

## **Use of Copper to Control Algae and Aquatic Vegetation in District Conveyances**

---

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

---

**November 12, 2021**

*Prepared for:*  
**Firebaugh Canal Water District  
2412 Dos Palos Road  
PO Box 97  
Mendota, CA 93640  
Contact: Jeff Bryant  
(559) 655-4761**

*Prepared by:*  
**Blankinship & Associates, Inc.  
1615 5th Street, Suite A  
Davis, CA 95616  
Contact: Stephen Burkholder  
(530) 757-0941**

# Use of Copper to Control Algae and Aquatic Vegetation in District Conveyances

## CEQA Initial Study & Mitigated Negative Declaration

### Table of Contents

---

Table of Contents.....	i
List of Acronyms and Abbreviations.....	iv
1. Introduction .....	1
2. Project Description .....	2
2.1. Project Background.....	2
2.2. Environmental Setting.....	6
2.2.1. Project Location and Infrastructure .....	6
2.2.2. Water Rights and Hydrology .....	6
2.2.3. Water Quality .....	7
2.3. Regulatory Setting .....	9
2.3.1. Discretionary Approvals.....	9
2.3.2. NPDES Permit Notifications .....	10
2.4. Standard Operating Procedures .....	10
3. Environmental Checklist.....	13
3.1. Project Information.....	13
3.2. Environmental Factors Potentially Affected .....	14
3.3. Determination (To be completed by lead agency) .....	15
3.4. Evaluation of Environmental Impacts.....	16
3.4.1. Aesthetics .....	16
3.4.2. Agriculture and Forestry Resources .....	17
3.4.3. Air Quality .....	18
3.4.4. Biological Resources .....	20
3.4.5. Cultural Resources .....	23
3.4.6. Energy .....	24
3.4.7. Geology and Soils.....	25
3.4.8. Greenhouse Gas Emissions .....	26
3.4.9. Hazards and Hazardous Materials .....	27
3.4.10. Hydrology and Water Quality .....	29
3.4.11. Land Use and Planning.....	34
3.4.12. Mineral Resources .....	34
3.4.13. Noise .....	35

3.4.14.	Population and Housing .....	36
3.4.15.	Public Services.....	37
3.4.16.	Recreation.....	37
3.4.17.	Transportation .....	38
3.4.18.	Tribal Cultural Resources.....	39
3.4.19.	Utilities and Service Systems .....	41
3.4.20.	Wildfire .....	42
3.4.21.	Mandatory Findings of Significance .....	43
4.	Mitigation Measures .....	45
4.1.	Summary of Mitigation Measures .....	45
4.2.	Mitigation Monitoring and Reporting Program .....	45
5.	References.....	46
6.	Persons and Agencies Contacted.....	48
7.	List of Preparers.....	48

## List of Figures

Figure 1. Project Location Map

Figure 2. Service Area Map

Figure 3. Average Daily Temperature and Precipitation (1996-2021)

Figure 4. Copper Criteria vs. Hardness Graph

## List of Tables

Table 1. District Water Quality Characteristics (2018-2021)

Table 2. San Joaquin Valley Air Basin Ambient Air Quality Standard Attainment Status

## List of Appendices

Appendix A. Example Product Labels and Safety Data Sheets

Appendix B. Special Status Species List and Species Descriptions

Appendix C. Copper Species-Specific Risk and Ecological Toxicity Data

Appendix D. Copper Speciation Graphs from the Biotic Ligand Model

## Limitations

The services used to prepare this document were performed consistent with the agreement with Firebaugh Canal Water District and were rendered in a manner consistent with generally accepted professional consulting principles and practices using the level of care and skill ordinarily exercised by other professional consultants under similar circumstances at the same time the services were performed. No warranty, express or implied, is included. This document is solely for the use of our client. Any use or reliance on this document by a third party is not authorized and is at such party's sole risk.



## LIST OF ACRONYMS AND ABBREVIATIONS

APAP .....	Aquatic Pesticide Application Plan
BLM.....	Biotic Ligand Model
BMP .....	Best Management Practice
CARB .....	California Air Resources Board
CDFW .....	California Department of Fish and Wildlife
CEQA.....	California Environmental Quality Act
CIMIS .....	California Irrigation Management Information System
CNDDB .....	California Natural Diversity Database
CO.....	Carbon Monoxide
CTR.....	California Toxics Rule
Cu <sup>2+</sup> .....	Cupric ion
District .....	Firebaugh Canal Water District
DOC .....	Dissolved Organic Carbon
DPR .....	California Department of Pesticide Regulation
EC50 .....	Median Effect Concentration
ECOS.....	Environmental Conservation Online System
HWQ .....	Hydrology and Water Quality
IPAC.....	Information for Planning and Conservation
IPM.....	Integrated Pest Management
IS/MND .....	Initial Study and Mitigated Negative Declaration
kWh.....	Kilowatt Hours
LC50 .....	Median Lethal Concentration
LD50 .....	Median Lethal Dose
LOC.....	Level of Concern
MMRP .....	Mitigation Monitoring and Reporting Program
NAHC.....	Native American Heritage Commission
NMFS.....	National Marine Fisheries Service
NO <sub>2</sub> .....	Nitrogen Dioxide
NOA .....	Notice of Applicability
NOAEC .....	No Observed Adverse Effect Concentration
NOAEL.....	No Observed Adverse Effect Level
NOI.....	Notice of Intent

NPDES.....	National Pollutant Discharge Elimination System
NTU .....	Nephelometric Turbidity Units
O <sub>3</sub> .....	Ozone
PCA.....	Pest Control Adviser
Permit.....	Statewide National Pollutant Discharge Elimination System Permit for Residual Aquatic Pesticide Discharges to Water of the United States from Algae and Aquatic Weed Control Applications
PM <sub>2.5</sub> .....	Fine Particulate Matter (less than 2.5 µm in diameter)
PM <sub>10</sub> .....	Respirable Particulate Matter (less than 10 µm in diameter)
PPE .....	Personal Protective Equipment
PRESCRIBE .....	Pesticide Regulation's Endangered Species Custom Realtime Internet Bulletin Engine
PSIS.....	Pesticide Safety Information Series
QAC .....	Qualified Applicator Certificate
QAL.....	Qualified Applicator License
RQ.....	Risk Quotient
RWL .....	Receiving Water Limit
RWQCB .....	Regional Water Quality Control Board
SCADA.....	Supervisory Control and Data Acquisition
SDS.....	Safety Data Sheet
SIP .....	Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California ("State Implementation Plan")
SJVAB.....	San Joaquin Valley Air Basin
SJVAPCD .....	San Joaquin Valley Air Pollution Control District
SO <sub>2</sub> .....	Sulfur Dioxide
SWRCB.....	State Water Resources Control Board
USBR .....	U.S. Bureau of Reclamation
USEPA.....	U.S. Environmental Protection Agency
USFWS .....	U.S. Fish and Wildlife Service
USGS.....	U.S. Geological Survey

# 1. INTRODUCTION

Firebaugh Canal Water District (herein referred to as the “District”) maintains and operates a system of approximately 45 miles of irrigation water and drainage conveyances, encompassing about 22,000 acres of irrigated land in Fresno County. To maintain flow rates and water elevation in its irrigation conveyances, the District uses Integrated Pest Management (IPM) techniques to control algae and aquatic weeds that adversely impact the District’s operations.

In 2018, the District obtained coverage from the State Water Resources Control Board (SWRCB) under 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”) to apply algaecides and aquatic herbicides. The District is seeking a State Implementation Plan (SIP) exception from the SWRCB to allow for short-term or seasonal exceedances of the dissolved copper receiving water limit (RWL). The District intends to use this coverage to facilitate efficient delivery of irrigation water within its conveyance system by incorporating, on an as-needed basis, the use of copper-containing algaecides and/or aquatic herbicides to its Integrated Pest Management (IPM) program for the control of algae and aquatic vegetation.

This document was prepared in a manner consistent with Section 21064.5 of the California Public Resources Code and Article 6 of the California Environmental Quality Act (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.

## 2. PROJECT DESCRIPTION

### 2.1. Project Background

Firebaugh Canal Water District is located in the San Joaquin Valley of California. See **Figure 1**. The District's service area, shown in **Figure 2**, encompasses approximately 22,000 acres of irrigated land in Fresno County, west of the city of Firebaugh and the San Joaquin River. The District is one of the four entities that comprise the San Joaquin River Exchange Contractors Water Authority. Its contract with the United States Bureau of Reclamation (USBR) supplies the four districts with irrigation water from Millerton Lake by way of the San Joaquin River, and delivered from the Mendota Pool. Irrigated agriculture dominates the area. The main crops grown in the District include alfalfa, almonds, asparagus, cotton, melons, pistachios, pomegranates, tomatoes, and wheat.

Efficient irrigation conveyance is critical to the functions of the District. However, the District's conveyances are prone to infestation by several floating and submersed aquatic weeds including pondweeds (sago, American, horned), Brazilian waterweed (*Egeria densa*), common elodea, and planktonic and filamentous algae. The presence of these weeds and algae in District facilities can adversely impact water flow and reduce water capacity, prevent or greatly reduce delivery of irrigation water at turnouts, encourage bank erosion in unlined conveyances, clog siphons and pumps, and block screens, thus slowing or preventing delivery of irrigation water.

Many growers have taken steps to conserve water and maximize irrigation efficiency by using sprinklers, drip, and micro-irrigation systems that require water to be free and clear of algae or nuisance vegetation that could clog filter systems, sprinklers or drip lines. In 2018 and 2019, significant algae growth throughout many sections of the District's canal system required growers to assign labor staff to mechanically remove mats and pieces of filamentous algae to prevent clogging of irrigation turnouts. Depending on the crop, irrigation events typically last between four and 24 hours and workers may need to be on-site during the entire irrigation event if algae or aquatic weed growth is significant. This approach is not sustainable and is counter to water use efficiency practices.

The District currently uses endothall-based products to control algae and/or aquatic vegetation in its conveyances. Endothall-based algaecides like Teton® (active ingredient mono-N,N-dimethylalkylamine salt of endothall) can control algae but may be acutely toxic to fish at application rates needed to effectively control algae. Endothall-based products like Cascade® (active ingredient dipotassium salt of endothall) are effective at controlling most types of submersed aquatic vegetation and is used by the District as needed during the irrigation season. The District proposes to use copper-containing algaecides and/or aquatic herbicides to allow for use of a different active ingredient. Typically, copper-based products are less expensive than endothall equivalents and may provide an increased distance of control from the point of application. Further, copper-based products can be more effective than monoamine salt endothall formulations at typical algaecide use rates.

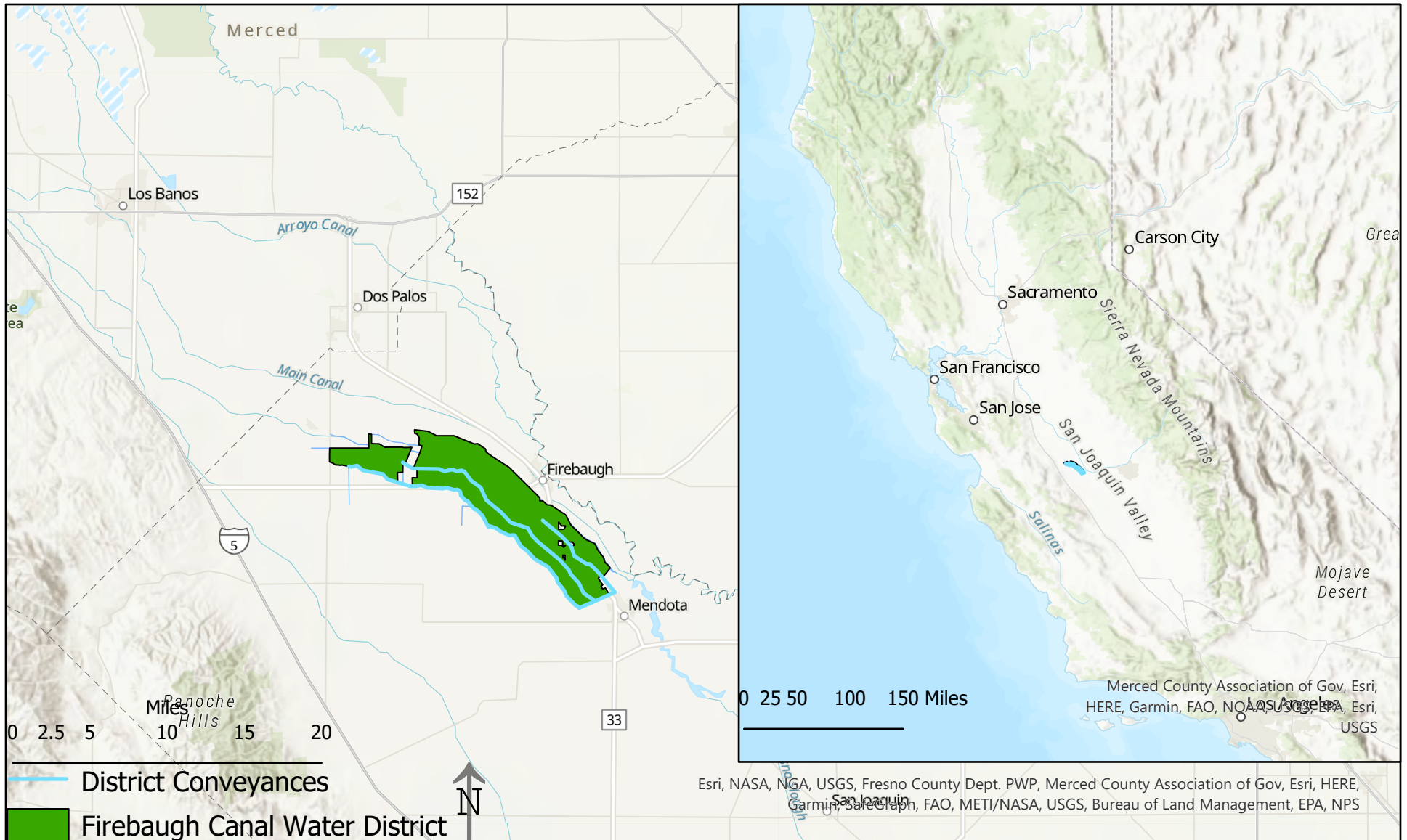
To maintain flow rates and water elevation in its irrigation conveyances, the District uses Integrated Pest Management (IPM) techniques to control algae and aquatic weeds that adversely impact the District's operations. As such, the District has determined the need to use

algaecides and aquatic herbicides, including those that contain copper, on an “as-needed” basis to achieve algae and aquatic weed control necessary for efficient water conveyance.

Depending on weed or algae type and density, and their location within the conveyance system, algaecides and/or 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 weed or algae density, growth or predicted growth, water demand, water and air temperature and forecasted temperature, or water level in the system. Some years, algaecides and/or aquatic herbicides may not be used if thresholds are not met.

Applications may be made throughout the irrigation supply conveyance system. The District makes no algaecides and/or aquatic herbicide applications to the San Joaquin River or Mendota Pool. Water treated with algaecides and aquatic herbicides is used to irrigate agricultural fields.

The “Project” is defined as the District’s application of algaecides and/or aquatic herbicides that contain copper to its conveyance system to control algae and aquatic vegetation on an as-needed basis to efficiently deliver irrigation water.



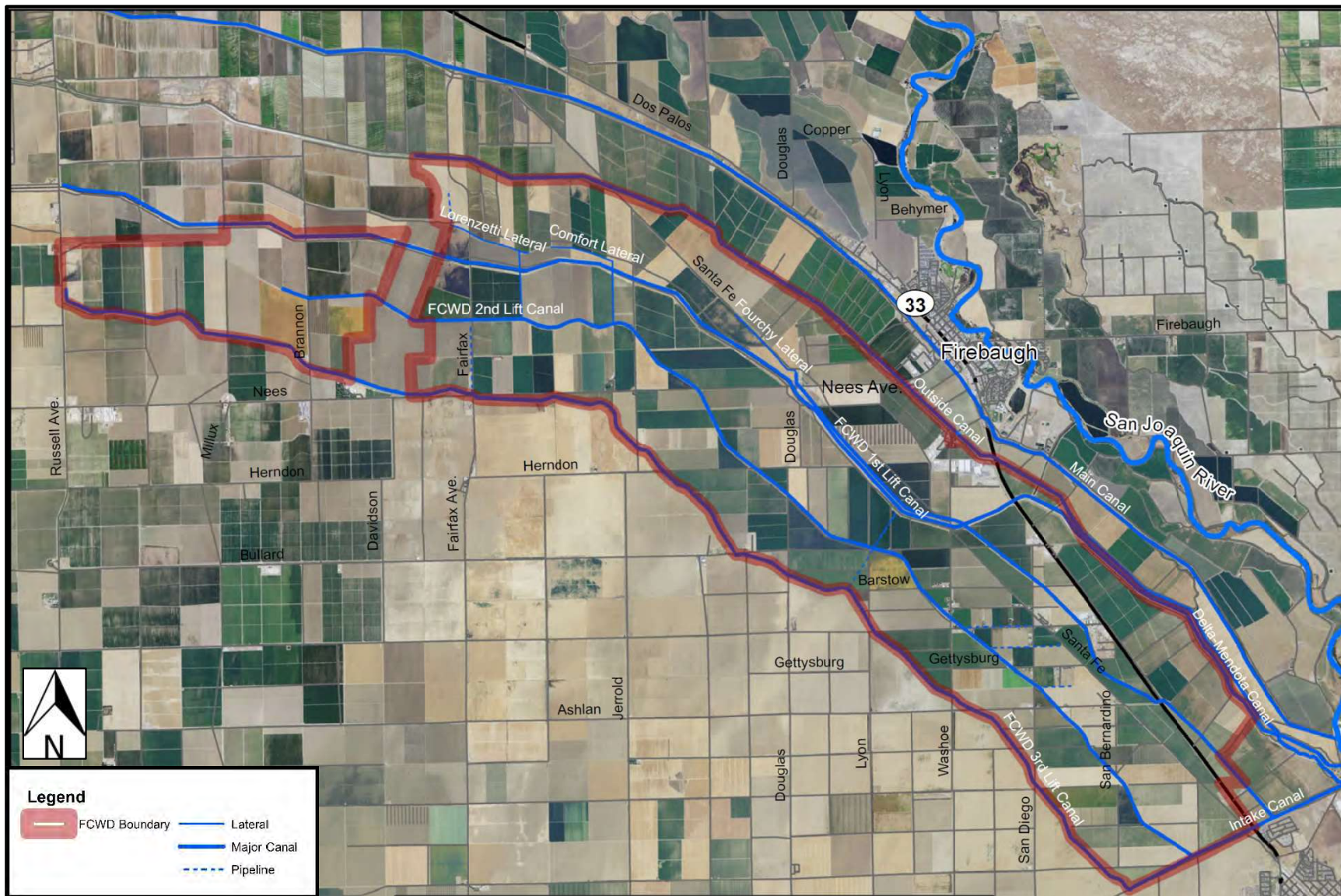
1615 5th Street, Suite A  
Davis, CA 95616  
Ph: (530) 757-0941

## Firebaugh Canal Water District

Figure 1: Project Location Map

Project	Figure
ISMND	1
10/13/21	





Source: Summers Engineering, Inc. Consulting Engineers, Hanford California, February 2012



1615 5<sup>th</sup> Street, Suite A  
Davis, CA 95616  
Ph: (530) 757-0941

## Firebaugh Canal Water District

Figure 2: Service Area Map

Project  
**ISMND**

Date  
**10/13/21**

Figure

**2**

## **2.2. Environmental Setting**

### **2.2.1. Project Location and Infrastructure**

The District's service area includes approximately 22,000 acres of irrigated land in western Fresno County, west of the city of Firebaugh and the San Joaquin River. The District maintains and operates a system of approximately forty-five (45) miles of conveyances. Water in the District's system generally flows from the south to the northwest, beginning at the Mendota Pool and ending approximately 11 miles west of Firebaugh, CA. The main conveyances operated by the District are 1st Lift, 2nd Lift, and 3rd Lift canals, as well as the Comfort, Fourchy, and Lorenzetti Laterals.

The land surrounding and within the District consists primarily of parcels used for agricultural purposes. In addition to the forty-five (45) miles of conveyances that service approximately 45 landowners, as of 2016 the District owns and operates a series of four (4) pumping facilities that draw water into its canal system from the Mendota Pool (Firebaugh Canal Water District (FCWD), 2016). Water is diverted from the Mendota Pool into the District's "Intake Canal" and is then lifted into one of three main distribution canals by way of gravity and booster pumps. Flows in the District's open canal system are controlled with automated or manually controlled weirs. Water elevation in the District is monitored by an extensive Supervisory Control and Data Acquisition (SCADA) network, and water can be added to the canal from groundwater pumps or the Delta-Mendota Canal as needed.

### **2.2.2. Water Rights and Hydrology**

The District receives approximately 85,000 acre-feet of water in non-critical water years as an Exchange Contractor (FCWD, 2016). In critical years, the amount of water received through its USBR contract is reduced to approximately 58,000 acre-feet. The District can add water to the canal systems from groundwater pumps or the Delta-Mendota Canal as needed to maintain target elevation or flow. It may pump approximately 4,000 acre-feet of water per year from shallow groundwater wells, which are operated primarily to reduce the production of subsurface drainage within the watershed.

Water may leave the District's irrigation system at the end of the canals, or by intentional spills to drains within the District. Typically, water that leaves the irrigation supply system is picked up by drain pumps and returned to either the District's or a neighboring irrigation district's conveyance system. Additionally, the District operates recycle pumps to return tailwater to its irrigation system for reuse. The District may use groundwater from its deep wells to supplement the District's USBR supply of irrigation water.

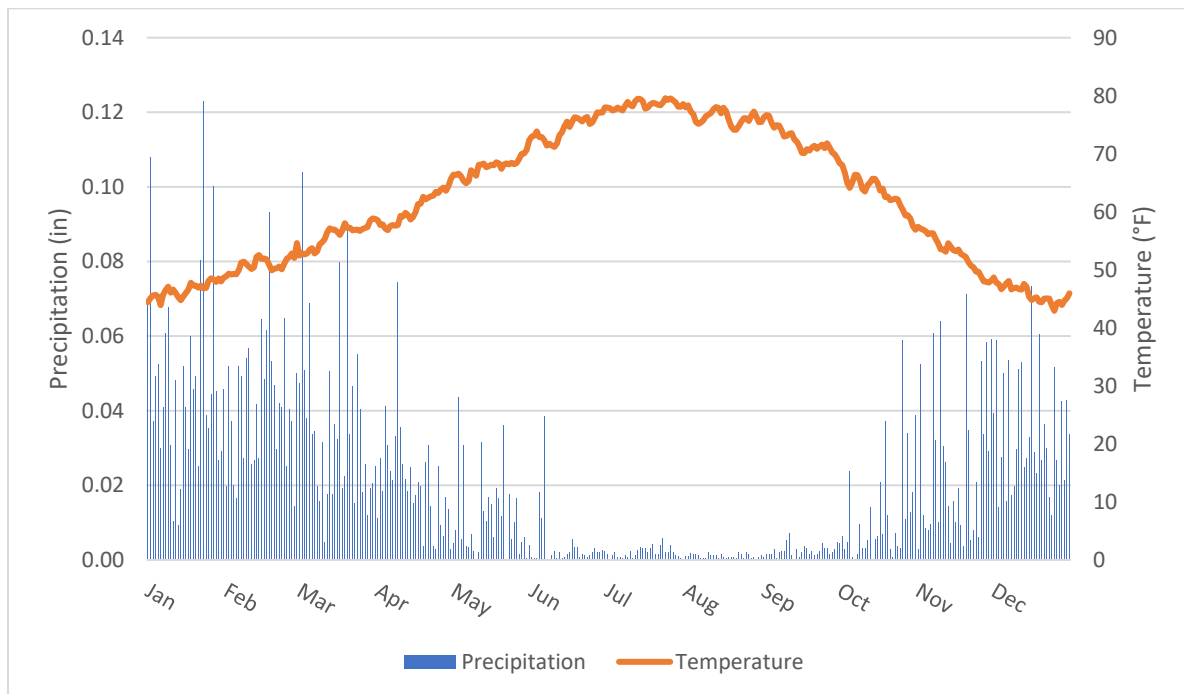
Tile drains under fields in the District are used to convey water away from the root zone of crops. Tile drain water collected in the District is plumbed to parcels for irrigation of salt-tolerant vegetation as part of the San Joaquin River Water Quality Improvement Project (SJRIIP).

Western Fresno County consists of a cold, semi-arid climate. Snowfall in Fresno and the surrounding area is minimal, having been measurable only twelve (12) times since 1907 (NWS, 2021). Most rainfall is typically restricted to winter months (December–March) (CIMIS, 2021). Local precipitation data was obtained from the California Irrigation Management Information System (CIMIS) Station 7 to assess the District's hydrology. CIMIS Station 7 is used to collect weather representative of the Firebaugh/Telles area and is located at 36.851222, -120.590920



at an elevation of 185 feet. Average daily temperature and precipitation data for the period of May 7, 1996 to July 27, 2021 is presented in **Figure 3**.

**Figure 3. Average Daily Temperature and Precipitation (1996-2021)**



Source: CIMIS, 2021

### 2.2.3. Water Quality

The conductivity, pH, dissolved oxygen, turbidity, and hardness of various Districts canals was measured by Blankinship and Associates staff during water quality monitoring conducted between May 2018 and July 2021, the details of which are presented in **Table 1**. The conductivity of District water ranged from 252 to 1,009 uS/cm with an average of 538 uS/cm, while dissolved oxygen levels ranged from 7.6 to 11.5 mg/L with an average of 9.6 mg/L. pH values ranged from 7.1 to 8.7 with an average of 8. Turbidity measurements ranged from 0.6 to 201 Nephelometric Turbidity Units (NTU) with an average of 36.8 NTU. Water hardness ranged from 75.6 to 190 mg CaCO<sub>3</sub>/L. Average hardness was estimated as 108.1 mg CaCO<sub>3</sub>/L, which is considered moderately hard water. Hardness values of water monitored in 2021, a dry year where the District was adding groundwater to its canals, was higher than in 2020 when water in the canal the District was delivering Millerton Lake water from the Mendota Pool.

**Table 1. District Water Quality Characteristics (2018-2021)**

<b>Sample Date</b>	<b>DO (mg/L)</b>	<b>SC (uS/cm)</b>	<b>pH</b>	<b>Turbidity (NTU)</b>	<b>Hardness (mg CaCO<sub>3</sub>/L)</b>
5/2/2018	9.0	363.0	7.4	14.6	NR
5/7/2018	9.6	344.6	7.2	18.9	NR
5/8/2018	10.1	326.1	7.6	10.7	NR
5/14/2018	10.2	376.8	7.5	33.4	NR
5/15/2018	9.7	427.3	7.9	201.0	NR
5/22/2018	9.5	353.6	8.1	178.0	NR
5/30/2018	7.9	251.8	7.2	13.2	NR
6/5/2018	9.1	414.8	7.9	48.8	NR
6/11/2018	8.5	485.0	7.7	70.1	NR
8/12/2019	11.2	323.9	8.3	43.7	NR
8/13/2019	10.5	309.7	7.2	60.7	NR
8/19/2019	8.9	299.8	8.0	30.2	NR
7/27/2020	9.0	409.5	8.2	31.4	90.9
7/31/2020	9.8	501.9	8.1	16.0	87.7
8/3/2020	9.8	542.0	8.3	31.6	94.2
8/4/2020	11.5	491.3	8.7	42.1	86.0
8/6/2020	10.8	434.1	8.2	25.4	77.9
8/10/2020	9.5	557.0	8.1	34.3	101.1
8/11/2020	10.5	442.1	8.2	21.5	102.0
8/13/2020	8.0	519.0	7.8	65.0	89.1
8/14/2020	8.2	492.3	7.8	13.6	87.2
8/19/2020	7.6	549.0	7.8	59.7	98.2
9/8/2020	10.7	638.0	8.0	12.3	NR
9/9/2020	10.0	775.0	8.0	8.9	NR
9/15/2020	8.4	811.3	7.5	10.6	NR
7/19/2021	10.2	685.1	8.6	0.8	127.0
7/21/2021	9.7	665.2	7.9	1.6	122.0
7/22/2021	10.0	614.8	8.6	0.6	121.0
7/26/2021	8.4	766.0	8.3	44.0	123.0
7/27/2021	8.7	627.5	8.3	32.0	116.0
7/28/2021	8.7	677.5	8.1	33.2	119.0
8/1/2021	10.0	744.0	8.2	26.8	117.0
8/2/2021	10.5	1009.0	7.1	36.9	190.0
8/3/2021	10.4	741.0	8.4	27.5	NR
8/4/2021	11.3	745.0	8.7	22.2	118.0
8/9/2021	10.3	722.0	7.8	27.5	124.0
8/10/2021	10.4	753.5	8.0	41.8	NR
Average:	9.6	538.1	8.0	36.8	108.1

**Notes:**

- 1) Abbreviations: Dissolved Oxygen (DO), Specific Conductance (SC), Not Reported (NR)
- 2) Average values are provided when multiple locations were sampled on the same date.  
Source: Internal data.

## 2.3. Regulatory Setting

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. The District has applied for and been granted coverage under the Permit since 2018. The District has developed and implemented an Aquatic Pesticide Application Plan (APAP) and submitted annual reports to the SWRCB. The Permit was last amended on July 27, 2016 (SWRCB, 2016a). In addition to other provisions, the Permit requires compliance with the following:

- Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California ("State Implementation Plan" or "SIP"; SWRCB, 2005)
- California Toxics Rule (CTR) (40 CFR § 131.38, 2018)
- Central Valley Regional Water Quality Control Board (RWQCB) Basin Plan (Central Valley RWQCB, 2018)

The SIP assigns limitations for CTR priority pollutants, including algaecides and/or aquatic herbicides containing copper. Further, the SIP prohibits discharges of priority pollutants in excess of applicable water quality criteria or RWL outside the mixing zone.

Although the SIP prohibits the discharge of copper in excess of the RWL 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) requirements. 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. Accordingly, the District intends to submit its Exception request to the State Water Resources Control Board (SWRCB), along with this document, once the CEQA process is complete. After a public comment period, the District may be granted a short-term or seasonal exemption from meeting the RWL for dissolved copper, and Attachment G of the Permit would be revised to list the District's exemption.

### 2.3.1. Discretionary 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 which includes the method of completing the action;
- b) A time schedule;
- c) A discharge and receiving water quality monitoring plan that specifies monitoring prior to application events, during application events and after completion (e.g. Background, Event and Post Event sampling consistent with the District's APAP) with the appropriate quality control procedures;
- d) CEQA documentation including notifying potentially affected public and government agencies; and
- e) Any necessary contingency plans.

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

### **2.3.2. NPDES Permit Notifications**

At least 15 days prior to the first application of algaecides and/or aquatic herbicides (including those containing copper), the District will send an annual notification to potentially affected public and governmental agencies. The District may also post the notification on its website. The notification must include the following information:

- 1) A statement of the District's intent to apply algaecide and/or aquatic herbicide(s);
- 2) Name of algaecide and/or 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.

The District typically sends the annual notification to the following agencies: California Department of Fish and Wildlife (CDFW), Fresno County Agricultural Commissioner, U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS).

## **2.4. Standard Operating Procedures**

The District implements an IPM program for algae and aquatic weed control that involves regular scouting by District staff for algae and aquatic weed presence in the conveyance system to determine if the locations and densities exceed or are likely to exceed treatment thresholds. If algae or aquatic weeds are present in locations and densities that exceed thresholds above which control is needed, the District may make applications of copper-containing algaecides and/or aquatic herbicides on an "as-needed" basis to achieve the algae and aquatic weed control necessary to efficiently convey irrigation water.

The approaches outlined below are supplemented by the following components of the District's algae and aquatic vegetation management program, as well as Best Management Practices (BMPs) from the District's APAP. These would be implemented before, during and after the use of algaecides and/or aquatic herbicides that contain copper:

- 1) District personnel that make algaecide and/or aquatic herbicide applications are themselves, or are under the direct supervision of, a California Department of Pesticide Regulation (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 Adviser (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 is based on site-scouting and results of the District's algae and aquatic vegetation monitoring activities, and must evaluate the proximity of people and occupied buildings, health and environmental hazards and restrictions, and must 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.
- 3) All District personnel applying algaecides and/or aquatic herbicides review and strictly adhere to the product label that has clear and specific warnings that alert users to hazards that may exist. Examples of specific product labels are included in **Appendix A**.
- 4) All District personnel applying algaecides and/or aquatic herbicides review and consult the product label and Safety Data Sheet (SDS) (examples provided in **Appendix A**) and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS, label and the SDS have specific information that describes precautions to be taken during the use of the algaecides and/or aquatic herbicides.
- 5) District personnel are familiar with and implement the DPR PSIS N-series that mitigates potentially significant impacts. For example, the PSIS series and product label describe the personal protective equipment (PPE) needed for the safe handling of algaecides and/or aquatic herbicides, including protective eyewear, disposable coveralls, and gloves, as appropriate.
- 6) District personnel consult U.S. Environmental Protection Agency (USEPA) Endangered Species Bulletins (if applicable) and DPR's Pesticide Regulation's Endangered Species Custom Realtime Internet Bulletin Engine (PRESCRIBE) to identify potential presence of special status species. If required or recommended product use limitations are identified by these sources, District personnel implement the use limitations as appropriate to prevent potentially adverse impacts to special status species known to occur near the project area.
- 7) The condition of the conveyance being treated is field-evaluated to confirm that the application is necessary, feasible, and can be conducted safely and according to the product label. This evaluation considers target algae or weed species, level of infestation, water and flow conditions, alternate control methods, and amount of algaecide and/or aquatic herbicide to be applied.
- 8) After field evaluation, notice is given by District water operators to growers. Growers are given the opportunity to postpone water deliveries in the event that sensitive crops or commodities, such as organic crops, are present. District water operators are generally do not make adjustments to the turnout gates during the application and until copper-treated water is no longer present in the irrigation system.
- 9) The location(s) at which applications of copper are made is continuously staffed until the application is complete. District staff performing conveyance inspections are in regular cell phone or radio contact with staff making the application. In the event that a spill or

leak to a non-target area is discovered during application, the application will be stopped, if feasible. For example, water delivery to the lateral may be reduced or stopped to increase freeboard, and lessen or stop subsequent leakage. Operators may add additional plastic sheeting or grout to spill gates to stop leaks. Growers on an affected lateral may be asked to irrigate additional fields to lower the water level and lessen or stop discharge. Generally, the application is not restarted until after the spill or leak is fixed.

- 10) As required by the Permit, water quality monitoring is conducted. District staff evaluate post-treatment efficacy and continue monitoring algae or aquatic vegetation density, type, location, and water quality.

These actions are intended to minimize and/or prevent water treated with copper-containing algaecides and/or aquatic herbicide from leaving the irrigation conveyance system.

### 3. ENVIRONMENTAL CHECKLIST

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.

#### 3.1. Project Information

- |  |   |
|--|---|
| <b>1. Project Title:</b>                                     | Use of Copper to Control Algae and Aquatic Vegetation in District Conveyances           |
| <b>2. Lead Agency Name and Address:</b>                      | Firebaugh Canal Water District<br>2412 Dos Palos Road<br>PO Box 97<br>Mendota, CA 93640 |
| <b>3. Contact Person and Phone Number:</b>                   | Jeff Bryant, General Manager<br>(559) 655-4761  |
| <b>4. Project Location:</b>                                  | Near Mendota and Firebaugh, California  |
| <b>5. Project Sponsor’s Name and Address:</b>                | See #2 above  |
| <b>6. General Plan Designation:</b>                          | Agricultural (County of Fresno, 2000)   |
| <b>7. Zoning:</b>  | Agricultural  |
| <b>8. Description of Project:</b>                            | See <b>Section 1</b>  |
| <b>9. Surrounding Land Uses and Planning:</b>                | Agricultural, Industrial, Commercial, Residential                                       |
| <b>10. Other Public Agencies Whose Approval is Required:</b> | See <b>Sections 2.3.1</b> and <b>2.3.2</b>  |

**11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1?**

Yes (See **Section 3.4.18**)

### **3.2. Environmental Factors Potentially Affected**

The environmental factors checked below would be potentially affected by this 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/Forestry Resources | <input type="checkbox"/> Air Quality                                   |
| <input checked="" type="checkbox"/> Biological Resources    | <input type="checkbox"/> Cultural Resources             | <input type="checkbox"/> Energy  |
| <input type="checkbox"/> Geology/Soils                      | <input type="checkbox"/> Greenhouse Gas Emissions       | <input type="checkbox"/> Hazards and 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                 | <input type="checkbox"/> Tribal Cultural Resources                     |
| <input type="checkbox"/> Utilities/Service Systems          | <input type="checkbox"/> Wildfire                       | <input checked="" type="checkbox"/> Mandatory Findings of Significance |



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

DocuSigned by:

*Jeff Bryant*

87D311C03F6B4E...

Signature

11/12/2021 | 12:05 PM PST

Date

Jeff Bryant

Printed Name

Firebaugh Canal Water District

For

### 3.4. Evaluation of Environmental Impacts

#### 3.4.1. Aesthetics

*Except as provided in Public Resources Code Section 21099, would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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) In nonurbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	<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) through c): **No Impact**

The Project does not alter or remove any existing natural resource or structure. There are no designated or eligible state scenic highways within the District's footprint. The nearest eligible state scenic highway is State Highway 168 between Clovis and Shaver Lake, approximately 35 miles east of the District (Caltrans, 2019). The Project is not in an urbanized area and does not conflict with any applicable zoning or other regulations governing scenic quality. The visual quality of the District's conveyance system and the surrounding landscape will not be negatively impacted by Project activities. To the contrary, the Project may enhance the visual quality of the District's conveyance system by limiting nuisance algae and weed growth.

#### Item d): **No Impact**

Project activities are generally limited to daylight hours, therefore no artificial light sources are needed and no substantial new light or glare is produced. No new structures or landscape features will be created as a result of the project that would adversely affect day or nighttime views in the area.

The Project is not expected to result in any significant impacts to aesthetic resources or scenic vistas. Therefore, no mitigation measures are proposed.

### 3.4.2. Agriculture and Forestry Resources

*In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California District of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Result in the loss of forest land or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

### Items a) through e): *No Impact*

The Project is limited to activity within existing irrigation supply and drainage conveyances operated by the District. No additional facilities will be created and no existing facilities will be modified in a manner that could result in the loss or conversion of existing farmland or forest/timberland. 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; conflict with zoning related to forest land or timberland; result in the conversion of forest land or conversion of forest land to non-forest use, or otherwise involve changes to the existing environment which could result conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use. The Project will facilitate sustainable agricultural practices by providing high quality irrigation water to growers that is suitable for use in irrigation systems that promote principles of water conservation like micro-sprinklers, subsurface drip irrigation lines, and other water-efficient irrigation techniques. By promoting water-efficient irrigation techniques, the Project could potentially allow for an expansion of agricultural use on land that would otherwise remain fallow due to lack of available water during times of drought. Further, copper-containing algaecides and aquatic herbicides are regularly used to control aquatic weeds and algae in water storage and conveyance systems and when used in accordance with product labels, require no irrigation restrictions. Copper is frequently used as a fungicide and bactericide on agricultural crops and, depending on the formulation of copper, is among the few pesticides that are permitted for use on crops with organic certifications (USEPA, 2009).

