crystals or other products and applying to citrus during the post-bloom period when young fruit is present may result in spray burn.)

**Bacterial Blast** – Prepare a 10-10-100 Bordeaux spray and apply a spray in late October to early November or before fall rains begin. Make a complete coverage spray using 10 to 25 gals per mature tree.

**Lemon, Orange, Grapefruit: Phytophthora Brown Rot** - Prepare a 3-4.5-100 Bordeaux mixture only where there is no history of copper injury or use a 3-2-6-100 (Zinc Sulfate-Copper Sulfate Crystals-Hydrated Lime-Gallons of water) Bordeaux mixture. Spray 6 gals on skirt of tree 3 to 4 ft high and 2 to 4 gals on trunk and ground under tree. If P. hibernalis is present, use 10 to 25 gals to completely cover each tree. Apply in November or December just before or after first rain. In severe brown rot season, apply second application in January or February.

**Lemon, Orange, Grapefruit: Septoria Fruit, Leaf Spot; Central California – Brown Rot, Zinc, Copper Deficiencies** – Prepare a 3-2-6-100 Bordeaux mixture (Zinc Sulfate-Copper Sulfate Crystals-Hydrated Lime Gallons of water) and use 10 to 25 gals to completely cover each tree. Apply in October, November or December before or just after first rain.

**Grape: Downy Mildew** – Prepare and apply a 2-6-100 Bordeaux spray beginning when downy mildew is detected. Repeat as needed to achieve and maintain control. This mixture and its use will exhibit some phytotoxicity on most varieties.

**Grape (Dormant): Powdery Mildew** – Apply in spring before bud-swell and before any green tissue is present. Use 4 to 8 lbs of Copper Sulfate Crystals per 100 gals of water. Apply in a high volume spray of 300 gals water per acre. Direct spray to thoroughly wet the dormant vine, especially the bark of the trunk, head or cordons.

**Olive: Olive Leaf Spot (Peacock spot), Olive Knot** – Prepare a 10-10-100 Bordeaux and apply up to 500 gals per acre. Apply in autumn before heavy winter rains to prevent peacock spot. In wet winters, a repeat spray may be needed in mid-winter. In areas with less than 10 inches of annual rainfall, a 5-5-100 Bordeaux applied in up to 500 gals per acre may be used. To help protect against olive knot, apply a 10-10-100 Bordeaux before heavy rains and again in the spring. Injury may occur in areas of less than 10 inches of rainfall.

**Peach: Leaf Curl** – Prepare a 10-10-100 Bordeaux and apply at leaf fall or as a dormant spray in late fall or early spring before buds begin to swell.

**Potatoes: To enhance vine-kill and suppress late blight**, apply 10 lbs. per acre in 10 to 100 gals of water (ground equipment) or in 5 to 10 gals (aerial equipment) with Diquat at vine-kill to enhance vine desiccation and suppress late blight. Additional applications can be made with Diquat if needed to within 7 days of harvest. Copper Sulfate Crystals 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.

**Walnuts: Walnut Blight** – Apply 15 lbs with 10 lbs of lime in 100 gals of water. Make application in early pre-bloom before catkin blooms are showing (10-20% pistillate) before or after rain. Use only if Bordeaux mixture has been shown to be non-phytotoxic in your area. If desired, add one-half gal summer oil emulsion per 100 gals of water. NOTE: Addition of summer oil emulsion to pre-bloom and early bloom sprays may result in plant injury.

## GENERAL CHEMIGATION INSTRUCTIONS

Apply this product only through one or more of the following types of systems: sprinkler including center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move irrigation system(s). Do not apply this product through any other type of irrigation system. Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from nonuniform distribution of treated water. If you have questions about calibration, you should contact State Extension Service specialists, equipment manufacturers or other experts. Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system unless the pesticide label-prescribed safety devices for public water systems are in place. A person knowledgeable of the chemigation system and responsible for its operation or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise.

Posting of areas to be chemigated is required when 1) any part of a treated area is within 300 feet of sensitive areas such as residential area, labor camps, businesses, day care centers, hospitals, in-patient clinics, nursing homes or any public areas such as schools, parks, playgrounds, or other public facilities not including public roads, or 2) when the chemigated area is open to the public such as golf courses or retail greenhouses. Posting must conform to the following requirements. Treated areas shall be posted with signs at all usual points of entry and along likely routes of approach from the listed sensitive areas. When there are no usual points of entry, signs must be posted in the corners of the treated areas and in any other location affording maximum visibility to sensitive areas. The printed side of the sign should face away from the treated area towards the sensitive area. The signs shall be printed in English. Signs must be posted prior to application and must remain posted until foliage has dried and soil surface water has disappeared. Signs may remain in place indefinitely as long as they are composed of materials to prevent deterioration and maintain legibility for the duration of the posting period. At the top of the sign shall be the words "KEEP OUT", followed by an octagonal stop sign symbol at least 8 inches in diameter containing the word "STOP". Below the symbol shall be the words "PESTICIDES IN IRRIGATION WATER". All words shall consist of letters at least 2 ½ inches tall, and all letters and the symbol shall be a color that sharply contrasts with their immediate background. This sign is in addition to any sign posted to comply with the Worker Protection Standard.

### CHEMIGATION SYSTEMS CONNECTED TO PUBLIC WATER SYSTEMS:

Public water system means a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Chemigation systems connected to public water systems must contain a functional, reduced-pressure zone, backflow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of pesticide introduction. As an option to the RPZ, the water from the public water system should be discharged into the reservoir tank prior to pesticide introduction. There shall be a complete physical break (air gap) between the flow outlet end of the fill pipe and the top or overflow rim of the reservoir tank of at least twice the inside diameter of the fill pipe. The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump. The pesticide injection pipeline must contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down. See Treatment Instructions, below.

### SPRINKLER CHEMIGATION:

The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops, or in cases where there is no water pump, when the water pressure decreases to the point where pesticide distribution is adversely affected. Systems must use a metering pump, such as a positive displacement

injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock. The system must contain a functional check valve, vacuum relief valve, and low pressure drain approximately located on the irrigation pipeline to prevent water source contamination from backflow. The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump. This pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down. The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops. The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected. Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

**TREATMENT INSTRUCTIONS:**

Do not apply when wind speed favors drift beyond the area intended for treatment. When mixing, fill nurse tank half full with water. Add Copper Sulfate Crystals slowly to tank while hydraulic or mechanical agitation is operating and continue filling with water. Stickers, spreaders, insecticides, nutrients, etc. should be added last. If compatibility is in question, use the compatibility jar test before mixing a whole tank. Because of the wide variety of possible combinations which can be encountered, observe all cautions and limitations on the label of all products used in mixtures. Copper Sulfate Crystals should be added through a traveling irrigation system continuously or at the last 30 minutes of solid set or hand moved irrigation systems. Agitation is recommended.

NOTICE: CHEM ONE LTD. warrants that this product in its unopened package conforms to the chemical description on the label. THERE ARE NO OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. This warranty does not extend to the handling or use of this product contrary to label instructions or under abnormal conditions or under conditions not reasonably foreseeable to seller and buyer assumes all risk of any such use.

**CHEM ONE LTD.**

8017 Pinemont Drive, Suite 100  
HOUSTON, TEXAS 77040-6519  
TEL: (713) 896-9966

ENVIRONMENTALLY HAZARDOUS SUBSTANCES  
SOLID, N.O.S. (CUPRIC SULFATE) UN3077, RQ

# Material Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

**\*\*\* Section 1 - Chemical Product and Company Identification \*\*\***

**Chemical Name:** Copper Sulfate Pentahydrate

**Product Use:** For Commercial Use

**Synonyms:** Copper Sulfate Crystals, Blue Copper, Blue Stone, Blue Vitriol, Copper (II) sulfate, Cupric Sulfate, Copper Sulfate Fine 200, Fine 100, Fine 30, 20, Small, Medium, Large, FCC IV, and Very High Purity

**Supplier Information**

Chem One Ltd. (Importer of record)  
8017 Pinemont Drive, Suite 100  
Houston, Texas 77040-6519

Phone: (713) 896-9966  
Fax: (713) 896-7540  
Emergency # (800) 424-9300 or (703) 527-3887

**General Comments**

NOTE: Emergency telephone numbers are to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure, or accident involving chemicals. All non-emergency questions should be directed to customer service.

**\*\*\* Section 2 - Composition / Information on Ingredients \*\*\***

CAS #	Component	Percent
7758-99-8	Copper (II) Sulfate Pentahydrate	> 99

**Component Related Regulatory Information**

This product may be regulated, have exposure limits or other information identified as the following: Copper (7440-50-8) and inorganic compounds, as Cu, Copper (7440-50-8) dusts and mists, as Cu and Copper fume, Cu.

**Component Information/Information on Non-Hazardous Components**

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

**\*\*\* Section 3 - Hazards Identification \*\*\***

**Emergency Overview**

Copper Sulfate Pentahydrate is a blue crystalline or powdered, odorless solid. Potentially fatal if swallowed. May cause irritation to the eyes, respiratory system and skin. Fire may produce irritating, corrosive and/or toxic fumes. Firefighters should use full protective equipment and clothing.

**Hazard Statements**

HARMFUL OR FATAL IF SWALLOWED. Can cause irritation of eyes, skin, respiratory tract and, in extreme cases, burns. Avoid contact with eyes and skin. Avoid breathing dusts. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. Keep from contact with clothing and other combustible materials.

**Potential Health Effects: Eyes**

Exposure to particulates or solution of this product may cause redness and pain. Prolonged contact may cause conjunctivitis, ulceration and corneal abnormalities.

**Potential Health Effects: Skin**

This product can cause irritation of the skin with pain, itching and redness. Severe overexposure can cause skin burns. Prolonged exposure may cause dermatitis and eczema.

**Potential Health Effects: Ingestion**

Harmful or fatal if swallowed. May cause gastrointestinal irritation with symptoms such as nausea, vomiting, and diarrhea.

Ingestion may cause degeneration of liver, kidney, or renal failure. Persons who survive ingestion may develop granulomatous lesions of the kidney. Ingestion of large amounts may lead to convulsions, coma or death.

**Potential Health Effects: Inhalation**

May irritate the nose, throat and respiratory tract. Symptoms can include sore throat, coughing and shortness of breath. In severe cases, ulceration and perforation of the nasal septum can occur. If this material is heated, inhalation of fumes may lead to development of metal fume fever. This is a flu-like illness with symptoms of metallic taste, fever and chills, aches, chest tightness and cough. Repeated inhalation exposure can cause shrinking of the lining of the inner nose.

**HMIS Ratings: Health Hazard: 2\* Fire Hazard: 0 Physical Hazard: 1 Personal Protective Equipment: E = chemical goggles, impervious gloves, dust respirator.**

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe \* = Chronic hazard

## Material Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

### \*\*\* Section 4 - First Aid Measures \*\*\*

**First Aid: Eyes**

In case of contact with eyes, rinse immediately with plenty of water for at least 20 minutes. Seek immediate medical attention.

**First Aid: Skin**

Remove all contaminated clothing. For skin contact, wash thoroughly with soap and water for at least 20 minutes. Seek immediate medical attention if irritation develops or persists.

**First Aid: Ingestion**

DO NOT INDUCE VOMITING. Have victim rinse mouth thoroughly with water, if conscious. Never give anything by mouth to a victim who is unconscious or having convulsions. Contact a physician or poison control center immediately.

**First Aid: Inhalation**

Remove source of contamination or move victim to fresh air. Apply artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Get immediate medical attention.

**First Aid: Notes to Physician**

Provide general supportive measures and treat symptomatically. Basic Treatment: Establish a patent airway. Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by non-rebreather mask at 10 to 15 L/minutes. Monitor for shock and treat if necessary. For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport. Do not use emetics. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal. Advanced Treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious. Start an IV with lactated Ringer's SRP: "To keep open", minimal flow rate. Watch for signs of fluid overload. For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if hypotensive with a normal fluid volume. Watch for signs of fluid overload. Use proparacaine, hydrochloride to assist eye irrigation.

### \*\*\* Section 5 - Fire Fighting Measures \*\*\*

**Flash Point:** Not flammable

**Method Used:** Not applicable

**Upper Flammable Limit (UEL):** Not applicable

**Lower Flammable Limit (LEL):** Not applicable

**Auto Ignition:** Not applicable

**Flammability Classification:** Not applicable

**Rate of Burning:** Not applicable

**General Fire Hazards**

Copper Sulfate Pentahydrate is not combustible, but may decompose in the heat of a fire to produce corrosive and/ or toxic fumes.

**Hazardous Combustion Products**

Sulfur oxides and copper fumes.

**Extinguishing Media**

Use methods for surrounding fire.

**Fire Fighting Equipment/Instructions**

Firefighters should wear full protective clothing including self-contained breathing apparatus. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

**NFPA Ratings: Health: 2 Fire: 0 Reactivity: 1 Other:**

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

### \*\*\* Section 6 - Accidental Release Measures \*\*\*

**Containment Procedures**

Stop the flow of material, if this can be done without risk. Contain the discharged material. If sweeping of a contaminated area is necessary use a dust suppressant agent, which does not react with product (see Section 10 for incompatibility information).

**Clean-Up Procedures**

Wear appropriate protective equipment and clothing during clean-up. Shovel the material into waste container. Thoroughly wash the area after a spill or leak clean-up. Prevent spill rinsate from contamination of storm drains, sewers, soil or groundwater.

**Evacuation Procedures**

Evacuate the area promptly and keep upwind of the spilled material. Isolate the spill area to prevent people from entering. Keep materials which can burn away from spilled material. In case of large spills, follow all facility emergency response procedures.

## Material Safety Data Sheet

Material Name: **Copper Sulfate Pentahydrate**

ID: **C1-121A**

### Special Procedures

Remove soiled clothing and launder before reuse. Avoid all skin contact with the spilled material. Have emergency equipment readily available.

### \* \* \* Section 7 - Handling and Storage \* \* \*

### Handling Procedures

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling, when used as a pesticide. Do not breathe dust. Avoid all contact with skin and eyes. Use this product only with adequate ventilation. Wash thoroughly after handling.

### Storage Procedures

Keep in original container in locked storage area. Keep container tightly closed when not in use. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of fire-resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Use corrosion-resistant structural materials, lighting, and ventilation systems in the storage area. Floors should be sealed to prevent absorption of this material. Have appropriate extinguishing equipment in the storage area (i.e., sprinkler system, portable fire extinguishers). Empty containers may contain residual particulates; therefore, empty containers should be handled with care. Do not cut, grind, weld, or drill near this container. Never store food, feed, or drinking water in containers that held this product. Keep this material away from food, drink and animal feed. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Do not store this material in open or unlabeled containers. Limit quantity of material stored. Store in suitable containers that are corrosion-resistant.

### \* \* \* Section 8 - Exposure Controls / Personal Protection \* \* \*

### Exposure Guidelines

#### A: General Product Information

Follow the applicable exposure limits.

#### B: Component Exposure Limits

The exposure limits given are for **Copper & inorganic Compounds, as Cu (7440-50-8), Copper fume as Cu or Copper dusts and mists, as Cu.**

ACGIH: 1 mg/m<sup>3</sup> TWA (dusts & mists)  
0.2 mg/m<sup>3</sup> TWA (fume)

OSHA: 1 mg/m<sup>3</sup> TWA (dusts & mists)  
0.1 mg/m<sup>3</sup> TWA (fume)

NIOSH: 1 mg/m<sup>3</sup> TWA (dusts & mists)  
0.1 mg/m<sup>3</sup> TWA (fume)

DFG MAKs 1 mg/m<sup>3</sup> TWA Peak, 30 minutes, average value (copper and inorganic copper compounds)  
0.1 mg/m<sup>3</sup> TWA Peak, 30 minutes, average value (fume)

### Engineering Controls

Use mechanical ventilation such as dilution and local exhaust. Use a corrosion-resistant ventilation system and exhaust directly to the outside. Supply ample air replacement. Provide dust collectors with explosion vents.

### PERSONAL PROTECTIVE EQUIPMENT

*The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132). Please reference applicable regulations and standards for relevant details.*

#### Personal Protective Equipment: Eyes/Face

Wear safety glasses with side shields (or goggles) and a face shield, if this material is made into solution. If necessary, refer to U.S. OSHA 29 CFR 1910.133.

#### Personal Protective Equipment: Skin

Wear chemically-impervious gloves, made of any waterproof material, boots and coveralls to avoid skin contact. If necessary, refer to U.S. OSHA 29 CFR 1910.138.

## Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

### \*\*\* Section 8 - Exposure Controls / Personal Protection (Continued)\*\*\*

#### Personal Protective Equipment: Respiratory

If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). If airborne concentrations are above the applicable exposure limits, use NIOSH-approved respiratory protection. If airborne concentrations are above the applicable exposure limits, use NIOSH-approved respiratory protection. The following NIOSH Guidelines for Copper dust and mists (as Cu) are presented for further information.

Up to 5 mg/m<sup>3</sup>: Dust and mist respirator.

Up to 10 mg/m<sup>3</sup>: Any dust and mist respirator except single-use and quarter mask respirators or any SAR.

Up to 25 mg/m<sup>3</sup>: SAR operated in a continuous-flow mode or powered air-purifying respirator with a dust and mist filter(s).

Up to 50 mg/m<sup>3</sup>: Air purifying, full-facepiece respirator with high-efficiency particulate filter(s), any powered air-purifying respirator with tight-fitting facepiece and high-efficiency particulate filter(s) or full-facepiece SCBA, or full-facepiece SAR.

Up to 100 mg/m<sup>3</sup>: Positive pressure, full-facepiece SAR.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full-facepiece SCBA, or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape: Full-facepiece respirator with high-efficiency particulate filter(s), or escape-type SCBA.

NOTE: The IDLH concentration for Copper dusts and mists (as Cu) is 100 mg/m<sup>3</sup>.

#### Personal Protective Equipment: General

Have an eyewash fountain and safety shower available in the work area

### \*\*\* Section 9 - Physical & Chemical Properties \*\*\*

#### Physical Properties: Additional Information

The data provided in this section are to be used for product safety handling purposes. Please refer to Product Data Sheets, Certificates of Conformity or Certificates of Analysis for chemical and physical data for determinations of quality and for formulation purposes.

<b>Appearance:</b> Blue crystals or powder	<b>Odor:</b> Odorless
<b>Physical State:</b> Solid	<b>pH:</b> 3.7-4.2 (10% soln.)
<b>Vapor Pressure:</b> 20 torr at 22.5 deg C	<b>Vapor Density:</b> 8.6
<b>Boiling Point:</b> 560 deg C (1040 deg F) [decomposes]	<b>Freezing/Melting Point:</b> 150 deg C (302 deg F)
<b>Solubility (H2O):</b> 31.6 g/100 cc (@ 0 deg C)	<b>Specific Gravity:</b> 2.28 @ 15.6 deg C (H2O = 1)
<b>Softening Point:</b> Not available	<b>Particle Size:</b> Various
<b>Molecular Weight:</b> 249.68	<b>Bulk Density:</b> Not available
	<b>Chemical Formula:</b> CuSO4*5H2O

### \*\*\* Section 10 - Chemical Stability & Reactivity Information \*\*\*

#### Chemical Stability

Copper Sulfate Pentahydrate is hygroscopic, but stable when kept dry, under normal temperature and pressures.

#### Chemical Stability: Conditions to Avoid

Avoid high temperatures, exposure to air and incompatible materials.

#### Incompatibility

Copper Sulfate causes hydroxylamine to ignite and the hydrated salt is vigorously reduced. Solutions of sodium hypobromite are decomposed by powerful catalytic action of cupric ions, even as impurities. Copper salts, including Copper Sulfate may react to form explosive acetylides when in contact with acetylene or nitromethane. Contact with reducing agents, can cause a vigorous reaction, especially in solution. This product can corrode steel and iron. Copper Sulfate Pentahydrate is incompatible with magnesium, strong bases, alkalines, phosphates, acetylene, hydrazine, and zirconium. Copper Sulfate Pentahydrate can be corrosive to aluminum.

#### Hazardous Decomposition

Sulfur oxides and Copper oxides.

#### Hazardous Polymerization

Will not occur.

# Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

## \*\*\* Section 11 - Toxicological Information \*\*\*

### Acute and Chronic Toxicity

#### A: General Product Information

Acute toxicity is largely due to the caustic (alkaline) properties of this material. Harmful or fatal if swallowed. Product is an eye and skin irritant, and may cause burns. Product is a respiratory tract irritant, and inhalation may cause nose irritation, sore throat, coughing, and chest tightness and possibly, ulceration and perforation of the nasal septum.

Chronic: Long term skin overexposure to this product may lead to dermatitis and eczema. Prolonged or repeated eye contact may cause conjunctivitis and possibly corneal abnormalities. Chronic overexposure to this product may cause liver and kidney damage, anemia and other blood cell abnormalities.

#### B: Component Analysis - LD<sub>50</sub>/LC<sub>50</sub>

##### Copper Sulfate Pentahydrate (7758-99-8)

Oral-rat LD<sub>50</sub>: = 300 mg/kg; Intraperitoneal-Rat LD<sub>50</sub>: 18,700 mg/kg; Intraperitoneal-rat LD<sub>50</sub>: 20 mg/kg; Subcutaneous-rat LD<sub>50</sub>: 43 mg/kg; Intravenous-rat LD<sub>50</sub>: 48900 µg/kg; Unreported-rat LD<sub>50</sub>: 520 mg/kg; Oral-mouse LD<sub>50</sub>: 369 mg/kg; Intraperitoneal-Mouse LD<sub>50</sub>: 33 mg/kg; Intraperitoneal-mouse LD<sub>50</sub>: 7182 µg/kg; Intravenous-mouse LD<sub>50</sub>: 23300 µg/kg

#### B: Component Analysis - TDLo/LDLo

##### Copper Sulfate Pentahydrate (7758-99-8)

Oral-man LDLo: 857 mg/kg; Oral-Human LDLo: 50 mg/kg; Behavioral: somnolence (general depressed activity); Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Blood: hemorrhage; Oral-Human TDLo: 11 mg/kg; Gastrointestinal: gastritis; Gastrointestinal: hypermotility, diarrhea, nausea or vomiting; Oral-Human TDLo: 272 mg/kg; liver, kidney, Blood effects; Oral-Human LDLo: 1088 mg/kg; Oral-child : 150 mg/kg; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular ; necrosis); Blood: other hemolysis with or without anemia; unknown-Man LDLo: 221 mg/kg; Oral-Woman TDLo: 2400 mg/kg/day; Gastrointestinal tract effects; DNA Inhibition-Human: lymphocyte 76 mmol/L; Oral-woman LDLo: 100 mg/kg; Vascular: Blood pressure lowering not characterized in autonomic section; Liver: hepatitis (hepatocellular necrosis), diffuse; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Oral-Human LDLo: 143 mg/kg; Pulmonary system effects, Gastrointestinal tract effects ;Oral-rat TDLo: 915 mg/kg/1 year-intermittent: Cardiac: changes in coronary arteries; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Oral-rat TDLo: 157 mg/kg/6 weeks-intermittent: Endocrine: changes in adrenal weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases; Oral-rat TDLo: 7530 mg/kg/30 days-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Blood: changes in erythrocyte (RBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels:- multiple enzyme effect; Oral-rat TDLo: 2 gm/kg/20 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases, Enzyme inhibition, induction, or change in blood or tissue levels; Intraperitoneal-rat TDLo: 791 mg/kg/18 weeks-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Intraperitoneal-rat TDLo: 7500 µg/kg; female 3 day(s) after conception: Reproductive: Fertility: other measures of fertility; Subcutaneous-rat TDLo: 12768 µg/kg; male 1 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct; Intratesticular-rat TDLo: 3192 µg/kg; male 1 day(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct; Oral-mouse TDLo: 3 gm/kg/8 weeks-continuous: Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response; Oral-mouse TDLo: 2 gm/kg/3 weeks-continuous: Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response; Subcutaneous-mouse LDLo: 500 µg/kg; Subcutaneous-mouse TDLo: 12768 µg/kg; male 30 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct; Intravenous-mouse TDLo: 3200 µg/kg; female 8 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), Specific Developmental Abnormalities: Central Nervous System, cardiovascular (circulatory) system; Intravenous-mouse TDLo: 3200 µg/kg; female 7 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Oral-Dog, adult LDLo: 60 mg/kg; Intravenous-guinea pig TDLo: 2 mg/kg; Subcutaneous-Guinea Pig, adult LDLo: 62 mg/kg; Oral-Pigeon LDLo: 1000 mg/kg; Oral-Domestic animals (Goat, Sheep) LDLo: 5 mg/kg; Oral-Bird-wild species LDLo: 300 mg/kg; Intravenous-frog LDLo: 25 mg/kg; Parenteral-chicken TDLo: 10 mg/kg; Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Endocrine: tumors; Oral-pig TDLo: 140 mg/kg; female 1-15 week(s) after conception, lactating female 4 week(s) post-birth: Reproductive: Effects on Newborn: biochemical and metabolic; Intravenous-hamster TDLo: 2130 µg/kg; female 8 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants), Specific Developmental Abnormalities: Central Nervous System, body wall

## Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

### \*\*\* Section 11 - Toxicological Information (Continued) \*\*\*

#### Carcinogenicity

##### A: General Product Information

Copper Sulfate Pentahydrate (7758-99-8)

Cytogenetic Analysis-Rat/ast 300 mg/kg

##### B: Component Carcinogenicity

Copper dusts and mists, as Cu (7440-50-8)

EPA: EPA-D (Not Classifiable as to Human Carcinogenicity - inadequate human and animal evidence of carcinogenicity or no data available)

#### Epidemiology

No information available.