The Project is not expected to result in any significant impacts to agriculture or forestry resources. Therefore, no mitigation measures are proposed.

### 3.4.3. Air Quality

*Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

- d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

☐☐☐☒

## Discussion

### Items a) and b): *No Impact*

The Project area lies within the San Joaquin Valley Air Basin (SJVAB), which includes the counties of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and a portion of Kern County. The SJVAB is managed by the San Joaquin Valley Air Pollution Control District (SJVAPCD), which currently has air quality management plans for PM<sub>2.5</sub>, PM<sub>10</sub>, Ozone, and Carbon Monoxide. The California Air Resources Board (CARB) provides annual updates on attainment status for ten State criteria pollutants and seven National criteria pollutants in each of the State's 15 Air Basins. The most recent available information comes from the February 2021 update.

**Table 2. San Joaquin Valley Air Basin Ambient Air Quality Standard Attainment Status**

Pollutant	State Designation	National Designation
Ozone (O <sub>3</sub> )	Nonattainment	Nonattainment (8-Hr)
Respirable Particulate Matter (PM <sub>10</sub> )	Nonattainment	Attainment
Fine Particulate Matter (PM <sub>2.5</sub> )	Nonattainment	Nonattainment
Carbon Monoxide (CO)	Unclassified/Attainment	Unclassified/Attainment
Nitrogen Dioxide (NO <sub>2</sub> )	Attainment	Unclassified/Attainment
Sulfur Dioxide (SO <sub>2</sub> )	Attainment	Unclassified/Attainment
Lead	Attainment	Unclassified/Attainment
Visibility Reducing Particles	Unclassified	No National Standard
Sulfates	Attainment	No National Standard
Hydrogen Sulfide	Unclassified	No National Standard

Source: CARB, 2021

The Project will not conflict with or obstruct implementation of any of the current SJVAPCD management plans. The application of copper-containing aquatic herbicides and/or algaecides requires the use of pick-up trucks or other service vehicles for purposes of transporting algaecides and/or aquatic herbicides to locations where they are needed. Pick-up trucks and passenger vehicles are also used for purposes of site reconnaissance before, during, and after applications of algaecide and/or aquatic herbicides. Short-term vehicle emissions will be generated during algaecide and/or aquatic herbicide application. Algaecide and/or aquatic herbicide are generally brief in duration and occur on an "as-needed" basis throughout the year. Consequently, emission generation will be minor. Existing conditions and current practices used for making endothall applications are nearly identical to those for making applications of copper-containing algaecides and/or aquatic herbicides; as such, the Project is not expected to result in a cumulatively considerable net increase in nonattainment pollutants. It is the District's hope that the frequency and duration of algaecide and aquatic herbicide applications may decrease

slightly by using copper-based products as part of its IPM approach to algae and aquatic vegetation management.

**Items c) and d): *No Impact***

Algaecide and/or aquatic herbicides containing copper will be applied by District personnel. Applications will take place in the District's conveyance system. Applications are made directly to water using spray equipment less than approximately 4 feet above the water surface, or by using hoses or drip lines to inject algaecides and/or aquatic herbicides below the water surface. Applications are typically brief in duration (< 8 hours) and made infrequently (i.e., every two to four weeks during summer months). Applications are not made near schools, health care facilities, or day care facilities, thereby reducing or eliminating exposure to these sensitive receptors. Similarly, there will be no objectionable odors that affect a substantial number of people as a result of the application of copper-containing algaecides and/or aquatic herbicides.

**3.4.4. *Biological Resources***

*Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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 Wildlife 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, regulations or by the California Department of Fish and Wildlife 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 state or federally protected wetlands (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 special status species was compiled using records from the California Natural Diversity Database (CNDDDB), and the USFWS's Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) (CNDDDB, 2020; USFWS, 2021). Location-specific species information for Fresno County is available from ECOS IPaC. Special status species data from CNDDDB was obtained for the two United States Geological Survey (USGS) 7.5 x 7.5 minute quadrangles that the District fell within (i.e., core quads) as well as ten peripheral quadrangles (i.e., border 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 within the boundaries of the project area. Data was queried from the CDFW and USFWS databases for these quads and combined into one table. 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 and interaction with treated water.

A summary of the listed species, their conservation status, and whether or not they were considered for evaluation of potential impact is presented in **Appendix B, Table B-1**. Species habitat and rationale for removal from further consideration is presented in **Table B-1** and more detailed species life history information can be found in **Appendix B**.

There are three special status species that could have habitat in or near District conveyances and potentially be affected by proposed Project activities through dietary exposure: the giant gartersnake, western pond turtle, and San Joaquin kit fox. The snake and turtle could be exposed via ingestion of aquatic prey items exposed to copper and direct consumption of copper-treated water from drinking. Because of its terrestrial prey base, the fox could be exposed only through direct consumption of copper-treated drinking water. A screening level ecological risk assessment was conducted for these species to evaluate potential impacts from management of algae or aquatic vegetation with copper-containing materials. Details of the risk assessment process, endpoint and exposure data, and estimations of risk for the three potentially affected special status species are presented in **Appendix C**. A summary is presented below.

A quantitative assessment of a risk involves the calculation of a risk quotient (RQ) by dividing the estimated exposure by the concentration associated with a toxicity endpoint.

Toxicity endpoints routinely used by USEPA (2020) in calculating risk assessments for animals include the median lethal dose (LD50), median lethal concentration (LC50), or median effect concentration (EC50) for acute assessments and the No Observed Adverse Effect Level (NOAEL) or Concentration (NOAEC) for chronic assessments. There are limited to no toxicity data available for various taxonomic groups like reptiles for many chemicals. As a result, avian (bird) toxicity endpoints were used in place of specific toxicity values for the snake and turtle in this assessment.

Once an RQ is calculated, it is compared to the Level of Concern (LOC) to determine whether an adverse effect for a given species is likely to occur. Risk is present when the RQ exceeds the LOC. Exposure is not considered to pose a risk when the RQ is lower than the LOC.

For evaluation of risk to the giant gartersnake and western pond turtle, application of copper-containing algaecides at the maximum label application rate of 1.0 mg/L was estimated to result in the accumulation of approximately 37.1 milligrams of copper per kilogram dry weight of aquatic prey item based on a 24-hour (acute) exposure period. After incorporation of food and water intake rates normalized to body weight, daily exposure to copper was estimated to be approximately 0.36 and 0.31 milligrams of copper per kilogram body weight per day for the snake and turtle, respectively, resulting in an RQ of approximately 0.004 and 0.003, respectively. Because neither RQ exceeds the acute threatened or endangered species LOC for terrestrial animals of 0.1, copper applied to District conveyances for algae and/or aquatic vegetation control does not appear to pose acute risk to the giant gartersnake or western pond turtle.

In support of these findings, the California Department of Fish and Game (now “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 (Hosea et al., 2004).

For evaluation of risk to the San Joaquin kit fox, only dietary exposure from drinking treated water was considered. After normalizing daily water intake to body weight, application of copper-containing algaecides at the maximum label application rate of 1.0 mg/L was estimated to result in a daily exposure of approximately 0.91 milligrams of copper per kilogram body weight and an RQ of 0.008. Since the RQ is below the acute threatened or endangered species LOC for terrestrial animals of 0.1, copper applied to District conveyances for algae and/or aquatic vegetation control does not appear to pose acute risk to the San Joaquin kit fox.

**Item b): *No Impact***

The Project will take place in the District’s engineered irrigation conveyances, therefore, will not impact any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by CDFW or USFWS.

**Item c): *No Impact***

The Project involves the application of copper-containing algaecides and/or aquatic herbicides to water in the District’s conveyance system and, therefore, will not have a substantial adverse



impact on state or federally protected wetlands through direct removal, filling, or hydrological interruption.

**Item d): No Impact**

The Project involves applications of copper-containing herbicides to District conveyances. Project activities will not adversely influence movement of any native, resident, or migratory birds or fish. No impacts to movement of established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites will occur as a result of project activities.

**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.

### 3.4.5. Cultural Resources

*Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource pursuant to § 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) Disturb any human remains, including those interred outside of dedicated cemeteries?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

**Items a) through c): No Impact**

Pursuant to §15064.5, a substantial adverse change in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired. Further, the significance of an historical resource is materially impaired when a project demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements

of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

The Project would not require any construction, demolition, or ground disturbing activity and would not demolish, destroy, relocate, or alter historical or architectural resources, nor would it disturb human remains.

### 3.4.6. Energy

*Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

### Item a): *No Impact*

Project activities do not include significant consumption of energy resources, therefore no significant environmental impacts due to wasteful, inefficient or unnecessary consumption of energy resources are expected. The Project is limited to the application of copper-containing products to the District's conveyance system for purposes of algae and/or aquatic vegetation control. A very small amount of energy may be used to charge deep cycle marine batteries used to power pumps used for application. Typically, deep cycle marine batteries with a capacity of approximately 100 amp hours will take less than 2 kilowatt hours (kWh) to reach a full charge. In comparison, the average U.S. household consumes about 11,000 kWh per year, or about 30 kWh per day (EIA, 2019). Note that these batteries and charging cycles are an existing condition because they are currently used by District staff to apply non-copper products for algae and/or aquatic vegetation control activities.

### Item b): *No Impact*

Project activities do not conflict with or obstruct state or local plans for renewable energy or energy efficiency. The application of copper-containing products would not interfere with the local and state plans and infrastructure related to renewable energy and energy efficiency.

### 3.4.7. Geology and Soils

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map, issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Strong seismic ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect 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 waste water disposal systems where sewers are not available for the disposal of waste water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

- |   |                          |                          |                          |                                     |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|
| f) 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"/> |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|

## Discussion

### Items a) through f): *No Impact*

The Project consists of the application of algaecides and/or aquatic herbicides that contain copper to the District's conveyance system. 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 soil erosion, loss of topsoil, risk of landslide, lateral spreading, subsidence, liquefaction, or collapse due to Project activities. Since no new structures are part of Project activities, there is no risk to life or property if expansive soils were located in the area. The Project would not require installation of septic or other wastewater disposal systems. No paleontological resource, site, or unique geologic feature will be affected as a result of the Project.

### 3.4.8. Greenhouse Gas Emissions

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

## Discussion

### Items a) and b): *Less Than Significant Impact*

The Project requires the use of pick-up trucks or other service vehicles for purposes of transporting algaecides and/or aquatic herbicides to their place of use. A pickup truck or pickup truck towing a trailer may be used to transport and/or make applications of algaecides and/or aquatic herbicides. Pick-up trucks are also used for purposes of site reconnaissance before, during, and after application of algaecides and/or aquatic herbicides. For some applications, gas-powered equipment may be used to pump liquid algaecides and/or aquatic herbicides into District conveyances. Applications are typically brief in duration (< 8 hours) and made infrequently (e.g., zero to a few times per month during the summer).

The use of vehicles and application equipment described above are not expected to conflict with or violate greenhouse gas emission standards. Current algae and aquatic vegetation management practices conducted by the District include similar use of pickup trucks for application, scouting, and transportation. Given the current levels of control with the existing suite of products used and the District's anticipation that algae control will improve with the use of copper-containing products, proposed Project activities may lead to a reduction in greenhouse gas emissions generated compared to current practices. It is reasonable to expect that the project may reduce or eliminate the need for mechanical (excavators, backhoe, dump trucks, tractors, and other heavy equipment) removal of algae and/or aquatic vegetation and as a result reduce greenhouse gas emissions compared to existing conditions.

Although short-term vehicle and equipment emissions will be generated during algaecide and/or aquatic herbicide application; these emissions will be minor and will not create additional greenhouse gas emissions that would have a significant impact on the environment. To minimize impacts, equipment will be properly tuned and muffled, and unnecessary idling will be minimized. As a result, project activities are not expected to be cumulatively considerable.

### 3.4.9. Hazards and Hazardous Materials

*Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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 type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 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 or excessive noise for people residing or working in the project area? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| f) 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"/> |
| g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

## Discussion

### Items a) and b): *Less Than Significant Impact*

The Project would involve handling copper-containing products which may be regulated hazardous materials when reportable quantities, as described in 40 CFR Subtitle B, Chapter I, Subchapter C, are transported. 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 product SDSs presented in **Appendix A**. Use of these material would create a potential for spills that could affect worker safety and the environment. The spills could occur potentially at the District storage facilities, during transport, or at the site of application. District staff handles, stores, and transports copper-containing products and disposes of containers in accordance with federal, state, and county requirements and manufacturer's recommendations.

The District conducts safety meetings and safe handler training annually and prior to the application season to review information with District staff on emergency response to accidental releases of material. District staff who mix, load, apply, transport or dispose of copper-containing products are trained to contain spilled material and spill kits are available at sites of storage, use or disposal. Spill kits generally include booms for containment, and absorbent materials such as vermiculite, diatomaceous earth, kitty litter, or spill "pigs" or "pillows" to lessen or prevent released material from creating a hazard to the environment or public. Spills would be reported, as required, and affected material would be disposed of properly.

By following the manufacturer's label and SDS directions, federal, state and county transportation, handling and disposal requirements, and the District's pesticide handler training and aquatic herbicide applications BMPs described in its APAP, the District will minimize the risk of spill, upset or accident conditions that would cause a hazard to the public or the release of hazardous materials into the environment.

### Item c): *No Impact*

There are no schools located within ¼ mile of District canals or locations where applications may be made.

**Item d): No Impact**

The Project, the area within the District's conveyance system, is not located on a site that is listed on any hazardous materials site lists compiled pursuant to Government Code Section § 65962.5.

**Item e): No Impact**

The William Robert Johnston Municipal Airport is located within 2 miles of the project location; however, the Project does not result in a safety hazard for people residing or working in or around the airport and will not generate excessive noise.

**Item f): No Impact**

No public roadways would be affected by the Project; therefore, Project activities would not impair implementation of or physically interfere with adopted emergency response plans or emergency evacuation plans.

**Item g): No Impact**

The Project will not expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildlife fires. 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 or eliminate muffler contact with combustible materials such as dry grass.

**3.4.10. Hydrology and Water Quality**

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	<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 or through the addition of impervious surfaces, in a manner which would:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

i) Result in a substantial erosion or siltation on- or off-site;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii) 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; or	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv) Impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

The District implements an IPM program for algae and aquatic weed control in a manner consistent with the NPDES Aquatic Weed Permit. The IPM program involves the scouting of algae and aquatic weed locations and densities, establishment of thresholds above which control is needed, and making applications of algaecides and/or aquatic herbicides on an “as-needed” basis to achieve the algae and aquatic weed control necessary to efficiently convey water.

Depending on algae or aquatic weed presence, algaecides and/or aquatic herbicides containing copper may be applied as necessary, generally this would be limited to the months of March through November. Some years, copper-containing products may not be applied. Treatments may be made throughout the District’s conveyance system.

Applications of copper-containing products will be done over a short duration (< 8 hours) and not all conveyances are necessarily treated at the same time, for the same length of time, or treated during every application. Depending on weed or algae presence, some conveyances may not get treated while others may require multiple treatments during the same season.

When applied during algaecide and/or aquatic herbicide treatment, copper dissipation from the water column occurs by way of multiple processes including dilution, sorption, and precipitation. Due to processes such as advection, diffusion, and dispersion and because label language prohibits application of copper-containing algaecides and aquatic herbicides to more than half of a static water body, dilution is presumed to be a major dissipation process after initial application (Calomeni et al., 2017). In addition to static waterbodies, these processes occur in flowing water systems where untreated water is present and moving into the treatment area after treatment.



Copper in the water column occurs as dissolved ions and as part of inorganic and organic complexes. Unlike organic chemicals, copper does not degrade over time, instead transforming from one form to another based on environmental properties such as pH, alkalinity, temperature, ionic strength, and organic carbon content. Many such physiochemical characteristics influence copper speciation, associated bioavailability, and resultant toxicity to aquatic organisms. The form of copper most commonly associated with aquatic toxicity is the free cupric ion ( $\text{Cu}^{2+}$ ) (USEPA, 2009). The likelihood and magnitude of toxicity to aquatic receptors exposed to the cupric ion is typically greater in water characterized by low levels of hardness, pH, ionic strength, and dissolved organic carbon than in hard waters with higher pH, ionic strength, and dissolved organic carbon. Copper bioavailability in water is also influenced by the presence of biotic ligands such as algae and the gill membranes of fish. When used as an algaecide, application to water containing higher density algae blooms is associated with lower bioavailability and risk of copper toxicity to non-target aquatic receptors than application to water containing lower density algae blooms (Franklin et al., 2002).

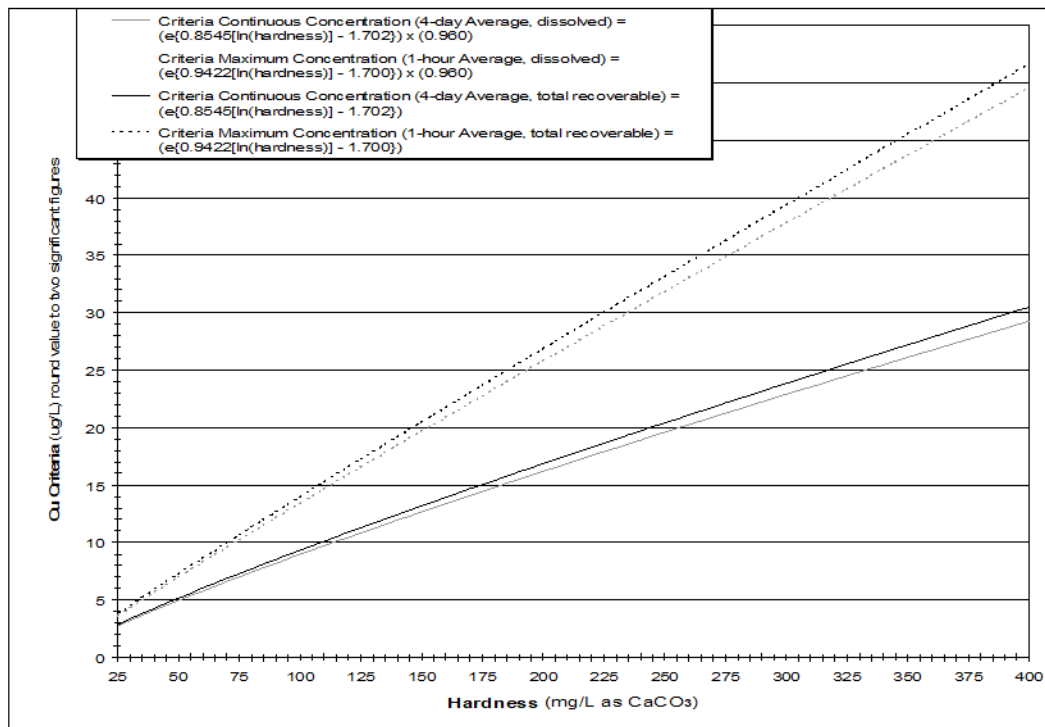
In addition to using a hardness-based approach to quantifying dissolved copper water quality criteria or the Permit's RWL, the USEPA suggests the use of another model, described below, to analyze and/or predict toxicity of bioavailable copper in the water column. In the 2007 revision of Aquatic Life Ambient Freshwater Quality Criteria-Copper, the USEPA (2007) recommended the Biotic Ligand Model (BLM) as a tool 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.

Using the BLM to predict copper speciation, a total of 27 graphs have been generated to illustrate how variations in water quality parameters including pH, alkalinity, hardness, and dissolved organic carbon (DOC) influence the concentration of bioavailable  $\text{Cu}^{2+}$ . See **Appendix D**. Generally, an increase in one or more of these water parameters lowers the concentration of the  $\text{Cu}^{2+}$  species, thereby lowering the bioavailability of copper. Copper speciation trends most applicable to water in District conveyances are illustrated in **Graphs 5 and 14**.

#### **Item a): *Less than Significant with Mitigation Incorporated***

As previously discussed, the District intends to obtain coverage for residual algaecide discharges under the Aquatic Weed Permit, which requires compliance with the Basin Plan, SIP and the CTR. Discharges of copper-containing materials may exceed the hardness-adjusted RWL for dissolved copper as described in the permits Basin Plan, SIP and CTR. As allowed by the Permit and the SIP, the District intends to use this CEQA analysis to support the request for an exception under Section 5.3 of the SIP to allow applications of copper-containing algaecides and/or aquatic herbicides that exceed CTR water quality criteria for a short-term or seasonal basis within the treatment area after application or in receiving waters.

Applications of copper-based algaecides and/or aquatic herbicides according to label direction typically require concentrations of copper between 500 and 1,000 ug/L metallic copper. RWLs for dissolved copper as described in the Permit, CTR (40 CFR § 131.38, 2018) and by the Central Valley RWQCB (Central Valley RWQCB, 2018) are hardness-dependent. Refer to **Figure 3**. District water varies in hardness throughout the season.

**Figure 4. Copper Criteria vs. Hardness Graph**

Source: SWRCB, 2016b

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, data from 2020 and 2021 indicates that the average hardness of water within District conveyances is 108 mg  $\text{CaCO}_3/\text{L}$  with an average pH of 8. Based on the equation above, the associated continuous dissolved concentration (4-day average) water quality criteria for copper in District conveyances is 9.6 ug/L. This water quality criteria value may be exceeded at and downstream of the point of application into the conveyance.

Receiving waters for the purpose of determining exceedance of the dissolved copper RWL are considered to be untreated portions of District conveyances or, treated water spilled outside the District's conveyance system, if spilling occurs. Compliance with the Permit requires implementation of a monitoring and reporting program. This program requires the Discharger to collect and analyze water quality samples to determine compliance with applicable RWLs and receiving water beneficial uses.

Twelve applications of copper-containing algaecides and/or aquatic herbicides were made to District conveyances between 2020 and 2021 at the maximum labeled application rate of 1 mg/L. Results from post-application monitoring performed after each treatment indicated that the highest concentration of copper measured 7 days after treatment was 4.7 ug/L, corresponding to a half-life of 0.91 days or approximately 22 hours. Based on this half-life, the

residual copper concentration in District conveyances may exceed the RWL for up to approximately 6.1 days following algaecide and/or aquatic herbicide application. When used according to label directions by qualified personnel, impacts of copper-containing algaecides and/or aquatic herbicides have no significant impact. The District will implement the following mitigation measure, Hydrology and Water Quality 1 (**HWQ-1**) for applications of copper to continue operating without a significant impact and reduce any future potentially significant impacts to less than a significant level:

**HWQ-1.** The District will comply with the Aquatic Pesticide Application Plan (APAP) and the Permit. Monitoring and reporting described in the APAP will include the Permit-required surface water sampling and analysis, a quality control and quality assurance plan, as well as several time-sensitive reporting requirements if adverse impacts to water quality or non-target organisms are detected. The water quality sampling and annual reporting required by the APAP and Permit will assess the impact, if any, that the project may have on water quality and beneficial uses of the water in and downstream of District conveyances. Additionally, consistent with SIP exception requirements, the District will arrange for a qualified biologist to assess the extent of restoration of receiving water beneficial uses, as compared to pre-project conditions, after the use of copper-containing algaecides and/or aquatic herbicides.

**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 that may impede the sustainable groundwater management of the basin.

**Items c) and d): *No Impact***

The project does not involve construction of any structures or activities that would alter drainage patterns, increase erosion or siltation on- or off-site, increase runoff amount or rate, create or contribute additional runoff, or impact flood flows. The project would not risk release of pollutants due to project inundation in a flood hazard, tsunami or seiche zone.

**Item e): *No Impact***

Project activities are not expected to result in any conflict with or obstruction to implementation of a water quality control plan. As discussed, the SIP and CTR specifically allow for dischargers to request the Section 5.3 Exception the District is pursuing through preparation of this analysis. Project activities will have no impact to a sustainable groundwater management plan.

**3.4.11. Land Use and Planning***Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Discussion****Item a): No Impact**

The Project does not involve any construction of structures, canals, roads, etc., so no established communities in the Project area will be physically divided.

**Item b): No Impact**

The Project would not create new land uses or alter the existing uses and would not conflict with any known land use plans, policies, or agency regulations.

**3.4.12. Mineral Resources***Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be a 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 or other land use plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

### Items a) and b): *No Impact*

The Project involves the application of algaecides and/or aquatic herbicides that contain copper to the District's conveyance system and has no impact on the availability of any known mineral resource, or result in the loss of a locally-important mineral resource recovery site.

### 3.4.13. Noise

Would the project result in:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project 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) Generation of excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) For a project located within the vicinity of a private airstrip or 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"/>

## Discussion

### Item a): *No Impact*

Project activity primarily occurs in rural and agriculturally-dominated areas that commonly have machinery operating that include tractors, generators, groundwater and irrigation pumps and heavy trucks. Application equipment includes the use of pick-up and flatbed trucks, and in some cases a small generator. The incidental noise and vibration generated by the use of such equipment is temporary and inconsequential and thus will have no impact.

### Item b): *No Impact*

The Project would not generate groundborne noise or vibration, thus no person could be exposed to groundborne noise or vibration.

**Item c): No Impact**

The William Robert Johnston Municipal Airport is located within two miles of the District boundaries. However, the Project will not result in excessive noise levels for people working or living within these areas.

**3.4.14. Population and Housing**

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Induce substantial unplanned 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 people or housing, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Discussion****Items a) and b): No Impact**

No new homes, roads or other infrastructure are part of the proposed Project. No displacement of existing homes or people will occur.

**3.4.15. Public Services***Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) 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 governmental facilities, schools, parks, or other public facilities, nor will it increase the need for police, fire, school, park, or other public services or facilities.

**3.4.16. Recreation**

	Potentially Significant Impact	Less Than Significant with 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 physical effect on the environment? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|

## Discussion

### Items a) and b): *No Impact*

Project activities are limited to the application of copper-containing algaecides and/or aquatic herbicides to the District's conveyance system. There would be no impact to use or accelerated deterioration of parks or other recreational facilities. Project activities do not include recreational facilities or require their construction. Treatment of algae and aquatic vegetation improves the ability of the District to deliver water for agricultural irrigation purposes and has no impact on recreational activities.

### 3.4.17. Transportation

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Would the project conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially increase hazards due to a geometric 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"/>
d) Result in inadequate emergency access?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

### Items a) and 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. The Project will not conflict with any known programs, plans, ordinances, or policies addressing



the circulation system, including transit, roadway, bicycle, and pedestrian facilities. The Project will be limited to routine maintenance activities and would not involve any land use modifications, construction, or changes to roadway capacity.

**Item c): No Impact**

The Project will not include the addition of any design feature which would substantially increase hazards due to a geometric design feature or incompatible uses.

**Item d): No Impact**

The Project does not involve construction of facilities or activities that would influence or adversely impact emergency access.

### 3.4.18. Tribal Cultural Resources

*Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code § 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code § 5024.1? In applying the criteria set forth in subdivision (c) of Public Resource Code § 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Discussion

### Item a) and b): *No Impact*

The Project involves the treatment of algae and/or aquatic vegetation in District conveyances which is not expected to cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code § 21074.

To confirm the protection of tribal cultural resources in the project area, a request was submitted to the Native American Heritage Commission (NAHC) in order to obtain contact list of Native American tribes in the area on December 17, 2019. The request was made consistent with the requirements of Assembly Bill 52, which established a “tribal cultural resources” category for CEQA project consideration and consultation process for California tribes.

On December 26, 2019, letters of notification were sent to each of the tribes on the NAHC contact list. The letters were sent to establish contact and notify tribes to submit their request for consultation, as needed. Letters were sent via United States Postal Service Certified Mail, and follow-up emails were also sent when email addresses were available for the tribal group. Notifications were sent to the following groups:

- Big Sandy Rancheria of Western Mono Indians
- Cold Springs Rancheria
- Dumna Wo-Wah Tribal Government
- Dunlap Band of Mono Indians
- Kings River Choinumni Farm Tribe
- North Fork Mono Tribe
- Santa Rosa Rancheria Tachi Yokut Tribe
- Table Mountain Rancheria
- Traditional Choinumni Tribe
- Wuksache Indian Tribe/Eshom Valley Band

Per AB 52, tribes have 30 days to respond and request further project information and request formal consultation. One group, the North Fork Mono Tribe, requested that the District provide a copy of the Initial Study and Mitigated Negative Declaration (IS/MND) once it becomes publicly available. The District will directly submit the IS/MND and associated appendices to the tribe and coordinate review and/or consultation with this group concurrent with the public comment period. The other groups contacted did not respond or indicated they did not require consultation.

No ground-disturbing activities or construction activities are part of the project. Introduction of copper-containing algaecides and/or aquatic herbicides to District facilities would not cause a substantial adverse change in the significance of tribal cultural resources, therefore no impacts would occur to tribal cultural resources.

**3.4.19. Utilities and Service Systems***Would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) 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"/>
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Discussion****Items a) and b): No Impact**

The Project involves application of copper-containing algaecides and/or aquatic herbicides to the District's irrigation conveyance system and would not require or result in the relocation or construction of new or expanded water, wastewater treatment or stormwater drainage, electric power, natural gas, or telecommunications facilities. Because copper-containing algaecides and/or aquatic herbicides do not require dilution with water prior to application, Project implementation would not rely on existing water supplies; therefore, there would be no impact to the water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years.

**Item c) through e): 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 algaecides and/or aquatic herbicides are typically returned to the vendor for reuse or recycling.

**3.4.20. Wildfire**

*If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:*

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Discussion****Items a) through d): No Impact**

The scope of the Project is limited to in-water applications of copper-containing algaecides and/or aquatic herbicides. The Project would not impair the ability to follow any emergency response or evacuation plan, exacerbate wildfire risks, require installation or maintenance of associated infrastructure, or result in runoff, post-fire slope instability, or drainage changes that would expose people or structures to significant risks.

**3.4.21. Mandatory Findings of Significance**

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to substantially 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, substantially 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 type="checkbox"/>	<input checked="" type="checkbox"/>

**Discussion****Item a): Less Than Significant with Mitigation Incorporated**

The Project involves the use of copper-based algaecides and/or aquatic herbicides introduced into the District's conveyances at concentrations that temporarily exceed CTR water quality objective for dissolved copper. Significant evidence suggests that, when used according to label directions by qualified personnel, CTR exceedance is short-term and impacts of these algaecides and/or aquatic herbicides are less than significant. Further, the District will implement mitigation measure **HWQ-1** to reduce any potential impacts to water quality to a less than significant level.

A site-specific assessment of the fate and toxicity of copper and the resulting potential for risk to the giant garter snake, western pond turtle and San Joaquin kit fox was completed, as described in the Biological Resource section and **Appendix C**. The exposure to these receptors due to the application of copper-containing material does not result in risk above the LOC. As

such, the project is not anticipated to adversely impact the habitat or population of the giant garter snake, western pond turtle or San Joaquin kit fox.

**Item b): Less Than Significant Impact**

The cumulative impacts of continued application of copper-based algaecides and/or herbicides are not precisely known. Available evidence indicates that of the application of copper-based algaecides and/or aquatic herbicides are not cumulatively significant. Studies examining the relationship between sediment copper concentration and toxicity support the conclusion that sediment-bound copper is not bioavailable. Deaver and Rodgers (1996) compared limnetic water and copper-amended sediment toxicity to *Hyalella azteca*, an epibenthic detritivore sentinel species, and found that sediment concentrations were not predictive of copper toxicity across various water and sediment conditions. The limnetic water LC50 of the free cupric ion, however, varied by <4% in the sediment-toxicity tests, indicating that the form of copper associated most strongly with toxicity (i.e., the bioavailable fraction) in its aquatic phase rather than sediment-bound copper. These results are corroborated by those of Suedel et al. (1996) which showed that copper toxicity to several aquatic organisms, including fish, water fleas, a midge, and an amphipod species, were correlated with overlying (limnetic) water concentration rather than sediment or pore water concentration. As noted in this IS/MND and its appendices, copper-containing algaecides and/or aquatic herbicides rapidly dissipate and/or form inorganic and organic complexes that reduce its bioavailability shortly after application, particularly when applied to hard water such as in District conveyances.

Toxicity studies have also been conducted using water and sediment samples from copper herbicide application sites. Gallagher et al. (2005) collected water and sediment samples from a 20,234-hectare lake treated for 10 years in some areas with Komeen®, a product formulated with chelated copper applied annually at copper concentrations of 1 mg/L. This rate of application is similar to the rate and application interval the District anticipates using. The Gallagher study also looked at untreated areas to assess copper bioavailability to *Hyalella azteca* and *Ceriodaphnia dubia*. No statistical differences in response of either *H. azteca* or *C. dubia* to treated (16.3-18.0 mg Cu/kg) and untreated (0.3 mg Cu/kg) sediments were observed when compared to control sediments. In a 10-day exposure study by Huggett et al. (1999), sediments were collected from Steilacoom Lake in Washington and amended with CuSO<sub>4</sub> (800-2,000 mg Cu/kg dry weight) to assess copper bioavailability to *H. azteca*, *Chironomus tentans*, and *C. dubia*. When comparing the NOAECs derived under these experimental conditions (906-2,010 mg Cu/kg) with the current concentrations of copper in the lake sediment (180-1,110 mg/kg), it is apparent that the sediment-bound copper in the lake is not bioavailable to the three species.

Mitigation has been incorporated into the Project (**HWQ-1**). This mitigation reduces the impact to a less than significant.

**Item c): No Impact**

The Project would not have environmental effects which would cause substantial adverse effects to humans, either directly or indirectly.

## 4. MITIGATION MEASURES

### 4.1. Summary of Mitigation Measures

Implementation of **HWQ-1** mitigates significant environmental effects of the application of copper-containing algaecides and/or aquatic herbicides. From **Section 3.4.10** (Hydrology and Water Quality):

**HWQ-1.** The District will comply with the Aquatic Pesticide Application Plan (APAP) and the Permit. Monitoring and reporting described in the APAP will include the Permit-required surface water sampling and analysis, a quality control and quality assurance plan, as well as several time-sensitive reporting requirements if adverse impacts to water quality or non-target organisms are detected. The water quality sampling and annual reporting required by the APAP and Permit will assess the impact, if any, that the project may have on water quality and beneficial uses of the water in and downstream of District conveyances. Additionally, consistent with SIP exception requirements, the District will arrange for a qualified biologist to assess the extent of restoration of receiving water beneficial uses as compared to pre-project conditions after the use of copper-containing algaecides and/or aquatic herbicides.

### 4.2. Mitigation Monitoring and Reporting Program

CEQA requires agencies to adopt mitigation monitoring and reporting program (MMRP) when measures are necessary to mitigate or avoid significant effects on the environment. To maintain compliance with mitigation measures over the course of the Project, this MMRP would be implemented by the District to track the water quality resulting from application of copper-containing material, and to verify that mitigation measures are followed. Records shall be kept by District water quality staff and reviewed annually. Examples of the records to be kept include annual reports and annual information collection data for the Aquatic Weed NPDES Permit. Upon review, the District may consult with the SWRCB and/or RWQCB, and subject matter experts regarding the addition, discontinuation, or modification of mitigation measures, including application techniques, product choice or application timing to allow for effective algae and/or aquatic vegetation control while meeting MMRP and NPDES Permit objectives.

Mitigation measure HWQ-1 will be accomplished by implementation of the District's APAP that requires surface water sampling, analysis, visual monitoring, and reporting as a condition of the NPDES Aquatic Weed Permit issuance. Each year copper-containing products are applied to the District's irrigation conveyance system, a qualified biologist will assess pre- and post-project conditions, and if applicable, will certify, through an expression of professional opinion regarding those facts or findings which are the subject of the certification, that the beneficial uses of the receiving waters have been restored. The APAP requires an annual report be prepared and submitted to the SWRCB annually on March 1 of the year following applications.

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

## 5. REFERENCES

- California Air Resources Board (CARB). 2021. Proposed 2020 Amendments to Area Designations for State Ambient Air Quality Standards, Appendix C: Maps and Tables of Area Designations for State and National Ambient Air Quality Standards. California Environmental Protection Agency. Sacramento, CA.
- California Irrigation Management Information System (CIMIS). 2021. CIMIS Station Reports. Available: <https://cimis.water.ca.gov/WSNReportCriteria.aspx> (Accessed: October 15, 2021).
- California Natural Diversity Database (CNDDDB). 2020. RareFind 5. California Department of Fish & Wildlife, Wildlife & Habitat Data Analysis Branch. Available: <https://wildlife.ca.gov/Data/CNDDDB/Maps-and-Data> (Accessed: October 15, 2021).
- California Department of Transportation (Caltrans). 2019. List of Eligible and Officially Designated State Scenic Highways. Available: <https://dot.ca.gov/programs/design/lap-landscape-architecture-and-community-livability/lap-liv-i-scenic-highways> (Accessed: October 15, 2021).
- Calomeni, A.J., K.J. Iwinski, A.D. McQueen, C.M. Kinley, M. Hendrikse, and J.H. Rodgers, Jr. 2017. Characterization of Copper Algaecide (Copper Ethanolamine) Dissipation Rates Following Pulse Exposures. *Water, Air, & Soil Pollution* 228(11): 1-13.
- Central Valley Regional Water Quality Control Board (Central Valley RWQCB). 2018. The Water Quality Control Plan (Basin Plan) for the California RWQCB Central Valley Region. The Sacramento River Basin and the San Joaquin River Basin. Fifth Edition. Revised May 2018.
- County of Fresno. 2000. Fresno County General Plan. Policy Document. October 3, 2000.
- Deaver, E. and J.H. Rodgers, Jr. 1996. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. *Environmental Toxicology and Chemistry* 15(11): 1925-1930.
- Establishment of numeric criteria for priority toxic pollutants for the State of California, 40 CFR § 131.38 (2018).
- Firebaugh Canal Water District (FCWD). 2016. Municipal Service Review and Sphere of Influence Update. Report to the Fresno Local Agency Formation Commission. MSR-16-2. Fresno, CA.
- Franklin, N.M., J.L. Stauber, S.C. Apte, and R.P. Lim. 2002. Effect of Initial Cell Density on the Bioavailability and Toxicity of Copper in Microalgal Bioassays. *Environmental Toxicology and Chemistry* 21(4): 742-751.
- Gallagher, J.S., B.M. Duke, and J.H. Rodgers, Jr. 2005. Responses of *Hyaella azteca* and *Ceriodaphnia dubia* to Reservoir Sediments Following Chelated Copper Herbicide Applications. *Journal of Aquatic Plant Management* 43: 95-99.
- Hosea, R.C., K.Z. Bjurstrom, and E.E. Littrell. 2004. Acute oral and dermal toxicity of aquatic herbicides and a surfactant to garter snakes. Administrative Report 2004-01. California Department of Fish and Wildlife, Office of Spill Prevention and Response. Rancho Cordova, CA.
- Huggett, D.B., W.B. Gillespie, Jr., J.H. Rodgers, Jr. 1999. Copper bioavailability in Steilacoom Lake sediments. *Archives of Environmental Contamination and Toxicology* 36(2): 120-123.