#### Neurotoxicity

Has not been identified.

#### Mutagenicity

Human and animal mutation data are available for Copper Sulfate Pentahydrate; these data were obtained during clinical studies on specific human and animal tissues exposed to high doses of this compound.

#### Teratogenicity

There are no reports of teratogenicity in humans. Animal studies indicate that a deficiency or excess of copper in the body can cause significant harm to developing embryos. The net absorption of copper is limited and toxic levels are unlikely from industrial exposure.

#### Other Toxicological Information

Individuals with Wilson's disease are unable to metabolize copper. Thus, persons with pre-existing Wilson's disease may be more susceptible to the effects of overexposure to this product.

### \*\*\* Section 12 - Ecological Information \*\*\*

#### Ecotoxicity

##### A: General Product Information

Harmful to aquatic life in very low concentrations. Copper Sulfate Pentahydrate is toxic to fish and marine organisms when applied to streams, rivers, ponds or lakes.

##### B: Ecotoxicity

Copper Sulfate Pentahydrate (7758-99-8)

LC<sub>50</sub> (*Lepomis machochirus* bluegill) wt 1.5 g = 884 mg/L at 18°C, static bioassay (95% confidence limit 707-1,100 mg/L) (technical material, 100% (about 25% elemental copper); LC<sub>50</sub> (*Leopmis cyanellus*, Green Sunfish) = 1.1 g, 3,510 µg/L at °C; LC<sub>50</sub> (*Pimephales promelas*, Fat-head minnow) = 1.2 g, 838 µg/L at 18°C; LC<sub>50</sub> (*Crassius auratus*, Goldfish) = 0.9 g, 1380 µg/L at 18°C; LC<sub>50</sub> (*Crassius auratus*, Goldfish) = 0.1-2.5 mg/L; LC<sub>50</sub> (*EEL*) = 0.1-2.5 mg/L; LC<sub>50</sub> (*Salmo gairdneri*, Rainbow trout) = 1.6 g, 135 µg/L at 18°C; LC<sub>50</sub> (*Salmo gairdneri*, Rainbow trout) 48 hours = 0.14 ppm; LC<sub>50</sub> (*Daphnia magna*) no time specified = 0.182 mg/L; LC<sub>50</sub> (*Salmo gairdneri*, Rainbow trout) no time specified = 0.17 mg/L; LC<sub>50</sub> (*Lepomis machochirus*, Blue gill) no time specified = 1.5 g, 884 µg/L at 18°C; LC<sub>50</sub> (Stripped Bass) 96 hours = 1 ppm or lower; LC<sub>50</sub> (Prawn) 48 hours = 0.14; LC<sub>50</sub> (Shrimp) 96 hours = 17.0 ppm copper; LC<sub>50</sub> (Blue Crab) 96 hours = 28 ppm copper; LC<sub>50</sub> (Oyster) 96 hours = 5.8 ppm copper; LC<sub>50</sub> (*Viviparus bengalensis* snail) 96 hours = 0.060 ppm copper (at 32.5°C; 0.066 ppm copper static bioassay); LC<sub>50</sub> (*Viviparus bengalensis* snail) 96 hours = 0.09 ppm copper (at 27.3°C; 0.066 ppm copper static bioassay); LC<sub>50</sub> (*Viviparus bengalensis* snail) 96 hours = 0.39 ppm copper (at 20.3°C; 0.066 ppm copper static bioassay)

#### Environmental Fate

If released to soil, copper sulfate may leach to groundwater, be partly oxidized or bind to humic materials, clay or hydrous oxides of iron and manganese. In water, it will bind to carbonates as well as humic materials, clay and hydrous oxides of iron and manganese. Copper is accumulated by plants and animals, but it does not appear to biomagnify from plants to animals. In air, copper aerosols have a residence time of 2 to 10 days in an unpolluted atmosphere and 0.1 to greater than 4 days in polluted, urban areas.

### \*\*\* Section 13 - Disposal Considerations \*\*\*

#### US EPA Waste Number & Descriptions

##### A: General Product Information

This product is a registered pesticide.

##### B: Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

## Material Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

**\*\*\* Section 13 - Disposal Considerations (Continued) \*\*\***

### Disposal Instructions

All wastes must be handled in accordance with local, state and federal regulations. This material can be converted to a less hazardous material by weak reducing agents followed by neutralization. Do not reuse empty containers. Do not rinse unless required for recycling. If partly filled, call local solid waste agency or (1-800-CLEANUP or equivalent organization) for disposal instructions. Never pour unused product down drains or on the ground.

### Pesticide Disposal

Pesticide wastes are acutely hazardous. Improper disposal of excess pesticides, spray mixtures, or rinsate is a violation of U.S. Federal and Canadian Law. If these wastes cannot be disposed of by use, according to product label instruction, contact your U.S. State, or Canadian Province Pesticide or Environmental Control Agency, or the hazardous waste representative at the nearest U.S. EPA Regional Office for guidance.

**\*\*\* Section 14 - Transportation Information \*\*\***

NOTE: The shipping classification information in this section (Section 14) is meant as a guide to the overall classification of the product. However, transportation classifications may be subject to change with changes in package size. Consult shipper requirements under I.M.O., I.C.A.O. (I.A.T.A.) and 49 CFR to assure regulatory compliance.

### US DOT Information

**Shipping Name:** Environmentally Hazardous Substance, solid, n.o.s. (cupric sulfate)  
**Hazard Class:** 9 (Miscellaneous Hazardous Materials)  
**UN/NA #:** UN 3077  
**Packing Group:** III  
**Required Label(s):** Class 9 (Miscellaneous Hazardous Materials)  
**RQ Quantity:** 10 lbs (4.54 kg)[Cupric Sulfate]

### Additional Shipping Information

Cupric Sulfate is a Severe Marine Pollutant (49 CFR 172.322) and requires the marine pollutant mark for vessel transportation. Because Copper Sulfate is listed as a Severe Marine Pollutant as found in Appendix B to 172.101 and when shipped by vessel, each inner package which exceeds 500 g (17.6 ounces) will need a marine pollutant marking. UN-certified package, marked with the Proper Shipping Name, UN Number will be required when shipped by vessel, when each inner package exceeds 500 g (17.6 ounces).

**Limited Quantity Shipments:** Inner packagings less than 500 g (17.6 ounces) will not need to be in a UN-approved box and will not need a Marine Pollutant marking. Such shipments need not be marked with the Proper Shipping Name of the contents, but shall be marked with the UN Number (3077) of the contents, preceded by the letters "UN", placed within a diamond. The width of the line forming the diamond shall be at least 2 mm; the number shall be at least 6 mm high. The total weight of each outer packaging cannot exceed 30 kg (66 pounds). For a shipment by air the class 9 label will be required.

### Domestic Transportation Exception

49 CFR 172.504(f)(9) Domestic transportation, a Class 9 placard is not required. A bulk packaging containing a Class 9 material must be marked with the appropriate identification number displayed on a Class 9 placard, an orange panel or a white-square-on-point display configuration as required by subpart D of this part. 49 CFR 172(d)(3) allows the use of the class 9 placard to replace the marine pollutant marking for domestic shipments.

# Material Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

**\*\*\* Section 14 - Transportation Information (Continued) \*\*\***

**International Air Transport Association (IATA)**

For Shipments by Air transport: We classify this product as hazardous (Class 9) when shipped by air because 49 CFR 173.140 (a). "For the purposes of this subchapter, miscellaneous hazardous material (Class 9) means a material which presents a hazard during transportation, but which does not meet the definition of any other hazard class. This class includes: (a) Any material which has an anesthetic, noxious, or other similar property which could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties."

**Proper Shipping Name:** Environmentally hazardous substance, solid, n.o.s. (cupric sulfate)

**Hazard Class:** 9

**UN:** UN 3077

**Packing Group:** III

**Passenger & Cargo Aircraft Packing Instruction:** 911

**Passenger & Cargo Aircraft Maximum Net Quantity:** No Limit

**Limited Quantity Packing Instruction (Passenger & Cargo Aircraft):** Y911

**Limited Quantity Maximum Net Quantity (Passenger & Cargo Aircraft):** 30 kg

**Special Provisions:** A97

**ERG Code:** 9L

**International Maritime Organization (I.M.O.) Classification**

For shipments via marine vessel transport, the following classification information applies.

**Proper Shipping Name:** Environmentally hazardous substance, solid, n.o.s. (Cupric sulfate)

**Hazard Class:** class 9

**UN #:** UN3077

**Packing Group:** III

**Special Provisions:** 274, 909, 944

**Limited Quantities:** 500g.

**Packing Instructions:** P002, LP02

**Packing Provisions:** PP12

**IBC Provisions:** IBC07

**IBC Provisions:** B3

**EmS:** Fire F-A Spill S-B

**Stowage and Segregation:** Category A

This material is considered a severe marine pollutant by the IMO and shipments of the material must carry the marine pollutant mark label. Refer to IMO Amendment 31-02 Chapter 2.10.

**\*\*\* Section 15 - Regulatory Information \*\*\***

**US Federal Regulations**

**A: General Product Information**

Copper Sulfate Pentahydrate (CAS # 7758-99-8) is listed as a Priority and Toxic Pollutant under the Clean Water Act.

**B: Component Analysis**

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4):

**Copper Compounds (7440-50-8)**

SARA 313: final RQ = 5000 pounds (2270 kg) Note: No reporting of releases of this substance is required if the diameter of the pieces of the solid metal released is equal to or greater than 0.004 inches.

**Cupric Sulfate (7758-98-7)**

CERCLA: final RQ = 10 pounds (4.54 kg)

**C: Sara 311/312 Tier II Hazard Ratings:**

Component	CAS #	Fire Hazard	Reactivity Hazard	Pressure Hazard	Immediate Health Hazard	Chronic Health Hazard
Copper Sulfate Pentahydrate	7758-99-8	No	No	No	Yes	Yes

## Material Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

**\*\*\* Section 15 - Regulatory Information (Continued)\*\*\***

**US Federal Regulations (continued)**

**State Regulations**

**A: General Product Information**

**California Proposition 65**

Copper Sulfate Pentahydrate is not on the California Proposition 65 chemical lists.

**B: Component Analysis - State**

The following components appear on one or more of the following state hazardous substance lists:

Component	CAS #	CA	FL	MA	MN	NJ	PA
Copper	7440-50-8	Yes	No	Yes	No	Yes	Yes
Copper, fume, dust and mists		No	Yes	No	Yes	No	Yes
Copper Sulfate Pentahydrate	7758-99-8	No	No	No	No	Yes	Yes

**Other Regulations**

**A: General Product Information**

When used as a pesticide, the requirements of the U.S. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), or requirements under the Canadian Pest Control Act, are applicable.

**B: Component Analysis - Inventory**

Component	CAS #	TSCA	DSL	EINECS
Copper Sulfate Pentahydrate	7758-99-8	Exempted	No	Yes

Although this compound is not on the TSCA Inventory, it is exempted as a hydrate of a listed compound, Copper Sulfate (CAS # 7758-98-7), per 40 CFR 710.4 (d)(3) and 40 CFR 720.30 (h)(3). Under this section of TSCA, any chemical substance which is a hydrate of a listed compound is exempted.