- National Weather Service (NWS). 2021. Fresno Climate: Fresno Snow Statistics. National Oceanic and Atmospheric Administration. Available: <https://www.weather.gov/hnx/fatmain#> (Accessed: October 15, 2021).
- State Water Resources Control Board (SWRCB). 2005. Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California. California Environmental Protection Agency. Sacramento, CA.
- State Water Resources Control Board (SWRCB). 2016a. Water Quality Order No. 2013-0002-DWQ; Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications. General Permit No. CAG990005. Amended July 27, 2016.
- State Water Resources Control Board (SWRCB). 2016b. A Compilation of Water Quality Goals. 17<sup>th</sup> Edition. California Environmental Protection Agency. Sacramento, CA. 62 pp.
- Suedel, B.C., E. Deaver, and J.H. Rodgers, Jr. 1996. Experimental factors that may affect toxicity of aqueous and sediment-bound copper to freshwater organisms. Archives of Environmental Contamination and Toxicology 30: 40-46
- U.S. Energy Information Administration (EIA). 2019. Use of Energy Explained – Energy Use in Homes. Available: <https://www.eia.gov/energyexplained/use-of-energy/electricity-use-in-homes.php> (Accessed: October 21, 2021).
- U.S. Environmental Protection Agency (USEPA). 2007. Aquatic Life Ambient Freshwater Quality Criteria – Copper: 2007 Revision. Office of Water. EPA-822-R-07-001.
- U.S. Environmental Protection Agency (USEPA). 2009. Reregistration Eligibility Decision (RED) for Coppers. EPA 738-R-09-304. Office of Prevention, Pesticides and Toxic Substances. Washington, D.C.
- U.S. Environmental Protection Agency (USEPA). 2020. Technical Overview of Ecological Risk Assessment: Risk Characterization. Available: <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/technical-overview-ecological-risk-assessment-risk> (Accessed: August 2, 2021).
- U.S. Fish and Wildlife Service (USFWS). 2021. Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC). Available: <https://ecos.fws.gov/ipac/> (Accessed: October 15, 2021).

## **6. PERSONS AND AGENCIES CONTACTED**

- 1) Sheri Clark, San Joaquin Valley Air Pollution Control District
- 2) Andrew Green, Native American Heritage Commission
- 3) Elizabeth Kipp, Big Sandy Rancheria of Western Mono Indians
- 4) Carol Bill, Cold Springs Rancheria
- 5) Robert Ledger Sr., Dumna Wo-Wah Tribal Government
- 6) Dirk Charley and Benjamin Charley Jr., Dunlap Band of Mono Indians
- 7) Stan Alec, Kings River Choinumni Farm Tribe
- 8) Ron Goode, North Fork Mono Tribe
- 9) Leo Sisco, Santa Rosa Rancheria Tachi Yokut Tribe
- 10) Leanne Walker-Grant and Bob Pennell, Table Mountain Rancheria
- 11) David Alvarex and Rick Osborne, Traditional Choinumni Tribe
- 12) Kenneth Woodrow, Wuksache Indian Tribe/Eshom Valley Band
- 13) Gurgan Chand, SWRCB
- 14) Hossein Aghazeynali, PE, Central Valley RWQCB, Fresno Office

## **7. LIST OF PREPARERS**

- 1) Michael S. Blankinship, PE, PCA, Blankinship & Associates, Inc.
- 2) Stephen Burkholder, Senior Biologist, PCA, Blankinship & Associates, Inc.
- 3) Steve Metzger, Project Scientist, Blankinship & Associates, Inc.
- 4) Alyssa Nagai, Staff Toxicologist, Blankinship & Associates, Inc.
- 5) Michael Zadeh, Associate Environmental Scientist, Blankinship & Associates, Inc.
- 6) Kelly Phang, Associate Toxicologist, Blankinship & Associates, Inc.
- 7) Jeff Bryant, General Manager, Firebaugh Canal Water District
- 8) Madison Medeiros, Office Manager, Firebaugh Canal Water District

# Appendix A

## Example Product Labels and Safety Data Sheets



# Captain® XTR

## Liquid Copper Algaecide

SPECIMEN



For use in still or flowing aquatic sites including: golf course, ornamental, fish, irrigation and fire ponds and aquaculture including fish and shrimp; fresh water lakes, ponds, and fish hatcheries; potable water reservoirs, rivers, streams, bays and coves; and crop and non-crop irrigation and drainage systems (canals, laterals and ditches) and chemigation systems.

### Active Ingredient

Copper Ethanolamine Complex†

(Mixed CAS#'s 82027-59-6 & 14215-52-2)

Other Ingredients 28.2%

TOTAL 71.8%

†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.)

Refer to inside of label booklet for additional precautionary information and *Directions for Use* including *First Aid* and *Storage and Disposal*.

**NOTICE:** Read the entire label before using. Use only according to label directions. Before buying or using this product, read *Terms and Conditions of Use*, *Warranty Disclaimer*, *Inherent Risks of Use* and *Limitation of Remedies* inside label booklet. If terms are unacceptable, return at once unopened.

\*Captain and Littora are registered trademarks of SePRO Corporation

SePRO Corporation

11550 North Meridian Street, Suite 600

Carmel, IN 46032, U.S.A.

EPA Reg. No. 67690-9

FPL20131205

## PRECAUTIONARY STATEMENTS

### Hazards to Humans and Domestic Animals

## 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.)

**Corrosive. Causes irreversible eye damage. Causes skin irritation. Harmful if swallowed. Harmful if absorbed through skin. Harmful if inhaled. Do not get in eyes, on skin, or on clothing. Avoid breathing mist or spray vapor. When handling, wear protective eyewear, clothing, and chemical-resistant gloves as described under the section of this label pertaining to Personal Protective Equipment (PPE). Wash skin thoroughly with soap and water after handling and before eating, drinking, chewing gum, or using tobacco. Remove and wash contaminated clothing before reuse.**

For applications in waters destined for use as drinking water, those waters must receive additional and separate potable water treatment. Do not apply more than 1.0 ppm as metallic copper in any waters.

### FIRST AID

If in eyes	<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 a poison control center or doctor for treatment advice.</li></ul>
If on skin or clothing	<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>
If swallowed	<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 to an unconscious person.</li></ul>
If inhaled	<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>

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 INFOTRAC at 1-800-535-5053.

## PERSONAL PROTECTIVE EQUIPMENT (PPE)

Some materials that are chemical-resistant to this product are barrier laminate, butyl rubber ≥ 14 mils, or nitrile rubber ≥ 14 mils. If you want more options, follow the instructions for category A on an EPA chemical-resistant category selection chart.

### Mixers, loaders, applicators and other handlers must wear the following:

- Coveralls worn over short-sleeved shirt and short pants;
- Socks and chemical resistant footwear;
- Chemical-resistant gloves (such as nitrile or butyl rubber);
- Protective eyewear (such as goggles, safety glasses, or face shield); and
- A chemical-resistant apron when mixing and loading or cleaning equipment.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them.

## USER SAFETY RECOMMENDATIONS

### Users should:

- Wash the outside of gloves before removing.
- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.

## ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and aquatic invertebrates. Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize this hazard, do not treat more than ½ of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. Consult with the State or local agency with primary responsibility for regulating pesticides before applying to public waters, to determine if a permit is required.

Certain water conditions including low pH (≤ 6.5), low dissolved organic carbon (DOC) levels (3.0 mg/L or lower), and "soft" waters (i.e. alkalinity less than 50 mg/L), increases the potential acute toxicity to non-target aquatic organisms. Do not use in waters containing trout or other fish species that are highly sensitive to copper if the alkalinity is less than 50 ppm. Fish toxicity generally decreases when the hardness of water increases. Captain XTR must not be used in ornamental ponds containing Koi.

## DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. Read all directions for use carefully before applying this product. Use only according to label directions.

Do not apply this product in a way that concentrate will contact workers or other persons, either directly or through drift; only protected handlers may be in close proximity to the mixing area or application equipment while in use.

**Obtain Required Permits:** Consult with appropriate state or local pesticide and/or water authorities before applying this product in or around public waters. Permits and posting or treatment notification may be required by state, Tribal, or local public agencies.

## PRODUCT INFORMATION

Captain XTR is a chelated copper formulation that is effective in controlling a broad range of green and blue-green (cyanobacteria) algae, including filamentous, planktonic and macrophytic. Captain XTR is also an effective herbicide on submersed weed species with susceptibility to copper. The ethanolamines in Captain XTR reduce the precipitation of copper with carbonates and bicarbonates in the water.

Use the lower concentrations/rates in softer water (<50 ppm alkalinity) or when treating species with greater susceptibility to Captain XTR; use higher concentrations/rates in harder water (>50 ppm alkalinity) and when treating heavier infestations and/or less susceptible species.

### Treatment Notes

Performance of Captain XTR is enhanced under certain conditions. It is recommended to consult a SePRO Aquatic Specialist for guidance in implementing a treatment program to achieve optimal results. The following apply to the use of Captain XTR to achieve optimum effectiveness:

- Treat when growth first begins to appear (if possible) or when target vegetation is actively growing.
- Apply in a manner that will ensure even distribution of Captain XTR within the treatment area.
- Use a high-pressure surface spray application to break up dense floating algal mats.
- In heavily infested areas, a second application may be necessary. Retreat areas if regrowth begins to appear or if seasonal control is desired. Repeating application of Captain XTR too soon after initial application may have no effect.



### Precautions and Restrictions

- Do not apply Captain XTR directly to, or otherwise permit it to come into contact with any desirable plants as injury may result.
- Do not apply in such a way that concentrated Captain XTR comes in contact with crops, ornamentals, grass or other desirable plants.
- Wash spray equipment thoroughly before and after each application.
- Contents may cause bluing where marcite has been etched.

### Spray Drift Management

A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and method of application (e.g., ground, aerial, airblast, chemigation) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product.

### Droplet Size

Apply only as a medium or coarser spray (ASAE standard 572) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles.

### Wind Speed

Do not apply at wind speeds greater than 15 mph. Only apply this product if the wind direction favors on-target deposition (approximately 3 to 10 mph), and there are no sensitive areas within 250 feet downwind.

### Temperature Inversions

If applying at wind speeds less than 3 mph, the applicator must determine if a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions.

### Other State and Local Requirements

Applicators must follow all state and local pesticide drift requirements regarding application of copper compounds. Where states have more stringent regulations, they must be observed.

### Equipment

All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates.

### Additional requirements for aerial applications:

- The boom length must not exceed 75% of the wingspan or 90% of the rotor blade diameter.
- Release spray at the lowest height consistent with efficacy and flight safety. Do not release spray at a height greater than 10 feet above the crop canopy unless a greater height is required for aircraft safety.
- When applications are made with a crosswind, the swath must be displaced downwind. The applicator must compensate for this displacement at the up and downwind edge of the application area by adjusting the path of the aircraft upwind.

### Additional requirements for ground boom application:

Do not apply with a nozzle height greater than 4 feet above the crop canopy.

### APPLICATION INFORMATION

For aquatic weed control (including algae and vascular plants), do not exceed a concentration of 1.0 ppm copper during any single application; wait a minimum of 14 days between retreatments. (When treating aquaculture ponds when fish are present, do not exceed a concentration of 0.4 ppm during any single application when targeting nuisance algae; wait a minimum of 10 days between treatments.)

### Application Methods and Rates

#### Surface Spray/Injection Algaecide Application

For effective control, proper rates of Captain XTR should be maintained for a minimum of three hours. The application concentrations/rates in Table 1 are based on static or minimal flow situations. Where significant dilution occurs from untreated waters or loss of water, within a three hour period, Captain XTR may have to be metered in (refer to the *Drip System or Metering Pump Application for Flowing Water Treatments* section of this label).

Identify the algae growth present as one of the following types: planktonic (suspended), filamentous (matforming), or macrophytic algae (chara/nitella).

Determine the surface acreage (1 acre = 43,560 ft.<sup>2</sup>) and average depth of infested area.

Refer to chart below to determine gallons of Captain XTR to apply per surface acre.

TABLE 1 Captain Application Rates (Gallons per surface acre)			
Algae Type or Species	Dose	Rates	Treatment Comments
	PPM Copper	Gallons per Acre Foot	
Planktonic (Suspended)	0.2 - 1.0†	0.6 - 3.0	Apply lower rates for light infestations. Use higher rates on heavy blooms and where algae masses are clumped and accumulated.
Filamentous (Mat-forming)	0.2 - 1.0†	0.6 - 3.0	Apply lower rates for early season applications, light infestations or treatment of regrowth. Apply higher rates on surface mats and species such as <i>Pithophora</i> , <i>Cladophora</i> , <i>Lyngbya</i> , and <i>Hydrodictyon</i> .
Macrophytic (Chara/Nitella/Starry Stonewort)	0.4 - 1.0	1.2 - 3.0	Apply lower rates for new infestations or early season growth. Apply higher rates on older, established calcified plants. Apply as close to plant growth as possible.

† For planktonic and filamentous algae, Captain XTR may be applied up to 1.0 ppm when growth conditions require higher rates and for difficult to control species.

For dense infestations of filamentous algae or where the species of *Hydrodictyon*, *Cladophora* or *Pithophora* are present, apply the higher rate in the rate range. Filamentous algae species are easier to control before floating to the water's surface (when they are forming on the pond/lake bottom). An adjuvant, such as d-limonene or similar surfactant, may be added for enhanced control of floating mats or difficult to control species of algae. Follow surfactant labeling instructions for application rates and use directions.

For planktonic (suspended) algae and freefloating filamentous algae mats, application rates should be based on treating to depths where algae are present (e.g. the upper 3 to 4 feet of water). For dense infestations and in certain other situations, it may be necessary to calculate rates based on the depth of known algae infestation (e.g. > 4 feet) or require treating the entire water column in the target area. To calculate the application rate per surface acre, multiply the application rate in Table 1 (0.6 to 3.0 Gallon per Acre Foot) by the average depth of infestation, or average water depth if infestation reaches the entire water column.

As a surface or subsurface application, Captain XTR may be applied diluted or undiluted, whichever is most suitable to ensure uniform coverage of the area to be treated. Dilution with water may be necessary at the lower application rates. Dilute the required amount of Captain XTR with enough water to ensure even distribution in the treated area with the type of equipment being used. For best results, dilute Captain XTR in water to provide a minimum spray mix of 20 to 50 gallons per acre; in areas with heavy infestations of filamentous algae, a total tank mix of > 50 gallons per acre may be necessary; break up floating algae mats before spraying or while application is being made.

#### Submersed Plant Control Applications

Captain XTR can be applied to control hydrilla (*Hydrilla verticillata*), egeria (*Egeria densa*), and other aquatic weeds with susceptibility to copper. Apply Captain XTR at a rate to achieve 0.75 to 1.0 ppm copper (2.3 to 3.0 Gallons Captain XTR/Acre foot). In heavily infested areas, a second application after the 14 day retreatment interval may be necessary.

### TANK MIXES WITH OTHER AQUATIC ALGAECIDES AND HERBICIDES

Captain XTR may be mixed with other herbicides or algaecides registered for aquatic use provided that no labeling prohibits such mixing. Captain XTR can be tank mixed with other herbicides to improve efficacy; and to control algae in areas where heavy algae growth may cover target submersed plant species and interfere with herbicide exposure. Do not exceed any labeled rate or dose of any of the products in the combination. Observe the most restrictive of the labeling limitations and precautions of all products used in mixtures. To ensure compatibility, a jar test is recommended before field application of any tank mix combination. It is recommended to consult with SePRO Corporation for latest tank mix recommendations.

**NOTE:** Tank mixing or use of Captain XTR with any other product which is not specifically listed on the Captain XTR label shall be at the exclusive risk of the user, applicator and/or application adviser, to the extent allowed by applicable law.

#### Captain XTR and Endothal

Captain XTR may be applied as a tank mix or simultaneously injected or used with the dipotassium salt of endothal (e.g. Cascade®) or the mono (N,N-dimethylalkylamine) salt of endothal (e.g. Teton®) to broaden the weed control spectrum and/or reduce injection times or rates in canals, ditches, and laterals. In flowing canals, apply Captain XTR via drip or injection at a rate of 0.1 to 1.0 ppm (See Table 2) in conjunction with Teton (0.05 – 2.0 ppm) or Cascade (0.35-3.0 ppm) for a minimum of one hour.



### Hydrilla Control – Captain XTR + Diquat Tank Mix

Captain XTR can be mixed with diquat (diquat dibromide) in a 2:1 ratio of Captain XTR:Diquat (e.g. 4 gallons Captain XTR and 2 gallons diquat [e.g. Litora®- 2 lbs a.i./gallon] per acre in waters with average depth of 4 feet). Lower rates of Captain XTR may also enhance the activity of diquat. Captain XTR should be applied at a minimum of 0.1 ppm in combination with diquat. Higher rates may be needed in areas with dense weeds.

### Drip System or Metering Pump Application for Flowing Water Treatments For Use in Potable Water, Canals, Ditches, and Irrigation and Drainage Systems

For optimal control, apply Captain XTR as soon as algae begin active growth or interfere noticeably with normal delivery of water (clogging of lateral headgates, suction screens, weed screens, and siphon tubes). Delaying treatment could perpetuate the problem causing massing and compacting of plants. Heavy infestations and low flow may cause poor distribution resulting in unsatisfactory control. Under these conditions repeated applications or increasing water flow rate during application may be necessary.

Prior to treatment it is important to accurately determine water flow rates. In the absence of weirs, orifices, or similar devices, which give accurate waterflow measurements, volume of flow can be estimated by the following formula:

$$\text{Cubic feet per second (cfs)} = \text{average width (feet)} \times \text{average depth (feet)} \times \text{average velocity}^1 \text{ (feet/second)} \times 0.9$$

<sup>1</sup> The velocity can be estimated by determining the length of time it takes a floating object to travel a defined distance. Divide the distance (feet) by the time (seconds) to estimate velocity (feet/seconds). This measure should be repeated 3 times at the intended application site and then calculate the average velocity.

After accurately determining the water flow rate in cfs or gallons/minute, find the corresponding Captain XTR rate in Table 2 or use the below formula.

$$\text{cfs} \times \text{desired concentration of copper (ppm)} = \text{quarts/hour of application}$$

TABLE 2 Captain Application Rates For Flowing Water				
Water Flow Rate		PPM Copper	Captain Rate	
CFS	Gal/min.		Quart/ hr.	mL / min.
1	450	0.2 - 1.0	0.2 - 1.0	3.2 - 15.7
2	900	0.2 - 1.0	0.4 - 2.0	6.3 - 31.5
3	1,350	0.2 - 1.0	0.6 - 3.0	9.5 - 47.3
4	1,800	0.2 - 1.0	0.8 - 4.0	12.6 - 63.0
5	2,250	0.2 - 1.0	1.0 - 5.0	15.8 - 78.5
10	4,500	0.2 - 1.0	2.0 - 10.0	31.5 - 157.7
100	45,000	0.2 - 1.0	20 - 100.0	315 - 1,577

Calculate the amount of Captain XTR needed to maintain the drip rate for a treatment period of 3 hours by multiplying either:

$$\text{Quarts / hr} \times 3; \text{ Milliliters / Minute} \times 180; \text{ or Fluid ounces / Minute} \times 180$$

Rates will target 1.0 ppm copper concentration in the treated water for the treatment period. Lower concentrations may be used on highly susceptible algae species or if longer exposure times are maintained. Introduction of the chemical should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of the chemical. For injection periods longer than three hours (180 minutes), calculate the amount of Captain XTR needed by multiplying the rate by the desired time in minutes or hours, as appropriate.

Use a drum or tank equipped with a valve or other volume control device that can be calibrated 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. A small pump or other metering device may be used to meter Captain XTR into the water more accurately. Application can be made using diluted or undiluted material.

Results can vary depending upon species and density of algae and vegetation, desired distance of control and flow rate, and impact of water quality on efficacy. Periodic maintenance treatments may be required to maintain seasonal control. It is recommended to consult a SePRO Aquatic Specialist to determine optimal use rate, location of treatment stations and treatment period under local conditions.

### Slug Application Method for Flowing Irrigation Canals with no Functioning Potable Water Intakes

Do not use this method of application in flowing canals with functioning potable water intakes at or downstream from the application site.

For optimal control, apply Captain XTR as soon as algae begin active growth or interfere noticeably with normal delivery of water. Heavy infestations and low flow may cause poor distribution resulting in unsatisfactory control. Under these conditions repeated applications or increasing water flow rate during application may be necessary. Apply Captain XTR into the irrigation canal or lateral at 0.05 (6.4 fluid ounces) to 0.55 gallons (70 fluid ounces) per CFS as a slug or dump application (see above for determining CFS). Depending upon water hardness, alkalinity, velocity and algae conditions, a slug application is typically required every 5 to 30 miles. High water hardness or alkalinity levels may require the use of higher rates within the rate range above to achieve control. When velocity levels are higher (>1 foot per second) distance between drop stations for slug applications can be increased.

### Chemigation System Application

Captain XTR may be applied for the maintenance of chemigation systems. To control algae in chemigation systems Captain XTR should be applied continuously during water application. For continuous addition application apply 0.91 - 9.1 gallons of Captain XTR per 1,000,000 (one million) gallons of water (0.3 - 3.0 gallons of Captain XTR per acre-foot of water). This will produce a concentration of 0.1 to 1.0 ppm of copper. Do not exceed 1.0 ppm of copper or 0.91 gallons of Captain XTR per 100,000 gallons of water. For additional guidance regarding specific calibrations or application techniques contact application equipment manufacturer, supplier, or pest control advisor. It is not necessary to agitate or dilute Captain XTR in the supply tank before application to chemigation systems.

TABLE 3 Application Rates for Chemigation Systems				
Copper Concentration (ppm)	Amount of Captain			
	Per Acre-foot		Per Million Gallons	
	Gallons	Liters	Gallons	Liters
0.1	0.3	1.1	0.9	3.4
0.2	0.6	2.3	1.8	6.8
0.3	0.9	3.4	2.8	10.6
0.4	1.2	4.5	3.7	14.0
0.5	1.5	5.7	4.6	17.4
0.6	1.8	6.8	5.5	22.8
0.7	2.1	7.9	6.4	24.2
0.8	2.4	9.1	7.3	27.6
0.9	2.7	10.2	8.3	31.4
1.0	3.0	11.3	9.1	34.4

### CHEMIGATION SYSTEM APPLICATION

- Apply Captain XTR only through sprinkler and drip irrigation systems including: center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move; flood (basin), furrow, border or drip (trickle) systems.
- Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from non-uniform distribution of treated water.
- If you have questions about calibration, contact your SePRO Aquatic Specialist, State Extension Service, equipment manufacturer, 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 (refer to the *Chemigation Systems Connected to a Public Water Supply* section of this label).
- 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. The injection system should be inspected, calibrated, and maintained before application of Captain XTR begins.

### Chemigation Systems Connected to a Public Water Supply

- 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, back flow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of 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.
- 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.
- 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.
- Do not apply when wind speed favors drift beyond the area intended for treatment.



#### Sprinkler Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- 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 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.
- Do not apply when wind speed favors drift beyond the area intended for treatment.

#### Floor (Basin), Furrow and Border Chemigation Requirements

- Systems using a gravity flow pesticide dispensing system must meter the pesticide into the water at the head of the field and downstream of a hydraulic discontinuity such as a drop structure or weir box to decrease potential for water source contamination from back flow if water flow stops.
- Systems utilizing a pressurized water and pesticide injection system must meet the following requirements:
  - o The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
  - o The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump.
  - o The pesticide injection 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.
  - o The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
  - o 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.
  - o 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.

#### Drip (Trickle) Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- 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 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.

## STORAGE AND DISPOSAL

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

**Pesticide Storage:** Store in a cool dry place. Do not store near feed or foodstuffs. In case of leak or spill, use absorbent materials to contain liquids and dispose in a manner consistent with the pesticide disposal instructions.

**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. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

#### **Container Handling**

**Nonrefillable Container. DO NOT reuse or refill this container.** Triple rinse or pressure rinse container (or equivalent) promptly after emptying; then offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures approved by state and local authorities.

**Triple rinse containers small enough to shake (capacity  $\leq 5$  gallons) as follows:** Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container  $\frac{1}{4}$  full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank, or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

**Triple rinse containers too large to shake (capacity  $> 5$  gallons) as follows:** Empty the remaining contents into application equipment or a mix tank. Fill the container  $\frac{1}{4}$  full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank, or store rinsate for later use or disposal. Repeat this procedure two more times.

**Pressure rinse as follows:** Empty the remaining contents into application equipment or mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank, or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

**Refillable Container.** Refill this container with pesticide only. **DO NOT** reuse this container for any other purpose. Triple rinsing the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller.

**Triple rinse as follows:** To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10% full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times.

When this container is empty, replace the cap and seal all openings that have been opened during use; return the container to the point of purchase or to a designated location. This container must only be refilled with a pesticide product. Prior to refilling, inspect carefully for damage such as cracks, punctures, abrasions, worn-out threads and closure devices. Check for leaks after refilling and before transport. **DO NOT** transport if this container is damaged or leaking. If the container is damaged, or leaking, or obsolete and not returned to the point of purchase or to a designated location, triple rinse emptied container and offer for recycling, if available, or dispose of container in compliance with state and local regulations.



---

## TERMS AND CONDITIONS OF USE

---

If terms of the following *Warranty Disclaimer*, *Inherent Risks of Use* and *Limitation of Remedies* are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, to the extent consistent with applicable law, use by the buyer or any other user constitutes acceptance of the terms under *Warranty Disclaimer*, *Inherent Risks of Use*, and *Limitation of Remedies*.

---

## 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. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, 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 this 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 or the seller. To the extent consistent with applicable law, all such risks shall be assumed by buyer.

---

## LIMITATION OF REMEDIES

---

To the extent consistent with applicable law, 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 the product bought, or
- (2) Replacement of amount of the product used.

To the extent consistent with applicable law, 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*, *Inherent Risks of Use*, and this *Limitation of Remedies* cannot 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 this *Limitations of Remedies* in any manner.

©Copyright 2014 SePRO Corporation

Captain® and Littora® are registered trademarks of SePRO Corporation.  
Cascade® and Teton® are registered trademarks of United Phosphorus, Inc.





**SePRO Corporation**  
11550 North Meridian Street, Suite 600  
Carmel, IN 46032, U.S.A.

# SAFETY DATA SHEET



## Captain® XTR Algaecide

### Section 1. Identification

**GHS product identifier** : Captain® XTR Algaecide

**Other means of identification** : Not available.

**EPA Registration No. :** 67690-9

**Relevant identified uses of the substance or mixture**

Aquatic Algaecide.

**Supplier's details** : 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: 317-580-8290  
Monday - Friday, 8am to 5pm E.S.T.  
www.sepro.com

**Emergency telephone number (with hours of operation)** : **INFOTRAC - 24-hour service 1-800-535-5053**

The following recommendations for exposure controls and personal protection are intended for the manufacture, formulation and packaging of this product.  
For applications and/or use, consult the product label. The label directions supersede the text of this Safety Data Sheet for application and/or use.

### Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : ACUTE TOXICITY (oral) - Category 4  
SKIN CORROSION/IRRITATION - Category 2  
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A

**GHS label elements**

**Hazard pictograms** : Exclamation mark

**Signal word** : Warning

**Hazard statements** : Harmful if swallowed.  
Causes serious eye irritation.  
Causes skin irritation.

**Precautionary statements**

**Prevention** : Wear protective gloves. Wear eye or face protection. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.



## Section 2. Hazards identification

- Response** : IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
- Storage** : Not applicable.
- Disposal** : Dispose of contents and container in accordance with all local, regional, national and international regulations.
- Hazards not otherwise classified** : None known.

## Section 3. Composition/information on ingredients

- Substance/mixture** : Mixture
- Other means of identification** : Not available.

### CAS number/other identifiers

- CAS number** : Not applicable.

Ingredient name	%	CAS number
Copper Triethanolamine Complex	14.9	82027-59-6
Copper Monoethanolamine Complex	13.3	14215-52-2
Proprietary ingredient 1	10 - 30	-
Proprietary ingredient 2	10 - 30	-
Proprietary ingredient 3	10 - 30	-
Proprietary ingredient 4	30 - 60	-

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

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.

Occupational exposure limits, if available, are listed in Section 8.

## Section 4. First aid measures

### Description of necessary first aid measures

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Get medical attention.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. 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.
- Skin contact** : Flush contaminated skin with plenty of water. Continue to rinse for at least 20 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

## Section 4. First aid measures

- Ingestion** : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

- Eye contact** : Causes serious eye irritation.
- Inhalation** : Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
- Skin contact** : Causes skin irritation.
- Ingestion** : Harmful if swallowed. Irritating to mouth, throat and stomach.

#### Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:  
pain or irritation  
watering  
redness
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Adverse symptoms may include the following:  
irritation  
redness
- Ingestion** : No known significant effects or critical hazards.

### Indication of immediate medical attention and special treatment needed, if necessary

- 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.
- Specific treatments** : No specific treatment.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : No specific fire or explosion hazard.

## Section 5. Fire-fighting measures

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide  
nitrogen oxides  
metal oxide/oxides
- Special protective actions for fire-fighters** : No special measures are required.
- 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.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. 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.
- For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

- 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 and materials for containment and cleaning up

- 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.

## Section 7. Handling and storage

### Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. 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.
- Advice on general occupational hygiene** : 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. See also Section 8 for additional information on hygiene measures.

## Section 7. Handling and storage

**Conditions for safe storage, including any incompatibilities** : 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.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

Ingredient name	Exposure limits
Proprietary ingredient 1	<b>ACGIH TLV (United States, 3/2012).</b> TWA: 5 mg/m <sup>3</sup> 8 hours.
Proprietary ingredient 2	<b>ACGIH TLV (United States, 2/2010).</b>
	STEL: 15 mg/m <sup>3</sup> 15 minutes.
	STEL: 6 ppm 15 minutes.
	TWA: 7.5 mg/m <sup>3</sup> 8 hours.
	TWA: 3 ppm 8 hours.
	<b>NIOSH REL (United States, 6/2009).</b>
	STEL: 15 mg/m <sup>3</sup> 15 minutes.
	STEL: 6 ppm 15 minutes.
	TWA: 8 mg/m <sup>3</sup> 10 hours.
	TWA: 3 ppm 10 hours.
	<b>OSHA PEL (United States, 6/2010).</b>
	TWA: 6 mg/m <sup>3</sup> 8 hours.
	TWA: 3 ppm 8 hours.

**Appropriate engineering controls** : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

### Individual protection measures

**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.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

#### Skin protection

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

## Section 8. Exposure controls/personal protection

- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Use a properly fitted, air-purifying or supplied air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Liquid.
- Color** : Blue. [Dark]
- Odor** : Ammoniacal. [Slight]
- Odor threshold** : Not available.
- pH** : 10 to 10.5
- Melting point** : Not available.
- Boiling point** : 100°C (212°F)
- Flash point** : Open cup: >93.3°C (>199.9°F)
- Burning time** : Not applicable.
- Burning rate** : Not applicable.
- Evaporation rate** : <1 (Butyl acetate = 1)
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Not available.
- Vapor pressure** : 2.3 kPa (17 mm Hg) [room temperature]
- Vapor density** : 3.5 [Air = 1]
- Relative density** : 1.2
- Solubility** : Miscible in water.
- Solubility in water** : Not available.
- Partition coefficient: n-octanol/water** : Not available.
- Auto-ignition temperature** : Not available.
- Decomposition temperature** : 198.89°C (390°F)
- SADT** : Not available.
- Viscosity** : Not available.

## Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Conditions to avoid** : No specific data.

## Section 10. Stability and reactivity

**Incompatible materials** : Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis. Strong acids and nitrites.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Captain® XTR Algaecide	LD50 Dermal LD50 Oral	Rabbit Rat	>2000 mg/kg 590 mg/kg	- -

#### Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Captain® XTR Algaecide	Eyes - Severe irritant Skin - Severe irritant	Rabbit Rabbit	- -	0.1 ml 0.5 ml	- -

#### Sensitization

Product/ingredient name	Route of exposure	Species	Result
Captain® XTR Algaecide	skin	Guinea pig	Not sensitizing

#### Mutagenicity

There is no data available.

#### Carcinogenicity

There is no data available.

#### Reproductive toxicity

There is no data available.

#### Teratogenicity

There is no data available.

#### Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Proprietary ingredient 2	Category 3	Not applicable.	Respiratory tract irritation

#### Specific target organ toxicity (repeated exposure)

There is no data available.

#### Aspiration hazard

There is no data available.

**Information on the likely routes of exposure** : Routes of entry anticipated: Oral, Dermal, Inhalation, Eye.

#### Potential acute health effects

**Eye contact** : Causes serious eye irritation.

**Inhalation** : Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.



## Section 11. Toxicological information

- Skin contact** : Causes skin irritation.  
**Ingestion** : Harmful if swallowed. Irritating to mouth, throat and stomach.

### Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:  
 pain or irritation  
 watering  
 redness
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Adverse symptoms may include the following:  
 irritation  
 redness
- Ingestion** : No known significant effects or critical hazards.

### Delayed and immediate effects and also chronic effects from short and long term exposure

#### Short term exposure

- Potential immediate effects** : No known significant effects or critical hazards.
- Potential delayed effects** : No known significant effects or critical hazards.

#### Long term exposure

- Potential immediate effects** : No known significant effects or critical hazards.
- Potential delayed effects** : No known significant effects or critical hazards.

#### Potential chronic health effects

- General** : No known significant effects or critical hazards.
- 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.

### Numerical measures of toxicity

#### Acute toxicity estimates

There is no data available.

## Section 12. Ecological information

### Toxicity

Product/ingredient name	Result	Species	Exposure
Proprietary ingredient 1	Acute EC50 609.98 mg/L Fresh water	Crustaceans - <i>Ceriodaphnia dubia</i> - Neonate	48 hours
	Acute LC50 11800 mg/L Fresh water	Fish - <i>Pimephales promelas</i>	96 hours
	Chronic NOEC 16 mg/L Fresh water	Daphnia - <i>Daphnia magna</i>	21 days
Proprietary ingredient 2	Acute EC50 80 mg/L Fresh water	Algae - <i>Isochrysis galbana</i>	96 hours
	Acute LC50 >100 mg/L Marine water	Crustaceans - <i>Crangon crangon</i> - Adult	48 hours
	Acute LC50 170 mg/L Fresh water	Fish - <i>Carassius auratus</i>	96 hours
Proprietary ingredient 3	Acute EC50 4.53 mg/L Fresh water	Crustaceans - <i>Ceriodaphnia dubia</i> - Neonate	48 hours

## Section 12. Ecological information

### Persistence and degradability

There is no data available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
Proprietary ingredient 2	-1.31	-	low

### Mobility in soil





Soil/water partition coefficient (K<sub>oc</sub>) : Not available.

Other adverse effects : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

## Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN1760	UN1760	UN1760
UN proper shipping name	CORROSIVE LIQUID, N.O.S. (Alkanolamines)	CORROSIVE LIQUID, N.O.S. (Alkanolamines). Marine pollutant (Copper Monoethanolamine Complex, Copper Triethanolamine Complex)	CORROSIVE LIQUID, N.O.S. (Alkanolamines)
Transport hazard class(es)	8 	8  	8 
Packing group	III	III	III
Environmental hazards	No.	Yes.	No.
Additional information	- FOR PACKAGES SIZES GREATER THAN ONE GALLON	-FOR PACKAGES SIZES GREATER THAN ONE GALLON	-FOR PACKAGES SIZES GREATER THAN ONE GALLON

## Section 14. Transport information

**Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** : Not available.

## Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined  
**Commerce control list precursor:** Proprietary ingredient 1  
**United States inventory (TSCA 8b):** Not determined.  
**Clean Water Act (CWA) 307:** Copper Monoethanolamine Complex; Copper Triethanolamine Complex

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not listed

**Clean Air Act Section 602 Class I Substances** : Not listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

### SARA 302/304

#### Composition/information on ingredients

No products were found.

**SARA 304 RQ** : Not applicable.

### SARA 311/312

**Classification** : Immediate (acute) health hazard

#### Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Proprietary ingredient 2	10 - 30	No.	No.	No.	Yes.	No.
Proprietary ingredient 3	10 - 30	No.	No.	No.	Yes.	No.

## Section 15. Regulatory information

### SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Copper Monoethanolamine Complex	14215-52-2	13.3
	Copper Triethanolamine Complex	82027-59-6	14.9
Supplier notification	Copper Monoethanolamine Complex	14215-52-2	13.3
	Copper Triethanolamine Complex	82027-59-6	14.9

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

### State regulations

- Massachusetts** : The following components are listed: Proprietary ingredient 1; Proprietary ingredient 2
- New York** : None of the components are listed.
- New Jersey** : The following components are listed: Proprietary ingredient 1; Proprietary ingredient 2; Copper Monoethanolamine Complex; Copper Triethanolamine Complex
- Pennsylvania** : The following components are listed: Proprietary ingredient 1; Proprietary ingredient 2; Copper Monoethanolamine Complex; Copper Triethanolamine Complex

### California Prop. 65

No products were found.

### International regulations

- International lists** :
- Australia inventory (AICS)**: Not determined.
  - China inventory (IECSC)**: Not determined.
  - Japan inventory**: Not determined.
  - Korea inventory**: Not determined.
  - Malaysia Inventory (EHS Register)**: Not determined.
  - New Zealand Inventory of Chemicals (NZIoC)**: Not determined.
  - Philippines inventory (PICCS)**: Not determined.
  - Taiwan inventory (CSNN)**: Not determined.
- Chemical Weapons Convention List Schedule I Chemicals** : Not listed
- Chemical Weapons Convention List Schedule II Chemicals** : Not listed
- Chemical Weapons Convention List Schedule III Chemicals** : Listed

## Section 16. Other information

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

Health : 3 \* Flammability : 1 Physical hazards : 0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

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

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

Health : 3 Flammability : 1 Instability : 0

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

## Section 16. Other information

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### History

Date of issue mm/dd/yyyy	: 08/28/2018
Date of previous issue	: 06/08/2016
Version	: 2
Revised Section(s)	: 14
Prepared by	: SePRO Corp.
Key to abbreviations	: ATE = Acute Toxicity Estimate BCF = Bioconcentration Factor GHS = Globally Harmonized System of Classification and Labelling of Chemicals IATA = International Air Transport Association IBC = Intermediate Bulk Container IMDG = International Maritime Dangerous Goods LogPow = logarithm of the octanol/water partition coefficient MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution) UN = United Nations

### 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.

50 LBS. NET WEIGHT (22.68 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, 25.1%

See back panel for specific pesticide use directions and state restrictions.