**C: Component Analysis - WHMIS IDL**

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Copper Sulfate Pentahydrate	7758-99-8	1 percent

**ANSI Labeling (Z129.1):**

**DANGER! MAY BE FATAL IF SWALLOWED. CAUSES SKIN AND EYE IRRITATION. HARMFUL IF INHALED.** Keep from contact with clothing. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing dusts or particulates. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH-approved respiratory protection, as appropriate. **FIRST-AID:** In Case of Contamination of Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. In Case of Contamination of Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue to rinse eye. If Inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible. If Ingested: Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. Call a poison control center or doctor for treatment advice. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In the event of a medical emergency, you may also contact The National Pesticide Information Center at 1-800-858-7378. **IN CASE OF FIRE:** Use water fog, dry chemical, CO<sub>2</sub>, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

**Labeling Information for Pesticide Use of Product:**

**DANGER! HAZARD TO HUMANS AND DOMESTIC ANIMALS.**

**DANGER: CORROSIVE:** Causes eye damage and irritation to the skin and mucous membrane. Harmful or fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not breathe dust or spray mist. May cause skin sensitization reactions to certain individuals.

**PERSONAL PROTECTIVE EQUIPMENT:** Applicators and other handlers must wear long-sleeved shirt and long pants, chemical-resistant gloves, made of any water-proof material, shoes, plus socks and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this solutions of this product. Do not reuse such contaminated items. Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for reusable items exist, wash using detergent and hot water. Keep and wash PPE separately for other laundry.

## Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

### \*\*\* Section 15 - Regulatory Information (Continued)\*\*\*

#### US Federal Regulations (continued)

##### Labeling Information for Pesticide Use of Product (continued):

**USER SAFETY RECOMMENDATIONS:** Persons using this product should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if contaminated by the pesticide. Wash contaminated clothing thoroughly and put on clean clothing. Remove PPE immediately after use with this product. Wash outside of gloves and other equipment before removing. After removal of PPE, wash thoroughly and change into clean clothing.

**ENVIRONMENTAL HAZARDS:** This product is toxic to fish. 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 in order to avoid depletion of oxygen from decaying vegetation. Allow 1 to 2 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 the water increases. Do not contaminate water by cleaning of equipment or disposal of wastes. Consult local State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

**STORAGE AND DISPOSAL: PROHIBITIONS:** Do not contaminate water, food or feed by storage or disposal. Open burning and dumping is prohibited. Do not re-use empty containers. Keep pesticide in original container. Do not put concentrate or dilutions of concentrate in food or drink containers. Pesticide wastes are acutely hazardous. Improper disposal of excess 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. Completely empty bag of product into application equipment. Dispose of empty bag in a sanitary landfill or by incineration, or if allowed by State and local authorities, by burning. If burned, avoid smoke.

**DIRECTIONS FOR USE:** It is a violation of Federal Law to use this product inconsistent with its labeling. Do not apply this product in a way that will contaminate workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For requirements specific to your State, consult the agency responsible for your pesticide regulations.

**AGRICULTURAL USE REQUIREMENTS:** Use this product only in accordance with its labeling and with the Worker Protection Standard, CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries and greenhouses, and handlers of agricultural pesticides. The Standard contains requirements for the 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. These requirements only apply to uses of this product that are covered under the Worker Protection Standard. Do not apply this product in a way that will contaminate workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Do not allow worker entry into treated areas during the restricted 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."

**GENERAL USE INSTRUCTIONS:** Water hardness, temperature of the water, the type and amount of vegetation to be controlled and the amount of water flow, are to be considered in using Copper Sulfate to control algae. Begin treatment soon after plant growth has started. If treatment is delayed until a large amount of algae is present, larger quantities of Copper Sulfate will be required. Algal growth is difficult to control with Copper Sulfate when water temperatures are low or when water is hard. Larger quantities of Copper Sulfate will be required to kill and control algae in water which is flowing than in a body of stagnant water. If possible, curtail the flow of water before treatment and hold dormant until approximately three days after treatment or until the algae have begun to die. When preparing a Copper Sulfate solution in water, the mixing container should be made of plastic or glass, or a painted, enameled, or copper-lined metal container. It is usually best to treat algae on a sunny day when the heavy mats of filamentous algae are most likely to be floating on the surface, allowing the solution to be sprayed directly on the algae. If there is some doubt about the concentration to apply, it is generally best to start with a lower concentration and to increase this concentration until the algae are killed.

**ENDANGERED SPECIES RESTRICTION:** It is a violation of Federal Law to use any pesticide in a manner that results in the death of an endangered species or adverse modification to their habitat. The use of this product may pose a hazard to certain Federally Designated species known to occur in specific areas. Contact the EPA for information on these areas. Obtain a copy of the EPA Bulletin specific to your area. This bulletin identifies areas within specific State counties where the use of this pesticide is prohibited, unless specified otherwise. The EPA Bulletin is available from either your County Agricultural Extension Agent, the Endangered Species Specialist in your State Wildlife Agency Headquarters, or the appropriate Regional Office of the U.S. Fish and Wildlife Service. THIS BULLETIN MUST BE REVIEWED PRIOR TO PESTICIDE USE.

EPA REG. NO. 56576-

EPA EST. NO. 52117-MX-001

## Material Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

\* \* \* Section 16 - Other Information \* \* \*

### Other Information

Chem One Ltd. ("Chem One") shall not be responsible for the use of any information, product, method, or apparatus herein presented ("Information"), and you must make your own determination as to its suitability and completeness for your own use, for the protection of the environment, and for health and safety purposes. You assume the entire risk of relying on this Information. In no event shall Chem One be responsible for damages of any nature whatsoever resulting from the use of this product or products, or reliance upon this Information. By providing this Information, Chem One neither can nor intends to control the method or manner by which you use, handle, store, or transport Chem One products. If any materials are mentioned that are not Chem One products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed. Chem One makes no representations or warranties, either express or implied of merchantability, fitness for a particular purpose or of any other nature regarding this information, and nothing herein waives any of Chem One's conditions of sale. This information could include technical inaccuracies or typographical errors. Chem One may make improvements and/or changes in the product (s) and/or the program (s) described in this information at any time. If you have any questions, please contact us at Tel. 713-896-9966 or E-mail us at [Safety@chemone.com](mailto:Safety@chemone.com). Revision date: 05/31/01

### Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration

**Contact:** Sue Palmer-Koleman, PhD

**Contact Phone:** (713) 896-9966

### Revision log

07/24/00 4:24 PM SEP Changed company name, Sect 1 and 16, from Corporation to Ltd.  
07/27/00 2:49 PM SEP Added "Fine 200, FCC IV, Very High Purity" to synonyms, Section 1  
08/23/00 3:15 PM SEP Added "Copper Sulfate Crystals" to synonyms, Section 1  
05/31/01 9:31 AM HDF Checked exposure limits; made changes to Sect 9; overall review, add SARA 311/312 Haz Ratings.  
06/01/01 7:28 AM HDF Added text to label information from EPA Approved Label  
07/24/01 4:31 AM CLJ Add Shipments by Air information to Section 14, Changed contact to Sue, non-800 Chemtrec Num.  
09/18/01 11:34 AM SEP Added Domestic Transportation Exception, Sect 14  
10/05/01 3:30 PM SEP Deleted Alternate Shipping Name, Sect 14  
02/15/02 11:01 AM: HDF Revision of SARA Chronic Hazard Rating to "Yes".  
2/21/02 4:21 PM HDF Added more information on Marine Pollutant Markings and Limited Quantity Shipments  
223/03: 2:21 pm HDF Addition of chronic health hazard information. Addition of inhalation hazard information, Section 3. Section 4 – expansion of information on Information for Physicians. Up-graded Section 10 Reactivity Information. Up-Dated entire Section 14 Transportation Information to include IATA, IMO transport information.

This is the end of MSDS # C1-121A

# Specimen Label

# Nautique\*

## Aquatic Herbicide



For control of floating, emersed, and submersed vegetation in still or flowing aquatic sites such as potable water sources, lakes, rivers, reservoirs, and ponds, slow-flowing or quiescent water bodies, crop and non-crop irrigation systems (canals, laterals, and ditches), fish, golf course, ornamental, swimming, and fire ponds and aquaculture including fish and shrimp.

#### Active Ingredient

Copper Carbonate <sup>1</sup> .....	15.9%
Inert Ingredients .....	84.1%
TOTAL .....	100.0%

<sup>1</sup>Metallic copper equivalent, 9.1%.

## 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 the label, find someone to explain it to you in detail.)

### Precautionary Statements

#### Hazards to Humans and Domestic Animals

**DANGER:** Corrosive. Causes irreversible eye damage and skin burn. May be fatal if absorbed through skin. Harmful if swallowed. Do not get in eyes on skin or on clothing. Wear goggles, face shield, or safety glasses, protective clothing and chemical-resistant gloves. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Wash thoroughly with soap and water after handling and before eating, drinking and using tobacco. Remove contaminated clothing and wash before reuse.

#### Environmental Hazards

Fish toxicity is dependent on the hardness of the water. In soft water, trout and other species of fish may be killed at application rates recommended on this label. Do not use in waters containing trout or other sensitive species if the carbonate hardness of the

water is less than 50 ppm. Fish toxicity generally decreases when the hardness of water increases. Do not treat more than one-half of lake or pond at one time to avoid depletion of oxygen levels due to decaying vegetation. Consult State Fish and Game Agency or other responsible Agency before applying this product to public waters.

First Aid	
<b>If in eyes</b>	<ul style="list-style-type: none"><li>• Hold eye open and rinse slowly and gently with water for 15 - 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.</li><li>• Call poison control center or doctor for treatment advice.</li></ul>
<b>If on skin or clothing</b>	<ul style="list-style-type: none"><li>• Take off contaminated clothing.</li><li>• Rinse skin immediately with plenty of water for 15 - 20 minutes.</li><li>• Call a poison control center or doctor for treatment advice.</li></ul>
<b>If swallowed</b>	<ul style="list-style-type: none"><li>• Call a poison control center or doctor immediately for treatment advice.</li><li>• Have person sip a glass of water if able to swallow.</li><li>• Do not induce vomiting unless told to do so by a poison control center or doctor.</li><li>• Do not give anything by mouth to an unconscious person.</li></ul>
<b>If inhaled</b>	<ul style="list-style-type: none"><li>• Move person to fresh air.</li><li>• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.</li><li>• Call a poison control center or doctor for further treatment advice.</li></ul>
<b>Note to Physician:</b> Probable mucosal damage may contraindicate the use of gastric lavage. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In case of emergency endangering health or the environment involving this product, call <b>INFOTRAC</b> at <b>1-800-535-5053</b> .	

**Refer to inside of label booklet for additional precautionary information and Directions for Use.**

**Notice:** Read the entire label before using. Use only according to label directions. Before buying or using this product, read "Warranty Disclaimer", "Inherent Risks of Use" and "Limitation of Remedies" inside label booklet.

For product information, visit our web site at [www.sepro.com](http://www.sepro.com).

EPA Reg. No. 67690-10  
FPL 070705

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SePRO Corporation Carmel, IN 46032 U.S.A.

## Directions for Use

It is a violation of Federal Law to use this product in a manner inconsistent with its label directions.

### GENERAL INFORMATION

Nautique may be applied to potable water sources, lakes, rivers, reservoirs, ponds, slow-flowing or quiescent water bodies, crop and non-crop irrigation systems (ditches, canals, and laterals), fish, golf course, ornamental, swimming, and fire ponds, and aquaculture including fish and shrimp. In waters with greater calcium carbonate hardness, the higher use rates are recommended for improved plant control.

#### Target Species

Nautique Aquatic Herbicide is a double chelated copper formulation that provides effective control of floating, submersed, and emersed aquatic plants having a sensitivity to copper absorption including:

Coontail  
 Curlyleaf Pondweed  
 Egeria (*Brazilian Elodia*)  
 Elodea  
 Eurasian Watermilfoil<sup>1</sup>  
 Horned Pondweed<sup>1</sup>  
 Hydrilla  
 Naiads  
 Thin Leaf Pondweed  
 Vallisneria  
 Water Lettuce  
 Water Hyacinth  
 Widgeon Grass  
 Pondweed (e.g., Sago, American,)<sup>1</sup>

<sup>1</sup>Variable control may be obtained in waters with greater calcium carbonate hardness.

#### Timing of Treatments

When target vegetation is actively growing, apply Nautique Aquatic Herbicide to the area of greatest concentration of foliage in such a way as to evenly distribute the herbicide. In lakes, reservoirs, ponds, and static canals, the application site is defined by this label as the specific location where Nautique is applied. In slow moving and flowing canals and rivers, the application site is defined by this label as the target location for plant control. In order to maximize effectiveness, apply Nautique early in the day under bright or sunny conditions when water temperatures are at least 60° F (15° C). The activity of this product may be reduced if there is insufficient penetration of light into the water or if the plants and weeds are covered with silt, scale, or algae. If algae mats are thick, use high pressure when spraying to break up the algae mats.

#### Dissolved Oxygen Consideration

Treatment of aquatic plants and weeds can result in a reduction of dissolved oxygen due to the decomposition of the dead vegetation. This loss of dissolved oxygen can cause fish suffocation. To minimize this possible hazard treat 1/3 to 1/2 of the water area in a single operation, then wait 10 - 12 days before treating the remaining area. Begin treatment in the shallow areas, gradually proceeding outward in bands to permit the fish to move into the untreated area.

### Application Options

Nautique Aquatic Herbicide can be applied directly as a surface spray, subsurface through trailing weighted hoses, or in combination with other aquatic herbicides and algaecides, surfactants, sinking agents, polymers, or penetrants. These products are used to improve the retention time, sinking, and distribution of the herbicide. For surface application, this product may be applied diluted or undiluted, whichever is most suitable to insure uniform coverage of the area to be treated.

Aquatic plants and weeds will typically drop below the surface within 4 - 7 days after treatment. The complete results of treatment will be observed in 3 - 4 weeks in most cases. In heavily infested areas a second application may be necessary after 10 - 12 weeks. Repeating application of this product too soon after initial application may have no effect.

Use the lower rates for treating shallow water and the higher rates for treating deeper water and heavier infestations. Surface applications may be made from shore into shallow water along the shoreline.

Nautique Aquatic Herbicide inverts easily using either tank-mix or multi-fluid mixer techniques. For submersed plants invert applications should be made through weighted hoses dragged below the water surface; for heavy infestations, direct application is preferable.

### NO RESTRICTIONS ON WATER USE

Waters treated with Nautique may be used immediately after application for swimming, fishing, drinking, livestock watering, or irrigating turf and ornamental plants.

### Permits

Some states may require permits for the application of this product to public waters. Check with your local authorities.

### APPLICATION RATES

Recommended application rates in the chart below are based on minimal water flow in ponds, lakes, reservoirs, and irrigation conveyance or drainage systems. Treatments that extend chemical contact time with target vegetation will generally result in improved efficacy. In lakes, reservoirs, ponds, and static canals, the application site is defined by this label as the specific location where Nautique is applied. In conveyance systems where significant water flow results in rapid off-site movement of copper, consult the Flowing Water Treatment Instructions for the recommended application instructions.

APPLICATION RATES		GALLONS PER SURFACE ACRE				LITERS PER SURFACE HECTARE			
		Depth in Feet				Depth in meters			
Relative Density	ppm	1	2	3	4 <sup>2</sup>	0.5	0.75	1.0	1.25 <sup>2</sup>
Low	.5	1.5	3.0	4.5	6.0	12.0	24.1	36.1	48.2
Density	.6	1.8	3.6	5.4	7.2	14.9	29.8	44.7	59.6
Medium	.7	2.1	4.2	6.3	8.4	17.2	34.4	51.6	68.8
Density	.8	2.4	4.8	7.3	9.6	19.5	39.0	58.5	78.0
High	.9	2.7	5.4	8.1	10.8	21.8	43.6	65.4	87.2
Density	1.0 <sup>2</sup>	3.0	6.0	9.0	12.0	24.1	48.2	72.3	96.4

<sup>1</sup> For depths greater than 4 ft. (1.25 m) add rates given for the sum of the corresponding depths in the chart.

<sup>2</sup> Do not apply more than 1.0 ppm copper per application.

**Free-Floating Plants** Apply Nautique at a rate of 8 - 12 gallons/acre for control of water hyacinth and salvinia and 4 - 6 gallons/acre for control of water lettuce. Add Nautique and appropriate surfactant to 100 gallons of water and use an adequate spray volume to insure good coverage of the plant.

## TANK-MIX

### Nautique + Sonar® A.S. Tank-Mix (Except CA)

The following mixture can be used to provide rapid control of dense infestations of coontail, duckweed, egeria, elodea, Eurasian watermilfoil, hydrilla, sago and American pondweed, naiads, and other susceptible species. Apply 1 to 4 gallons of Nautique per surface acre in conjunction with normal Sonar rates. Observe all cautions and restrictions on the labels of both products used in this mixture.

### Nautique + Reward® Tank-Mix

The following mixture can be used to enhance control of coontail, duckweed, egeria, elodea, Eurasian watermilfoil, hydrilla, pondweeds (Potamogeton species), salvinia, water lettuce, water hyacinth, and other susceptible species. Tank-mix a ratio of 2:1 or 1.5:1 Nautique to Reward. This can be applied as a tank mix or metered in as a concentrate. The addition of a surfactant is recommended to enhance performance on floating plants. Observe all cautions and restrictions on the labels of both products used in this mixture. **DO NOT MIX CONCENTRATES IN TANK WITHOUT FIRST ADDING WATER.**

## FLOWING WATER TREATMENT:

### Drip System or Metering Pump Application for Canals, Ditches, and Laterals

This product should be applied as soon as submersed macrophytes begin to interfere with normal delivery of water (clogging of lateral head gates, suction screens, weed screens, and siphon tubes). Delaying treatment could perpetuate the problem causing massing and compacting of plants. Heavy infestations and low flows may result in pooling or uneven chemical distribution resulting in unsatisfactory control. Under these conditions increasing the water flow rate during application may be necessary. In flowing canals the application site is defined by this label as the target location for aquatic plant control.

To achieve desired control with Nautique herbicide in flowing waters, it is recommended that a minimum exposure period of three hours be maintained. Other factors to consider include: plant species and density of infestation and water temperature and hardness. Treatment on bright sunny days will tend to enhance efficacy of this product.

1. Treatment with Nautique requires accurate calculations of water flow rates. Devices that provide accurate flow measurements such as weirs or orifices are the preferred method, however, the volume of water to be treated may also be estimated using the following formula:

$$\text{Average width (ft.)} \times \text{Average Depth (ft.)} \times \text{Average Velocity (ft./sec.)} = \text{Cubic Feet per Second (CFS)}$$

The velocity can be estimated by determining the length of time it takes a floating object to travel a defined distance. Divide the distance (ft.) by the time (sec.) to estimate velocity (ft./sec). This measure should be repeated 3 times at the intended application site and then calculate the average velocity.

2. After accurately determining the water flow rate in C.F.S. or gallons/minute, find the corresponding drip rate in the chart below.

Water Flow Rate		ppm Copper	Chemical Drip Rate	
C.F.S.	Gal/Min.		Quart/Hr.	MI/Min.
1	450	0.5 - 1.0	0.5 - 1.0	8.0 - 16.0
2	900	0.5 - 1.0	1.0 - 2.0	16.0 - 32.0
3	1350	0.5 - 1.0	1.5 - 3.0	23.5 - 47.0
4	1800	0.5 - 1.0	2.0 - 4.0	31.5 - 63.0
5	2250	0.5 - 1.0	2.5 - 5.0	39.5 - 79.0

Calculate the amount of product needed to maintain the drip rate for a treatment period of 3 or more hours by multiplying quart/hr x 3; ml / min. by 180; or fl. oz. / min x 180. Dosage will maintain 1.0 ppm copper concentration in the treated water for the treatment period. Introduction of the chemical should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of the chemical.

Pour the required amount of this product into a drum or tank equipped with a brass needle valve and constructed to maintain a constant drip rate. Use a stopwatch and appropriate measuring container to set the desired drip rate. Readjust accordingly if the canal flow rate changes during the treatment period. This product can also be applied by using metering pumps that adjust to flow rates in the canal.

Results can vary depending upon species and density of vegetation, desired distance of control and flow rate, and impact of water quality on copper residues and efficacy. Consult an Aquatic Specialist to determine optimal use rate and treatment period under local conditions. Periodic maintenance treatments may be required to maintain seasonal control.

### Irrigation Ponds

When applying to irrigation ponds, it is best to hold water for a minimum of 3 hours before irrigating to ensure proper exposure of Nautique at targeted rates to plants. If water is to be continually pumped from the treated system during application, application techniques (drip, injection, or multiple spray applications) should be made to compensate for dilution of Nautique within the targeted area.

## GENERAL TREATMENT NOTES

The following suggestions apply to the use of this product as an algaecide or herbicide in all approved use sites. For optimum effectiveness:

- Apply early in the day under calm, sunny conditions when water temperatures are at least 60° F.
- Treat when growth first begins to appear or create a nuisance, if possible.
- Apply in a manner that will ensure even distribution of the chemical within the treatment area.
- Re-treat areas if regrowth begins to appear and seasonal control is desired. Allow one to two weeks between consecutive treatments.
- Allow seven to ten days to observe the effects of treatment (bleaching and breaking apart of plant material).

### Storage and Disposal

Store in a cool, dry place.

**PESTICIDE DISPOSAL:** Do not contaminate water, food or feed by storage and disposal. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Pesticide wastes are acutely hazardous. Improper disposal of excess 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.

**CONTAINER DISPOSAL:** Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incinerate, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

## Warranty Disclaimer

SePRO Corporation warrants that the product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. SEPRO CORPORATION MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

## Inherent Risks Of Use

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of SePRO Corporation as the seller. All such risks shall be assumed by the buyer.

## Limitation of Remedies

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories) shall be limited to, at SePRO Corporation's election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used.

SePRO Corporation shall not be liable for losses or damages resulting from handling or use of this product unless SePRO Corporation is promptly notified of such losses or damages in writing. In no case shall SePRO Corporation be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer above and this Limitation of Remedies can not be varied by any written or verbal statements or agreements. No employee or sales agent of SePRO Corporation or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or Limitations of Remedies in any manner.

# Material Safety Data Sheet



## Nautique\* Aquatic Herbicide

### 1. Product and company identification

Product name : Nautique\* Aquatic Herbicide  
EPA Registration Number : 67690-10  
Material uses : Aquatic plant herbicide.  
Supplier/Manufacturer : **SePRO Corporation**  
11550 North Meridian Street  
Suite 600  
Carmel, IN 46032 U.S.A.  
Tel: 317-580-8282  
Toll free: 1-800-419-7779  
Fax: 317-428-4577  
Monday - Friday, 8am to 5pm E.S.T.  
**www.sepro.com**

Responsible name : KMK Regulatory Services inc.  
In case of emergency : **INFOTRAC - 24-hour service 1-800-535-5053**

### 2. Hazards identification

Physical state : Liquid.  
Odor : Ammoniacal. [Slight]  
OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).  
Emergency overview : **DANGER!**  
**CAUSES RESPIRATORY TRACT, EYE AND SKIN BURNS. MAY CAUSE SEVERE ALLERGIC RESPIRATORY AND SKIN REACTION. HARMFUL IF ABSORBED THROUGH SKIN. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.**  
Harmful if absorbed through the skin. Corrosive to the eyes, skin and respiratory system. Causes burns. May be harmful if swallowed. May cause sensitization by inhalation and skin contact. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Contains material that can cause target organ damage. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.  
Potential acute health effects  
Inhalation : Corrosive to the respiratory system. May cause sensitization by inhalation. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.  
Ingestion : Harmful if swallowed. May cause burns to mouth, throat and stomach.  
Skin : Corrosive to the skin. Causes burns. Toxic in contact with skin. May cause sensitization by skin contact.  
Eyes : Corrosive to eyes. Causes burns.  
Potential chronic health effects  
Chronic effects : Contains material that can cause target organ damage.  
Carcinogenicity : No known significant effects or critical hazards.  
Mutagenicity : No known significant effects or critical hazards.  
Teratogenicity : No known significant effects or critical hazards.  
Developmental effects : No known significant effects or critical hazards.  
Fertility effects : No known significant effects or critical hazards.  
Target organs : Contains material which causes damage to the following organs: kidneys, liver, upper respiratory tract, skin, eye, lens or cornea.  
Over-exposure signs/symptoms

- Inhalation** : Adverse symptoms may include the following:  
respiratory tract irritation  
coughing  
wheezing and breathing difficulties  
asthma
- Ingestion** : Adverse symptoms may include the following:  
stomach pains
- Skin** : Adverse symptoms may include the following:  
pain or irritation  
redness  
blistering may occur
- Eyes** : Adverse symptoms may include the following:  
pain  
watering  
redness
- Medical conditions aggravated by over-exposure** : Pre-existing respiratory and skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

## 3. Composition/information on ingredients

United States			
Name	CAS number	%	
1,2-Diaminoethane	107-15-3	10 - 30	
Triethanolamine	102-71-6	10 - 30	
Copper (II) Carbonate Basic	12069-69-1	10 - 30	

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

## 4. First aid measures

- Eye contact** : Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 20 minutes. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 20 minutes. Get medical attention immediately.
- Inhalation** : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
- Ingestion** : Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
- Notes to physician** : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

## 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Extinguishing media**
- Suitable** : Use an extinguishing agent suitable for the surrounding fire.
- Not suitable** : None known.
- Hazardous thermal decomposition products** : Decomposes above 390°F (200°C). May form oxides of carbon and nitrogen.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## 6. Accidental release measures

- Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
- Methods for cleaning up**
- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

## 7. Handling and storage

- Handling** : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Storage** : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

## 8. Exposure controls/personal protection

	United States
<b>Product name</b>	<b>Exposure limits</b>
1,2-Diaminoethane	<b>ACGIH TLV (United States, 1/2006). Skin</b> TWA: 25 mg/m <sup>3</sup> 8 hour(s). <b>NIOSH REL (United States, 12/2001).</b> TWA: 25 mg/m <sup>3</sup> 10 hour(s). <b>OSHA PEL (United States, 11/2006).</b> TWA: 25 mg/m <sup>3</sup> 8 hour(s).
Triethanolamine	<b>ACGIH TLV (United States, 1/2006).</b> TWA: 5 mg/m <sup>3</sup> 8 hour(s).