**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 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 a 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 to an unconscious person.
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.
Notes:	Have the product container or label with you when calling a poison control center or doctor, or going for treatment. For non-emergency information concerning this product, call the National Pesticides Information Center (NPIC) at 1-800-858-7378 Monday through Friday, 8:00am to 12:00pm Pacific time (NPIC web site: <a href="http://www.npic.orst.edu">www.npic.orst.edu</a> ). For emergencies, call the poison control center 1-800-222-1222, 24 hours a day, 7 days a week
NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Product causes eye irritation	

CHEM ONE LTD

This product manufactured for  
CHEM ONE LTD.  
HOUSTON, TEXAS 77041-1104  
TEL. (713) 896-9966

MADE in México

EPA REG. NO 56576-20  
EPA EST. NO. 56576-TX-001

05/02/16

# PRECAUTIONARY STATEMENTS

## HAZARDS TO HUMANS AND DOMESTIC ANIMALS

# DANGER - PELIGRO

**CORROSIVE:** Causes irreversible eye damage. May be fatal if swallowed. Harmful if absorbed through skin. Do not get in eyes or on clothing. Avoid contact with skin. Do not breathe dust or spray mist. Wear goggles or face shield, long-sleeved shirt and long pants, socks, shoes and chemical resistant gloves made of any waterproof material.

For applications in waters destined for use as drinking water, those waters must receive additional and separate potable water treatment. Do not apply more than 1.0 ppm as metallic copper in these waters.

### PERSONAL PROTECTIVE EQUIPMENT

Mixers, loaders, applicators and other handlers must wear the following:

- Long-sleeved shirt and long pants,
- chemical-resistant gloves made of any waterproof material,
- shoes plus socks, and
- goggles or face shield.

Some materials that are chemical-resistant to this product are polyvinyl chloride, nitrile rubber, or butyl rubber. 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 by this product. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, 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. Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Users should 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

*For direct aquatic use:* This pesticide is toxic to fish and aquatic invertebrates. Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize this hazard, do not treat more than ½ of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. Consult with the State or local agency with primary responsibility for regulating pesticides before applying to public waters, to determine if a permit is required.

Certain water conditions including low pH ( $\leq 6.5$ ), low dissolved organic carbon (DOC) levels (3.0 mg/L or lower), and "soft" waters (i.e., alkalinity less than 50 mg/L), increases the potential acute toxicity to non-target aquatic organisms.

*For terrestrial use:* This pesticide is toxic to fish and aquatic invertebrates and may contaminate water through runoff. This product has a potential for runoff for several months or more after application. Poorly draining soils and soils with shallow water tables are more prone to produce runoff that contains this product. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters or rinsate.

### DIRECTIONS FOR USE

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

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the State or Tribal agency responsible for pesticide regulation.

### AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, 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 **48 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,**
- **shoes plus socks, and**
- **protective eyewear (goggles, face shield, or safety glasses).**

### 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. Do not enter or allow others to enter until sprays have dried.



### SPRAY DRIFT MANAGEMENT

A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and the method of application (e.g., ground, aerial, airblast, chemigation) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product.

**DROPLET SIZE:** Apply only as a medium or coarser spray (ASAE standard 572) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles.

**WIND SPEED:** Do not apply at wind speeds greater than 15 mph. Only apply this product if the wind direction favors on-target deposition (approximately 3 to 10 mph), and there are no sensitive areas within 250 feet downwind.

**TEMPERATURE INVERSIONS:** If applying at wind speeds less than 3 mph, the applicator must determine if a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions.

**OTHER STATE AND LOCAL REQUIREMENTS:** Applicators must follow all state and local pesticide drift requirements regarding application of copper compounds. Where states have more stringent regulations, they must be observed.

**EQUIPMENT:** All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates.

*For aerial applications:*

-The boom length must not exceed 75% of the wingspan or 90% of the rotor blade diameter.

-Release spray at the lowest height consistent with efficacy and flight safety. Do not release spray at a height greater than 10 feet above the crop canopy unless a greater height is required for aircraft safety.

-When applications are made with a crosswind, the swath must be displaced downwind. The applicator must compensate for this displacement at the up and downwind edge of the application area by adjusting the path of the aircraft upwind.

*For ground boom application:*

Do not apply with a nozzle height greater than 4 feet above the crop canopy.

### 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 Crystals 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 Crystals will be required. Algal growth is difficult to control with Copper Sulfate Crystals when water temperatures are low (less than 60° F) or when the water alkalinity is above 50 ppm. Larger quantities of Copper Sulfate Crystals 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 Crystals solution in water, the mixing container should be made of plastic, glass, or a painted, enameled, or copper-lined metal container. It is 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 they can be sprayed directly. If there is some doubt about the concentration to apply, it is best to start with the lower concentration given in the Specific Instructions below.

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 no more than one-half of the water area in a single operation and wait at least 14 days 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 Crystals).

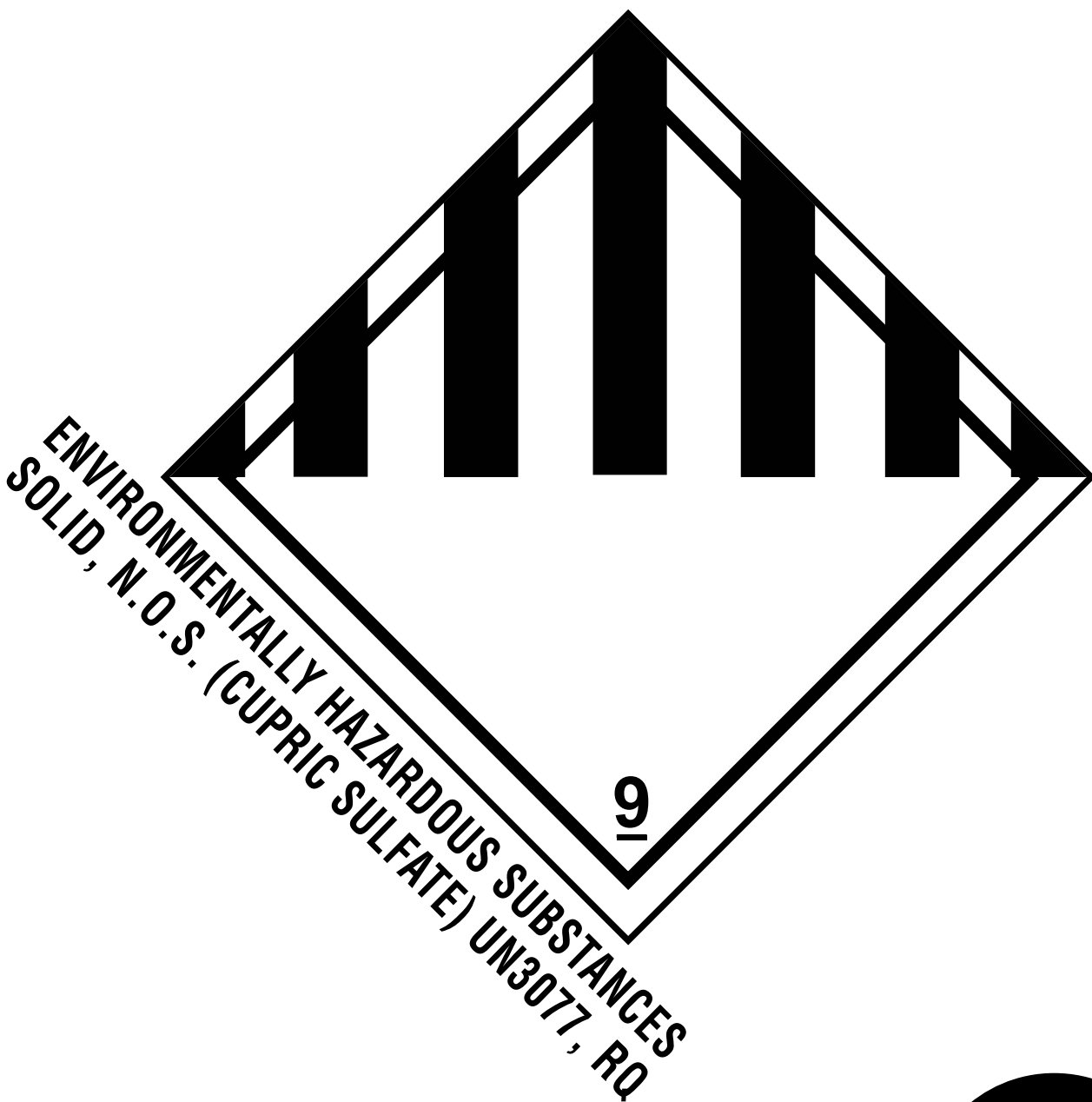
**CALCULATIONS FOR THE AMOUNT OF WATER IMPOUNDED AND FOR THE AMOUNT OF COPPER SULFATE CRYSTALS TO BE USED:** Calculate water volume as follows: (1) Obtain surface area by measuring of regular shaped ponds or mapping of irregular ponds or by reference to previously recorded engineering data or maps. (2) 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 Crystals needed to achieve the recommended concentration, multiply the weight of water by the recommended concentration of Copper Sulfate Crystals. 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 Crystals to treat 1 acre-foot of water with 2 ppm Copper Sulfate Crystals (or 0.5 ppm metallic copper), the calculation would be as follows:  
 $0.000002 \times 2,720,000 = 5.44$  lbs. Copper Sulfate Crystals

**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.





Certified to NSF/ANSI 60

## 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 Crystals 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 Crystals. 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 in **6 month** 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 in **6 or 12 month intervals**, if 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 re-grow, follow-up treatments with Copper Sulfate Crystals will be required. Applications may be made each year in the spring after plant growth begins, or during late summer or early fall, or any time a reduced water flow, thought to be caused by root growth, occurs.

Apply **2 pounds** Copper Sulfate Crystals to household sewers. Add Copper Sulfate Crystals to sewer line by pouring **1/2 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. Repeat in **6 or 12 month intervals**, if necessary.

### ROOT CONTROL IN SEPTIC TANKS, LEACH LINES AND LEACH LINE PIPES:

The majority of the Copper Sulfate Crystals will settle in the septic tank itself and little will pass into the leach lines. To treat leach line pipes, add **2 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. Repeat in **6 or 12 month intervals**, if necessary.

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

**\*NOTE:** Copper Sulfate Crystals added to an active 300 gallon septic tank at 2 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 Crystals. Copper Sulfate Crystals 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 States of Florida and Massachusetts and State of Washington.

**\*NOTE:** For all sewer line treatment applications do not use more than 2 lbs Copper Sulfate Crystals (0.5 lbs. metallic copper) per application. Minimum retreatment interval is 6 months. Make no more than two applications per calendar year. Per EPA guidelines, do not exceed 8 lbs Copper Sulfate Crystals (2 lbs metallic copper) per year.

**TO CONTROL ALGAE AND THE POTOMOGETON POND WEEDS, LEAFY AND SAGO, IN IRRIGATION SYSTEMS:** Once the amount of Copper Sulfate Crystals required for treating ditches or streams has been calculated, use a continuous application method, selecting proper equipment to supply the granular crystals. Minimum retreatment interval is 2 weeks.

**FOR ALGAE CONTROL –** Begin continuous addition application of granular Copper Sulfate Crystals when water is first turned into the system and continue throughout the irrigation season, applying **0.1 to 0.2 lbs** Copper Sulfate Crystals **per hour per cubic ft per second for 12 hours of each 24 hours**.

This rate provides 0.112 to 0.224 ppm metallic copper in the treated water. **Maximum application rate is 4 ppm Copper Sulfate Crystals** (1 ppm metallic copper). Note: 4 ppm Copper Sulfate Crystals = 10.88 lbs of product/acre ft. = 1.0 ppm metallic copper in the treated water.

**FOR LEAFY AND SAGO POND WEED CONTROL –** Use the same continuous feeder, applying **0.5 to 0.9 lbs** Copper Sulfate Crystals **per hour per cubic foot per second for 12 hours of each 24 hours**.

This provides **0.5 to 1.0 ppm** metallic copper in the treated water. **Maximum application rate is 4 ppm Copper Sulfate Crystals** (1 ppm metallic copper).

**NOTE:** For best control of leafy and sago pond weed, it is essential to begin Copper Sulfate Crystals additions when water is first turned into the system or ditch to be treated and to continue throughout the irrigation season. Copper Sulfate Crystals becomes less effective as the alkalinity increases. Its effectiveness is significantly reduced when the bicarbonate alkalinity exceeds 150 ppm. Should Copper Sulfate Crystals 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 Crystals addition as soon as possible.

Useful formulas for calculating water volume flow rates:

Multiply the water volume in cu. ft. times 7.5 to obtain gallons.

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

1 ppm Copper Sulfate Crystals = 0.25 ppm metallic copper                      1 ppm Copper Sulfate Crystals = 2.72 lb of product/acre ft

**TO CONTROL ALGAE IN IRRIGATION CONVEYANCE SYSTEMS USING THE SLUG APPLICATION METHOD:** Make an addition (dump) of Copper Sulfate Crystals into the irrigation ditch or lateral at **0.25 to 2.0 lbs per cubic foot per second of water per treatment**. Repeat on **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 Crystals decreases as the bicarbonate alkalinity increases and is significantly reduced when the alkalinity exceeds approximately 150 ppm as CaCO<sub>3</sub>. **Maximum application rate is 4 ppm Copper Sulfate Crystals** (1 ppm metallic copper).

**APPLICATION METHODS TO CONTROL ALGAE IN IMPOUNDED WATERS, LAKES, PONDS AND RESERVOIRS:** There are several methods by which to apply Copper Sulfate Crystals 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 Crystals may be **applied under the water by dragging burlap bags** containing Copper Sulfate Crystals. 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 Crystals can be applied to impounded waters by injecting a solution in water via a piping system. **Note: Maximum application rate is 4 ppm Copper Sulfate Crystals** (1 ppm metallic copper). Minimum retreatment interval is **14 days**. EPA sets the maximum application rate at 4 ppm Copper Sulfate Crystals; however, based on the table below, 0.25 to 2 ppm Copper Sulfate Crystals can be used to treat for specific genera of algae.

## COPPER SULFATE CRYSTALS 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	0.25 to 0.50 ppm*	0.50 to 1 ppm*	1 to 1.5 ppm*	1.5 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 Staurostrum 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

\* Copper Sulfate Crystals ppm (Cu metallic ppm) = lbs/acre ft  
0.25 - 0.5 ppm (0.0625 - 0.125 ppm) = 0.68 - 1.36 lbs/acre ft  
0.5 - 1.0 ppm (0.125 - 0.25 ppm) = 1.36 - 2.72 lbs/acre ft  
1.0 - 1.5 ppm (0.25 - 0.375 ppm) = 2.72 - 4.08 lbs/acre ft  
1.5 - 2.0 ppm (0.375 - 0.50 ppm) = 4.08 - 5.44 lbs/acre ft

**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: The solution of crystals must be thoroughly mixed with sludge. **Dissolve 2 lbs** of crystals in 1-2 gals of water and **apply to each 60,000 gals** of sludge. **Maximum application rate is 4 ppm Copper Sulfate Crystals** (1 ppm metallic copper). **Minimum retreatment interval is 14 days.**

**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 at the first sign of algae after the field has been flooded and prior to the algae's leaving the soil surface and rising to the water surface. **Apply to the water surface as either crystals or dissolve in water and make a surface spray.** For a 3-inch flood depth, apply Copper Sulfate Crystals at a rate of **2.72 lbs per acre**. Likewise, for a 6- inch flood depth, use **5.44 lbs per acre**. Adjust the rate according to average water depth, **not to exceed the maximum application rate of 4 ppm Copper Sulfate Crystals** (1 ppm metallic copper), which is equivalent to **10.88 lbs** Copper Sulfate Crystals / acre foot of water.

**TO CONTROL TADPOLE SHRIMP IN RICE (Domestic and Wild) FIELDS:** Tadpole shrimp in rice fields may be effectively controlled by the prompt and proper use of Copper Sulfate Crystals. After the rice field has been flooded, Copper Sulfate Crystals should be uniformly applied at the first sign of infestation. For a 3-inch flood depth, apply **6.8 lbs per acre**. For a flood depth of 6 inches, use **13.6 lbs per acre**. Adjust the rate according to average water depth, **not to exceed the maximum application rate of 10 ppm Copper Sulfate Crystals** (2.5 ppm metallic copper), which is equivalent to **27.2 lbs** Copper Sulfate Crystals/ acre foot of water.

**SCHISTOSOME-INFECTED FRESH WATER SNAILS:** For recreational lakes, reservoirs, and ponds, **5.44- 13.6 lbs/acre-ft** Copper Sulfate Crystals (i.e., 2-5 ppm Copper Sulfate Crystals), 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. A second application may be made if necessary, **10 to 14 days later. DO NOT make more than two applications per calendar year.** Apply by broadcast application using boat, aircraft, or hand equipped with power or hand seeder or underwater dispenser. **DO NOT exceed 1 ppm metallic copper** (4 ppm Copper Sulfate Crystals) in **potable water systems**. This labeling must be in the possession of the user at the time of pesticide application. **Maximum application rate is 6 ppm Copper Sulfate Crystals (1.5 ppm metallic copper).** Note: 6 ppm Copper Sulfate Crystals = 16.32 lbs of product /acre ft.

**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.

## PLANT DISEASE TREATMENT

Maximum Application Rates, Application Interval, and Season Maximum Application Rates are listed below. Weight of Copper Sulfate Crystals in lbs is followed by weight expressed as metallic copper, e.g., 1 lb Copper Sulfate Crystals equals 0.25 lb metallic copper.

**Apple: Fireblight –** Mix 5 lbs of Copper Sulfate Crystals in 100 gals of water and spray uniformly. Apply in dormant season up to 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. **DO NOT** exceed 64 lbs (16 lbs metallic copper) per acre per year. **Dormant use:** Make one application at no more than 32 lbs (8 lbs metallic copper) per acre. **Silver tip use:** Make one application at no more than 24 lbs (6 lbs metallic copper) per acre.

**Grape (Dormant): Powdery Mildew –** Apply in spring before bud-swell and before any green tissue is present. Use 4 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. **Do not** apply more than 12.0 lbs (3.0 lbs metallic copper) per acre per application. Minimum retreatment interval is 3 days. **DO NOT** exceed 80.0 lbs (20.0 lbs metallic copper) per acre per year.

**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. **DO NOT** apply more than 10 lbs (2.5 lbs metallic copper) per acre per application. Minimum retreatment interval is 5 days. Do not exceed 100 lbs. (25 lbs metallic copper) per acre per year.

#### **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. In the instruction below, weight of copper sulfate in lbs is followed by weight expressed as metallic copper, e.g., 1 lb Copper Sulfate Crystals equals 0.25 lb metallic copper.

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.

**Almond, Apricot, Peach, Nectarine: Shot Hole Fungus** – Prepare a **10-10-100 Bordeaux** mixture and apply as a dormant spray in late fall or early spring. **DO NOT** apply more than **32 lbs** copper sulfate (8 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 72 lbs** (18 lbs metallic copper) **per acre per year**.

**Almond, Apricot, Cherry, Peach, Nectarine, Plum, Prune: Brown Rot Blossom Blight** – Prepare a **10-10-100 Bordeaux** mixture and apply when buds begin to swell (late dormant). **DO NOT** apply more than **32 lbs** (8 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 72 lbs** (18 lbs metallic copper) **per acre per year**.

**Blueberries: Bacterial Canker (Not for use in California)** – Prepare and apply an **8-8-100 Bordeaux** mixture in the fall before heavy rains begin and again 4 weeks later. **DO NOT** apply more than **8.4 lbs** (2.1 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 33.6 lbs** (8.4 lbs metallic copper) **per acre per year**.

**Bulbs (Easter Lily): 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 **7 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. **DO NOT** apply more than **10 lbs** (2.5 lbs metallic copper) per acre per application. **DO NOT exceed 300 lbs** (75 lbs metallic copper) **per acre per year**. **DO NOT** apply any additional copper pesticide to this land for 36 months.

**Bulbs (all other ornamentals, Tulip, Gladiolus): Botrytis Blight** – Prepare a **8-8-80 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 **7 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. **DO NOT** apply more than **8 lbs** (2 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 80 lbs** (20 lbs metallic copper) **per acre per year**.

**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. **DO NOT** apply more than **8 lbs** (2.0 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 40 lbs** (10 lbs metallic copper) **per acre per year**.

**Cherry (Sweet): Dead Bud, Bacterial Canker (Pseudomonas Syringae)** – Prepare a **12-12-100 Bordeaux** mixture. 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. **DO NOT** apply more than **32 lbs** (8 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 72 lbs** (18 lbs metallic copper) **per acre per year**.

**Cherry (Sour): Leaf Spot** – Prepare a **10-10-100 Bordeaux** mixture. Apply as a full coverage spray after petal fall or as recommended by the State Extension Service. **DO NOT** apply more than 60 gallons or **6 lbs** (1.5 lbs metallic copper) per acre per application. Minimum retreatment interval is **5 days**. **DO NOT exceed 72 lbs** (18 lbs metallic copper) **per acre per year**.

(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.)

**Citrus: Bacterial Blast** – Prepare a **10-10-100 Bordeaux** mixture 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. **DO NOT** apply more than **12.6 lbs** (3.15 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 50.4 lbs** (12.6 lbs metallic copper) **per acre per year**.

**Citrus: 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. hiemalis* 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. **DO NOT** apply more than **12.6 lbs** Copper Sulfate Crystals (3.15 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 50.4 lbs** (12.6 lbs metallic copper) **per acre per year**.

**Citrus: 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. **DO NOT** apply more than **12.6 lbs** (3.15 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 50.4 lbs** (12.6 lbs metallic copper) **per acre per year**.

**Grape: Downy Mildew** – Prepare and apply a **2-6-100 Bordeaux** mixture 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. **DO NOT** apply more than **12.0 lbs** (3.0 lbs metallic copper) per acre per application. Minimum retreatment interval is **3 days**. **DO NOT exceed 80.0 lbs** (20.0 lbs metallic copper) **per acre per year**.

**Olive: Olive Leaf Spot (Peacock spot), Olive Knot** – Prepare a **10-10-100 Bordeaux** mixture. 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** may be used. To help protect against olive knot, apply a **10-10-100 Bordeaux** mixture before heavy rains and again in the spring. Injury may occur in areas of less than 10 inches of rainfall. **DO NOT** apply more than **24 lbs** (6.0 lbs metallic copper) per acre per application. Minimum retreatment interval is 30 days. **DO NOT exceed 72 lbs** (18 lbs metallic copper) **per acre per year**.

**Peach: Leaf Curl** – Prepare a **10-10-100 Bordeaux** mixture and apply at leaf fall or as a dormant spray in late fall or early spring before buds begin to swell. **DO NOT** apply more than **32 lbs** (8 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 72 lbs** (18 lbs metallic copper) **per acre per year**.

**Walnuts: Walnut Blight** – Prepare a **15-10-100 Bordeaux** mixture and apply 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. **DO NOT** apply more than **16 lbs** (4.0 lbs metallic copper) per acre per application. Minimum retreatment interval is **7 days**. **DO NOT exceed 128 lbs** (32 lbs metallic copper) **per acre per year**.

#### **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 non-uniform 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 appropriately 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.

#### **STORAGE AND DISPOSAL**

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

**PESTICIDE 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. Open burning and dumping is prohibited.

**CONTAINER HANDLING:** Nonrefillable container (bag). Do not reuse or refill this container. Completely empty bag into application equipment. Offer for recycling, if available. Or, 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.

(FOR RIGID, NONREFILLABLE CONTAINERS, EQUAL TO OR LESS THAN 50 LBS)

**CONTAINER HANDLING:** Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then, offer for recycling, if available, or puncture and dispose of in a sanitary landfill, or by incineration.

(FOR RIGID, NONREFILLABLE CONTAINERS GREATER THAN 50 LBS)

**CONTAINER HANDLING:** Non-refillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows. Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water. Recap and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration.

**NOTICE:** CHEM ONE LTD. warrants that this product conforms to the chemical description on the label thereof and is reasonably fit for purposes stated on such label only when used in accordance with directions under normal use conditions. It is impossible to eliminate all risks inherently associated with use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use or application, all of which are beyond the control of CHEM ONE LTD. To the extent consistent with applicable law, CHEM ONE LTD. shall not be liable for consequential, special or indirect damages resulting from the use or handling of this product. To the extent consistent with applicable law, all such risks shall be assumed by the Buyer. To the extent consistent with applicable law exclusive remedy of any buyer or user of this product for any and all losses, injuries, or damages resulting from or in any way arising from the use, handling or application of this product, whether in contract, warranty, tort, negligence, strict liability or otherwise, shall not exceed the purchase price paid for this product or at CHEM ONE LTD.'s election, the replacement of this product. CHEM ONE LTD. MAKES NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS STATED ABOVE.

CHEM ONE LTD.  
14140 Westfair East Dr  
HOUSTON, TEXAS 77041-1104

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

# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

## \*\*\* Section 1 - Identification \*\*\*

**Chemical Name:** Copper Sulfate Pentahydrate

**Product Use:** Specific applications are listed on the label for the product

### RESTRICTIONS on USE

**SPECIFIC RESTRICTION ARE LISTED ON THE LABEL FOR THE PRODUCT**

#### Supplier Information

Chem One Ltd.  
14140 Westfair East Drive  
Houston, Texas 77041-1104

Phone: (713) 896-9966

Fax: (713) 896-7540

**Emergency # (800) 424-9300 or +1- (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 – Hazard(s) Identification \*\*\*

### GHS HAZARD

#### Hazard Classes

**Eye damage/irritation**

**Acute toxicity, oral**

**Acute aquatic toxicity**

**Chronic aquatic toxicity**

#### Hazard Categories

**Category 1**

**Category 4**

**Category 1**

**Category 1**

**Signal Word: Danger**



#### Pictograms:

#### Hazard Statements

##### PHYSICAL HAZARDS:

None

##### HEALTH HAZARDS:

H302: Harmful if swallowed

H318: Causes serious eye damage

##### ENVIRONMENTAL HAZARDS:

H410: Very toxic to aquatic life with long lasting effects

##### PRECAUTIONARY STATEMENTS:

P102: Keep out of reach of children

P202: Do not handle until all safety precautions have been read and understood

P264: Wash hands thoroughly after handling

P270: Do not eat, drink or smoke when using this product

P273: Avoid release to the environment

P280: Wear protective gloves, clothing and eye protection

##### RESPONSE STATEMENTS:

P301+P312+P330: IF SWALLOWED: Call a POISON CENTER /doctor if

# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

you feel unwell (USA National POISON CENTER 800-222-1222). Rinse mouth.  
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.  
P310: Immediately call a POISON CENTER/doctor ((USA National POISON CENTER 800-222-1222)  
P391: Collect spillage

**STORAGE STATEMENTS:**

None

**DISPOSAL STATEMENTS:**

P501: Dispose of content and/or container in accordance with local, regional, national or international regulations

**HAZARDS NOT OTHERWISE CLASSIFIED**

No data available

## \* \* \* Section 3 – Composition/information on Ingredients \* \* \*

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

**Synonyms:** Copper Sulfate Crystals, Blue Copper, Blue Stone, Blue Vitriol, Copper (II) sulfate, Cupric Sulfate, Copper Sulfate Fine 200, Fine 100, Fine 30, 20, 25, Small, Medium, Large, FCC IV, and Very High Purity

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

### Potential Health Effects: Eyes

Causes serious eye damage. Signs/symptoms may include cloudy appearance of the cornea, chemical burns, severe pain, tearing, ulcerations, significantly impaired vision or complete loss of vision.

### First Aid: Eyes

Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.

### Potential Health Effects: Skin

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

### 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.

### 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.

### 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.

### 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.

# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

## 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 nontracheal 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 \* \* \*

### 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

Copper Sulfate Pentahydrate is not flammable. Use extinguishing media suitable 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: 0 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 reinstatement 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.

### 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



# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

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. 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, 2•MAK 15 minutes, average value, 1-hr interval (copper and inorganic copper compounds)  
0.1 mg/m<sup>3</sup> TWA Peak, 2•MAK 15 minutes, average value, 1-hr interval (fume)

### 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.

### 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.

*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

#### 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.

#### Personal Protective Equipment: Respiratory

# Safety Data Sheet

## Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

If airborne concentrations are above the applicable exposure limits, use NIOSH-approved respiratory protection. 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). 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

Wash hands thoroughly after handling material. Do not eat, drink or smoke in work areas. Have a safety shower or eye-wash fountain available. Use good hygiene practices when handling this material including changing and laundering work clothing after use. Discard contaminated shoes and leather goods.

### Protective Clothing Pictograms



## \*\*\* 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>	Not applicable	<b>Vapor Density:</b>	Not applicable
<b>Initial boiling point and boiling range:</b>	Not applicable	<b>Freezing/Melting Point:</b>	150 deg C (302 deg F)
<b>Solubility (H<sub>2</sub>O):</b>	31.6 g/100 cc (@ 20 deg C)	<b>Specific Gravity:</b>	2.28 @ 15.6 deg C (H <sub>2</sub> O = 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>Flash Point:</b>	Not flammable	<b>Chemical Formula:</b>	CuSO <sub>4</sub> *5H <sub>2</sub> O
<b>Upper Flammable Limit (UEL):</b>	Not applicable	<b>Lower Flammable Limit (LEL):</b>	Not applicable
<b>Auto Ignition temperature:</b>	Not applicable	<b>Flammability (solid, gas):</b>	Not flammable
<b>Rate of Burning:</b>	Not applicable	<b>Relative density:</b>	No data available
<b>Odor threshold:</b>	Not applicable	<b>Evaporation rate:</b>	Not applicable
<b>Partition coefficient: n-octanol/water:</b>	No data available	<b>Decomposition temperature:</b>	560 deg C (Copper Sulfate)
<b>Viscosity:</b>	Not applicable		

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

# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

## 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 aluminum, steel and iron. Copper Sulfate Pentahydrate is incompatible with magnesium, strong bases, alkalines, phosphates, acetylene, hydrazine, and zirconium.

## Hazardous Decomposition

Sulfur oxides and Copper oxides.

**Hazardous Polymerization** Will not occur.

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

### Acute and Chronic Toxicity

#### A: General Product Information

Acute toxicity is largely due to the corrosive (acidic) properties of this material. Harmful or fatal if swallowed. Product causes serious eye damage. Product may cause skin irritation. Product may cause respiratory tract irritation, 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> = 330 mg/kg (testing done June 2006, Consumer Product Testing Co., Inc.); 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; 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; Subcutaneousrat 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

# Safety Data Sheet

## Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

in cellular immune response, decrease in humoral immune response; Oral-mouse TDLo: 2 gm/kg/3 weekscontinuous: 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: postimplantationmortality (e.g. dead and/or resorbed implants per total number of implants), Specific Developmental Abnormalities: Central Nervous System, body wall

### Carcinogenicity

#### A: General Product Information

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

Cytogenetic Analysis-Rat/ast 300 mg/kg

#### B: Component Carcinogenicity

This product is not listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

### 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)

### 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

# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

a residence time of 2 to 10 days in an unpolluted atmosphere and 0.1 to greater than 4 days in polluted, urban areas.

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)

## \*\*\* 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.

### Disposal Instructions

All wastes must be handled in accordance with local, state and federal regulations or with regulations of Canada and its Provinces. 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 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, or the offices of Environment Canada for guidance.

## \*\*\* Section 14 – Transport Information Ground \*\*\*

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 49 CFR, IATA and IMDG to assure regulatory compliance.

### US DOT 49 CFR 100-185 Revised April 24, 2017 Information



UN/NA #: UN 3077

Shipping Name: Environmentally Hazardous Substance, solid, n.o.s. (cupric sulfate)

Hazard Class: 9

Packing Group: III

Required Label(s): Class 9

Special Provision: 8, 146, 335, A112, B54, IB8, IP2, N20, T1, TP33

Packaging: 172.155, 172.213

RQ Quantity: For a single package, less than the RQ of 10lb (4.54 kg), the RQ designation should be not be used.

# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

**Marking:** MARINE POLLUTANT Marine Pollutant when shipping ground greater than 882 pounds' single container or any quantity by water

## Additional Shipping Information



**Limited Quantity Shipments:** Shipments, except for air, need not be marked with the Proper Shipping Name and UN # of the contents, but shall be marked with a diamond. The top and bottom portions of the square-on-point must be black and the center white or of a suitable contrasting background. The mark must be at least 2 mm. Each side must have a minimum dimension of 100 mm. Small packages which cannot reasonably accommodate a 100-mm square-on-point mark may be marked with a square-on-point mark with a minimum side dimension of 50 mm. The total weight of each outer packaging cannot exceed 30 kg (66pounds).

**Small Quantities for Highway and Rail:** The maximum quantity of this material per inner receptacle is limited to 30 g (1 ounce) per receptacle. The inner receptacles must be securely packed in an inside packaging with cushioning material to prevent movement of the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg (64 pounds). The completed package must meet the drop test requirements of 173.4(6) (I). The outside of the package must be marked with the statement

**"This package conforms to 49 CFR 173.4 for domestic highway or rail transport only."**

**Excepted Quantities:** The maximum quantity of this material per inner receptacle is limited to 30 g (1 ounce) per receptacle and the aggregate quantity of this material per completed package does not exceed 1000 g (2.2 pounds). The inner receptacles must be securely packed in an inside packaging with cushioning material to prevent movement in the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg (64 pounds). The completed package must meet a drop test. The requirements are found in 173.4(6) (I). The package must not be opened or otherwise altered until it is no longer in commerce. For highway or rail transportation no shipping paper is required. The package must be legibly marked with the following marking:



**NOTE:** The "\*\*\*" must be replaced by the primary hazard class, or when assigned, the division of each of the hazardous materials contained in the package. The "\*\*\*" must be replaced by the name of the shipper or consignee if not shown elsewhere on the package. The symbol shall be not less than 100 mm (3.9 inches) x 100 mm (3.9 inches), and must be durable and clearly visible.

**De minimis Exceptions:** The maximum quantity of this material per inner receptacle is limited to 1g (0.04 ounce) per receptacle and the aggregate quantity of this material per completed package does not exceed 100 g (0.22 pounds). The inner receptacles must be securely packed in an inside packaging with cushioning material to prevent movement in the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg (64 pounds). The completed package must meet the drop test. The requirements are found in 173.4(6) (i). The package must not be opened or otherwise altered until it is no longer in commerce and may be transported by aircraft. If all of the above requirements are met, then this material is not regulated.

### \*\*\* Section 14 – Transport Information Air \*\*\*

**58<sup>th</sup> Edition International Air Transport Association (IATA):**

For Shipments by Air transport: This information applies to air shipments both within the U.S. and for shipments originating in the U.S., but being shipped to a different country.

# Safety Data Sheet

**Material Name:** Copper Sulfate Pentahydrate

**ID:** C1-121A



**UN/NA #:** UN 3077

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

**Hazard Class:** 9 (Miscellaneous Dangerous Goods)

**Packing Group:** III

**Passenger & Cargo Aircraft Packing Instruction:** 956

**Passenger & Cargo Aircraft Maximum Net Quantity:** 400 kg

**Limited Quantity Packing Instruction (Passenger & Cargo Aircraft) :** Y956

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

**Excepted Quantities :** E1

**Excepted Quantity Maximum inner package:** 30g

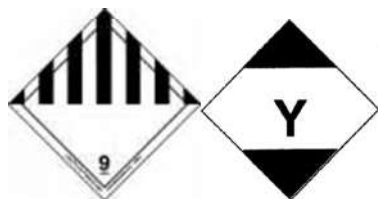
**Excepted Quantity Maximum outer package:** 1kg

**Cargo Aircraft Only Packing Instruction:** 956

**Cargo Aircraft Only Maximum Net Quantity:** 400 kg

**Special Provisions:** A97, A158, A179 A197

**ERG:** 9L



**Limited Quantity Shipments:** Shipments for air must be marked with the Proper Shipping Name and UN # shall on the package. The top and bottom portions of the square-on-point must be black and the center white or of a suitable contrasting background and the symbol “Y” must be black and located in the center of the square-on-point. The mark must be at least 2 mm. Each side must have a minimum dimension of 100 mm. Small packages which cannot reasonably accommodate a 100mm square-on-point mark may be marked with a square-on-point mark with a minimum side dimension of 50 mm. The total weight of each outer packaging cannot exceed 30 kg.

**Excepted Quantities:** The maximum quantity of this material per inner receptacle is limited to 30 g per receptacle and the aggregate quantity of this material per completed package does not exceed 1kg. The inner receptacles must be securely packed in an intermediate packaging with cushioning material to prevent movement in the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg. The completed package must meet a drop test. The requirements are found in 2.7.6.1. The package must not be opened or otherwise altered until it is no longer in commerce. For air transportation, no shipping paper is required. The package must be legibly marked with the following marking:



**NOTE:** The “\*” must be replaced by the primary hazard class, or when assigned, the division of each of the hazardous materials contained in the package. The “\*\*\*” must be replaced by the name of the shipper or consignee if not shown elsewhere on the package. The symbol shall be not less than 100 mm x 100 mm and must be durable and clearly visible.

**\* \* \* Section 14 – Transport Information Vessel \* \* \***



# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

**Amendment 38-16 International Maritime Dangerous Goods (IMDG) Code**

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



**UN/NA #:** UN 3077

**Proper Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Cupric sulfate)

**Hazard Class:** 9

**Packing Group:** III

**Special Provisions:** 274, 335, 966, 967

**Limited Quantities:** 5 kg

**Excepted Quantities:** E1

**Packing Instructions:** P002/LP02

**Provisions:** PP12

**IBC Instructions:** IBC08

**IBC Provisions:** B2

**EmS:** F-A, S-F

**Stowage and: Handling:** Category A., SW23

**Segregation:** None

**Marine Pollutant:** This material is considered a marine pollutant by the IMO and shipments of the material must carry the new marking. Refer to IMO Amendment 36-12 Chapter 2.9 and 2.10.



**Limited Quantity Shipments:** Shipments need not be marked with the Proper Shipping Name of the contents, but shall be marked with a diamond. The top and bottom portions of the square-on-point must be black and the center white or of a suitable contrasting background. The mark must be at least 2 mm. Each side must have a minimum dimension of 100 mm. Small packages which cannot reasonably accommodate a 100-mm square-on-point mark may be marked with a square-on-point mark with a minimum side dimension of 50 mm. The total weight of each outer packaging cannot exceed 30 kg (66 pounds).

**Excepted Quantities:** The maximum quantity of this material per inner receptacle is limited to 30 g per receptacle and the aggregate quantity of this material per completed package does not exceed 1000g. The inner receptacles must be securely packed in an intermediate packaging with cushioning material to prevent movement in the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg. The completed package must meet a drop test. The requirements are found in 3.5.3.1. The package must not be opened or otherwise altered until it is no longer in commerce. For air transportation, no shipping paper is required. The package must be legibly marked with the following marking:



**NOTE:** The "\*" must be replaced by the primary hazard class, or when assigned, the division of each of the hazardous materials contained in the package.

The "\*\*\*" must be replaced by the name of the shipper or consignee if not shown elsewhere on the package. The symbol shall be not less than 100 mm x 100 mm and must be durable and clearly visible.



# Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

## \*\*\* 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

### 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	N/A	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

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

# Safety Data Sheet

**Material Name: Copper Sulfate Pentahydrate**

**ID: C1-121A**

## 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).

## 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:** Chem One Ltd.

**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

9/16/03: 3:45 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 DFG MAK exposure limits. Up-Dated entire Section 14 Transportation Information to include IATA, IMO and current Canadian transport information.

06/22/05 2:24PM SEP Update IATA Section 14

01/06/2006 10:12 am SEP Corrected Section 14 DOT domestic transport exception to read 49 CFR 172.322 (d) (3).

09/08/06 2:52PM SEP Updated DOT and IMO Section 14 SEP

09/25/06 08:43 HDF Review of new toxicological data and addition of data to Section 11.

10/17/06 12:15 pm SEP Updated Section 11.

10/16/07 9:48am SEP Updated Section 14- IATA

10/10/08 3:48 PM DLY Changed Chem One Physical Address, Section 1

09/18/09 MMK Updated Section 14 limited & excepted quantities and exceptions, updated REI and treatment interval per EPA label RED

04 /07/ 11 SEP Add "F 25" Section 1

01/14/2015 GHS revision all sections

04/28/2017 Section 14

05/03/2017 Revised Section 7 Storage Procedures

Revised By:

SJC Compliance Education, Inc.

16516 El Camino Real Suite 417

Houston, TX 77062

05/15/2019 Revised Sections 2, 4, 5, 9, 11 and 16

# CUTRINE-PLUS®

## ALGAECIDE and HERBICIDE

### GENERAL INFORMATION

This product is a liquid copper-based formulation containing ethanolamine chelating agents to prevent the precipitation of copper with carbonates and bicarbonates in the water. This product effectively controls a broad range of algae including: **Planktonic** (suspended) forms such as the Cyanobacteria (*Microcystis*, *Anabaena* & *Aphanizomenon*), Green algae (*Raphidocelis* & *Cosmarium*) Golden algae (*Prymnesium parvum*) and diatoms (*Navicula* & *Fragilaria*); **Filamentous** (mat-forming) forms such as the Green Algae (*Spirogyra*, *Cladophora*, *Ulothrix* & *Rhizoclonium*) and **Benthic** (bottom-growing) forms such as *Chara* and *Nitella*. This product has also been proven effective in controlling the rooted aquatic plant, *Hydrilla verticillata*. Waters treated with this product may be used for swimming, fishing, further potable water treatment, livestock watering or irrigating turf, ornamental plants or crops after treatment.

### DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. For applications in waters destined for use as drinking water, those waters must receive additional and separate potable water treatment. Do not apply more than 1.0 ppm as metallic copper in these waters. Read entire label and use strictly in accordance with precautionary statements and directions.

### GENERAL APPLICATION RESTRICTIONS:

*(For end-use products in containers  $\geq 5$  gallons or  $\geq 50$  pounds.)*

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the State or Tribe agency responsible for pesticide regulation.

*(For end-use consumer products in containers less than 5 gallons or less than 50 pounds)*

Do not apply this product in a way that will contact adults, children, or pets, either directly or through drift. Some states may require permits for the application of this product to public waters. Check with your local authorities.

*(For all sizes)* Do not enter or allow others to enter until application of product has been completed.

### PRE-TREATMENT CONSIDERATIONS:

*(For end-use products in containers  $\geq 5$  gallons or  $\geq 50$  pounds.)*

In Potable Water Reservoirs, Lakes, Industrial Ponds & Wastewater or other monitored water systems, initial treatment with this product must be considered at the onset of nuisance bloom conditions as evidenced by initial taste and odor complaints; high cell counts or chlorophyll *a* concentrations; high MIB or geosmin concentrations; visible surface scum formations; low Secchi disk readings; significant daily fluctuations in dissolved oxygen; and/or sudden increases in pH. Monitoring of several of these parameters on a regular basis will assist in optimizing the timing of treatments and reducing the amounts of this product needed for seasonal control. Identification of primary nuisance species or genera may also be helpful in determining and refining dosage rates.

*(For end-use consumer products in containers less than 5 gallons or less than 50 pounds)*

In Ponds (Farm, Fire, Fish, Golf Course, Irrigation, Ornamental, Storm water Retention, Swimming), Small Lakes, Fish Hatcheries, Aquaculture Facilities, treatment with this product should be started when visible, actively growing algae and susceptible plants appear in spring, preferably before significant surface accumulations occur. Aeration and/or fountain system, where available, should be in operation at the time of treatment.

### Spray Drift Management

A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and the method of application (e.g., ground, aerial, airblast, chemigation) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product.

### Droplet Size

Apply only as a medium or coarser spray (ASAE standard 572) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles.

### Wind Speed

Do not apply at wind speeds greater than 15 mph. Only apply this product if the wind direction favors on-target deposition (approximately 3 to 10 mph), and there are no sensitive areas within 250 feet down wind.

### Temperature Inversions

If applying at wind speeds less than 3 mph, the applicator must determine if a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions.

### Other State and Local Requirements

Applicators must follow all state and local pesticide drift requirements regarding application of copper compounds. Where states have more stringent regulations, they must be observed.

### Equipment

All ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates.

FOR USE IN: LAKES; POTABLE WATER RESERVOIRS; PONDS; FISH HATCHERIES AND RACEWAYS; CROP AND NON-CROP IRRIGATION CONVEYANCE SYSTEMS (DITCHES, CANALS AND LATERALS)

### ACTIVE INGREDIENTS:

Copper Ethanolamine Complex, Mixed (Mono CAS# 14215-52-2 and Tri CAS# 82027-59-6)\* .....27.9%

OTHER INGREDIENTS.....72.1%

TOTAL.....100.0%

\*Metallic copper equivalent, 9%.  
Contains 0.909 lbs. of elemental copper per gallon.

## KEEP OUT OF REACH OF CHILDREN CAUTION

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.)

See Additional Precautions on Back Panel



SCAN TO VIEW ON YOUR  
MOBILE PHONE

Manufactured for:  
Applied Biochemists  
W175 N11163 Stonewood Drive  
Suite 234  
Germantown, Wisconsin 53022  
1-800-558-5106  
www.appliedbiochemists.com  
Pat. No. 3,930,834  
EPA Reg. No. 8959-10  
EPA Est. No. 42291-GA-1



This specimen label is intended as informational purposes only and not for use as container labeling.

## SURFACE SPRAY / INJECTION

### SLOW-FLOWING OR QUIESCENT WATER BODIES

#### ALGAECIDE APPLICATION

For effective control, proper chemical concentration must be maintained for a minimum of three hours contact time. The application rates in the chart are based on static or minimal flow situations. Where significant dilution or loss of water from unregulated inflows or outflows occur (raceways) within a three hour period, chemical may have to be metered in.

1. Identify the form of algae growth present as one of the following types: Planktonic (suspended), Filamentous (mat forming), or Benthic (Chara/Nitella) and estimate

Table 1 - Copper Concentration

Form of Algal Growth	Density of Growth		
	Low	Medium	High
Planktonic	0.2	0.4	0.6
Filamentous	0.2	0.6	0.8
Benthic	0.4	0.7	1.0

Table 2 - Product Application Rate (Gallons)

PPM Copper	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Gallon per Acre-ft	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0

3. Determine acre-feet within the intended treatment area (area of infestation) by measuring length, width plus averaging several depth readings within the treatment area. Use the formula:

$$\frac{\text{Length (ft.)} \times \text{Width (ft.)} \times \text{Avg. Depth (ft.)}}{43,560} = \text{Acre-Feet}$$

4. Multiply Acre-Feet calculated in Step #3 times the gallons of this product determined in Step #2 to determine number of gallons of this product required for the intended treatment area.
5. Before applying, dilute the required amount of this product with enough water to ensure even distribution with the type of equipment being used. Typical dilution range is 9:1 when using backpack-type sprayer or up to 50:1 when using water pump equipment or large tank sprayers.
6. Break up floating algae mats manually before spraying or with force of power sprayer if one is used. Use hand or power sprayer adjusted to rain-sized droplets to cover area evenly taking water depth into consideration. If using underwater injection systems such as drop hoses or booms with weighted drop hoses, ensure boat pattern is uniform throughout treatment area. Spray shoreline areas first to avoid trapping fish.
7. Clean spray equipment by flushing with clean water after treatment and follow **STORAGE AND DISPOSAL** instructions on the label for empty or remaining partial containers.
8. Under conditions of heavy infestation, treat only 1/3 to 1/2 of the water body at a time to avoid fish suffocation caused by oxygen depletion from decaying algae. (see additional Environmental Hazards).

#### OTHER TREATMENT FACTORS AND CONSIDERATIONS

- Calm and sunny conditions when water temperature is at least 60°F will usually expedite control results.
- Effective control of algae requires direct contact with all cells throughout the water column, since these plants do not have vascular systems to transport copper from cell to cell.
- Visible reduction in algae growth should be observed in 24 to 48 hours following application with full infestation and water temperatures.
- Re-treat areas if re-growth or new growth begins to appear and seasonal control is desired. Identify new growth to re-check required copper concentration that may be needed for control. Apply treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas.
- No more than 1/2 of the water body may be treated at one time. (refer to Environmental Hazards for additional guidance)
- The minimum retreatment interval between consecutive treatments is 14 days.

**CUTRINE-PLUS® Granular Algaecide** may be used as an alternative in low volume flow situations, spot treatments or treatment of bottom-growing algae in deep water.

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

#### HERBICIDE APPLICATION (For Hydrilla Control)

**CUTRINE-PLUS®:** Control of *Hydrilla verticillata* can be obtained from copper concentrations of 0.4 to 1.0 ppm resulting from product treatment. Choose the application rate based upon stage and density of Hydrilla growth and respective water depth from the chart below.

#### CUTRINE-PLUS®: HARVESTER® TANK MIX

On waters where enforcement of use restrictions for recreational, domestic and irrigation uses are acceptable, the following mixture can be used as an alternative Hydrilla control method.

Tank mix 3 gallons of **CUTRINE-PLUS®** with 2 gallons of **HARVESTER®**. Apply mixture at the rate of 5 gallons per surface acre. Dilute with at least 9 parts water and apply as a surface spray or underwater injection.

Observe all cautions and restrictions on the labels of both products used in this mixture.

Application Rates  
Gallons/Surface Acre\*

Growth/Stage Relative Density	PPM copper	Depth (in feet)*					
		1	2	3	4	5	6
Early Season Low Density	0.4	1.2	2.4	3.6	4.8	6.0	7.2
	0.5	1.5	3.0	4.5	6.0	7.5	9.0
	0.6	1.8	3.6	5.4	7.2	9.0	10.8
Mid-Season Moderate Density	0.7	2.1	4.2	6.3	8.4	10.5	12.6
	0.8	2.4	4.8	7.3	9.6	12.0	14.4
Late Season High Density	0.9	2.7	5.4	8.1	10.8	13.5	16.2
	1.0	3.0	6.0	9.0	12.0	15.0	18.0

\*Application rates for depths greater than six feet may be obtained by adding the rates given for the appropriate combination of depths. Application rates should not result in excess of 1.0 ppm copper concentration within treated water.

#### FLOWING WATER

#### DRIP SYSTEM APPLICATION -

#### FOR USE IN POTABLE WATER AND IRRIGATION CONVEYANCE SYSTEMS

#### PRE-TREATMENT CONSIDERATIONS

In **Crop and Non-Crop Irrigation Conveyance Systems:** Ditches Canals & Laterals, product treatments must be applied as soon as algae or aquatic vascular plants begin to interfere noticeably with normal delivery of water (clogging of lateral headgates, suction screens, weed screens and siphon tubes). Delaying treatment could perpetuate the problem causing massing and compacting of plants. Heavy infestations and low flow conditions may require increasing water flow rate during application.

Accurately determine water flow rates. In the absence of weirs, orifices, or similar devices which give accurate water flow measurements, volume of flow may be estimated by the following formula:

$$\text{Average Width (feet)} \times \text{Average Depth (feet)} \times \text{Velocity* (feet/second)} \times 0.9 = \text{Cubic Feet per Second (C.F.S.)}$$

\*Velocity is the time it takes a floating object to travel a given distance. Dividing the distance traveled (feet) by the time (seconds) will yield velocity (feet/second). Repeat this measurement at least three times at the intended application site then averaged.

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

- Calculate the amount of this product needed to maintain the drip rate for a period of 3 hours by multiplying Qts./Hr. x 3; ml/Min. x 180; or Fl. Oz./Min. x 180. Dosage will maintain

WATER FLOW RATE		PRODUCT DRIP RATE*		
C.F.S.	Gal./Min.	Qts./Hr.	ml/Min.	Fl.Oz./Min.
1	450	1	16	0.5
2	900	2	32	1.1
3	1350	3	47	1.6
4	1800	4	63	2.1
5	2250	5	79	2.7

1.0 ppm Copper concentration in the treated water for the 3 hour period. Introduction of the chemical should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of 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 stop watch and appropriate measuring container to set the desired drip rate. Readjust accordingly if flow rate changes during the 3 hour treatment period.

- Distance of control obtained down the waterway will vary depending upon density of vegetation growth. Treatment period may have to be extended up to 6 hours in areas where control may be difficult due to high flows or significant growth. Periodic maintenance treatments may be required to maintain seasonal control.



## Chemigation System Application

This product may be applied for the maintenance of chemigation systems. To control algae in chemigation systems this product should be applied continuously during water application. For continuous addition application apply 0.60 – 3.0 gallons of this product per 1,000,000 (one million) gallons of water (1.80 - 9.0 gallons of this product per acre-foot of water). The copper concentration range is 0.20 to 1.0 ppm. Do not exceed 1.0 ppm of copper or 2.75 gallons of this product per 100,000 gallons of water. For additional guidance regarding specific calibrations or application techniques contact application equipment manufacturer, supplier, or pest control advisor. It is not necessary to agitate or dilute this product in the supply tank before application to chemigation systems.

Application Rates for Chemigation Systems	
Copper Concentration (ppm)	Amount of This Product Per Acre-Foot
	Gallons
0.2	0.60
0.3	0.90
0.4	1.20
0.5	1.50
0.6	1.80
0.7	2.10
0.8	2.40
0.9	2.70
1.0	3.00

## CHEMIGATION SYSTEM APPLICATION

- Apply product only through sprinkler and drip irrigation systems including: center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move; flood (basin), furrow, border or drip systems.
- Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from non-uniform distribution of treated water.
- If you have questions about calibration, contact Applied Biochemists, State Extension Service, equipment manufacturer, 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 (refer to the **Chemigation Systems Connected to a Public Water Supply** section of this label).
- Trained personnel, 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. The system should be inspected, calibrated, and maintained before product application begins.

## Chemigation Systems Connected to a Public Water Supply

- Public water system is 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, back flow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of 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 backflow of solution toward the injection.
- 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.
- 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 in use and capable of being fitted with a system interlock.
- Inspect, calibrate and maintain the system before product application.

## Sprinkler Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
- The pesticide injection 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.
- Do not apply when drift would extend beyond the area intended for treatment.

## Floor (Basin), Furrow and Border Chemigation Requirements

- Gravity Flow Systems pesticide dispensing system must meter the pesticide into the water at the head of the field and downstream of a hydraulic discontinuity such as a drop structure or weir box to decrease potential for water source contamination from back flow if water flow stops.
- Pressurized water systems with a pesticide injection system must meet the following requirements:
  - The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
  - The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
  - The pesticide injection 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.

## Drip Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
- The pesticide injection 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.

## Submersed Plant Control Applications

This product can be applied to control hydrilla (*Hydrilla verticillata*), egeria (*Egeria densa*), and other aquatic weeds susceptible to copper treatment. Apply at a rate to achieve 0.70 to 1.0 ppm copper (3.72 to 5.32 Gallons/Acre foot). In heavily infested areas, a second application after the 14 day retreatment interval may be necessary.

## Tank Mix Applications

This product can be tank mixed with other herbicides to improve efficacy; and to control algae in areas where heavy algae growth may cover target submersed plant species and interfere with herbicide exposure. Do not mix concentrates in tank without first adding water. To ensure compatibility, conduct a jar test before application. This product must not be mixed with any product containing a label prohibition against such mixing and must be used in accordance with the most restrictive label limitations and precautions. Label dosage rates must not be exceeded.

## 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 swallowed:

- Call a 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 a Poison Control Center or doctor.
- Do not give anything by mouth to an unconscious person.

### 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 rinsing eye.
- 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 mouth-to-mouth if possible.
- Call a Poison Control Center or doctor for further treatment advice.

Have the product container or label with you when calling a Poison Control Center or doctor, or going for treatment.

In case of emergency call 1-800-654-6911

## PRECAUTIONARY STATEMENTS

### HAZARDS TO HUMANS AND DOMESTIC ANIMALS

**CAUTION.** Harmful if swallowed or absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes or clothing.

Personal Protective Equipment (PPE)

Mixers, loaders, applicators, and other handlers must wear the following:

- Long-sleeved shirt and long pants,
- Shoes and socks.

### USER SAFETY REQUIREMENTS

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that have been drenched or heavily contaminated with the product's concentrate. Do not reuse them. Users must wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing. Wash outside of gloves before removing.

Potable water sources treated with this copper product may be used as drinking water only after proper additional potable water treatments.

### ENVIRONMENTAL HAZARDS:

**Do not use in waters containing Koi and hybrid goldfish. Not intended for use in small volume, garden pond systems.**

### FISH AND AQUATIC ORGANISMS:

Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize hazard, do not treat more than 1/2 of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. In regions where ponds freeze in winter, treatment should be done 6 to 8 weeks before expected freeze time to prevent masses of decaying algae under an ice cover. Consult with the State or local agency with primary responsibility for regulating pesticides before applying to public waters, to determine if a permit is required. This pesticide is toxic to some fish and aquatic invertebrates and may contaminate water through runoff. This product has a potential for runoff for several months or more after application. Poorly draining soils and soils with shallow water tables are more prone to produce runoff that contains this product. Do not contaminate water when disposing of equipment wash-waters or rinsate.

Certain water conditions including low pH ( $\leq 6.5$ ) low dissolved organic carbon (DOC) levels (3.0 mg/L or lower), and "soft" waters (i.e., alkalinity less than 50 mg/L), increases the potential acute toxicity to non-target aquatic organism. Potable water sources treated with copper products may be used as drinking water only after proper additional potable water treatments. Trout and other species of fish may be killed at application rates recommended on the label, especially in soft or acidic waters as described above. Do not contaminate water when disposing of equipment wash-waters or rinsate.

To protect listed species in California, contact your County Agricultural Commissioner or refer to the Department of Pesticide Regulation's PRESCRIBE Internet Database: <http://www.cdpr.ca.gov/docs/endspec/prescript>

## STORAGE & DISPOSAL:

Do not contaminate water, food or feed by storage or disposal. Open dumping is prohibited.

### PESTICIDE STORAGE:

Keep container closed when not in use. Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers. Do not reuse or refill container. Do not contaminate feed, feedstuffs, or drinking water. Do not store or transport near feed or food.

### PESTICIDE DISPOSAL:

Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

### CONTAINER DISPOSAL:

*(For  $\leq 5$  gallon non-refillable containers only):*

Nonrefillable container. Do not reuse container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

*(For  $>5$  gallon non-refillable containers only):*

Nonrefillable container. Do not reuse container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 with water and recap. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand container on its end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

*(For 275 Gallon refillable container only):* Refillable container. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill container about 10 percent full with water. Agitate vigorously or recirculate water with pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat rinsing procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

## WARRANTY

To the extent consistent with applicable law neither the manufacturer nor the seller makes any warranty, expressed or implied concerning the use of this product other than indicated on the label. To the extent consistent with applicable law buyer assumes risk of use of this material when such use is contrary to label instructions. Read and follow the label directions.

Cutrine-Plus® and Harvester® are registered trademarks of Arch Chemicals, Inc.

FOR ANY EMERGENCY, 24 HOURS / 7 DAYS, CALL:

1-800-654-6911 (OUTSIDE  
USA: 1-423-780-2970)

FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC®:

1-800-424-9300 (OUTSIDE  
USA: 1-703-527-3887)

FOR ALL SDS QUESTIONS & REQUESTS, CALL:

1-800-511-MSDS (OUTSIDE  
USA: 1-423-780-2347)

PRODUCT NAME: **AB CUTRINE-PLUS**

## SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

### Supplier

Applied Biochemists (WI)  
1400 Bluegrass Lakes Pkwy ,  
Alpharetta, GA, 30004  
USA

Telephone: +18005585106

Telefax: +12626741786

Web: [www.appliedbiochemists.com](http://www.appliedbiochemists.com)

REVISION DATE:

02/22/2017

SUPERCEDES:

06/16/2016

MSDS Number:

000000024433

SYNONYMS:

None

CHEMICAL FAMILY:

Mixture

DESCRIPTION / USE

Water treatment chemical

FORMULA:

None established

### Manufacturer

Advantis Technologies  
1200 Bluegrass Lakes Parkway  
Alpharetta, GA 30004  
United States of America (USA)

## SECTION 2. HAZARDS IDENTIFICATION

### GHS Classification

Acute toxicity (Oral)

: Category 4

### GHS label elements

Hazard pictograms



Signal word

: Warning

Hazard statements

: H302 Harmful if swallowed.



Precautionary statements : **Prevention:**  
P264 Wash skin thoroughly after handling.  
P270 Do not eat, drink or smoke when using this product.  
**Response:**  
P301 + P312 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.  
P330 Rinse mouth.  
**Storage:**  
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.  
**Disposal:**  
P501 Dispose of contents/ container to an approved waste disposal plant.

**Other hazards**

None known.

---

### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

<u>CAS OR CHEMICAL NAME</u>	<u>CAS #</u>	<u>% RANGE</u>
Triethanolamine	102-71-6	13 - 16
2-Aminoethanol	141-43-5	11 - 13
copper MEA complex	14215-52-2	11 - 15
copper TEA complex	82027-59-6	11 - 15

---

### SECTION 4. FIRST AID MEASURES

General Advice: Call a poison control center or doctor for treatment advice. For 24-hour emergency medical assistance, call Arch Chemical Emergency Action Network at 1-800-654-6911. Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

Inhalation: IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Skin Contact: 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.

Eye Contact: 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 rinsing eye. Call a poison control center or doctor for treatment advice.

Ingestion: IF SWALLOWED: Call a 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 a poison control center or doctor. Do not give anything by mouth to an unconscious person.

---

## SECTION 5. FIREFIGHTING MEASURES

Flammability Summary (OSHA): Product is not known to be flammable, combustible or pyrophoric.

### Flammable Properties

Flash Point: boils without flashing

Fire / Explosion Hazards: Will not burn

Extinguishing Media: Carbon dioxide (CO<sub>2</sub>) Dry chemical Foam

Fire Fighting Instructions: Use water spray to cool unopened containers. In case of fire, use normal fire-fighting equipment and the personal protective equipment recommended in Section 8 to include a NIOSH approved self-contained breathing apparatus.

Hazardous Combustion Products: During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

---

## SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Protection for Emergency Situations: Use the personal protective equipment recommended in Section 8 and a NIOSH approved self-contained breathing apparatus.

### Spill Mitigation Procedures

Air Release: Keep people away from and upwind of spill/leak.

Water Release: If the product contaminates rivers and lakes or drains inform respective authorities.

Land Release: Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13). The product should not be allowed to enter drains, water courses or the soil.

Additional Spill Information : Prevent further leakage or spillage if safe to do so. Evacuate personnel to safe areas. Use personal protective equipment as required.

## SECTION 7. HANDLING AND STORAGE

Handling: Do not take internally. Avoid contact with skin, eyes and clothing. Upon contact with skin or eyes, wash off with water. Avoid breathing mist or vapor.

Storage: Store in a cool, dry and well ventilated place. Isolate from incompatible materials.

Incompatible Materials for Storage: Refer to Section 10, "Incompatible Materials."

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation: Local exhaust ventilation or other engineering controls are normally required when handling or using this product to keep airborne exposures below the TLV, PEL or other recommended exposure limit.

### Protective Equipment for Routine Use of Product

Respiratory Protection : Wear a NIOSH approved respirator if levels above the exposure limits are possible., A NIOSH approved air purifying respirator with organic vapor cartridge and N95 particulate filter. Air purifying respirators should not be used in oxygen deficient or IDLH atmospheres or if exposure concentrations exceed ten (10) times the published limit.

Skin Protection : Avoid contact with skin. Impervious gloves

Eye Protection: Safety glasses with side-shields

Protective Clothing Type: Impervious clothing

General Protective Measures: Emergency eyewash should be provided in the immediate work area.

### Components with workplace control parameters

Components (CAS-No.)	Value	Control parameters	Basis (Update)
Triethanolamine (102-71-6)	TWA	5 mg/m3	ACGIH (02 2014)
2-Aminoethanol (141-43-5)	TWA	3 ppm	ACGIH (02 2014)
	STEL	6 ppm	ACGIH (02 2014)

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: liquid  
Form: liquid  
Color: dark blue  
Odor: Amine  
Molecular Weight: None established  
pH : 10.3 - 10.5

Boiling Point:	() no data available
Melting point/freezing point	no data available
Density	Not applicable
Bulk Density:	() no data available
Vapor Pressure:	no data available
Vapor Density:	> 1 (Air = 1.0)
Viscosity:	no data available
Solubility in Water:	completely miscible
Partition coefficient n-octanol/water:	no data available
Evaporation Rate:	no data available
Oxidizing:	None established
Volatiles, % by vol.:	no data available
VOC Content	This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489). This product does not contain any VOC exemptions listed under the U.S. Clean Air Act Section 450.
HAP Content	Not applicable

## SECTION 10. STABILITY AND REACTIVITY

Stability and Reactivity Summary:	Stable under normal conditions.
Conditions to Avoid:	High temperatures
Chemical Incompatibility:	Strong acids, Nitrates
Hazardous Decomposition Products:	Carbon oxides, Nitrogen oxides (NOx)
Decomposition Temperature:	None known.

## SECTION 11. TOXICOLOGICAL INFORMATION

### Component Animal Toxicology

#### Oral LD50 value:

Triethanolamine	LD50	4,200 - 11,300 mg/kg	Rat
2-Aminoethanol	LD50	1,510 mg/kg	Rat

### Component Animal Toxicology

#### Dermal LD50 value:

Triethanolamine	LD50	> 2,000 mg/kg	Rabbit
	LD50	> 18,000 mg/kg	Rat
2-Aminoethanol	LD50	1,025 mg/kg	Rabbit

### Component Animal Toxicology

AB CUTRINE-PLUS

REVISION DATE : 02/22/2017

Page 5 of 9

Inhalation LC50 value:

Product Animal Toxicity

Oral LD50 value: LD50 Believed to be approximately 3,790 mg/kg Rat

Dermal LD50 value: LD50 Believed to be > 2,000 mg/kg Rabbit

Inhalation LC50 value: no data available

Skin Irritation: Not expected to be irritating to the skin.

Eye Irritation: slight irritation

Skin Sensitization: This material is not known or reported to be a skin or respiratory sensitizer.

Triethanolamine

Acute Toxicity: May cause mild eye irritation. Ingestion may cause mild gastrointestinal discomfort. Inhalation of mist or vapor may cause irritation to the mucous membranes of the respiratory tract.

Subchronic / Chronic Toxicity: Not known or reported to cause subchronic or chronic toxicity.

Reproductive and Developmental Toxicity: Not known or reported to cause reproductive or developmental toxicity.

Mutagenicity: Not known or reported to be mutagenic.

Carcinogenicity: This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP or EPA.

## SECTION 12. ECOLOGICAL INFORMATION

Overview: Toxic to fish and other aquatic organisms.

Ecological Toxicity Values for: Triethanolamine

- |                                       |  |
|---------------------------------------|--|
| Pimephales promelas (fathead minnow)  | - Acute toxicity 96 h LC50 > 1,000 mg/l  |
| Daphnia magna (Water flea)            | - Acute toxicity 24 h EC50 1,386 mg/l    |
| Desmodesmus subspicatus (green algae) | - Growth inhibition 72 h ErC50 750 mg/l  |
| Pseudomonas putida                    | - Growth inhibition 16 h EC10 7,650 mg/l |

Ecological Toxicity Values for: 2-Aminoethanol

- |                                       |  |
|---------------------------------------|--|
| Oncorhynchus mykiss (rainbow trout)   | - Acute toxicity 96 h LC50 150 mg/l            |
| Daphnia magna (Water flea)            | - Immobilization 24 h EC50 120 mg/l            |
| Desmodesmus subspicatus (green algae) | - Growth inhibition 72 h EC50 15 mg/l          |
| activated sludge                      | - Respiration inhibition 3 h EC50 > 1,000 mg/l |
| Pseudomonas putida                    | - Growth inhibition 16 h EC10 6,300 mg/l       |

---

## SECTION 13. DISPOSAL CONSIDERATIONS

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THE MATERIAL. THE USER OF THE MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

Waste Disposal Summary : If this product becomes a waste, it DOES NOT meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D.

Disposal Methods : As a nonhazardous liquid waste, it should be disposed of in accordance with local, state and federal regulations.

---

## SECTION 14. TRANSPORT INFORMATION

**DOT**

Not dangerous goods

**TDG**

Not dangerous goods

**IATA**

Not dangerous goods

**IMDG-CODE**

Not dangerous goods

---

## SECTION 15. REGULATORY INFORMATION

This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals.

Signal word : CAUTION!  
Hazard statements : Harmful if swallowed.  
Harmful if absorbed through skin.

Causes moderate eye irritation.

**EPCRA - Emergency Planning and Community Right-to-Know Act****CERCLA Reportable Quantity**

This material does not contain any components with a CERCLA RQ.

**SARA 304 Extremely Hazardous Substances Reportable Quantity**

This material does not contain any components with a section 304 EHS RQ.

**SARA 311/312 Hazards**

See above: SECTION 2. Hazard Identification-GHS Classification

**SARA 302**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313**

The following components are subject to reporting levels established by SARA Title III, Section 313:

Components	CAS-No.	Concentration
Copper, [carbonato(2-)]dihydroxydi-	12069-69-1	

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**Clean Air Act**

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCM I Intermediate or Final VOC's (40 CFR 60.489).

**Clean Water Act**

This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.



This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

### US State Regulations

#### Massachusetts Right To Know

Components	CAS-No.
2,2',2''-Nitrilotriethanol	102-71-6
2-Aminoethanol	141-43-5

#### Pennsylvania Right To Know

Components	CAS-No.
2,2',2''-Nitrilotriethanol	102-71-6
Copper triethanolamine complex	82027-59-6
Copper, bis[2-(amino-.kappa.N)ethanolato-.kappa.O]-	14215-52-2
2-Aminoethanol	141-43-5

#### New Jersey Right To Know

Components	CAS-No.
2,2',2''-Nitrilotriethanol	102-71-6
Copper triethanolamine complex	82027-59-6
Copper, bis[2-(amino-.kappa.N)ethanolato-.kappa.O]-	14215-52-2
2-Aminoethanol	141-43-5

#### California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

## SECTION 16. OTHER INFORMATION

Major References : Available upon request.

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. ARCH CHEMICALS BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION BUT, MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS MSDS IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT ARCH CHEMICALS MSDS CONTROL AT THE PHONE NUMBER ON THE FRONT PAGE TO MAKE CERTAIN THAT THIS DOCUMENT IS CURRENT. .

# Nautique®

## Aquatic Herbicide

SPECIMEN



FOR USE IN POTABLE AND NON-POTABLE WATER SOURCES IN STILL OR FLOWING AQUATIC SITES INCLUDING LAKES, RESERVOIRS, AND PONDS, SLOW-FLOWING OR QUIESCENT WATER BODIES, CROP AND NON-CROP IRRIGATION AND DRAINAGE SYSTEMS (CANALS, DITCHES, AND LATERALS), GOLF COURSE, ORNAMENTAL, SWIMMING, AND FIRE PONDS AND FISH, SHRIMP AND OTHER AQUACULTURE.

### Active Ingredients

Copper Ethylenediamine Complex† (CAS# 13426-91-0)	13.2%
Copper Triethanolamine Complex† (CAS# 82027-59-6)	14.9%
Other Ingredients	71.9%
<b>TOTAL</b>	<b>100.0%</b>

†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.)

Refer to inside of label booklet for additional precautionary information and directions for use including first aid and storage and disposal.

**Notice:** Read the entire label before using. Use only according to label directions. **Before buying or using this product, read *Warranty Disclaimer* and *Misuse* statements inside label booklet. If terms are unacceptable, return at once unopened.**

Nautique is a registered trademark of SePRO Corporation.  
SePRO Corporation  
11550 North Meridian Street, Suite 600, Carmel, IN 46032 U.S.A.

EPA Reg. No. 67690-10  
FPL20180531

## PRECAUTIONARY STATEMENTS

### HAZARDS TO HUMANS AND DOMESTIC ANIMALS

## 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.)

**Corrosive. Causes irreversible eye damage. Causes skin burns. May be fatal if absorbed through skin. Harmful if swallowed. Harmful if inhaled. Do not get in eyes, on skin or on clothing. Avoid breathing spray or mist vapor. When handling, wear protective eyewear, clothing and chemical-resistant gloves as described under the section of this label pertaining to Personal Protective Equipment (PPE). Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Wash skin thoroughly with soap and water after handling and before eating, drinking, chewing gum, or using tobacco. Remove and wash contaminated clothing before reuse.**

### 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 a 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 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>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>

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 **INFOTRAC** at **1-800-535-5053**.

**NOTE TO PHYSICIAN:** Probable mucosal damage may contraindicate the use of gastric lavage.

For applications in waters destined for use as drinking water, those waters must receive additional and separate potable water treatment. Do not apply more than 1.0 ppm as metallic copper in any waters.

## PERSONAL PROTECTIVE EQUIPMENT (PPE)

Some materials that are chemical-resistant to this product are barrier laminate, butyl rubber ≥14 mils, or nitrile rubber ≥14 mils. If you want more options, follow the instructions for category A on an EPA chemical-resistant category selection chart.

### Mixers, loaders, applicators and other handlers must wear the following:

- Coveralls (such as Tyvek suit or similar) worn over long-sleeved shirt and long pants;
- Socks and chemical resistant footwear;
- Chemical-resistant gloves (such as nitrile or butyl rubber);
- Protective eyewear such as goggles, safety glasses, or face shield; and
- A chemical-resistant apron when mixing and loading or cleaning equipment.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them.

## USER SAFETY RECOMMENDATIONS

### Users should:

- Wash the outside of gloves before removing.
- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling Nautique. As soon as possible, wash thoroughly and change into clean clothing.

## ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and aquatic invertebrates. Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize this hazard, do not treat more than ½ of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. Consult with the State or local agency with primary responsibility for regulating pesticides before applying to public waters, to determine if a permit is required.

Certain water conditions including low pH (<6.5), low dissolved organic carbon (DOC) levels (3.0 mg/L or lower), and "soft" waters (i.e. alkalinity less than 50 mg/L), increases the potential acute toxicity to non-target aquatic organisms. Do not use in waters containing trout or other fish species that are highly sensitive to copper if the alkalinity is less than 50 ppm. Fish toxicity generally decreases when the hardness of water increases. This product must not be used in ornamental ponds containing Koi.

## DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. Read all directions for use carefully before applying this product. Use only according to label directions.

Do not apply this product in a way that concentrate will contact workers or other persons, either directly or through drift; only protected handlers may be in close proximity to the mixing area or application equipment while in use.

**Obtain Required Permits:** Consult with appropriate state or local pesticide and/or water authorities before applying this product in or around public waters. Permits and posting or treatment notification may be required by State, Tribal or local public agencies.

## PRODUCT INFORMATION

Nautique controls a variety of submersed, floating, and emergent aquatic weeds and algae in potable and non-potable water sources in still or flowing aquatic sites including lakes, reservoirs, and ponds, slow-flowing or quiescent water bodies, crop and non-crop irrigation and drainage systems (canals, ditches, and laterals), golf course, ornamental, swimming, and fire ponds and fish, shrimp and other aquaculture.

Nautique is formulated with dual chelating agents. This aids in copper uptake by aquatic plants and reduces the precipitation of copper with carbonates and bicarbonates in the water. Nautique has a broad spectrum of activity to weed species that are susceptible to copper.

## Treatment Notes

Performance of Nautique is enhanced under certain conditions. It is recommended to consult a SePRO Aquatic Specialist for guidance in implementing a treatment program to achieve optimal results. The following apply to the use of Nautique to achieve optimum effectiveness:

- Treat when growth first begins to appear (if possible) or when target vegetation and algae are actively growing.
- Apply in a manner that will ensure even distribution of the chemical within the treatment area.
- Aquatic weeds typically drop below the surface within 3 to 14 days after treatment. The complete results of treatment will be observed 1 to 4 weeks post-treatment in most cases.
- In heavily infested areas a second application may be necessary. Retreat areas if regrowth begins to appear and seasonal control is desired. Repeating application of Nautique too soon after initial application may have no effect.

## Precautions and Restrictions

- Do not apply Nautique directly to, or otherwise permit it to come into contact with any desirable plants as injury may result. Do not apply in such a way that concentrated Nautique comes in contact with crops, ornamentals, grass or other desirable plants.
- Wash spray equipment thoroughly before and after each application.

## Spray Drift Management

A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and method of application (e.g., ground, aerial, airblast, chemigation) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product.

## Droplet Size

Apply only as a medium or coarser spray (ASAE standard 572) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles.

## Wind Speed

Do not apply at wind speeds greater than 15 mph. Only apply this product if the wind direction favors on-target deposition (approximately 3 to 10 mph), and there are no sensitive areas within 250 feet downwind.

## Temperature Inversions

If applying at wind speeds less than 3 mph, the applicator must determine if a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions.

## Other State and Local Requirements

Applicators must follow all state and local pesticide drift requirements regarding application of copper compounds. Where states have more stringent regulations, they must be observed.

## Equipment

All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates.

### Additional requirements for aerial applications:

- The boom length must not exceed 75% of the wingspan or 90% of the rotor blade diameter.
- Release spray at the lowest height consistent with efficacy and flight safety. Do not release spray at a height greater than 10 feet above the water surface unless a greater height is required for aircraft safety.
- When applications are made with a crosswind, the swath must be displaced downwind. The applicator must compensate for this displacement at the up and downwind edge of the application area by adjusting the path of the aircraft upwind.

### Additional requirements for ground boom application:

Do not apply with a nozzle height greater than 4 feet above the water surface.

## APPLICATION INFORMATION

For aquatic weed control (including vascular plants and algae), do not exceed a concentration of 1.0 ppm copper during any single application. Wait at least 10 to 14 days between treatments. When treating aquaculture ponds when fish are present, do not exceed a concentration of 0.4 ppm during any single application when targeting nuisance algae; wait a minimum of 10 days between retreatments.