Consult local authorities for acceptable exposure limits.

- Recommended monitoring procedures** : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. **Applicators should refer to the product label for personal protective clothing and equipment.**

- Engineering measures** : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

# Nautique\* Aquatic Herbicide



**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

## Personal protection

**Applicators should refer to the product label for personal protective clothing and equipment.**

**Eyes** : Face shield.  
**Skin** : Synthetic apron. Boots.  
**Respiratory** : Vapor respirator.  
**Hands** : Nitrile gloves.

**Personal protective equipment (Pictograms)** :



**HMIS Code/Personal protective equipment** : D

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## 9 . Physical and chemical properties

**Physical state** : Liquid.  
**Color** : Purple. [Dark]  
**Odor** : Ammoniacal. [Slight]  
**pH** : 12.03 [Conc. (% w/w): 1%]Typical  
**Relative density** : 1.2

## 10 . Stability and reactivity

**Stability** : The product is stable.  
**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.  
**Conditions to avoid** : No specific data.  
**Materials to avoid** : Reactive or incompatible with the following materials: Strong acids and nitrites. Should not be used in water where the pH is less than 6.0 due to the possible breakdown of the copper chelate, which could form copper ions, which would precipitate. Should not be applied to water when temperature of the water is below 60°F (15°C).  
**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.  
Highly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge.  
Flammable in the presence of the following materials or conditions: heat.

## 11 . Toxicological information

### Acute toxicity

Product/ingredient name	Species	Dose	Result	Exposure
Nautique* Aquatic Herbicide	Rabbit - Male, Female	700 mg/kg	LD50 Dermal	-
	Rat - Male, Female	0.68 g/kg	LD50 Oral	-
	Rat - Male, Female	2100 g/m <sup>3</sup>	LC50 Inhalation Vapor	4 hours

- Inhalation** : Corrosive to the respiratory system. May cause sensitization by inhalation. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
- Ingestion** : Harmful if swallowed. May cause burns to mouth, throat and stomach.
- Skin** : Corrosive to the skin. Causes burns. Toxic in contact with skin. May cause sensitization by skin contact.
- Eyes** : Corrosive to eyes. Causes burns.

## Carcinogenicity

### Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
1,2-Diaminoethane	A4	-	-	-	-	-
Triethanolamine	-	3	-	-	-	-

## 12 . Ecological information

**Environmental effects** : No known significant effects or critical hazards.

### Aquatic ecotoxicity

Product/ingredient name	Test	Species	Exposure	Result
1,2-Diaminoethane	Population	Algae	48 hours	Acute EC50 >100 mg/L
	Mortality	Fish	96 hours	Acute LC50 275 mg/L
	Mortality	Fish	96 hours	Acute LC50 220 mg/L
	Mortality	Fish	96 hours	Acute LC50 115.7 mg/L
	Mortality	Fish	96 hours	Acute LC50 1544.7 mg/L
	Mortality	Fish	96 hours	Acute LC50 1544.7 mg/L

**Remark:** It is reasonable to assume that Copper compounds contain Arsenic, Cadmium, Chromium, and Lead in concentrations ranging from a few parts per billion to several hundred parts per million.

## 13 . Disposal considerations

**Waste disposal** : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

## 14 . Transport information

**AERG** : 153

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
<b>DOT Classification</b>	UN2735	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-Diaminoethane)	8	III		-
<b>IMDG Class</b>	UN2735	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-Diaminoethane)	8	III		-
<b>IATA-DGR Class</b>	UN2735	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-Diaminoethane)	8	III		-

PG\* : Packing group

## 15 . Regulatory information

### United States

- HCS Classification** : Toxic material  
Corrosive material  
Sensitizing material  
Target organ effects
- U.S. Federal regulations** : **United States inventory (TSCA 8b)**: All components listed.  
TSCA precursor chemical list: Triethanolamine  
**SARA 302/304/311/312 extremely hazardous substances**: 1,2-Diaminoethane  
**SARA 302/304 emergency planning and notification**: 1,2-Diaminoethane  
**SARA 302/304/311/312 hazardous chemicals**: Copper (II) Carbonate Basic; 1,2-Diaminoethane; Triethanolamine  
**SARA 311/312 MSDS distribution - chemical inventory - hazard identification**:  
Copper (II) Carbonate Basic: Delayed (chronic) health hazard; 1,2-Diaminoethane: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard;  
Triethanolamine: Immediate (acute) health hazard, Delayed (chronic) health hazard  
**Clean Water Act (CWA) 307**: Copper (II) Carbonate Basic  
**Clean Water Act (CWA) 311**: 1,2-Diaminoethane  
**Clean Air Act (CAA) 112 accidental release prevention**: 1,2-Diaminoethane  
**Clean Air Act (CAA) 112 regulated flammable substances**: No products were found.  
**Clean Air Act (CAA) 112 regulated toxic substances**: 1,2-Diaminoethane

### SARA 313

	Product name	CAS number	Concentration
<b>Form R - Reporting requirements</b>	: Copper (II) Carbonate Basic	12069-69-1	10 - 30
<b>Supplier notification</b>	: Copper (II) Carbonate Basic	12069-69-1	10 - 30

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

- State regulations** : **Connecticut Carcinogen Reporting**: None of the components are listed.  
**Connecticut Hazardous Material Survey**: None of the components are listed.  
**Florida substances**: None of the components are listed.  
**Illinois Chemical Safety Act**: None of the components are listed.  
**Illinois Toxic Substances Disclosure to Employee Act**: None of the components are listed.  
**Louisiana Reporting**: None of the components are listed.  
**Louisiana Spill**: None of the components are listed.  
**Massachusetts Spill**: None of the components are listed.  
**Massachusetts Substances**: The following components are listed: 1,2-Diaminoethane  
**Michigan Critical Material**: None of the components are listed.  
**Minnesota Hazardous Substances**: None of the components are listed.  
**New Jersey Hazardous Substances**: The following components are listed: 1,2-Diaminoethane; Copper (II) Carbonate Basic  
**New Jersey Spill**: None of the components are listed.  
**New Jersey Toxic Catastrophe Prevention Act**: None of the components are listed.  
**New York Acutely Hazardous Substances**: The following components are listed: 1,2-Diaminoethane  
**New York Toxic Chemical Release Reporting**: None of the components are listed.  
**Pennsylvania RTK Hazardous Substances**: The following components are listed: 1,2-Diaminoethane; Copper (II) Carbonate Basic  
**Rhode Island Hazardous Substances**: None of the components are listed.

**California Prop. 65** : No products were found.

### International regulations

- International lists** : This product, (and its ingredients) is (are) listed on national inventories, or is (are) exempted from being listed, in Australia (AICS), in Europe (EINECS/ELINCS), in Korea (TCCL), in Japan (METI), in the Philippines (RA6969).

**16 . Other information**

Label requirements : CAUSES RESPIRATORY TRACT, EYE AND SKIN BURNS. MAY CAUSE SEVERE ALLERGIC RESPIRATORY AND SKIN REACTION. HARMFUL IF ABSORBED THROUGH SKIN. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

Hazardous Material Information System (U.S.A.) :

HAZARD RATINGS

Health	*	3
Fire hazard		0
Physical Hazard		0
Personal protection		D

4- Extreme  
 3- Serious  
 2- Moderate  
 1- Slight  
 0- Minimal  
 See section 8 for more detailed information on personal protection.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



References : ANSI Z400.1, MSDS Standard, 2004. - Manufacturer's Material Safety Data Sheet. - 29CFR Part1910.1200 OSHA MSDS Requirements. - 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG.

Date of issue : 07/15/2009  
 Date of previous issue : 01/15/2009  
 Version : 2.1

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The data in this MSDS relates only to the specific material designated herein. Possible adverse effects (see Section 2, 11 and 12) may occur if this material is not handled in the recommended manner.

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# Appendix F

(CEQA Documentation-To Be Completed)

SWRCB SIP Exception Info Sheet  
CEQA NOD  
CEQA NOI  
CEQA NOC  
RD 1000 Board Resolution  
State Clearinghouse Letter, Comments, Responses  
DFW Filing Fee Receipts

**State Implementation Policy (SIP) Section 5.3 Exception Information Sheet**  
**Use of Copper to Control Aquatic Vegetation**  
**in Conveyances**  
**Reclamation District 1000**  
**August 6, 2014**

1. **Notification.** Reclamation District 1000 (District) will notify potentially effected public and governmental agencies of the project. The project is described in the District's Initial Study/Mitigated Negative Declaration (IS/MND) dated June 19, 2014.
2. **Description of the Proposed Action.** The proposed action is the application of copper-containing aquatic herbicides to control aquatic vegetation. For a more detailed description, see the District's aforementioned IS/MND.
3. **Schedule.** The schedule for the action will be according to Integrated Pest Management (IPM) principles. For example, the application of aquatic herbicides will be done at times and frequencies when the type and density of aquatic vegetation equals or exceeds thresholds established by the District. Aquatic herbicide applications typically take place annually between April 1st and November 30th.
4. **Discharge and Receiving Water Quality Monitoring Plan.** The District has prepared and will use its Aquatic Pesticide Application Plan (APAP) as required in the Statewide General NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications #CAG990005 (#2013-0002-DWQ). 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.
5. **Contingency Plans.** The District will maintain its ability to use other herbicides and/or manual removal of aquatic vegetation and aquatic herbicides that do not contain copper. Alternative aquatic weed and algae control methods are not always as cost-effective, easy to apply, or efficacious as copper. Refer to the aforementioned IS/MND for a discussion of the use of copper-containing aquatic herbicides.
6. **Identification of Alternate Water Supply.** No alternative water supply exists for the District.
7. **Residual Waste Disposal Plans.** The District's use of copper to control algae and aquatic weeds does not create residual waste.
8. **Certification by a Qualified Biologist.** At the annual completion of the project, the District will provide certification by a qualified biologist that the receiving water beneficial uses have been maintained. Pre- and post-project certification will take into account natural variations in project site conditions and the influence these conditions have on beneficial uses.

# Notice of Determination

To: Sacramento County Clerk  
600 8<sup>th</sup> Street  
Sacramento, CA 95814

ENDORSED  
SACRAMENTO COUNTY

AUG 11 2014

From: Reclamation District 1000  
1633 Garden Highway  
Sacramento, CA 95833

DAVID VILLANUEVA, CLERK/RECORDER  
BY David Villanueva DEPUTY

Subject: FILING OF NOTICE OF DETERMINATION IN COMPLIANCE WITH SECTION  
21152 OF THE PUBLIC RESOURCES CODE

Project Title: Use of Copper to Control Aquatic Vegetation in Conveyances

Contact Person: Paul Devereux, phone: 916-922-1449

A copy of the Mitigated Negative Declaration adopted for this project and related documents are available for public examination at the District office at the above address and telephone number.