## Target Species

Nautique is a chelated copper formulation that provides effective control of floating, submersed, and emergent aquatic plants having sensitivity to copper including:

Brazilian elodea ( <i>Egeria densa</i> )	Naiad
Coontail	Pondweed spp.(e.g., sago, American) <sup>1</sup>
Curlyleaf pondweed	Salvinia spp. (e.g. giant and common)
Duckweed	Starry stonewort <sup>1</sup>
Elodea	Thinleaf pondweed
Eelgrass ( <i>Vallisneria</i> ) <sup>1</sup>	Watermilfoil, Eurasian <sup>1</sup>
Horned pondweed <sup>1</sup>	Water hyacinth
Hydrilla	Water lettuce
Macroalgae ( <i>Chara</i> , <i>Nitella</i> )	Widgeon grass

<sup>1</sup> Variable control may be obtained, especially in waters with higher alkalinity, and repeat applications may improve control.

## Application Methods

Nautique can be applied directly as a surface spray, subsurface through trailing weighted hoses, by aerial application, or by metering/drip in flowing water. Tank mixing or using in combination with other aquatic herbicides and algacides can broaden the spectrum of control. Surfactants, sinking agents, polymers (except CA), penetrants, or other adjuvants may be combined with Nautique to improve the retention time, sinking, and distribution of the herbicide. Nautique 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.

When treating moving water, apply the spray solution counter to the flow of water (unless metering Nautique into flowing water – see the *Flowing Water Treatment* section of this label). Nautique can be applied diluted or undiluted, whichever is most suitable to insure uniform coverage of the area to be treated. Dilution with water may be necessary at the lower application rates and when targeting floating or emergent vegetation. Dilute the required amount of Nautique with enough water to ensure even distribution in the treated area with the type of equipment being used. For best results, dilute Nautique in water to provide a minimum spray mix of 20 to 50 gallons per acre; in areas with heavy weed infestations, a total tank mix of >50 gallons per acre may be necessary.

For effective control, proper Nautique concentrations should be maintained for a minimum of three (3) hours. The rates in Table 1, *Nautique Application Rates*, are based on static or minimal flow situations. Where significant dilution occurs from untreated waters or loss of water within a three (3) hour period, Nautique may have to be metered in (refer to the *Flowing Water Treatment* section of this label).

Use the lower rates for treating soft water (less than 50 ppm alkalinity) or when targeting species with greater susceptibility to Nautique. Use the higher rates for treating less susceptible species, heavier infestations, and/or treating hard water (above 50 ppm alkalinity). Surface applications may be made from shore into shallow water along the shoreline.

## Application Rates

Application rates in Table 1 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 conveyance systems where significant water flow results in rapid off-site movement of Nautique, consult Table 2 and the *Flowing Water Treatment* section of this label for application instructions.

Application rates are calculated by using the following formula to obtain the appropriate Nautique dose/rate:

**Gallons of Nautique per surface acre** = desired concentration of metallic copper (ppm) x average depth of water (feet) x 3.0

TABLE 1: Application Rates									
Relative Plant Density	ppm copper <sup>††</sup>	Gallons Per Surface Acre				Liters Per Surface Hectare			
		Depth in Feet <sup>†</sup>				Depth in Meters <sup>†</sup>			
		1	2	3	4	0.5	0.75	1.0	1.25
Low Density	0.4	1.2	2.4	3.6	4.8	9.6	14.4	19.2	24.0
	0.5	1.5	3.0	4.5	6.0	12.0	24.1	36.1	48.2
	0.6	1.8	3.6	5.4	7.2	14.9	29.8	44.7	59.6
Medium Density	0.7	2.1	4.2	6.3	8.4	17.2	34.4	51.6	68.8
	0.8	2.4	4.8	7.3	9.6	19.5	39.0	58.5	78.0
High Density	0.9	2.7	5.4	8.1	10.8	21.8	43.6	65.4	87.2
	1.0	3.0	6.0	9.0	12.0	24.1	48.2	72.3	96.4

<sup>†</sup> For depths greater than 4 feet (1.25 meters) add rates given for the sum of the corresponding depths in the chart

<sup>††</sup> Use 0.4ppm copper only in aquaculture when fish are present for suppression of algae or in low density situations.

### Free-Floating Plants

Apply Nautique using a foliar spray at a rate of 8 - 12 gallons/acre for control of water hyacinth, duckweed, and salvinia, and up to 4 - 6 gallons/acre for control of water lettuce (do not exceed 3 gallons/acre foot). Add Nautique and the appropriate surfactant to a minimum of 20 to 50 gallons per acre with water. Use an adequate spray volume to ensure good coverage of the plant. Apply Nautique to the area where the greatest concentration of foliage is located in a manner that will optimize herbicide contact on leaf surfaces.

### Tank Mix

For a broader spectrum of control, Nautique may be mixed with other herbicides or algacides registered for aquatic use provided that no labeling prohibits such mixing. Do not exceed labeled rate or dose of any of the products in the combination. Observe the most restrictive of the labeling limitations and precautions of all products used in mixtures. To ensure compatibility, a jar test is recommended before field application of any tank mix combination. It is recommended to consult with SePRO Corporation for latest tank mix recommendations.

**NOTE:** Tank mixing or use of Nautique with any other product which is not specifically listed on the Nautique label shall be at the exclusive risk of the user, applicator and/or application adviser, to the extent allowed by applicable law.

- **Nautique + Sonar® A.S. Tank Mix (Except California)** - Nautique can be mixed with Sonar A.S. to broaden the submersed weed control spectrum of either product alone and be applied as a uniform surface spray or injected under the water's surface. For best results, apply this tank mix at a minimum of 0.5 ppm Nautique and a low to moderate rate of Sonar A.S. Lower concentrations may be effective on more susceptible species.
- **Nautique + Diquat Tank Mix** - For best results, apply Nautique/diquat (e.g. Littora®) combinations in a 2:1 ratio of Nautique:Diquat. Do not exceed maximum labeled rates for any product. For hydrilla control and control of other species with high sensitivity to copper, lower rates of Nautique may also enhance the activity of diquat. Nautique must be applied at a minimum of 0.1 ppm in combination with diquat. Higher rates may be needed in areas with dense weeds.
- **Nautique + Endothall Tank Mix** - For best results apply Nautique at a minimum rate of 1 gallon per acre foot, in combination with a low rate of endothall.

Nautique may be applied as a tank mix or simultaneously injected or used with the dipotassium salt of endothall (e.g. Cascade®) or the mono (N,N-dimethylalkylamine) salt of endothall (e.g. Teton®) to broaden the control spectrum and/or reduce injection times or rates in canals, ditches, and laterals. In flowing canals, apply Nautique via drip or injection at a typical use rate of 0.1 to 1.0 ppm in conjunction with low rates of Teton or Cascade for a minimum of one hour. Use longer application times for areas with denser weeds.

- **Tank Mix Adjuvants/Surfactants** - The addition of a surfactant is recommended to improve efficacy on floating and emergent plants. **Silicone surfactants are not recommended for floating plants as they generally can cause the plant to sink causing the spray solution to be washed off the plant.** Observe all cautions and restrictions on the labels of both products used in this mixture. Adjuvants/surfactants may also enhance performance on other species. Consult manufacturer recommendations.

### Flowing Water Treatment

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

For optimal control, Nautique should be applied as soon as submersed macrophytes or algae begin active growth or 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 product distribution resulting in unsatisfactory control. Under these conditions repeated applications or increasing the water flow rate during application may be necessary.

To achieve desired control with Nautique herbicide in flowing waters, a minimum exposure period of three hours should be maintained at a concentration of 0.5 to 1.0 ppm. Other factors to consider include: plant species and density of infestation and water temperature and hardness. Longer contact times and the highest rates may be required for less susceptible species and in difficult treatment conditions (e.g. less susceptible weed species, dense weed beds, hard water).

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:

**Cubic feet per second (cfs)** = average width (feet) x average depth (feet) x average velocity (feet/second) x 0.9

The velocity can be estimated by determining the length of time it takes a floating object to travel a defined distance. Divide the distance (feet) by the time (seconds) to estimate velocity (feet/seconds). 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 cubic feet per second(s) (cfs) or gallons/minute, find the corresponding drip rate in Table 2. For flow rates not listed in the table, multiply the flow rate by the recommended amount of Nautique in 1 cfs for application rates or use the below formula.

cfs X desired concentration of metallic copper (ppm) = quarts/hour of application

TABLE 2: Drip or Injection Application Rates For Flowing Water				
Water Flow Rate		PPM Copper	Nautique Drip Rate	
cfs	gal/min.		Quart/ hr	ml / min
1	450	0.5 - 1.0	0.5 - 1.0	7.9 - 15.7
2	900	0.5 - 1.0	1.0 - 2.0	15.7 - 31.5
3	1,350	0.5 - 1.0	1.5 - 3.0	23.6 - 47.3
4	1,800	0.5 - 1.0	2.0 - 4.0	31.5 - 63.0
5	2,250	0.5 - 1.0	2.5 - 5.0	39.4 - 78.8
10	4,500	0.5 - 1.0	5.0 - 10.0	78.8 - 157.7
100	45,000	0.5 - 1.0	50 - 100	789 - 1,577

Calculate the amount of Nautique needed to maintain the drip rate for a treatment period of 3 hours by multiplying **quart(s)/hour by 3 or milliliters/minute by 180**. For longer injection periods, multiply dosage rate by desired time in minutes or hours as appropriate.

Rates will target up to 1.0 ppm copper concentration in the treated water for the treatment period. Lower concentrations may be used on susceptible plant species or if longer exposure/injection times are maintained. Introduction of Nautique should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of the chemical.

Use a drum or tank equipped with a valve or other volume control device that can be calibrated 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. A small pump or other metering device may be used to meter Nautique into the water more accurately. Application can be made using diluted or undiluted material.

Results can vary depending upon species and density of vegetation, desired distance of control and flow rate, and impact of water quality on Nautique and efficacy. Periodic maintenance treatments may be required to maintain seasonal control (every 2 to 6 weeks). In addition, Nautique can be used in a rotational program with other herbicides labeled for flowing water for an integrated management approach. It is recommended to consult a SePRO Aquatic Specialist to determine optimal use rate location of treatment stations and duration of treatment period under local conditions.

#### Slug Application Method for Flowing Irrigation Canals with no Functioning Potable Water Intakes

Do not use this method of application in flowing canals with functioning potable water intakes at or downstream from the application site. For optimal control, apply Nautique as soon as plants begin active growth or interfere noticeably with normal delivery of water. Heavy infestations and low flow may cause poor distribution resulting in unsatisfactory control. Under these conditions repeated applications or increasing water flow rate during application may be necessary. Apply Nautique into the irrigation canal or lateral at 0.05 (6.4 fluid ounces) to 0.55 gallons (70 fluid ounces) per CFS as a slug or dump application (see above for determining CFS). Depending upon water hardness, alkalinity, velocity and plant conditions, a slug application is typically required every 5 to 30 miles. High water hardness or alkalinity levels may require the use of higher rates within the rate range above to achieve control. When velocity levels are higher (>1 foot per second) distance between drop stations for slug applications can be increased.

#### Irrigation Ponds or Reservoirs

When applying to irrigation ponds or reservoirs, 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.



## STORAGE AND DISPOSAL

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

**Pesticide Storage:** Store in a cool dry place. Do not store near feed or foodstuffs. In case of leak or spill, use absorbent materials to contain liquids and dispose in a manner consistent with the pesticide disposal instructions.

**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. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

**Non-refillable Container Handling (rigid, 5 gallons or less):** Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank, treatment area, or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat the procedure two more times. Then offer for recycling (if available) 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.

**Non-refillable Container Handling (rigid, larger than 5 gal):** Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank, treatment area, or store rinsate for later use or disposal. Repeat this procedure two more times. Then offer for recycling (if available) 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.

**Container Handling (bulk):** 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.

**Warranty Disclaimer:** SePRO Corporation warrants that this product conforms to the chemical description on the product label. Testing and research have also determined that this product is reasonably fit for the uses described on the product label. To the extent consistent with applicable law, SePRO Corporation makes no other express or implied warranty of fitness or merchantability nor any other express or implied warranty and any such warranties are expressly disclaimed.

**Misuse:** Federal law prohibits the use of this product in a manner inconsistent with its label directions. To the extent consistent with applicable law, the buyer assumes responsibility for any adverse consequences if this product is not used according to its label directions. In no case shall SePRO Corporation be liable for any losses or damages resulting from the use, handling or application of this product in a manner inconsistent with its label.

For additional important labeling information regarding SePRO Corporation's Terms and Conditions of Use, Inherent Risks of Use and Limitation of Remedies, please visit <http://seprolabels.com/terms> or scan the image below.



©Copyright 2018 SePRO Corporation  
Sonar®, Nautique® and Littora® are registered trademarks of SePRO Corporation

Aquathol®, Cascade® and Teton® are registered trademarks of United Phosphorus, Inc.



**SePRO Corporation**  
11550 North Meridian Street, Suite 600  
Carmel, IN 46032, U.S.A.

# SAFETY DATA SHEET



## Nautique® Aquatic Herbicide

### Section 1. Identification

**GHS product identifier** : Nautique® Aquatic Herbicide

**Other means of identification** : Not available.

**EPA Registration No. :** 67690-10

**Relevant identified uses of the substance or mixture**

Aquatic plant herbicide.

**Supplier's details** : 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: 317-580-8290  
Monday - Friday, 8am to 5pm E.S.T.  
www.sepro.com

**Emergency telephone number (with hours of operation)** : **INFOTRAC - 24-hour service 1-800-535-5053**

The following recommendations for exposure controls and personal protection are intended for the manufacture, formulation and packaging of this product. For applications and/or use, consult the product label. The label directions supersede the text of this Safety Data Sheet for application and/or use.

### Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : ACUTE TOXICITY (oral) - Category 4  
ACUTE TOXICITY (dermal) - Category 3  
SKIN CORROSION/IRRITATION - Category 2  
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A  
RESPIRATORY SENSITIZATION - Category 1A  
AQUATIC HAZARD (ACUTE) - Category 1  
AQUATIC HAZARD (LONG-TERM) - Category 1

**GHS label elements**

**Hazard pictograms** : Skull and crossbones, Health hazard, Environment

**Signal word** : Danger

**Hazard statements** : Toxic in contact with skin.  
Harmful if swallowed.  
Causes serious eye irritation.  
Causes skin irritation.  
May cause allergy or asthma symptoms or breathing difficulties if inhaled.  
Very toxic to aquatic life with long lasting effects.



## Section 2. Hazards identification

### Precautionary statements

- Prevention** : Wear protective gloves. Wear eye or face protection. Wear protective clothing. In case of inadequate ventilation wear respiratory protection. Avoid accidental release to the environment. Avoid breathing vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace.
- Response** : Collect spillage. IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER or physician. IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN: Take off immediately all contaminated clothing. Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
- Storage** : Store locked up.
- Disposal** : Dispose of contents and container in accordance with all local, regional, national and international regulations.
- Hazards not otherwise classified** : None known.

## Section 3. Composition/information on ingredients

- Substance/mixture** : Mixture
- Other means of identification** : Not available.

### CAS number/other identifiers

- CAS number** : Not applicable.

Ingredient name	%	CAS number
Proprietary ingredient 3	30 - 60	-
Proprietary ingredient 1	10 - 20	-
Proprietary ingredient 2	5 - 10	-
Copper Triethanolamine Complex	14.9	82027-59-6
Copper Ethylenediamine Complex†	13.2	13426-91-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

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.

Occupational exposure limits, if available, are listed in Section 8.

## Section 4. First aid measures

### Description of necessary first aid measures

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Get medical attention.



## Section 4. First aid measures

- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. 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. In the event of any complaints or symptoms, avoid further exposure.
- Skin contact** : Wash with plenty of soap and water. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 20 minutes. Get medical attention. If necessary, call a poison center or physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

### **Most important symptoms/effects, acute and delayed**

#### **Potential acute health effects**

- Eye contact** : Causes serious eye irritation.
- Inhalation** : May cause allergy or asthma symptoms or breathing difficulties if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
- Skin contact** : Toxic in contact with skin. Causes skin irritation.
- Ingestion** : Harmful if swallowed. Irritating to mouth, throat and stomach.

#### **Over-exposure signs/symptoms**

- Eye contact** : Adverse symptoms may include the following:  
pain or irritation  
watering  
redness
- Inhalation** : Adverse symptoms may include the following:  
wheezing and breathing difficulties  
asthma
- Skin contact** : Adverse symptoms may include the following:  
irritation  
redness
- Ingestion** : No known significant effects or critical hazards.

### **Indication of immediate medical attention and special treatment needed, if necessary**

- 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.
- Specific treatments** : No specific treatment.

## Section 4. First aid measures

- 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.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

- Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide  
nitrogen oxides  
metal oxide/oxides

- Special protective actions for fire-fighters** : No special measures are required.

- 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.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : 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. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

- For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

- 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). May be harmful to the environment if released in large quantities. Collect spillage.

## Section 6. Accidental release measures

### Methods and materials for containment and cleaning up

- 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.

## Section 7. Handling and storage

### Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). 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. Avoid accidental release to the environment. 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. Keep away from acids. Empty containers retain product residue and can be hazardous. Do not reuse container.

- Advice on general occupational hygiene** : 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. See also Section 8 for additional information on hygiene measures.

- Conditions for safe storage, including any incompatibilities** : 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. Store locked up. Separate from acids. 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.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

Ingredient name	Exposure limits
Proprietary ingredient 1	<b>ACGIH TLV (United States, 3/2012). Absorbed through skin.</b> TWA: 10 ppm 8 hours. <b>NIOSH REL (United States, 6/2009).</b> TWA: 25 mg/m <sup>3</sup> 10 hours. TWA: 10 ppm 10 hours. <b>OSHA PEL (United States, 6/2010).</b> TWA: 25 mg/m <sup>3</sup> 8 hours. TWA: 10 ppm 8 hours.

- Appropriate engineering controls** : 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.

## Section 8. Exposure controls/personal protection

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

### Individual protection measures

**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.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

### Skin protection

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection** : Use a properly fitted, air-purifying or supplied air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

### Appearance

**Physical state** : Liquid.

**Color** : Purple. [Dark]

**Odor** : Ammoniacal.

**Odor threshold** : Not available.

**pH** : 12.03 [Conc. (% w/w): 1% in water]

**Melting point** : Not available.

**Boiling point** : Not available.

**Flash point** : Closed cup: >108°C (>226.4°F)

**Burning time** : Not applicable.

**Burning rate** : Not applicable.

**Evaporation rate** : Not available.

**Flammability (solid, gas)** : Not flammable.

**Lower and upper explosive (flammable) limits** : Not available.

**Vapor pressure** : Not available.

## Section 9. Physical and chemical properties

Vapor density	: Not available.
Relative density	: 1.2
Solubility	: Not available.
Solubility in water	: Not available.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: >198.89°C (>390°F)
SADT	: Not available.
Viscosity	: Not available.

## Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	: No specific data.
Incompatible materials	: Reactive or incompatible with the following materials: Strong acids and nitrites.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Nautique® Aquatic Herbicide	LC50 Inhalation Vapor	Rat - Male, Female	2.1 mg/L	4 hours
	LD50 Dermal	Rabbit - Male, Female	700 mg/kg	-
	LD50 Oral	Rat - Male, Female	0.68 g/kg	-

#### Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Nautique® Aquatic Herbicide	Skin - Severe irritant	Rabbit	-	-	-
	Eyes - Severe irritant	Rabbit	-	-	-

#### Sensitization

Product/ingredient name	Route of exposure	Species	Result
Nautique® Aquatic Herbicide	skin	Guinea pig	Not sensitizing

#### Mutagenicity

There is no data available.

## Section 11. Toxicological information

### **Carcinogenicity**

There is no data available.

### **Reproductive toxicity**

There is no data available.

### **Teratogenicity**

There is no data available.

### **Specific target organ toxicity (single exposure)**

There is no data available.

### **Specific target organ toxicity (repeated exposure)**

There is no data available.

### **Aspiration hazard**

There is no data available.

**Information on the likely routes of exposure** : Routes of entry anticipated: Oral, Dermal, Inhalation.

### **Potential acute health effects**

- |                     |   |
|---------------------|---|
| <b>Eye contact</b>  | : Causes serious eye irritation.  |
| <b>Inhalation</b>   | : May cause allergy or asthma symptoms or breathing difficulties if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure. |
| <b>Skin contact</b> | : Toxic in contact with skin. Causes skin irritation.   |
| <b>Ingestion</b>    | : Harmful if swallowed. Irritating to mouth, throat and stomach.  |

### **Symptoms related to the physical, chemical and toxicological characteristics**

- |                     |  |
|---------------------|--|
| <b>Eye contact</b>  | : Adverse symptoms may include the following:<br>pain or irritation<br>watering<br>redness     |
| <b>Inhalation</b>   | : Adverse symptoms may include the following:<br>wheezing and breathing difficulties<br>asthma |
| <b>Skin contact</b> | : Adverse symptoms may include the following:<br>irritation<br>redness                         |
| <b>Ingestion</b>    | : No known significant effects or critical hazards.  |

### **Delayed and immediate effects and also chronic effects from short and long term exposure**

#### **Short term exposure**

- |                                    |   |
|------------------------------------|---|
| <b>Potential immediate effects</b> | : No known significant effects or critical hazards. |
| <b>Potential delayed effects</b>   | : No known significant effects or critical hazards. |

#### **Long term exposure**

- |                                    |   |
|------------------------------------|---|
| <b>Potential immediate effects</b> | : No known significant effects or critical hazards. |
| <b>Potential delayed effects</b>   | : No known significant effects or critical hazards. |

## Section 11. Toxicological information

### Potential chronic health effects

<b>General</b>	: Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.
<b>Carcinogenicity</b>	: No known significant effects or critical hazards.
<b>Mutagenicity</b>	: No known significant effects or critical hazards.
<b>Teratogenicity</b>	: No known significant effects or critical hazards.
<b>Developmental effects</b>	: No known significant effects or critical hazards.
<b>Fertility effects</b>	: No known significant effects or critical hazards.

### Numerical measures of toxicity

#### Acute toxicity estimates

There is no data available.

## Section 12. Ecological information

### Toxicity

Product/ingredient name	Result	Species	Exposure
Proprietary ingredient 1	Acute EC50 100 mg/L Fresh water Acute LC50 46 mg/L Fresh water Acute LC50 220 mg/L Fresh water Chronic NOEC 160 µg/l Fresh water	Algae - <i>Chlorella pyrenoidosa</i> Daphnia - <i>Daphnia magna</i> Fish - <i>Pimephales promelas</i>	96 hours 48 hours 96 hours
Copper Triethanolamine Complex	Acute EC50 55.7 mg/L Fresh water Acute LC50 26 µg/l Fresh water	Daphnia - <i>Daphnia magna</i> Daphnia - <i>Daphnia magna</i> - Mature Fish - <i>Oncorhynchus mykiss</i>	21 days 48 hours 96 hours

### Persistence and degradability

There is no data available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
Proprietary ingredient 1	-7.02	-	low

### Mobility in soil

<b>Soil/water partition coefficient (K<sub>oc</sub>)</b>	: Not available.
--	------------------

<b>Other adverse effects</b>	: No known significant effects or critical hazards.
------------------------------	---

## Section 13. Disposal considerations






<b>Disposal methods</b>	: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid
-------------------------	---



## Section 13. Disposal considerations

dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

## Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN2735	UN2735	UN2735
UN proper shipping name	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-diaminoethane). Marine pollutant (Copper Ethylenediamine Complex) RQ (1,2-diaminoethane)	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-diaminoethane). Marine pollutant (1,2-diaminoethane, Copper Triethanolamine Complex)	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-diaminoethane)
Transport hazard class(es)	8  	8  	8 
Packing group	III	III	III
Environmental hazards	No.	Yes.	No.
Additional information	The marine pollutant mark is not required when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes.  <u>Reportable quantity</u> 33333.3 lbs / 15133.3 kg [3331.5 gal / 12611.1 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.	The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.	The environmentally hazardous substance mark may appear if required by other transportation regulations.

**Special precautions for user :** **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code :** Not available.

## Section 15. Regulatory information

**U.S. Federal regulations :** **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined  
**Commerce control list precursor:** Proprietary ingredient 2  
**United States inventory (TSCA 8b):** Not determined.  
**Clean Water Act (CWA) 307:** Copper Triethanolamine Complex  
**Clean Water Act (CWA) 311:** Proprietary ingredient 1

**Clean Air Act (CAA) 112 regulated toxic substances:** Proprietary ingredient 1



## Section 15. Regulatory information

Clean Air Act Section 112 : Not listed

(b) Hazardous Air  
Pollutants (HAPs)

Clean Air Act Section 602 : Not listed

Class I Substances

Clean Air Act Section 602 : Not listed

Class II Substances

DEA List I Chemicals : Not listed

(Precursor Chemicals)

DEA List II Chemicals : Not listed

(Essential Chemicals)

### SARA 302/304

#### Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
Proprietary ingredient 1	10 - 20	Yes.	-	-	-	-

SARA 304 RQ : 33333.3 lbs / 15133.3 kg [3331.5 gal / 12611.1 L]

### SARA 311/312

Classification : Immediate (acute) health hazard

#### Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Proprietary ingredient 1 Copper Ethylenediamine Complex†	10 - 20 13.2	Yes. No.	No. No.	No. No.	Yes. Yes.	No. No.

### SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Copper triethanolamine complex	82027-59-6	14.9
Supplier notification	Copper triethanolamine complex	82027-59-6	14.9

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

### State regulations

- Massachusetts** : The following components are listed: Proprietary ingredient 1; Proprietary ingredient 2
- New York** : The following components are listed: Proprietary ingredient 1
- New Jersey** : The following components are listed: Proprietary ingredient 1; Proprietary ingredient 2; Copper Triethanolamine Complex; Copper Ethylenediamine Complex†
- Pennsylvania** : The following components are listed: Proprietary ingredient 1; Proprietary ingredient 2; Copper Triethanolamine Complex

### California Prop. 65

No products were found.



## Section 15. Regulatory information

### International regulations

**International lists** : Australia inventory (AICS): Not determined.  
China inventory (IECSC): Not determined.  
Japan inventory: Not determined.  
Korea inventory: Not determined.  
Malaysia Inventory (EHS Register): Not determined.  
New Zealand Inventory of Chemicals (NZIoC): Not determined.  
Philippines inventory (PICCS): Not determined.  
Taiwan inventory (CSNN): Not determined.

**Chemical Weapons  
Convention List Schedule  
I Chemicals** : Not listed

**Chemical Weapons  
Convention List Schedule  
II Chemicals** : Not listed

**Chemical Weapons  
Convention List Schedule  
III Chemicals** : Listed

## Section 16. Other information

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

**Health :** 3 \* **Flammability :** 1 **Physical hazards :** 0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

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

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

**Health :** 3 **Flammability :** 1 **Instability :** 0

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### History

**Date of issue mm/dd/yyyy** : 06/15/2014  
**Date of previous issue** : 10/01/2012  
**Version** : 4  
**Revised Section(s)** : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16  
**Prepared by** : KMK Regulatory Services Inc.

## Section 16. Other information

**Key to abbreviations** : ATE = Acute Toxicity Estimate  
BCF = Bioconcentration Factor  
GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
IATA = International Air Transport Association  
IBC = Intermediate Bulk Container  
IMDG = International Maritime Dangerous Goods  
LogPow = logarithm of the octanol/water partition coefficient  
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)  
UN = United Nations

**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.

# Appendix B

## Special Status Species List and Species Descriptions

## 1. Approach

A list of special status species was compiled using records from the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDDB), and the U.S. Fish and Wildlife Service's (USFWS) Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) (CNDDDB, 2020; USFWS, 2021). Location-specific species information for Fresno County is available from ECOS IPaC. Special status species data from CNDDDB was obtained for the two United States Geological Survey (USGS) 7.5 x 7.5-minute quadrangles that the District fall within (i.e., core quads) as well as ten peripheral quadrangles (i.e., border 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 within the boundaries of the Project area. Data was queried from the CDFW and USFWS databases for these quads and combined into one table. 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 and interaction with treated water.

A summary of the listed species, their conservation status, and whether they were considered for evaluation of potential impact is presented in **Table B-1**. Species habitat and rationale for removal from further consideration is presented in **Table B-1** and more detailed species life history information can be found below.



**Table B-1. Species and Habitat Summary**

<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>	<b>Habitat</b>	<b>Not Present in Project Area; Species Eliminated from Further Consideration</b>	<b>Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)</b>	<b>Potentially Present in Project Area and Potential Exposure will be Considered</b>
Amphibians	California red-legged frog	<i>Rana draytonii</i>	FT, SSC	Lowland foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation.	X		
Amphibians	California tiger salamander	<i>Ambystoma californiense</i>	FT, ST	Herbaceous wetland, temporary pool; Grassland/herbaceous, Savanna, Woodland - Hardwood; benthic, burrowing in or using soil.	X		
Amphibians	foothill yellow-legged frog	<i>Rana boylei</i>	SCT, SSC	Partly-shaded shallow streams & riffles with a rocky substrate in a variety of habitats; need at least some cobble-sized substrate for egg-laying.	X		
Amphibians	western spadefoot	<i>Spea hammondi</i>	SSC	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	X (1)	
Birds	bank swallow	<i>Riparia riparia</i>	ST	Riparian/lowland; Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.		X (2)	
Birds	burrowing owl	<i>Athene cunicularia</i>	SSC	Agriculture/rangeland, grassland, parks with open ground squirrel burrows.		X (3)	

<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>	<b>Habitat</b>	<b>Not Present in Project Area; Species Eliminated from Further Consideration</b>	<b>Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)</b>	<b>Potentially Present in Project Area and Potential Exposure will be Considered</b>
Birds	California condor	<i>Gymnogyps californianus</i>	FE, SE, SFP	Chaparral, valley and foothill grassland in mountain ranges of moderate altitude.	X		
Birds	least Bell's vireo	<i>Vireo bellii pusillus</i>	FE, SE	Summer resident of Southern California; riparian forest, scrub, and woodland in vicinity of water or in dry river bottoms.		X (3)	
Birds	mountain plover	<i>Charadrius montanus</i>	SSC	Short grasslands, freshly plowed fields, newly sprouting grain fields, & sometimes sod farms.	X		
Birds	northern harrier	<i>Circus hudsonius</i>	SSC	Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas.	X		
Birds	southwestern willow flycatcher	<i>Empidonax traillii eximius</i>	FE, SE	Riparian woodland with thick understory and nearby flowing or pooled water.		X (3)	
Birds	Swainson's hawk	<i>Buteo swainsoni</i>	ST	Cropland/hedgerow, Desert, Grassland/herbaceous, Savanna, Woodland - Mixed.	X		
Birds	tricolored blackbird	<i>Agelaius tricolor</i>	ST, SSC	Freshwater and brackish marshes of cattails, tule, bulrushes and sedges; Cropland/hedgerow, Grassland/herbaceous.		X (4)	

<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>	<b>Habitat</b>	<b>Not Present in Project Area; Species Eliminated from Further Consideration</b>	<b>Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)</b>	<b>Potentially Present in Project Area and Potential Exposure will be Considered</b>
Birds	western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	FT, 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		
Birds	yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	SSC	Nests in freshwater emergent wetlands with dense vegetation and deep water; often along borders of lakes or ponds.		X (4)	
Fish	Delta smelt	<i>Hypomesus transpacificus</i>	FT, SE	Sacramento-San Joaquin Delta; seasonally in Suisun Bay, Carquinez Strait & San Pablo Bay.	X		
Fish	steelhead - Central Valley DPS	<i>Oncorhynchus mykiss irideus pop. 11</i>	FT	Sacramento River and San Joaquin Rivers and their tributaries.	X		
Invertebrates	longhorn fairy shrimp	<i>Branchinecta longiantenna</i>	FE	Small, clear-water depressions in sandstone and clear-to-turbid clay/grass-bottomed pools in shallow swales; vernal pools, valley & foothill grassland.	X		
Invertebrates	monarch butterfly	<i>Danaus plexippus</i>	FC	Milkweed and flowering plants.	X		
Invertebrates	valley elderberry longhorn beetle	<i>Desmocerus californicus dimorphus</i>	FT	Riparian scrub; occurs only in the Central Valley of California, in association with blue elderberry ( <i>Sambucus mexicana</i> ).	X		

<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>	<b>Habitat</b>	<b>Not Present in Project Area; Species Eliminated from Further Consideration</b>	<b>Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)</b>	<b>Potentially Present in Project Area and Potential Exposure will be Considered</b>
Invertebrates	vernal pool fairy shrimp	<i>Branchinecta lynchi</i>	FT	Vernal pools	X		
Invertebrates	vernal pool tadpole shrimp	<i>Lepidurus packardii</i>	FE	Vernal pools and swales in the Sacramento Valley containing clear to highly turbid water.	X		
Mammals	American badger	<i>Taxidea taxus</i>	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	X		
Mammals	Fresno kangaroo rat	<i>Dipodomys nitratoideus exilis</i>	FE, SE	Chenopod scrub; alkali sink-open grassland habitats in western Fresno County.	X		
Mammals	giant kangaroo rat	<i>Dipodomys ingens</i>	FE, SE	Chenopod scrub, valley & foothill grassland; annual grasslands on the western side of the San Joaquin Valley, marginal habitat in alkali scrub; burrows in sandy loam soil.	X		
Mammals	Nelson's antelope squirrel	<i>Ammospermophilus nelsoni</i>	ST	Chenopod scrub; sparsely vegetated loam soils; need widely scattered shrubs, forbs and grasses in broken terrain with gullies and washes.	X		
Mammals	San Joaquin kit fox	<i>Vulpes macrotis mutica</i>	FE, ST	Annual grasslands or grassy open stages with scattered shrubby vegetation; need loose-textured sandy soils for burrowing, and suitable prey base.			X

<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>	<b>Habitat</b>	<b>Not Present in Project Area; Species Eliminated from Further Consideration</b>	<b>Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)</b>	<b>Potentially Present in Project Area and Potential Exposure will be Considered</b>
Mammals	Tulare grasshopper mouse	<i>Onychomys torridus tularensis</i>	SSC	Hot, arid valleys and scrub deserts in the southern San Joaquin Valley.	X		
Mammals	western mastiff bat	<i>Eumops perotis californicus</i>	SSC	Semi-arid to arid habitats including conifer and deciduous woodlands, coastal scrub, grasslands, & chaparral. Roosts in crevices in cliff faces, high buildings, trees, and tunnels	X		
Mammals	western red bat	<i>Lasiurus blossevillii</i>	SSC	Along riparian and agricultural areas in broadleaf tree communities throughout the Central Valley.	X		
Plants	brittlescale	<i>Atriplex depressa</i>	CRPR-1	Chenopod scrub, meadows and seeps, playas, valley and foothill grassland, vernal pools; usually in alkali scalds or alkaline clay.	X		
Plants	California alkali grass	<i>Puccinellia simplex</i>	CRPR-1	Meadows and seeps, chenopod scrub, valley and foothill grasslands, vernal pools.	X		
Plants	chaparral ragwort	<i>Senecio aphanactis</i>	CRPR-2	Chaparral, cismontane woodland, coastal scrub; drying alkaline flats.	X		
Plants	Hall's tarplant	<i>Deinandra halliana</i>	CRPR-1	Cismontane woodland, chenopod scrub, valley and foothill grassland.	X		
Plants	heartscale	<i>Atriplex cordulata</i> var. <i>cordulata</i>	CRPR-1	Saline or alkaline soils in chenopod scrub, valley and foothill grassland.	X		

<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>	<b>Habitat</b>	<b>Not Present in Project Area; Species Eliminated from Further Consideration</b>	<b>Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)</b>	<b>Potentially Present in Project Area and Potential Exposure will be Considered</b>
Plants	hispid salty bird's-beak	<i>Chloropyron molle ssp. hispidum</i>	CRPR-1	Meadows and seeps, playas, valley and foothill grassland; alkaline soils.	X		
Plants	Hoover's eriastrum	<i>Eriastrum hooveri</i>	CRPR-4	Chenopod scrub, valley and foothill grassland, pinyon and juniper woodland; on sparsely vegetated alkaline alluvial fans; in the Temblor Range on sandy soils.	X		
Plants	lesser saltscale	<i>Atriplex minuscula</i>	CRPR-1	Chenopod scrub, valley and foothill grassland.	X		
Plants	Lost Hills crownscale	<i>Atriplex coronata var. vallicola</i>	CRPR-1	Chenopod scrub, valley and foothill grassland, vernal pools.	X		
Plants	marsh sandwort	<i>Arenaria paludicola</i>	FE, SE, CRPR-1	Marshes and swamps; sandy soil.	X		
Plants	Munz's tidy-tips	<i>Layia munzii</i>	CRPR-1	Chenopod scrub, valley and foothill grassland.	X		
Plants	palmate-bracted bird's-beak	<i>Chloropyron palmatum</i>	FE, SE, CRPR-1	Chenopod scrub, valley and foothill grassland.	X		
Plants	Panoche navarretia	<i>Navarretia panochensis</i>	CRPR-1	Chenopod scrub, valley and foothill grassland.	X		
Plants	Panoche pepper-grass	<i>Lepidium jaredii ssp. album</i>	CRPR-1	Valley and foothill grassland.	X		
Plants	recurved larkspur	<i>Delphinium recurvatum</i>	CRPR-1	Chenopod scrub, valley and foothill grassland, cismontane woodland; on alkaline soils.	X		

<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>	<b>Habitat</b>	<b>Not Present in Project Area; Species Eliminated from Further Consideration</b>	<b>Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)</b>	<b>Potentially Present in Project Area and Potential Exposure will be Considered</b>
Plants	San Benito evening-primrose	<i>Camissonia benitensis</i>	FT, CRPR-1	Chaparral, cismontane woodland, valley and foothill grassland on gravelly serpentine alluvial terraces	X		
Plants	San Benito onion	<i>Allium howellii</i> var. <i>sanbenitense</i>	CRPR-1	Chaparral, valley and foothill grassland.	X		
Plants	San Joaquin woollythreads	<i>Monolopia congdonii</i>	FE, CRPR-1	Chenopod scrub, valley and foothill grassland.	X		
Plants	Sanford's arrowhead	<i>Sagittaria sanfordii</i>	CRPR-1	Marshes and swamps.		X (5)	
Plants	showy golden madia	<i>Madia radiata</i>	CRPR-1	Valley and foothill grassland; cismontane woodland; chenopod scrub; mostly on adobe clay in grassland or among shrub.	X		
Plants	spiny-sepaed button-celery	<i>Eryngium spinosepalum</i>	CRPR-1	Vernal pools, valley and foothill grassland.	X		
Plants	subtle orache	<i>Atriplex subtilis</i>	CRPR-1	Valley and foothill grassland; alkaline soils.	X		
Plants	vernal pool smallscale	<i>Atriplex persistens</i>	CRPR-1	Vernal pools.	X		
Reptiles	blunt-nosed leopard lizard	<i>Gambelia sila</i>	FE, SE	Sparsely vegetated alkali and desert scrub habitats, in areas of low topographic relief.	X		
Reptiles	California glossy snake	<i>Arizona elegans occidentalis</i>	SSC	Generalist reported from a range of scrub and grassland habitats, often with loose or sandy soils.	X		



<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>	<b>Habitat</b>	<b>Not Present in Project Area; Species Eliminated from Further Consideration</b>	<b>Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)</b>	<b>Potentially Present in Project Area and Potential Exposure will be Considered</b>
Reptiles	coast horned lizard	<i>Phrynosoma blainvillii</i>	SSC	Most common in lowlands along sandy washes with scattered low bushes; open areas for sunning.	X		
Reptiles	giant gartersnake	<i>Thamnophis gigas</i>	FT, ST	Prefers freshwater marsh and low gradient streams, has adapted to drainage canals and irrigation ditches.			X
Reptiles	northern California legless lizard	<i>Anniella pulchra</i>	SSC	Sandy or loose loamy soils under sparse vegetation; prefer high soil moisture content.	X		
Reptiles	San Joaquin coachwhip	<i>Masticophis flagellum ruddocki</i>	SSC	Open, dry habitats with little or no tree cover; found in valley grassland and saltbush scrub in the San Joaquin Valley.	X		
Reptiles	two-striped gartersnake	<i>Thamnophis hammondi</i>	SSC	Marshes, riparian, wetland; found in or near permanent fresh water; often along streams with rocky beds and riparian growth.	X		
Reptiles	western pond turtle	<i>Actinemys marmorata</i>	SSC	Thoroughly aquatic turtle of ponds, marshes, rivers, streams & irrigation ditches, usually with aquatic vegetation.			X

Sources: CNDDDB, 2020; USFWS, 2021

**Table B-1 Numbered Notes:**

- 1) The Mendota Pool downstream of the project area may provide breeding habitat for some individuals; however, species is unlikely to occur in permanent water bodies such as the Mendota Pool due to the abundance of predator species. Therefore, no risk due to copper exposure is anticipated.