- Project Location: within Sacramento and Sutter Counties, CA
- Project Description: The short-term or seasonal use of aquatic herbicides that contain copper to control algae and aquatic weeds in water conveyances, including irrigation canals and ditches. Reclamation District 1000 has prepared the Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005

Determination: This notice is to advise that Reclamation District 1000 approved the above-described project on August 8, 2014 and has made the following determinations:

1. The project  will have a significant effect on the environment.  
 will not have a significant effect on the environment.
2.  An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.  
 A Mitigated Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures  were,  were not, made a condition of the approval of this project.
4. A statement of Overriding Considerations  was,  was not, adopted for this project.
5. California State Department of Fish & Game fees (AB 3158)
  - a)  The project has been found to be de minimis thus not subject to the provisions of AB 3158
  - b)  The project is not de minimis and is, therefore, subject to the following fees:
    - \$2,181.25 for review of a Negative Declaration
    - \$850 for review of an Environmental Impact Report
    - \$25 for County Fish and Game program processing fees



Paul Devereux, General Manager

08/08/2014

Date

RECEIVED

AUG 11 2014

STATE CLEARING HOUSE

# Notice of Determination

# FILED

AUG 11 2014

To: Sutter County Clerk  
433 Second Street  
Yuba City, CA 95991

BOARD OF SUPERVISORS  
DONNA M. JOHNSTON  
Clerk of the Board  
By Alicia Brown Deputy

From: Reclamation District 1000  
1633 Garden Highway  
Sacramento, CA 95833

Subject: FILING OF NOTICE OF DETERMINATION IN COMPLIANCE WITH SECTION 21152 OF THE PUBLIC RESOURCES CODE

Project Title: Use of Copper to Control Aquatic Vegetation in Conveyances

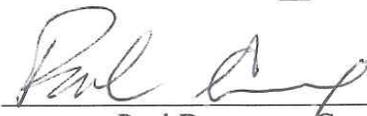
Contact Person: Paul Devereux, phone: 916-922-1449

A copy of the Mitigated Negative Declaration adopted for this project and related documents are available for public examination at the District office at the above address and telephone number.

- Project Location: within Sacramento and Sutter Counties, CA
- Project Description: The short-term or seasonal use of aquatic herbicides that contain copper to control algae and aquatic weeds in water conveyances, including irrigation canals and ditches. Reclamation District 1000 has prepared the Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005

Determination: This notice is to advise that Reclamation District 1000 approved the above-described project on August 8, 2014 and has made the following determinations:

1. The project  will have a significant effect on the environment.  
 will not have a significant effect on the environment.
2.  An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.  
 A Mitigated Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures  were,  were not, made a condition of the approval of this project.
4. A statement of Overriding Considerations  was,  was not, adopted for this project.
5. California State Department of Fish & Game fees (AB 3158)
  - a)  The project has been found to be de minimis thus not subject to the provisions of AB 3158
  - b)  The project is not de minimis and is, therefore, subject to the following fees:
    - \$2,181.25 for review of a Negative Declaration
    - \$850 for review of an Environmental Impact Report
    - \$25 for County Fish and Game program processing fees



Paul Devereux, General Manager

08/08/2014  
Date

RECEIVED

AUG 11 2014

STATE CLEARING HOUSE

# NOTICE OF INTENT

To Adopt a Mitigated Negative Declaration for  
Reclamation District 1000

## Use of Copper to Control Aquatic Vegetation In Water Conveyances

# FILED

JUL 01 2014

BOARD OF SUPERVISORS  
DONNA M. JOHNSTON  
Clerk of the Board

By  Deputy

Reclamation District 1000 (RD 1000) is proposing to begin to use copper-based aquatic herbicides to control aquatic weeds in its ditches and canals in Sacramento and Sutter Counties, California.

The proposed project would include the following elements:

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

To comply with the requirements of the California Environmental Quality Act (CEQA), RD 1000 authorized Blankinship & Associates, Inc. to prepare an Initial Study for the proposed project. The Initial Study includes an environmental checklist that evaluates the potential environmental impacts of the proposed project. Based on the results of the Initial Study, RD 1000 has determined that the proposed project can be carried out without significant impacts on the environment. Therefore, RD 1000 proposes to adopt a Mitigated Negative Declaration in order to meet its obligation under CEQA.

Prior to taking final action on the proposed Mitigated Negative Declaration, RD 1000 will consider public comments on the Initial Study and proposed Mitigated Negative Declaration. All interested parties are invited to submit written comments to:

Paul Devereux  
General Manager  
Reclamation District 1000  
1633 Garden Highway  
Sacramento, CA 95833

The Initial Study and proposed Mitigated Negative Declaration are available for public review at the above address during normal working hours, 8:00 a.m. to 5:00 p.m. The public review period begins on 07/01/14 and ends on 08/01/14. **All written comments must be received by the close of business on the last day of the review period.**

A public hearing on the proposed Negative Declaration will be held during the RD 1000 Board Meeting scheduled for **August 8, 2014 at 8:00am** at the District's Office located at 1633 Garden Highway, Sacramento, CA. After consideration of all comments, the RD 1000 Board of Directors will either certify or reject the proposed Mitigated Negative Declaration.

### Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613  
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SC# **2014071006**

Project Title: Use of Copper To Control Aquatic Vegetation in Water Conveyances

Lead Agency: Reclamation District 1000 Contact Person: Paul Devereux  
Mailing Address: 1633 Garden Highway Phone: (916) 922-1449  
City: Sacramento Zip: 95833 County: Sacramento

Project Location: County: Sacramento & Sutter City/Nearest Community: Sacramento  
Cross Streets: Water conveyances within District boundaries Zip Code: 95833

Longitude/Latitude (degrees, minutes and seconds): \_\_\_\_\_ " N / \_\_\_\_\_ " W Total Acres: 245,000  
Assessor's Parcel No.: Various Section: Various Twp.: \_\_\_\_\_ Range: \_\_\_\_\_ Base: \_\_\_\_\_  
Within 2 Miles: State Hwy #: 5, 80, 99 Waterways: Sacramento River  
Airports: Sacramento International Railways: Southern Pacific Schools: Various

Document Type:

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

RECEIVED  
JUL 01 2014

Local Action Type:

General Plan Update  Specific Plan  Rezone  Annexation  
 General Plan Amendment  Master Plan  Prezone  Redevelopment  
 General Plan Element  Planned Unit Development  Use Permit  Coastal Permit  
 Community Plan  Site Plan  Land Division (Subdivision, etc.)  Other: NPDES Permit

STATE CLEARINGHOUSE

Development Type:

Residential: Units \_\_\_\_\_ Acres \_\_\_\_\_  
 Office: Sq.ft. \_\_\_\_\_ Acres \_\_\_\_\_ Employees \_\_\_\_\_  
 Commercial: Sq.ft. \_\_\_\_\_ Acres \_\_\_\_\_ Employees \_\_\_\_\_  
 Industrial: Sq.ft. \_\_\_\_\_ Acres \_\_\_\_\_ Employees \_\_\_\_\_  
 Educational: \_\_\_\_\_  
 Recreational: \_\_\_\_\_  
 Water Facilities: Type Canals & Drains MGD \_\_\_\_\_  
 Transportation: Type \_\_\_\_\_  
 Mining: Mineral \_\_\_\_\_  
 Power: Type \_\_\_\_\_ MW \_\_\_\_\_  
 Waste Treatment: Type \_\_\_\_\_ MGD \_\_\_\_\_  
 Hazardous Waste: Type \_\_\_\_\_  
 Other: Aquatic Weed Mgt with Herbicides

Project Issues Discussed in Document:

Aesthetic/Visual  Fiscal  Recreation/Parks  Vegetation  
 Agricultural Land  Flood Plain/Flooding  Schools/Universities  Water Quality  
 Air Quality  Forest Land/Fire Hazard  Septic Systems  Water Supply/Groundwater  
 Archeological/Historical  Geologic/Seismic  Sewer Capacity  Wetland/Riparian  
 Biological Resources  Minerals  Soil Erosion/Compaction/Grading  Growth Inducement  
 Coastal Zone  Noise  Solid Waste  Land Use  
 Drainage/Absorption  Population/Housing Balance  Toxic/Hazardous  Cumulative Effects  
 Economic/Jobs  Public Services/Facilities  Traffic/Circulation  Other: \_\_\_\_\_

Present Land Use/Zoning/General Plan Designation:

Urban and Agriculture

Project Description: (please use a separate page if necessary)

The use of copper to treat algae and aquatic weeds in water conveyances, including canals and ditches. Reclamation District 1000 is preparing this Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005. See CEQA Initial Study and Mitigated Negative Declaration for details.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

## Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with an "X".  
If you have already sent your document to the agency please denote that with an "S".

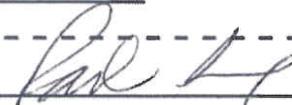
<input type="checkbox"/> Air Resources Board	<input type="checkbox"/> Office of Historic Preservation
<input type="checkbox"/> Boating & Waterways, Department of	<input type="checkbox"/> Office of Public School Construction
<input type="checkbox"/> California Emergency Management Agency	<input type="checkbox"/> Parks & Recreation, Department of
<input type="checkbox"/> California Highway Patrol	<input checked="" type="checkbox"/> Pesticide Regulation, Department of
<input type="checkbox"/> Caltrans District # _____	<input type="checkbox"/> Public Utilities Commission
<input type="checkbox"/> Caltrans Division of Aeronautics	<input checked="" type="checkbox"/> Regional WQCB #5 _____
<input type="checkbox"/> Caltrans Planning	<input type="checkbox"/> Resources Agency
<input checked="" type="checkbox"/> Central Valley Flood Protection Board	<input type="checkbox"/> Resources Recycling and Recovery, Department of
<input type="checkbox"/> Coachella Valley Mtns. Conservancy	<input type="checkbox"/> S.F. Bay Conservation & Development Comm.
<input type="checkbox"/> Coastal Commission	<input type="checkbox"/> San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
<input type="checkbox"/> Colorado River Board	<input type="checkbox"/> San Joaquin River Conservancy
<input type="checkbox"/> Conservation, Department of	<input type="checkbox"/> Santa Monica Mtns. Conservancy
<input type="checkbox"/> Corrections, Department of	<input type="checkbox"/> State Lands Commission
<input type="checkbox"/> Delta Protection Commission	<input type="checkbox"/> SWRCB: Clean Water Grants
<input type="checkbox"/> Education, Department of	<input checked="" type="checkbox"/> SWRCB: Water Quality
<input type="checkbox"/> Energy Commission	<input type="checkbox"/> SWRCB: Water Rights
<input checked="" type="checkbox"/> Fish & Game Region #2 _____	<input type="checkbox"/> Tahoe Regional Planning Agency
<input checked="" type="checkbox"/> Food & Agriculture, Department of	<input type="checkbox"/> Toxic Substances Control, Department of
<input type="checkbox"/> Forestry and Fire Protection, Department of	<input type="checkbox"/> Water Resources, Department of
<input type="checkbox"/> General Services, Department of	
<input type="checkbox"/> Health Services, Department of	<input checked="" type="checkbox"/> Other: <u>Sacramento Co Ag Commissioner</u>
<input type="checkbox"/> Housing & Community Development	<input checked="" type="checkbox"/> Other: <u>Sutter Co Ag Commissioner</u>
<input type="checkbox"/> Native American Heritage Commission	

-----  
**Local Public Review Period (to be filled in by lead agency)**

Starting Date 07/01/2014 Ending Date 08/01/2014

-----  
**Lead Agency (Complete if applicable):**

Consulting Firm: <u>Blankinship &amp; Associates, Inc.</u>	Applicant: <u>Reclamation District 1000</u>
Address: <u>1590 Drew Ave, Ste 120</u>	Address: <u>1633 Garden Highway</u>
City/State/Zip: <u>Davis, CA 95618</u>	City/State/Zip: <u>Sacramento, CA 95833</u>
Contact: <u>Michael Blankinship</u>	Phone: <u>(916) 922-1449</u>
Phone: <u>(530) 757-0941</u>	

-----  
 Signature of Lead Agency Representative:  Date: 06/21/2014

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

RECLAMATION DISTRICT NO. 1000

RESOLUTION NO. 2014-08

WHEREAS, Reclamation District No. 1000 (herein referred to as "District") proposes to apply aquatic herbicides containing copper to control aquatic vegetation in its canals, laterals, and other water conveyances, and regulation and recharge basins (the "Project").