- 2) These species may forage for emergent aquatic insects over water. These insects may be temporarily impacted by copper. Given the large amount of potential foraging area, the emergent aquatic insects from a treated waterbody or receiving water would likely only contribute an insignificant percentage of the total diet. Therefore, no risk due to copper exposure is anticipated.
- 3) Species not likely to have any exposure to copper-containing prey items as its target prey base consists of terrestrial species.
- 4) Project activity will not affect foraging or nesting.
- 5) Sanford's arrowhead is not a submerged aquatic plant; therefore, exposure to copper treated water is indirect, if any. Exposure will only occur through root uptake of soil water. Copper concentration in root zone water is not expected to be sufficient to cause impair growth or cause death.

**Table B-1 Status Abbreviations:**

FC - Federal Candidate

FE - Federally Listed as Endangered

FT - Federally Listed as Threatened

SE - State Listed as Endangered

SFP - State Fully Protected

SSC - CDFW Species of Special Concern

ST - State Listed as Threatened

CRPR-1 - California Native Plant Society Rare Plant Rank 1, threatened or extinct in CA

CRPR-2 - California Native Plant Society Rare Plant Rank 2, rare, threatened or endangered in CA, but more common elsewhere.

CRPR-4 - California Native Plant Society Rare Plant Rank 4, plants of limited distribution

## 2. Species Information

Life history information for species potentially present in the project area is presented below.

### 2.1. Amphibians

#### **Western spadefoot (*Spea hammondi*)**

The western spadefoot toad is a California Species of Special Concern that inhabits lowland habitats such as washes, floodplains of rivers, alluvial fans, playas, and alkali flats (Stebbins, 1985 in USFWS, 2005), as well as valley and foothill grasslands, chaparral, and pine-oak woodlands (USFWS, 2005). Optimal habitats consist of grasslands with shallow temporary pools (CDFW, 2000). Spadefoot toads are primarily terrestrial and require upland habitats for feeding and for constructing burrows in which they estivate for 8 to 9 months of the year (USFWS, 2005). Adult toads feed on a variety of terrestrial insects, worms, and other invertebrates (USFWS, 2005). Tadpoles consume planktonic organisms and algae. They may also consume dead aquatic larvae of amphibians, including their own species (CDFW, 2000). Western spadefoot toads breed from January to May in temporary (ephemeral) pools and drainages that form following winter or spring rains (USFWS, 2005), depositing eggs on plant stems or pieces of detritus in temporary rain pools, or sometimes in pools of ephemeral stream courses (Storer, 1925, Stebbins, 1985 in USFWS, 2005). Though spadefoot eggs and larvae have been observed in a variety of permanent and temporary wetlands including rivers, creeks, pools in intermittent streams, vernal pools, and temporary rain pools, USFWS (2005) notes that vernal pools and other temporary wetlands may be optimal for breeding due to the absence or reduced abundance of predators, many of which require more permanent water sources. Based on their habitat requirements, irrigation canals are considered low quality breeding ground for spadefoot toads and it is therefore unlikely that exposure to copper-containing algaecides will occur within the District's conveyance system. Similarly, the presence of predatory fish such as channel catfish, largemouth bass, and striped bass and other predators such as waterbirds, gartersnakes, and racoons make the nearby Mendota Pool an unlikely breeding ground for the toad. Therefore, no risk is anticipated.

### 2.2. Birds

#### **Bank swallow (*Riparia riparia*)**

The bank swallow is a State Threatened species. Bank swallows breed in eroded vertical banks of friable soil along ocean coasts, rivers, streams, lakes, reservoirs, and wetlands (American Ornithologists' Union, 1998 in Garrison, 1999; Cramp et al., 1988 in Garrison, 1999; Turner and Rose, 1989 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 (Gross, 1942 in Garrison, 1999; Stoner, 1936 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). Based on 2021 CDFW surveys for bank swallow nesting habitat and the species' nesting requirements, there does not appear to be any suitable habitat within 200 meters of District conveyances or its intake from the Mendota Pool. Application of copper-containing algaecides and/or aquatic herbicides to water may result in adverse impact to exposed aquatic invertebrates (e.g., juvenile aquatic insects). As a result, there may be a minor

and temporary reduction in food source production immediately following application of copper-containing products if treated areas are within the foraging range. No impact is anticipated for insects which emerged from the water prior to the application of copper-containing algacides. Because bank swallow colonies are typically located in areas with sufficient insect resources (Garrison, 1999), their reproductive success is unlikely to be impacted by a small reduction in food source production following application of copper-containing algacides. Therefore, no risk is anticipated.

**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 rights-of-way 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 (Haug, 1985; Martin, 1973 in Poulin et al., 2020; Thomsen, 1971; Wedgwood, 1978 in Poulin et al., 2020; Zarn, 1974). During the breeding season, they typically forage close to their burrows (Shuford and Gardali, 2008). In a study conducted by Thomsen (1971) in Alameda County, California, burrowing owls were observed to forage by four methods including: ground foraging in the winter and observation foraging, hovering, and flycatching in the late spring and summer. 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). The terrestrial nature of their foraging habitats and prey base will not result in exposure to algacides and/or aquatic herbicides applied to irrigation conveyances; no risk is anticipated.

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

Least Bell's vireos are California and Federally listed as endangered. They occur as summer breeders from mid- to late March through late September. Early to mid-successional riparian habitat is typically used for nesting (Howell et al., 2010) because it supports the dense shrub cover required for nest concealment as well as a structurally diverse canopy for foraging. Vegetation characteristics of riparian stands between five to ten years of age are most suitable for nesting. Least Bell's vireos obtain prey primarily by foliage gleaning (picking prey from leaf or bark substrates), and hovering (removing prey from vegetation surfaces while fluttering in the air). Foraging occurs at all levels of the canopy but appears to be concentrated in the lower to mid-strata, particularly when pairs have active nests. Least Bell's vireos are insectivores, preying on a wide variety of insect types including bugs, beetles, grasshoppers, moths, and particularly caterpillars (Kus, 2002). Because the project area is generally considered outside of the species' typical range and its target prey base consists of terrestrial species, the feeding habits of Least Bell's vireos will greatly limit their exposure to copper applied to irrigation conveyances for the control of algae or aquatic vegetation.

**Southwestern willow flycatcher (*Empidonax traillii extimus*)**

Southwestern willow flycatchers are listed as California and Federally Endangered. They are a summer resident and arrive in early May to early June and leave mid- to late August. The southwestern willow flycatcher usually breeds in patchy to dense riparian habitats along streams or other wetlands, near or adjacent to surface water or underlain by saturated soil. Common tree and shrub species comprising nesting habitat include willows. Willow flycatcher is an insectivore and catches insects while flying, hovers to glean them from foliage, and occasionally captures insects on the ground. Flycatchers forage within and above the canopy, along the patch edge, in openings within the territory, above water, and glean from tall trees as well as

herbaceous ground cover (USFWS, 2002). Because the project area is generally considered outside of the species' typical range and its target prey base consists of terrestrial species, the feeding habits of the flycatcher will greatly limit its exposure to copper applied to irrigation conveyances for the control of algae or aquatic vegetation.

### **Tricolored blackbird (*Agelaius tricolor*)**

Tricolored blackbird is a State Threatened species and Species of Special Concern. 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 irrigation ditches, 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 were reported to 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). Nestling tricolored blackbirds were observed to consume 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).

Project activities will take place within District conveyances for the control of algae and aquatic weeds; they will not affect foraging or nesting habitats. Furthermore, since tricolored blackbirds are unlikely to feed directly from District canals, they will have minimal to no exposure to copper-containing products applied. Therefore, no risk is anticipated.

### **Yellow-Headed blackbird (*Xanthocephalus xanthocephalus*)**

The yellow-headed blackbird is a Species of Special Concern (breeding) that occurs primarily as a migrant and summer resident in California from April to early October, breeding from mid-April to late July (Twedt and Crawford, 1995 in Shuford and Gardali, 2008). Breeding habitat for yellow-headed blackbirds is largely limited to marshes with tall emergent vegetation such as cattails and bulrush (Orians and Willson, 1964 in Shuford and Gardali, 2008). During breeding, the adult diet consists primarily of insects while nestlings are fed aquatic insects such as metamorphosed naiad and teneral damselflies (Willson, 1996). Yellow-headed blackbirds typically forage within their breeding territories if resource abundance is high, but often in agricultural fields otherwise (Shuford and Gardali, 2008). Although the project area is unlikely to serve as suitable breeding habitat, it is possible that breeding could occur in other sites near the project area (e.g., the Mendota Pool). Direct application of copper-containing algaecides to water may impact exposed aquatic invertebrates including juvenile aquatic insects and result in a minor and temporary reduction in food source production. No impact is anticipated for insects which emerged from the water prior to the application of copper-containing algaecides and/or aquatic herbicides. District conveyances are unlikely to support extensive populations of aquatic insects or invertebrates due their partial concrete lining, to regular maintenance activities performed during and after the irrigation season (including removal of accumulated sediment), and the seasonal presence of water. Because of their sizeable foraging range and that the project area itself likely serves as poor quality foraging ground, yellow-headed blackbirds are

unlikely to be impacted by a short-term reduction in food source production following application of copper-containing algaecides or aquatic vegetation. Therefore, no risk is anticipated.

### 2.3. Mammals

#### **San Joaquin kit fox (*Vulpes macrotis mutica*)**

The native habitat of the San Joaquin kit fox includes grasslands as well as various scrub and subshrub communities. Because their habitat range has been significantly reduced as a result of extensive land conversion, they may be found in grassland and scrubland communities which have been modified with industrial and agricultural practices. San Joaquin kit foxes dig dens in loose-textured soils for shelter, protection, and reproduction (USEPA, 2010). They may also inhabit dens constructed by other animals or use man-made structures such as culverts and abandoned pipelines (CDFW, 2010). The San Joaquin kit fox's diet consists largely of small mammals but can also include ground-nesting birds and insects. Despite their diet of terrestrial prey items, they may be exposed to copper-containing algaecides or aquatic herbicides would be via consumption of drinking water. At least one den is known to occur near District conveyances. Refer to **Appendix B** for a summary of exposure and risk analysis for the San Joaquin kit fox.

### 2.4. Plants

#### **Sanford's arrowhead (*Sagittaria sanfordii*)**

Sanford's arrowhead is a rhizomatous monocot that is native and endemic to California (CalFlora, 2021). It is an aquatic perennial herb that occurs in freshwater wetlands, marshes, swamps, and other assorted shallow freshwater (CNPS, 2021). 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).

Generally, copper is described as a contact herbicide because it expresses herbicidal activity only on the parts of the plant it touches. Because Sanford's arrowhead is not a submerged aquatic plant, exposure to copper will only occur through root uptake of soil water. Chloroplasts, which are responsible for carrying out the photosynthetic processes required for plant growth and survival, are the most vulnerable sites of copper toxicity (Costa et al., 2018) and are not naturally found in plant root cells. Therefore, adverse impacts to rooted, emergent vegetation such as the Sanford's arrowhead are not anticipated.

### 2.5. Reptiles

#### **Giant garter snake (*Thamnophis gigas*)**

The giant garter snake is a State and Federally Threatened species. Giant garter snakes occur in streams and sloughs, usually with mud bottom (Stebbins, 2003 in NatureServe, 2021). One of the most aquatic of garter snakes; inhabits agricultural wetlands and other waterways such as irrigation and drainage canals, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the California Central Valley (USFWS, 2016). Giant garter snake habitat consists of: 1) adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; 2) emergent, herbaceous wetland vegetation (e.g., cattails, bulrushes) for escape cover and foraging habitat during the active season; 3) grassy banks and openings in

waterside vegetation for basking; and 4) higher elevation uplands for cover and refuge from flood waters during the snake's inactive season (USFWS, 2016). Its diet consists primarily of fish and adult and juvenile amphibians (Kucera, 2014). Their habitat requirements and feeding habits indicate giant garter snakes may consume prey items exposed to algaecides and/or aquatic herbicides applied to the irrigation conveyances, as well as have direct exposure to treated water. Refer to **Appendix B** for a summary of exposure and risk analysis for the giant garter snake.

### **Western pond turtle (*Actinemys marmorata*)**

The western pond turtle historically existed from Washington to British Columbia to northern Baja California, west of the Cascade-Sierra crest (Ernst et al., 1994) and is currently a California Species of Special Concern. 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 consume prey items exposed to algaecides and/or aquatic herbicides applied to irrigation conveyances, as well as have direct exposure to treated water. Refer to **Appendix B** for a summary of exposure and risk analysis for the western pond turtle.

## **3. References**

- American Ornithologists' Union. 1998. Check-list of North American Birds. 7th edition. American Ornithologists' Union. Washington, D.C.
- Beedy, E.C. and W.J. Hamilton, III. 1997. Tricolored blackbird status update and management guidelines. September (Jones and Stokes Associates, Inc. 97-099.) Sacramento, CA. Prepared for U.S. Fish and Wildlife Service, Portland, Oregon, and California Department of Fish and Game, Sacramento, CA.
- Beedy, E.C. and W.J. Hamilton, Jr. 1999. Tricolored blackbird (*Agelaius tricolor*). In The Birds of North America, No. 423 (Poole, A.; Gill, F., Eds.). The Birds of North America, Inc., Philadelphia, PA. 24 pp.
- Bury, R.B. 1986. Feeding ecology of the turtle, *Clemmys marmorata*. J. Herpeton. 20:515-521.
- CalFlora. 2021. The CalFlora Database. Available: <https://www.calflora.org/> (Accessed: August 11, 2021).
- California Department of Fish and Wildlife (CDFW). 2000. Western Spadefoot (*Spea hammondi*). California Interagency Wildlife Task Group, California Wildlife Habitat Relationships System. Sacramento, CA.
- California Department of Fish and Wildlife (CDFW). 2010. Species Account: San Joaquin Kit Fox (*Vulpes macrotis mutica*). Sacramento Fish and Wildlife Office. Sacramento, CA.
- California Natural Diversity Database (CNDDDB). 2020. RareFind 5. California Department of Fish and Wildlife, Biogeographic Data Branch. Available: <https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx> (Accessed: September 16, 2021).



- California Native Plant Society (CNPS). 2021. Inventory of Rare and Endangered Plants of California. Available: <https://rareplants.cnps.org/Home/Index/> (Accessed: August 11, 2021).
- Costa, M.B., F.V. Tavares, C.B. Martinez, I.G. Colares, C.G. Martins. 2018. Accumulation and effects of copper on aquatic macrophytes *Potamogeton pectinatus* L.: Potential application to environmental monitoring and phytoremediation. *Ecotoxicology and Environmental Safety* 155: 117-124.
- Crase, F.T. and R.W. DeHaven. 1977. Food of nestling tricolored blackbirds. *Condor* 79(2): 265-269.
- Cramp, S., D.J. Brooks, E. Dunn, R. Gillmor, J. Hall-Craggs et al. 1988. The birds of the western Palearctic. Volume 5: tyrant flycatchers to thrushes. Oxford University Press, Oxford, UK.
- Ernst, C.H., J.E. Lovich, and R.W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, D.C.
- Garrison, B.A. 1999. Bank swallow (*Riparia riparia*). In The Birds of North America, No. 414 (Poole, A.; Gill, F., Eds.). Philadelphia: The Birds of North America, Inc. 28 pp.
- Gross, A.O. 1942. Bank swallow. Pp. 400-424 in Life histories of North American flycatchers, larks, swallows, and their allies (A.C. Bent, ed.). U.S. National Museum Bulletin 179.
- Haug, E.A. 1985. Observations on the breeding ecology of burrowing owls in Saskatchewan. M.Sc. thesis, University of Saskatchewan, Saskatoon.
- Holland, D.C. 1994. The western pond turtle: habitat and history. U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon.
- Howell, C.A., J.K. Wood, M.D. Dettling, K. Griggs, C.C. Otte, L. Lina, and T. Gardali. 2010. Least Bell's Vireo Breeding Records in the Central Valley Following Decades of Extirpation. *Western North American Naturalist* 70(1): 105-113.
- Kucera, T. 2014. Giant Gartersnake (*Thamnophis gigas*). California Wildlife Habitat Relationships System, California Department of Fish and Wildlife, California Interagency Wildlife Task Group. Available: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=3457> (Accessed: August 17, 2021).
- Kus, B. 2002. Least Bell's Vireo (*Vireo bellii pusillus*). In The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. Available: [http://www.prbo.org/calpif/htmldocs/species/riparian/least\\_bell\\_vireo.htm](http://www.prbo.org/calpif/htmldocs/species/riparian/least_bell_vireo.htm) (Accessed: August 11, 2021).
- Martin, D.J. 1973. Selected aspects of burrowing owl ecology and behaviour in central New Mexico. *Condor* 75: 446-456.
- Mead, C.J. 1979. Colony fidelity and interchange in the sand martin. *Bird Study* 26: 99-106.
- NatureServe. 2021. NatureServe Explorer Database. Available: <https://www.natureserve.org/> (Accessed: August 11, 2021).
- Orians, G.H. 1960. Autumnal breeding in the tricolored blackbird. *Auk* 77(4): 379-398.
- Orians, G.H. 1961. The ecology of blackbird (*Agelaius*) social systems. *Ecological Monographs* 31(3): 285-312.

- Orians, G.H. and M.F. Willson. 1964. Interspecific territories of birds. *Ecology* 45:736–744.
- Payne, R. 1969. Breeding seasons and reproductive physiology of tricolored blackbirds and red winged blackbirds. *University of California Publications of Zoology* 90: 1-137.
- Poulin, R.G., L.D. Todd, E.A. Haug, B.A. Millsap, and M.S. Martell. 2020. Burrowing owl (*Speotyto cunicularia*). In *The Birds of the World* (A.F. Poole, ed.). Cornell Lab of Ornithology, Ithaca, NY.
- Shuford, W.D. and T. Gardali (Eds). 2008. California Bird Species of Special Concern. *Studies of Western Birds* No. 1. Western Field Ornithologists, Camarillo, CA and California Department of Fish and Game, Sacramento, CA.
- Stebbins, R.C. 1985. A field guide to western reptiles and amphibians. Second Edition, revised. Houghton Mifflin Company, Boston, Massachusetts.
- Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. Third edition. Houghton Mifflin Company, Boston.
- Stoner, D. 1936. Studies on the bank swallow, *Riparia riparia riparia* (Linnaeus) in the Oneida Lake Region. *Roosevelt Wild Life Annals* 4: 126-233.
- Storer, T.I. 1925. A Synopsis of the Amphibia of California. University of California Press, Berkeley, CA.
- Thomsen, L. 1971. Behavior and ecology of burrowing owls on the Oakland municipal airport. *Condor* 73: 177-192.
- Turner, A.K. 1980. The use of time and energy by aerial-feeding birds. Ph.D. dissertation, University of Stirling, Scotland.
- Turner, A.K. and C. Rose. 1989. Swallows and martins and identification guide and handbook. Houghton Mifflin Co., Boston, MA.
- Twedt, D.J. and R.D. Crawford. 1995. Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*). In: *The Birds of North America* (A. Poole and F. Gill, eds.), No. 192. Proceedings of the Academy of Natural Sciences of Philadelphia.
- U.S. Environmental Protection Agency (USEPA). 2010. Endangered Species Facts: San Joaquin Kit Fox (*Vulpes macrotis mutica*). Endangered Species Protection Program. Washington, D.C.
- U.S. Fish and Wildlife Service (USFWS). 2002. Final Recovery Plan for Southwestern Willow Flycatcher (*Empidonax traillii estimus*). Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.
- U.S. Fish and Wildlife Service (USFWS). 2005. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. California/Nevada Operations Office. Portland, Oregon.
- U.S. Fish and Wildlife Service (USFWS). 2016. Species Account for Giant Garter Snake *Thamnophis gigas*. Available: [https://www.fws.gov/sacramento/es\\_species/Accounts/Amphibians-Reptiles/giant\\_garter\\_snake/documents/giant\\_garter\\_snake.pdf](https://www.fws.gov/sacramento/es_species/Accounts/Amphibians-Reptiles/giant_garter_snake/documents/giant_garter_snake.pdf) (Accessed: August 18, 2021).
- U.S. Fish and Wildlife Service (USFWS). 2021. Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC). Available: <https://ecos.fws.gov/ipac/> (Accessed: October 1, 2021).

- Wedgwood, J.A., 1978. The status of the Burrowing Owl in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario.
- Wesemann, T. and M. Rowe. 1987. Factors influencing the distribution and abundance of burrowing owls in Cape Coral, Florida. Pp. 129-137 *in* Integrating man and nature in the metropolitan environment (L.W. Adams and D.L. Leedy, eds.). National Institute of Urban Wildlife, Columbia, MD.
- Willson, M.F. 1996. Breeding Ecology of the Yellow-Headed Blackbird. Ecological Monographs 36(1): 51-77.
- Zarn, M. 1974. Burrowing owl, Report No. 11. Habitat management series for unique or endangered species. Bureau of Land Management, Denver, CO.

# Appendix C

## Copper Species-Specific Risk and Ecological Toxicity Data

## **1. Background**

### **1.1. Copper Exposure and Toxicity in Terrestrial Versus Aquatic Animals**

Copper is a naturally occurring, essential micronutrient for all organisms. Copper homeostasis is tightly regulated through a complex system of copper transporters and chaperone proteins (Gaetke et al., 2014) and most organisms have homeostatic mechanisms to process excess copper or to manage the deficiency of copper levels (USEPA, 2009). Copper exposure in terrestrial animals such as birds, reptiles and mammals primarily occurs through dietary intake. While exposure to high levels of copper in the diet can interfere with the ability to maintain homeostasis in terrestrial animals, animals with repeated exposure to copper concentrations which do not cause acute irreversible adverse impacts may undergo enzymatic adaptation and ultimately develop tolerance for greater levels of exposure (USEPA, 2009).

Aquatic animals such as fish are exposed to copper through both the dietary and direct uptake routes and are more susceptible to copper-induced toxicity than terrestrial animals. Copper toxicity in fish is primarily caused by its rapid binding to the gill membranes (USEPA, 2009). Copper accumulation in this way causes damage to the gill membranes and interferes with osmoregulatory processes. When exposed to sublethal concentrations of copper, many fish and mobile aquatic invertebrates exhibit an avoidance response, preferring areas within the waterbody that have lower concentrations of dissolved copper (Folmar, 1976, 1978).

### **1.2. Copper Fate in Aquatic Systems and Influence on Aquatic Toxicity**

When applied during algaecide and/or aquatic herbicide treatment, copper dissipation from the water column occurs by way of multiple processes including dilution, sorption, and precipitation. Due to processes such as advection, diffusion, and dispersion and because label language prohibits application of copper-containing algaecides and aquatic herbicides to more than half of a static water body, dilution is presumed to be a major dissipation process after initial application (Calomeni et al., 2017). This process occurs in flowing water systems where untreated water is present and moving into the treatment area after treatment as well, thereby diluting the concentration of copper. Treated water is either diluted with untreated water, or displaced from the treatment area or the canal by delivery onto an agricultural field where crops are grown.

Copper in the water column occurs as dissolved ions and as part of inorganic and organic complexes. Unlike organic chemicals, copper does not degrade over time, instead transforming from one form to another based on environmental properties such as pH, alkalinity, temperature, ionic strength, and organic carbon content. Many such physiochemical characteristics influence copper speciation, associated bioavailability, and resultant toxicity to aquatic organisms. The form of copper most commonly associated with aquatic toxicity is the free cupric ion ( $\text{Cu}^{2+}$ ) (USEPA, 2009). The likelihood and magnitude of toxicity to aquatic receptors exposed to the cupric ion is typically greater in waters characterized by low levels of hardness, pH, ionic strength, and dissolved organic carbon than in hard waters with higher pH, ionic strength, and dissolved organic carbon. Copper bioavailability in water is also influenced by the presence of biotic ligands such as algae and the gill membranes of fish. When used as an algaecide, application to water containing higher density algae blooms is associated with lower bioavailability and risk of copper toxicity to non-target aquatic receptors than application to water containing lower density algae blooms (Franklin et al., 2002). Water in District conveyances is generally considered to be “hard” or “moderately hard” according to ranges described by the United States Geological Survey.

## 2. Risk Assessment Process Overview

There are three special status species that could have habitat in or near District conveyances and potentially be affected by proposed Project activities. A screening level quantitative ecological risk assessment was conducted for these species to evaluate potential impacts from management of aquatic vegetation or algae with copper-containing materials. For contaminants frequently considered in ecological risk assessments, regulatory agencies such as USEPA recommend the evaluation of exposure compared to a toxicity endpoint to derive a risk quotient (RQ). RQs are often calculated as a method to identify high- or low-risk scenarios. The RQ is calculated by dividing the estimated exposure by the concentration associated with a toxicity endpoint. Toxicity endpoints routinely used by USEPA (2020) in calculating RQs for screening-level risk assessments for animals include the median lethal dose (LD50), median lethal concentration (LC50), or median effect concentration (EC50) for acute assessments and the No Observed Adverse Effect Level (NOAEL) or Concentration (NOAEC) for chronic assessments.

$$\text{Risk Quotient (RQ)} = \text{Exposure} / \text{Toxicity}$$

Once an RQ is calculated, it is compared to the Level of Concern (LOC) to determine whether an adverse effect for a given species is likely to occur. Risk is present when the RQ exceeds the LOC. Exposure is not considered to pose a risk when the RQ is lower than the LOC. USEPA (2020) uses the following LOCs for endangered animal species in regulatory decision-making:

- Terrestrial animal (birds and mammals) acute risk LOC = 0.1
- Terrestrial animal (birds and mammals) chronic risk LOC = 1.0
- Aquatic animal acute risk LOC = 0.05
- Aquatic animal chronic risk LOC = 1.0

Specific details regarding the estimation of risk in the giant garter snake, western pond turtle, and San Joaquin kit fox from exposure to water following application of copper-containing algaecides and/or aquatic herbicides in District irrigation conveyances are presented below.

### 2.1. Giant Garter Snake and Western Pond Turtle Risk Estimation

For many pesticides, there are limited to no toxicity data available for various taxonomic groups. For example, database and literature searches for copper toxicity testing of reptiles did not yield any useable studies. As a result, avian (bird) toxicity endpoints were used in place of specific toxicity values for reptile species. The uncertainty involved with using avian endpoint data to estimate risk to a reptile species does not require the application of an additional safety factor (USEPA, 2004). The endpoints used to estimate risk of copper to the giant garter snake and western pond turtle were found in USEPA's (2019) OPP database (**Table C-1**). The most sensitive acute endpoint for birds was 357.9 mg copper sulfate pentahydrate/kg body weight, equal to approximately 91.1 mg metallic copper/kg body weight.

**Table C-1. Copper Avian Oral Toxicity Studies Considered**

<b>Species</b>	<b>A.I. (Purity)</b>	<b>Study Duration</b>	<b>LD50 (mg A.I./kg-bw)</b>	<b>LD50 (mg Cu/kg-bw)</b>
Bobwhite quail ( <i>Colinus virginianus</i> )	Copper citrate (5.03%)	14 d	2,236	242.1
Bobwhite quail ( <i>Colinus virginianus</i> )	Copper sulfate, pentahydrate (99%)	14 d	368	93.7
<b>Bobwhite quail (<i>Colinus virginianus</i>)</b>	<b>Copper sulfate, pentahydrate (99%)</b>	<b>14 d</b>	<b>357.9</b>	<b>91.1</b>
Mallard duck ( <i>Anas platyrhynchos</i> )	Copper triethanolamine formulation (54.8%)	NR	> 2000	> 603.1

**General Notes:**

Data obtained from USEPA (2019).

The **bolded** study was used to derive a reptilian endpoint for risk assessment.

**Abbreviations:**

A.I. - Active ingredient (A.I.)

Median lethal dose (LD50)

Not reported (NR)

In this assessment, only oral exposure was considered for the giant garter snake and western pond turtle because little or no dermal and inhalation toxicity data exist for ecological receptors. Therefore, the sole exposure pathway that could be evaluated in the assessment of risk for these receptors is through oral exposure. The giant garter snake and western pond turtle were assumed to eat and drink solely from copper-treated water in the District's irrigation canal system.

Aquatic prey items were assumed to bioaccumulate copper following application of copper-containing algaecides and/or aquatic herbicides. Aquatic prey items were assumed to be exposed to a static water body treated at a rate of 1 mg/L of copper for 24 hours. Copper dissipation was assumed not to occur.

The rate and magnitude of copper bioaccumulation in organisms varies between species based on factors such as metabolic need, feeding mode, and exposure concentration and duration. Similarly, the bioavailability of copper compounds in treated water and subsequently accumulated within exposed receptors varies widely based on the species and exposure conditions (USEPA, 2007). Examples of the differential bioaccumulation patterns in a variety of ecological receptors are provided later in this appendix.

Biomagnification (i.e., transfer of copper from lower trophic levels to higher trophic levels within a food web) was presumed to occur when copper-exposed prey items such as fish were consumed by predators such as the snake and the turtle. Per USEPA (2007), inorganic metal compounds rarely biomagnify across three or more trophic levels. Due to the relatively small number of metals and predator-prey relationships evaluated in the literature, in addition to the site-specific nature of copper bioavailability, the ability to make generalizations regarding anticipated toxicity resulting from dietary exposure to copper is limited (USEPA, 2007) and a simplified approach was used for this assessment.

The juvenile common carp (*Cyprinus carpio*) was used to represent fish and other aquatic prey items potentially exposed to copper via uptake of treated water in the treated water body. Whole



body bioaccumulation patterns in the common carp were estimated based on data provided by Delahaut et al. (2020). Aquatic prey items were assumed to be exposed to a constant concentration of copper equal to the application rate for the duration of the exposure scenario without consideration of copper dissipation from the water column.

Copper uptake through food intake and drinking water were estimated to determine the exposure amount. A standard food intake factor, a multiplier used to calculate food intake based on metabolic rate, dietary preferences, and metabolizable energy content of the diet, was used to calculate the dose from aquatic prey items such as fish. Intake of copper through water consumption was calculated using a standard water intake factor, a multiplier based on metabolic need and body weight, to estimate the amount of copper the snake or turtle might consume from drinking copper-treated water. The body weight of the giant garter snake and western pond turtle were used in the calculation of food and water intake rates.

All food items were assumed to be consumed within the treatment area. The food intake rate used in exposure calculations was approximately 4.4 grams dry weight/day for the snake and approximately 4.2 grams of dry weight/day for the turtle. The methodology for estimating these values was provided by Nagy (2001).

The methodology for estimating water intake rates is contained in USEPA's (1993) Wildlife Exposure Factors Handbook. The concentration of copper in drinking water was assumed to be equal to the application rate, and water intake was assumed to occur only within the treatment area. The water intake rate used for exposure calculations in the current assessment was approximately 0.04 liters per day for the snake and 0.044 liters per day for the turtle.

Daily copper exposure was estimated using the sum of exposure from consumption of aquatic prey items exposed to copper and from consumption of copper-treated drinking water. Exposure was divided by the lowest LD50 to calculate an RQ which was subsequently compared to the LOC to assess the extent of risk.

Application of copper-containing algaecides at the maximum label application rate (1 mg/L) was estimated to result in the accumulation of approximately 37.1 milligrams of copper per kilogram dry weight of aquatic prey item based on a 24-hour (acute) exposure period. After incorporation of food and water intake rates normalized to body weight, daily exposure to copper was estimated to be approximately 0.36 and 0.31 milligrams of copper per kilogram body weight per day for the snake and turtle, respectively. This resulted in an RQ of approximately 0.004 for the giant garter snake and 0.003 for the western pond turtle. Because neither RQ exceeds the acute threatened or endangered species LOC for terrestrial animals of 0.1, copper applied to District conveyances for algae control does not appear to pose acute risk to the giant garter snake or western pond turtle.

In support of these findings, the California Department of Fish and Game (now "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 (Hosea et al., 2004).

## 2.2. San Joaquin Kit Fox Risk Estimation

The endpoints used to estimate risk of copper to the San Joaquin kit fox were obtained from USEPA (2009) (**Table C-2**). The most sensitive acute mammalian was 450 mg copper sulfate pentahydrate/kg body weight, equal to approximately 114 mg metallic copper/kg body weight.

**Table C-2. Copper Mammalian Oral Toxicity Studies Considered**

Species	A.I. (Purity)	Study Duration	LD50 (mg A.I./kg-bw)	LD50 (mg Cu/kg-bw)
Rat (male)	Copper sulfate, pentahydrate (NR)	NR	790	200
<b>Rat (female)</b>	<b>Copper sulfate, pentahydrate (NR)</b>	<b>NR</b>	<b>450</b>	<b>114</b>

**General Notes:**

Data obtained from USEPA (2009).

The **bolded** study was used to derive a reptilian endpoint for risk assessment.

**Abbreviations:**

Active ingredient (A.I.)

Median lethal dose (LD50)

Not reported (NR)

Acute oral exposure via consumption of drinking water was considered for the kit fox, which was assumed to drink solely from copper-treated water in the District's irrigation canal system. The concentration of copper in drinking water was assumed to be equal to the maximum application rate of 1 mg/L. Copper dissipation was assumed not to occur.

A standard water intake factor (multiplier used to water intake based on metabolic need and body weight) was used to estimate of the concentration of copper in water the kit fox could consume as part of its diet. The methodology for estimating this value is contained in USEPA's (1993) Wildlife Exposure Factors Handbook. The water intake rate used for exposure calculations in the current assessment was approximately 2.1 liters per day.

Daily copper exposure via consumption of copper-treated drinking water was divided by the lowest LD50 to calculate an RQ which was subsequently compared to the LOC to assess the extent of risk. Daily copper exposure of San Joaquin kit fox was estimated to be approximately 0.91 milligrams of copper per kilogram body weight per day, resulting in an RQ of 0.008. Because the RQ does not exceed the acute threatened or endangered species LOC for terrestrial animals of 0.1, copper applied to District conveyances for algae control does not appear to pose acute risk to the San Joaquin kit fox.

### 3. Summary of Bioaccumulation Studies

#### Edwards et al., 1998

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

#### Gintenreiter et al., 1993

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

#### Gomot and Pihan, 1997

Bioconcentration of copper was evaluated in two subspecies of terrestrial 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 4 different 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. However, 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*), a freshwater aquatic species, 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 terrestrial 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*). No significant differences in copper accumulation were observed between the sites.

**Khan et al., 1989**

Bioconcentration factors in grass shrimp (*Palaemonetes pugio*), an aquatic species, 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, 1997b**

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 copper 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 copper.

## 4. References

- Calomeni, A.J., K.J. Iwinski, A.D. McQueen, C.M. Kinley, M. Hendrikse, and J.H. Rodgers, Jr. 2017. Characterization of Copper Algaecide (Copper Ethanolamine) Dissipation Rates Following Pulse Exposures. *Water, Air, & Soil Pollution* 228(11): 1-13.
- Delahaut, V., B. Raskovic, M.S. Salvado, L. Bervoets, R. Blust, and G. De Boeck. 2020. Toxicity and bioaccumulation of Cadmium, Copper and Zinc in a direct comparison at equitoxic concentrations in common carp (*Cyprinus carpio*) juveniles. *PLoS ONE* 15(4): 1-24.
- Edwards, S.C., C.L. MacLeod, and J.N. Lester. 1998. The bioavailability of copper and mercury to the common nettle (*Urtica dioica*) and the earthworm *Eisenia fetida* from contaminated dredge spoil. *Water, Air, and Soil Pollution* 102: 75-90.
- Folmar, L.C. 1976. Overt avoidance reaction of rainbow trout fry to nine herbicides. *Bulletin of Environmental Contamination and Toxicology* 15(5): 509-514.
- Folmar, L.C. 1978. Avoidance chamber response of mayfly nymphs exposed to eight herbicides. *Bulletin of Environmental Contamination and Toxicology* 19(3): 312-318.
- Franklin, N.M., J.L. Stauber, S.C. Apte, and R.P. Lim. 2002. Effect of Initial Cell Density on the Bioavailability and Toxicity of Copper in Microalgal Bioassays. *Environmental Toxicology and Chemistry* 21(4): 742-751.
- Gaetke, L.M., H.S. Chow-Johnson, and C.K. Chow. 2014. Copper: Toxicological relevance and mechanisms. *Archives of Toxicology* 88(11): 1929-1938.
- Gintenreiter, S., J. Ortel, and H.J. Nopp. 1993. Bioaccumulation of cadmium, lead, copper, and zinc in successive developmental stages of *Lymantria dispar* L. (Lymantriidae, Lepid)—a life cycle study. *Archives of Environmental Contamination and Toxicology* 25: 55-61.
- Gomot, A. and F. Pihan. 1997. Comparison of the bioaccumulation capacities of copper and zinc in two snail subspecies (*Helix*). *Ecotoxicology and Environmental Safety* 38(2): 85-94.
- Gomot de Vaufleury, A. and F. Pihan. 2000. Growing snails used as sentinels to evaluate terrestrial environment contamination by trace elements. *Chemosphere* 40(3): 275-284.
- Han, B.C., W.L. Jeng, T.C. Hung, and M.Y. Wen. 1996. Relationship between copper speciation in sediments and bioaccumulation by marine bivalves of Taiwan. *Environmental Pollution* 91(1): 35-39.
- Haritonidis, S. and P. Malea. 1999. Bioaccumulation of metals by the green alga *Ulva rigida* from Thermaikos Gulf, Greece. *Environmental Pollution* 104(3): 365-372.
- Harrahy, E.A. and W.H. Clements. 1997. Toxicity and bioaccumulation of a mixture of heavy metals in *Chironomus tentans* (Diptera: Chironomidae) in synthetic sediment. *Environmental Toxicology and Chemistry* 16(2): 317-327.
- Hendriks, A.J., H. Pieters, and J. de Boer. 1998. Accumulation of metals, polycyclic (halogenated) aromatic hydrocarbons, and biocides in zebra mussels and eel from the Rhine and Meuse Rivers. *Environmental Toxicology and Chemistry* 17(10): 1885-1898.
- Hosea, R.C., K.Z. Bjurstrom, and E.E. Littrell. 2004. Acute oral and dermal toxicity of aquatic herbicides and a surfactant to garter snakes. Administrative Report 2004-01. California Department of Fish and Wildlife, Office of Spill Prevention and Response. Rancho Cordova, CA.