WHEREAS, Control of aquatic vegetation is necessary in order to efficiently convey stormwater and recirculated water;

WHEREAS, pursuant to the California Environmental Quality Act (CEQA) guidelines, the District has prepared a CEQA Initial Study and Mitigated Negative Declaration for the Project dated June 19, 2014.

WHEREAS, the District Initial Study concluded that with the implementation of mitigation measures described in the initial study, the project will not have a significant effect on the environment;

WHEREAS, the District therefore has proposed to adopt a CEQA Mitigated Negative Declaration for the Project;

WHEREAS, pursuant to CEQA guidelines, the District has circulated for public review and comment a Notice of Intent to Adopt the Mitigated Negative Declaration and the Initial Study;

WHEREAS, the District did not receive any public comments concerning the Mitigated Negative Declaration and the Initial Study prior to the close of the thirty day public comment period on July 31, 2014;

WHEREAS, the District received a letter from the California Department of Fish and Wildlife (CDFW) on August 7, 2014, seven days after the close of the public comment period and after receipt of a letter from the State Clearinghouse confirming no comments were received before the close of the comment period;

WHEREAS, out of respect for CDFW, the District has developed the Conditions of Project Approval and IS/MND Clarifications set forth in Attachment A hereto in accordance with CEQA Guidelines sections 15073.5(c)(3) and (4); and

WHEREAS, the District General Manager has recommended that the District Board of Trustees ("Board") adopt the Mitigated Negative Declaration, the Conditions of Project Approval and MND Clarifications set forth in Attachment A hereto and authorize the filing of a CEQA Notice of Determination; and

WHEREAS, the District General Manager has recommended that the Board approve the Project.

NOW, THEREFORE BE IT RESOLVED as follows:

- 1.) **Mitigated Negative Declaration.** The District hereby adopts the Mitigated Negative Declaration for the Project, and MND Clarifications set forth in Attachment A hereto pursuant to CEQA.
- 2.) **Findings.** The Board has reviewed the proposed Project, Initial Study, Mitigated Negative Declaration, Conditions of Project Approval and MND Clarifications set forth in

Attachment A hereto and other information provided by District and Blankinship & Associates, Inc. staff. On the basis of this information and the whole record before the District, the Board hereby finds and determines as follows:

- a. The Initial Study and Mitigated Negative Declaration, including the MND Clarifications set forth in Attachment A hereto, reflect the District's independent judgment and analysis;
  - b. Although the project could have a significant effect on the environment without mitigation, there will not be a significant effect because the District has put appropriate mitigation measures in place, which are described in the Mitigated Negative Declaration and are hereby adopted, together with the Mitigation Monitoring and Reporting Program described therein, by the District; and
  - c. There is no substantial evidence, in light of the whole record in front of the District that the Project may have a significant effect on the environment.
- 3.) **Location and Custodian of Documents.** The Mitigated Negative Declaration, the MND Clarifications set forth in Attachment A hereto, the Initial Study and Notice of Intent to Adopt the Initial Study are on file and available for public review at the District office located at 1633 Garden Highway, Sacramento, CA 95833. The District's General Manager at this address is the custodian of these documents that constitute the record of proceedings upon which the decision in this matter is based.
- 4.) **Project Approval.** The District Board hereby approves the Project, including the Conditions of Project Approval set forth in Attachment A hereto, and authorizes the District General Manager to proceed with Project implementation in accordance with District policies and requirements.
- 5.) **Notice of Determination.** The District Board hereby authorizes and directs the District's General Manager to prepare, sign and file a CEQA Notice of Determination with the Sacramento and Sutter County Clerks and the State Clearinghouse within 5 days from the date of this Mitigated Negative Declaration, and to pay the California Department of Fish and Wildlife fee for review of the Mitigated Negative Declaration in accordance with Fish and Wildlife Code section 711.4.

PASSED AND ADOPTED by the Board of Trustees of the District, at its regular meeting held on August 8, 2014 by the following roll call vote:

AYES: Avdis, Barandas, Christophel, Gilbert, Harris, Smith

NYES: None

ABSENT: Shiels

#### CERTIFICATION

The undersigned hereby certifies that she is the Secretary of Reclamation District No. 1000 and that the foregoing Resolution was duly adopted by the above vote at the regular meeting of the Board of Trustees held on August 8, 2014.



---

Terrie Figueroa, Secretary

**ATTACHMENT A**

## Conditions of Project Approval

1. The District shall notify CDFW of any fish or wildlife kills inside or outside of their canal system related to application of aquatic herbicides containing copper. Any fish kills due to application of aquatic herbicides containing copper shall be reported to CDFW Region 2 Hqts., Rancho Cordova, (916)358-2900. Any spills of deleterious materials shall also be reported, in accordance with applicable requirements, to the Office of Emergency Services, (916)845-8911.

2. Before application of aquatic herbicides containing copper to control vegetation in District canals and water conveyances, a qualified biologist shall conduct a worker's environmental awareness program (WEAP) for all personnel participating in the application. The WEAP will include, at a minimum, species identification, a description of suitable habitat for the species, and measures to implement in the event that this species is found during application. This training shall instruct personnel to recognize Giant garter snake, their habitats and life histories, the purpose of mitigation measures, and the terms and conditions of any permits applicable to the project.

## MND Clarifications

1. The term "qualified biologist" as used in the MND is defined based on the definition in the *General NPDES Permit for Residual Aquatic Pesticide Discharges from Algae and Aquatic Weed Control Applications* (Water Quality Order No. 2013-0002-DWQ) as "a biologist who has the knowledge and experience in the ecosystem where the algaecide or aquatic herbicide is applied so that he or she can adequately evaluate whether the beneficial uses of the receiving waters have been protected and/or restored upon completion of the algaecide and aquatic herbicide application project."



Edmund G. Brown Jr.  
Governor

STATE OF CALIFORNIA  
Governor's Office of Planning and Research  
State Clearinghouse and Planning Unit



Ken Alex  
Director

August 1, 2014

Paul Devereux  
Reclamation District No. 1000  
1633 Garden Highway  
Sacramento, CA 95833

Subject: Use of Copper to Control Aquatic Vegetation in Water Conveyances  
SCH#: 2014072007

Dear Paul Devereux:

The State Clearinghouse submitted the above named Mitigated Negative Declaration to selected state agencies for review. The review period closed on July 31, 2014, 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,

Scott Morgan  
Director, State Clearinghouse

**Document Details Report  
State Clearinghouse Data Base**

**SCH#** 2014072007  
**Project Title** Use of Copper to Control Aquatic Vegetation in Water Conveyances  
**Lead Agency** Reclamation District No. 1000

---

**Type** MND Mitigated Negative Declaration  
**Description** The use of copper to treat algae and aquatic weeds in water conveyances, including canals and ditches. Reclamation District 1000 is preparing this IS/MND to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005.

---

**Lead Agency Contact**

**Name** Paul Devereux  
**Agency** Reclamation District No. 1000  
**Phone** 916 922 1449 **Fax**  
**email**  
**Address** 1633 Garden Highway  
**City** Sacramento **State** CA **Zip** 95833

---

**Project Location**

**County** Sacramento, Sutter  
**City** Sacramento  
**Region**  
**Lat / Long**  
**Cross Streets** Water conveyances within District boundaries  
**Parcel No.** Various  
**Township**

**Range**

**Section**

**Base**

---

**Proximity to:**

**Highways** Hwy 5, 80, 99  
**Airports** Sacramento Int'l  
**Railways** SPRR  
**Waterways** Sacramento River  
**Schools** Various  
**Land Use** Urban and Agriculture

---

**Project Issues** Aesthetic/Visual; Agricultural Land; Air Quality; Archaeologic-Historic; Biological Resources; Geologic/Seismic; Minerals; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Schools/Universities; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Wetland/Riparian

---

**Reviewing Agencies** Resources Agency; Department of Boating and Waterways; Department of Fish and Wildlife, Region 2; Delta Protection Commission; Department of Parks and Recreation; Department of Water Resources; Caltrans, Division of Aeronautics; Caltrans, District 3 S; Air Resources Board; Regional Water Quality Control Bd., Region 5 (Sacramento); Department of Toxic Substances Control; Native American Heritage Commission; Public Utilities Commission

---

**Date Received** 07/01/2014      **Start of Review** 07/02/2014      **End of Review** 07/31/2014

# MEMO

**TO:** Paul Devereux  
**FROM:** Stephen Burkholder  
**DATE:** August 6, 2014  
**RE:** RD 1000 CEQA Initial Study/Mitigated Negative Declaration Public Comments

The State Clearinghouse (SCH) letter dated August 1, 2014 regarding the District's Mitigated Negative Declaration titled "Use of Copper to Control Aquatic Vegetation in Water Conveyances" SCH# 2014072007 indicates that the SCH did not receive any public comments during the review period. No comments were received at the District office or at the office of Blankinship & Associates, Inc. before the close of the comment period on July 31, 2014.

As such, no response to comments is needed. This memo will be added to Appendix F of the IS/MND to indicate that no comments were received, and no responses are required.

REC'T # 0008309655  
August 11, 2014 ----- 11:33:32 AM

Sacramento County Recorder  
David Villanueva, Clerk/Recorder

Check Number 1005  
REQD BY  
Refund \$24.00

Sub Total fee ..... \$24.00

Sub Total fee .... \$24.00  
DHB,58/1/0

REC'T # 0008309659  
August 11, 2014 ----- 11:34:02 AM

Sacramento County Recorder  
David Villanueva, Clerk/Recorder

Check Number 1005  
REQD BY  
State Fees \$2,181.25  
CLERKS \$26.00

Sub Total fee ..... \$2,207.25

Total fee ..... \$2,231.25  
Amount Tendered... \$2,231.25

Change ..... \$0.00  
DHB,58/1/0



State of California—Natural Resources Agency  
**CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE**  
**2014 ENVIRONMENTAL FILING FEE CASH RECEIPT**

RECEIPT# 51-2014- 34
STATE CLEARING HOUSE # (if applicable)

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY

LEAD AGENCY Reclamation District 1000	DATE 08/11/2014
COUNTY/STATE AGENCY OF FILING Sutter	DOCUMENT NUMBER

PROJECT TITLE  
Use of Copper to Control Aquatic Vegetation in Conveyances

PROJECT APPLICANT NAME Same as Above	PHONE NUMBER ( 916 ) 922-1449
---	----------------------------------

PROJECT APPLICANT ADDRESS 1633 Garden Highway	CITY Sacramento	STATE CA	ZIP CODE 95833
--	--------------------	-------------	-------------------

PROJECT APPLICANT (Check appropriate box):

Local Public Agency   
 School District   
 Other Special District   
 State Agency   
 Private Entity

CHECK APPLICABLE FEES:

<input type="checkbox"/> Environmental Impact Report (EIR)	\$3,029.75	\$	0.00
<input type="checkbox"/> Mitigated/Negative Declaration (MND)(ND)	\$2,181.25	\$	0.00
<input type="checkbox"/> Application Fee-Water Diversion (State Water Resources Control Board only)	\$850.00	\$	0.00
<input type="checkbox"/> Projects Subject to Certified Regulatory Programs (CRP)	\$1,030.25	\$	0.00
<input checked="" type="checkbox"/> County Administrative Fee	\$50.00	\$	50.00
<input type="checkbox"/> Project that is exempt from fees			
<input type="checkbox"/> Notice of Exemption (attach)			
<input type="checkbox"/> CDFW No Effect Determination (attach)			
<input type="checkbox"/> Other _____		\$	_____

*fees paid to Sacramento county on 8/11/2014*

PAYMENT METHOD:

Cash   
 Credit   
 Check   
 Other \_\_\_\_\_

TOTAL RECEIVED \$ 50.00

SIGNATURE <i>X Alicia Draves</i>	PRINTED NAME AND TITLE Alicia Draves, Deputy Clerk of the Board
-------------------------------------	--

OFFICIAL RECEIPT

Clerk of the Board  
Issuing Office or Department

8/11/14  
DATE

RECEIVED FROM Reclamation District 1000

THE SUM OF Fifty Dollars \$ 50<sup>00</sup> \$ 50<sup>00</sup>

FOR Administrative fees

PAID BY CASH

RECEIVED BY Alicia Daves

CK./M.O.  BK. NO. \_\_\_\_\_

TITLE Deputy