- Janssen, M.P.M. and R.F. Hogervorst. 1993. Metal accumulation in soil arthropods in relation to micro-nutrients. *Environmental Pollution* 79: 181-189.
- Khan, A.T., J.S. Weis, and L. D'Andrea. 1989. Bioaccumulation of four heavy metals in two populations of grass shrimp, *Palaemonetes pugio*. *Bulletin of Environmental Contamination and Toxicology* 42: 339-343.
- Marinussen, M.P.J.C, S.E.A.T.M. van der Zee, and F.A.M. de Haan. 1997a. Cu accumulation in the earthworm *Dendrobaena veneta* in a heavy metal (Cu, Pb, Zn) contaminated site compared to Cu accumulation in laboratory experiments. *Environmental Pollution* 96(2): 227-233.
- Marinussen, M.P.J.C., S.E.A.T.M. van der Zee, F.A.M. de Haan, L.M. Bouwman, and M.M. Hefting. 1997b. Heavy metal (copper, lead, and zinc) accumulation and excretion by the earthworm, *Dendrobaena veneta*. *Journal of Environmental Quality* 26(1): 278-284.
- Morgan, J.E., and A.J. Morgan. 1990. The distribution of cadmium, copper, lead, zinc, and calcium in the tissues of the earthworm *Lumbricus rubellus* sampled from one uncontaminated and four polluted sites. *Oecologia* 84(4): 559-566.
- Morgan, J.E. and A.J. Morgan. 1999. The accumulation of metals (Cd, Cu, Pb, Zn, and Ca) by two ecologically contrasting earthworm species (*Lumbricus rubellus* and *Aporrectodea caliginosa*): implications for ecotoxicological testing. *Applied Soil Ecology* 13: 9-20.
- Nagy, K.A. 2001. Food requirements of wildlife animals: predictive equations for free-living mammals, reptiles, and birds. *Nutrition Abstracts and Reviews Series B: Livestock Feeds and Feeding* 71(10): 21R-32.
- Neuhauser, E.F., Z.V. Cukic, M.R. Malecki, R.C. Loehr, P.R. Durkin. 1995. Bioconcentration and biokinetics of heavy metals in the earthworm. *Environmental Pollution* 89(3): 293-301.
- Pyatt, F.B., A.J. Pyatt, and V.W. Pentreath. 1997. Distribution of metals and accumulation of lead by different tissues in the freshwater snail *Lymnaea stagnalis* (L.). *Environmental Toxicology and Chemistry* 16(6): 1393-1395.
- Svendsen, C. and J.M. Weeks. 1997a. Relevance and applicability of a simple earthworm biomarker of copper exposure: I. Links to ecological effects in a laboratory study with *Eisenia andrei*. *Ecotoxicology and Environmental Safety* 36(1): 72-79.
- Svendsen, C. and J.M. Weeks. 1997b. Relevance and applicability of a simple earthworm biomarker of copper exposure: II. Validation and applicability under field conditions in a mesocosm experiment with *Lumbricus rubellus*. *Ecotoxicology and Environmental Safety* 36(1): 80-88.
- U.S. Environmental Protection Agency (USEPA). 1993. Wildlife Exposure Factors Handbook. U.S. Environmental Protection Agency. Report EPA/600/R-93/187.
- U.S. Environmental Protection Agency (USEPA). 2004. Overview of the ecological risk assessment process in the Office of Pesticide Programs, U.S. Environmental Protection Agency: Endangered and Threatened Species Effects Determinations. Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, Washington, D.C.
- U.S. Environmental Protection Agency (USEPA). 2007. Framework for Metals Risk Assessment. EPA 120/R-07/001. Office of the Science Advisor. Washington, D.C.
- U.S. Environmental Protection Agency (USEPA). 2009. Reregistration Eligibility Decision (RED) for Coppers. EPA 738-R-09-304. Office of Prevention, Pesticides and Toxic Substances. Washington, D.C.



U.S. Environmental Protection Agency (USEPA). 2019. Office of Pesticide Programs (OPP) Pesticide Ecotoxicity Database. Integrated Pest Management Center, U.S. Department of Agriculture, National Institute of Food and Agriculture.

U.S. Environmental Protection Agency (USEPA). 2020. Technical Overview of Ecological Risk Assessment: Risk Characterization. Available: <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/technical-overview-ecological-risk-assessment-risk> (Accessed: August 2, 2021).

# Appendix D

## Copper Speciation Graphs from the Biotic Ligand Model

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

In addition to using a hardness-based equation to quantify water quality criteria or receiving water limits, 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 (USEPA, 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 (USEPA, 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 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., LC50, EC50, EC20) 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, alkalinity, and dissolved organic carbon (DOC) influence the concentration of bioavailable  $\text{Cu}^{2+}$ . See **Table D-1** and **Graph 1** through **Graph 27** below. Generally, an increase in one or more of the three water parameters lowers the concentration of the  $\text{Cu}^{2+}$  species, thereby lowering the bioavailability of copper.

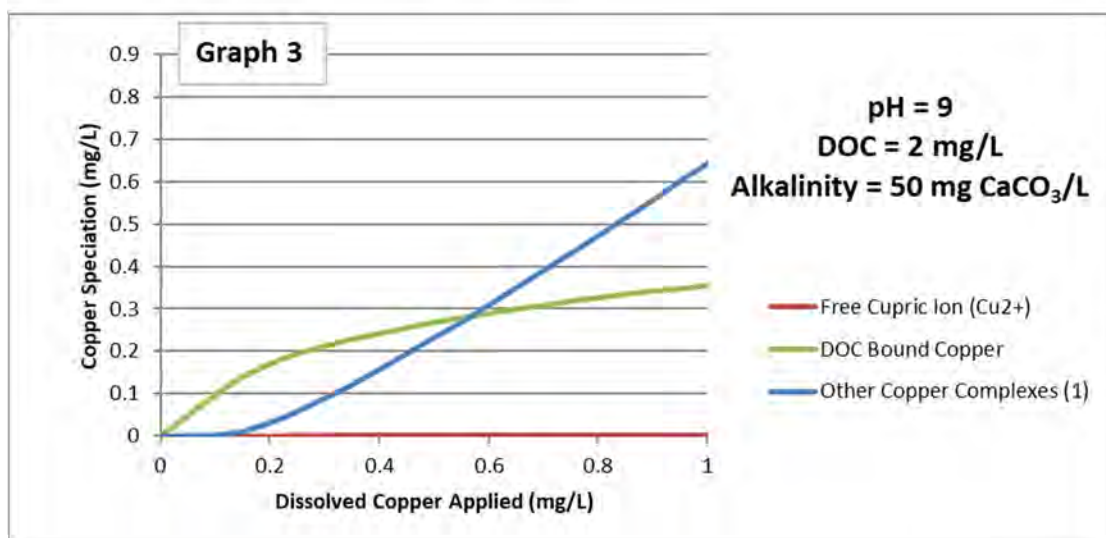
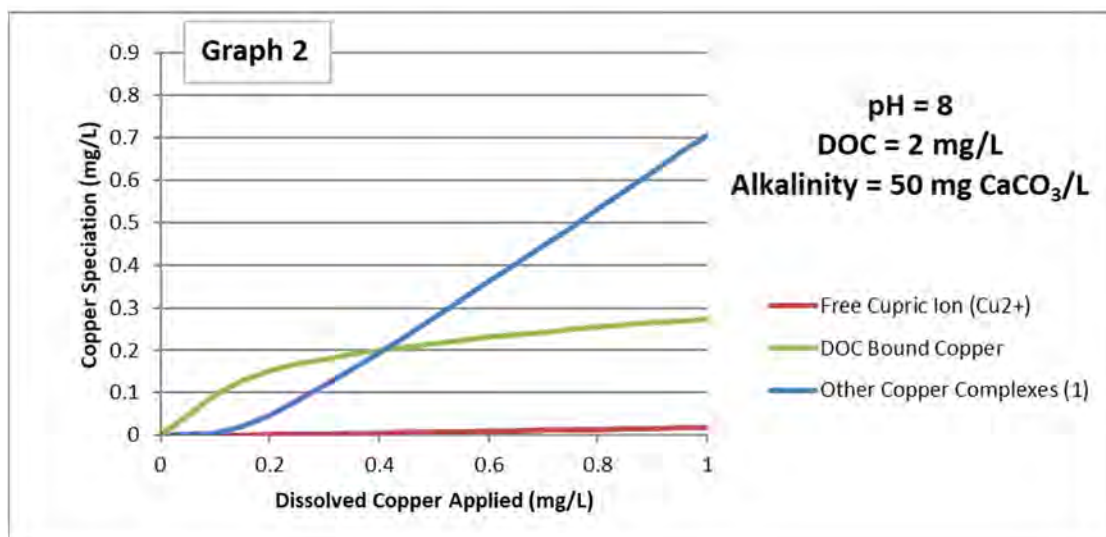
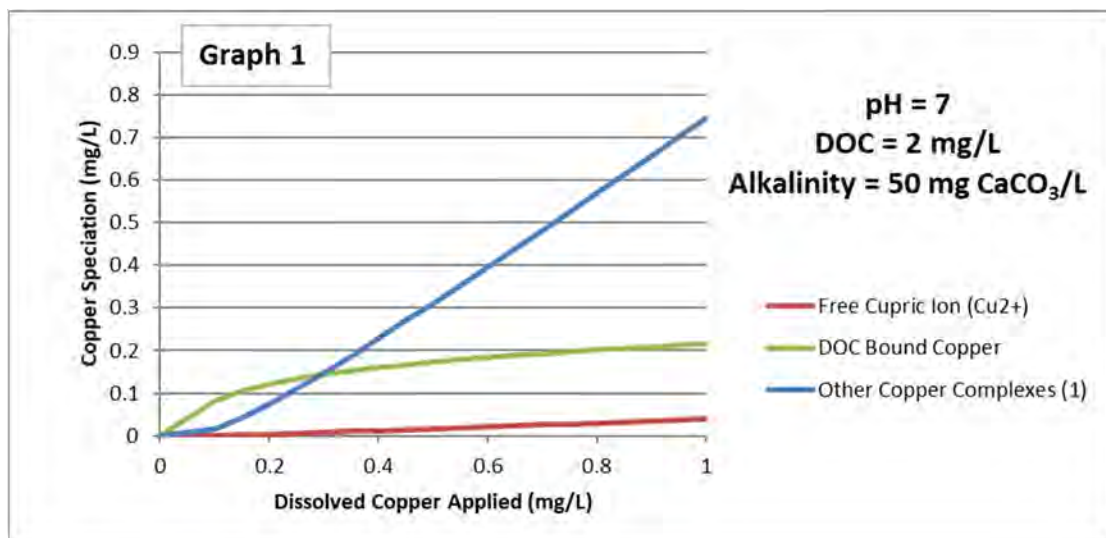
Copper speciation trends most applicable to water in Firebaugh Canal Water District conveyances are illustrated in **Graph 5** and **Graph 14**.

**Table D-1. BLM Input Parameters Used to Generate Graphs 1-27**

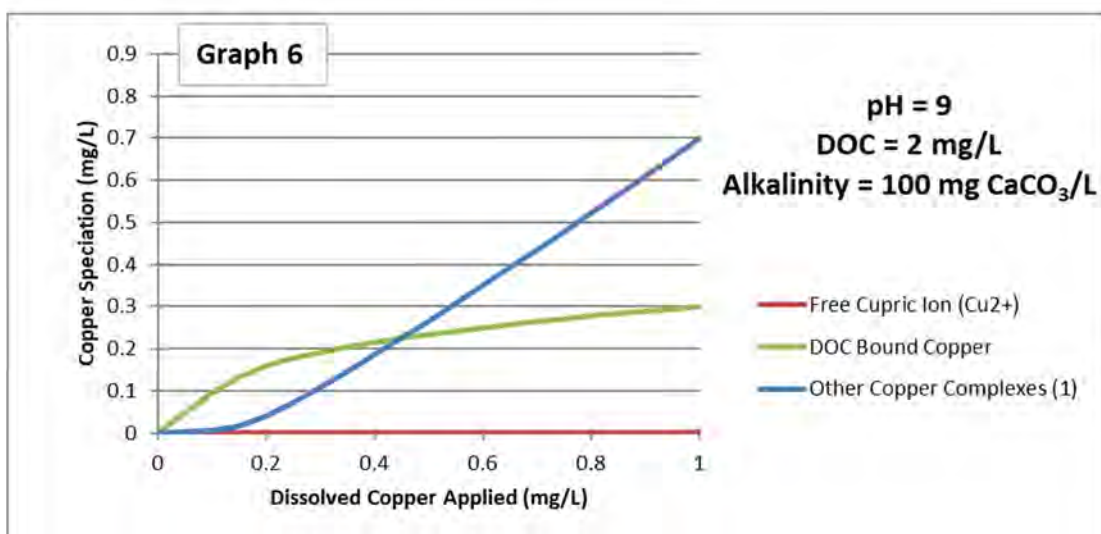
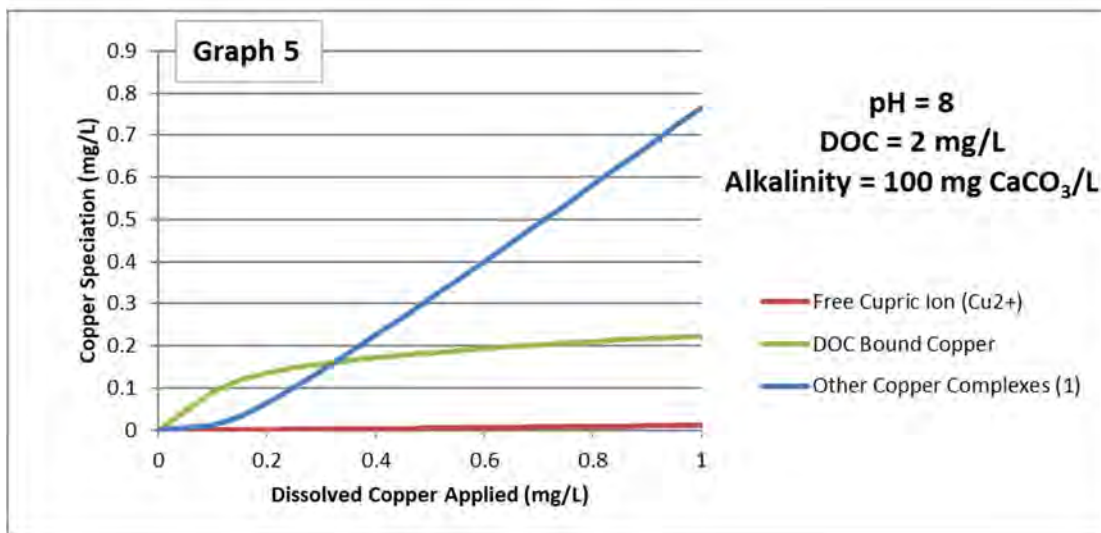
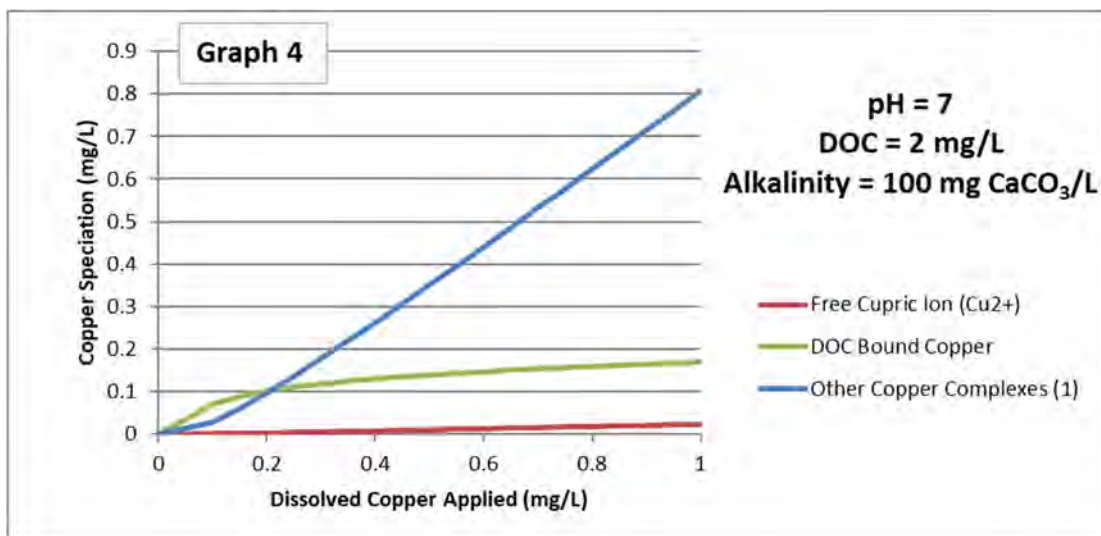
<b>Graph #</b>	<b>DOC (mg/L)</b>	<b>pH</b>	<b>Alkalinity (mg CaCO<sub>3</sub>/L)</b>
1	2	7	50
2	2	8	50
3	2	9	50
4	2	7	100
5	2	8	100
6	2	9	100
7	2	7	200
8	2	8	200
9	2	9	200
10	4	7	50
11	4	8	50
12	4	9	50
13	4	7	100
14	4	8	100
15	4	9	100
16	4	7	200
17	4	8	200
18	4	9	200
19	6	7	50
20	6	8	50
21	6	9	50
22	6	7	100
23	6	8	100
24	6	9	100
25	6	7	200
26	6	8	200
27	6	9	200

**General Notes:**

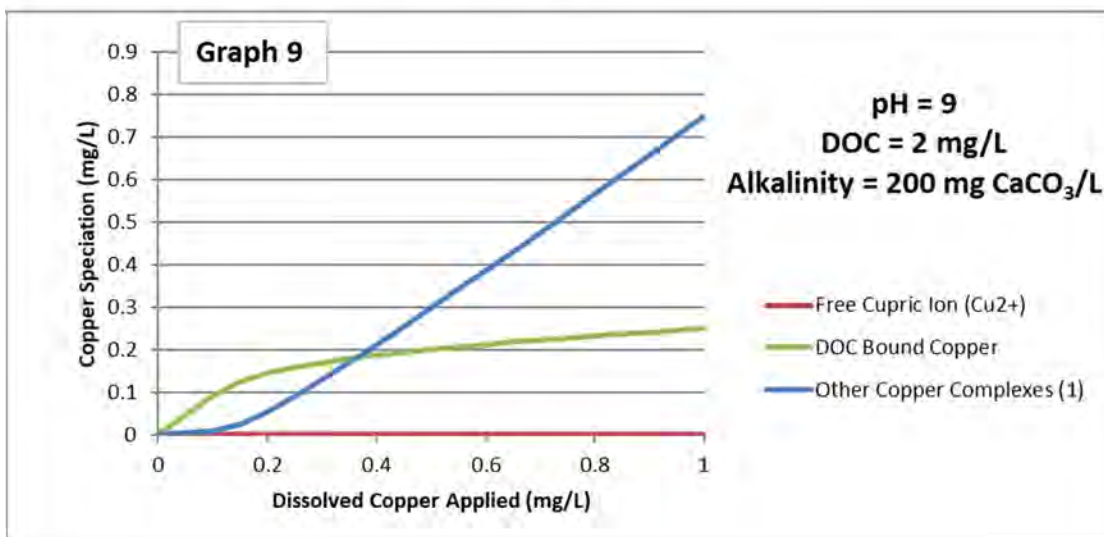
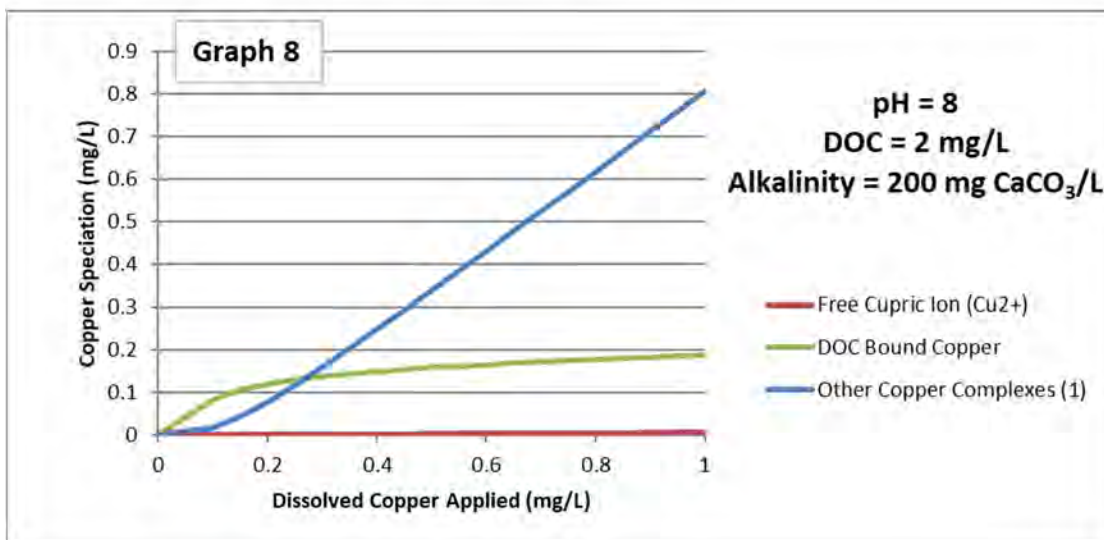
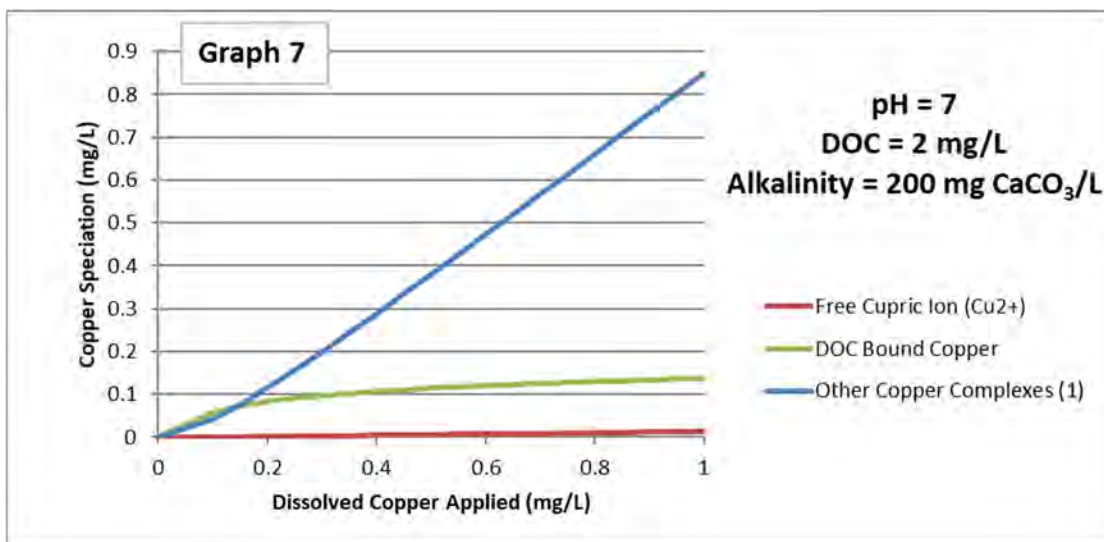
- 1) Copper speciation was modeled using Biotic Ligand Model (BLM) software, version 3.41.2.45 (see <https://www.windwardenv.com/biotic-ligand-model/>).
- 2) DOC is the dissolved organic carbon capable of complexing with copper cations, rendering them non-bioavailable. The humic acid content of DOC was assumed to be 10% consistent with guidance provided in the BLM User's Guide.
- 3) Temperature was assumed to be 25°C. Hardness and alkalinity, both expressed as CaCO<sub>3</sub>, were assumed equal. Calcium concentration inputs were estimated based on assumed hardness. All other parameter inputs (Mg, Na, K, SO<sub>4</sub>, Cl, and S) were assumed to be negligible (1.00E-15 mg/L).

**Notes:**

- 1) "Other Copper Complexes" 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>3+</sup>, and Cu(OH)<sub>2</sub>.

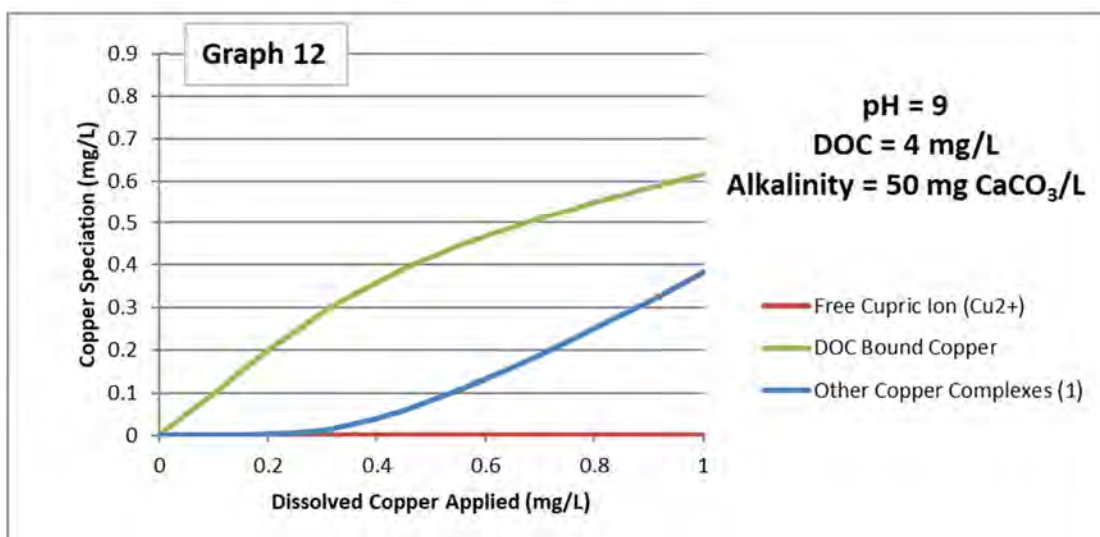
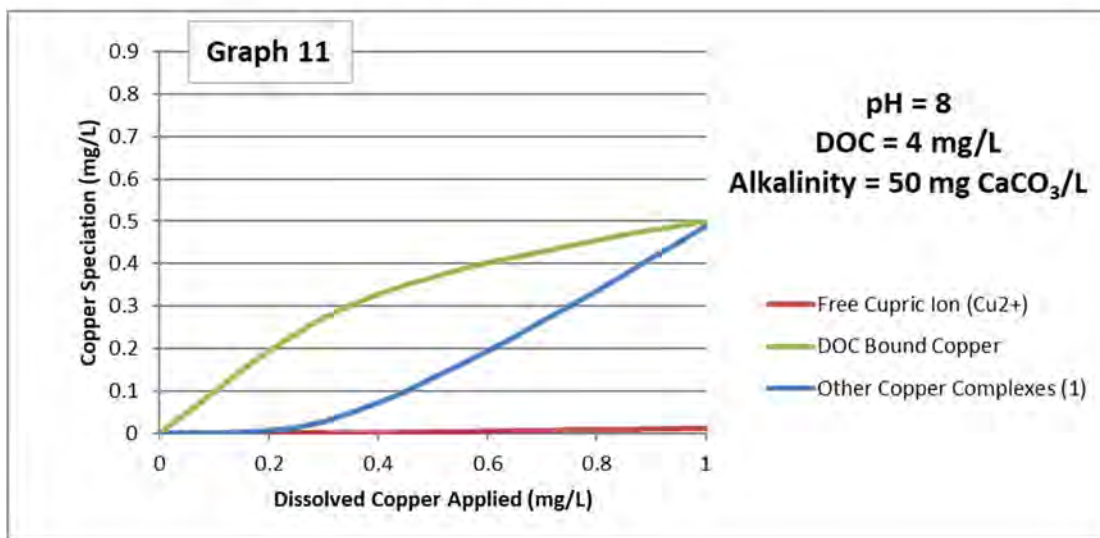
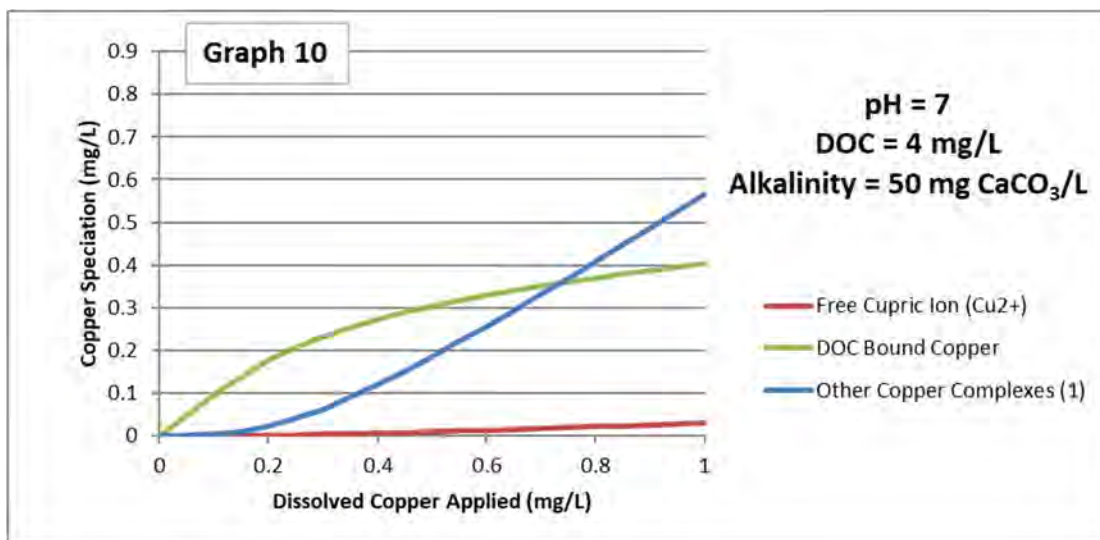
**Notes:**

- 1) "Other Copper Complexes" 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>.

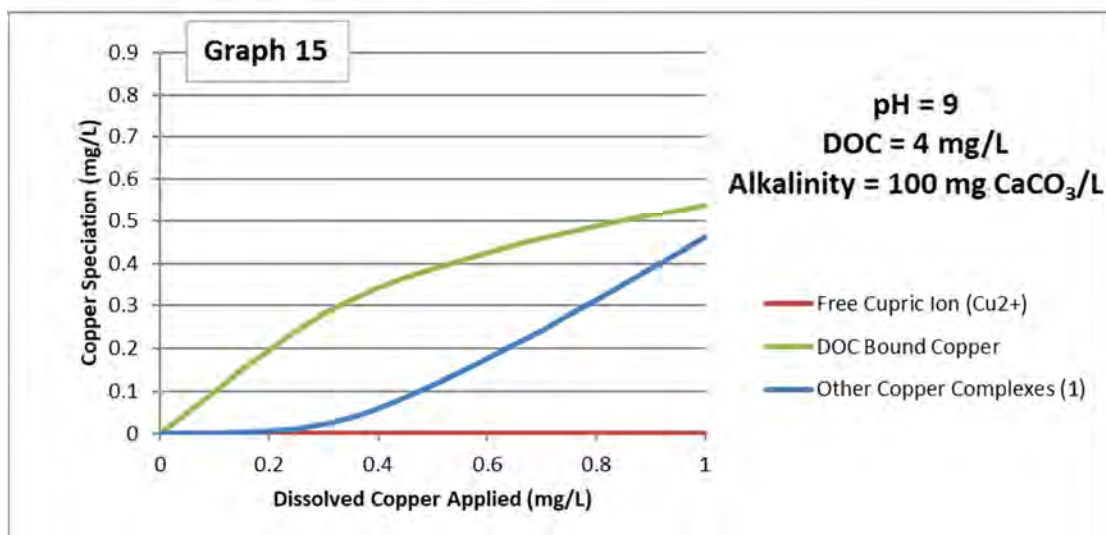
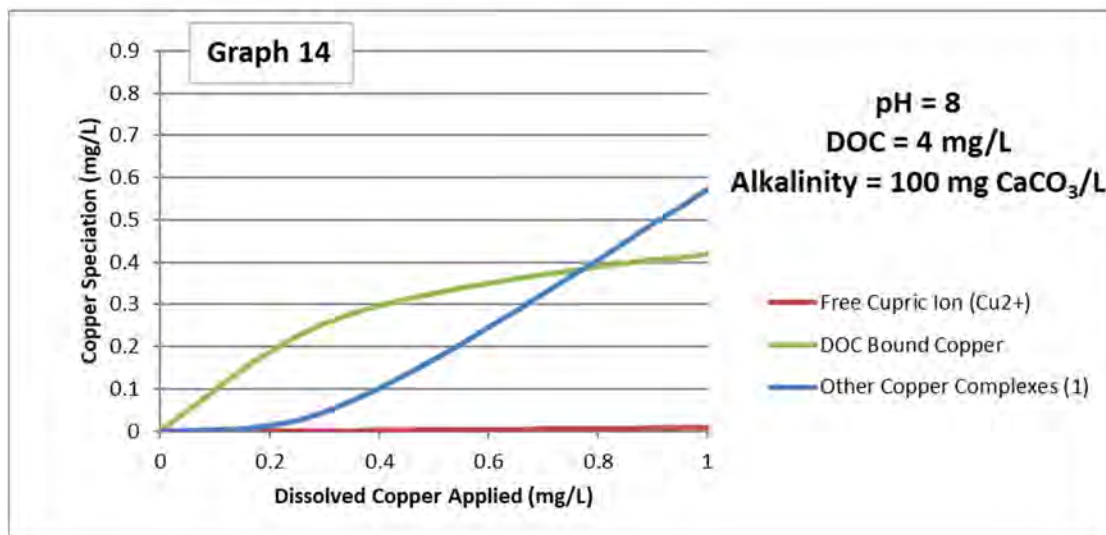
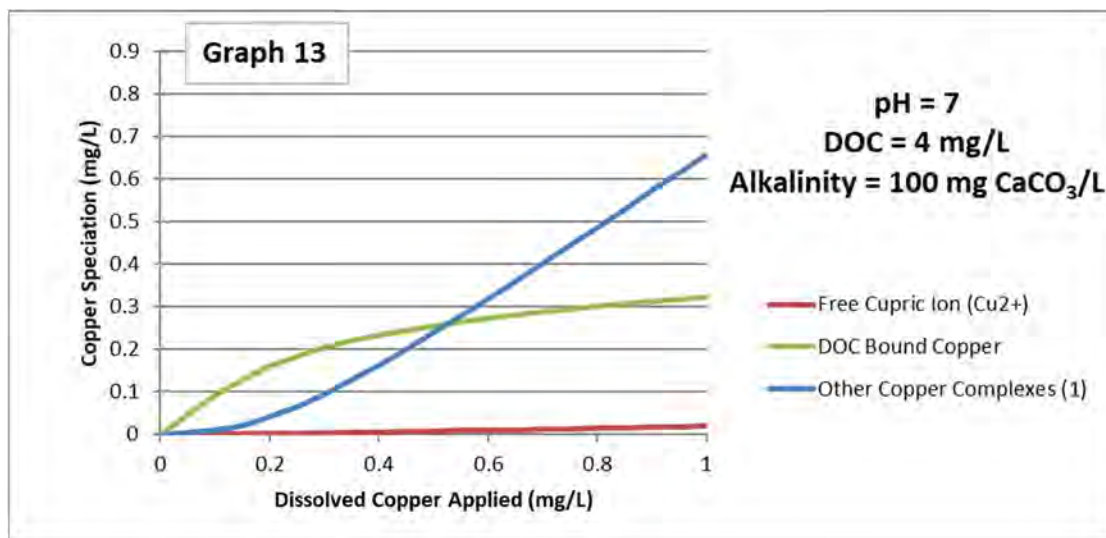
**Notes:**

- 1) "Other Copper Complexes" 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>3+</sup>, and Cu(OH)<sub>2</sub>.

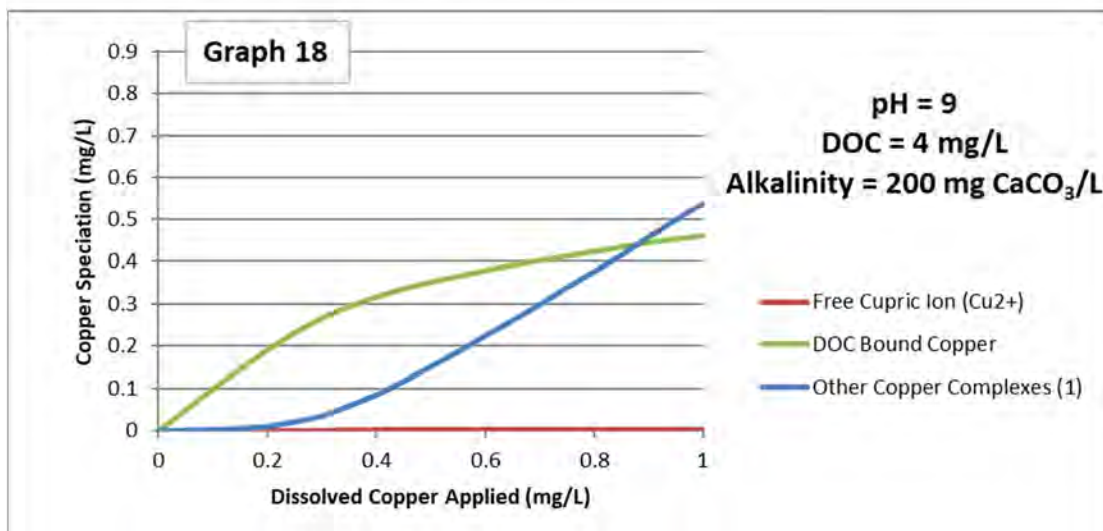
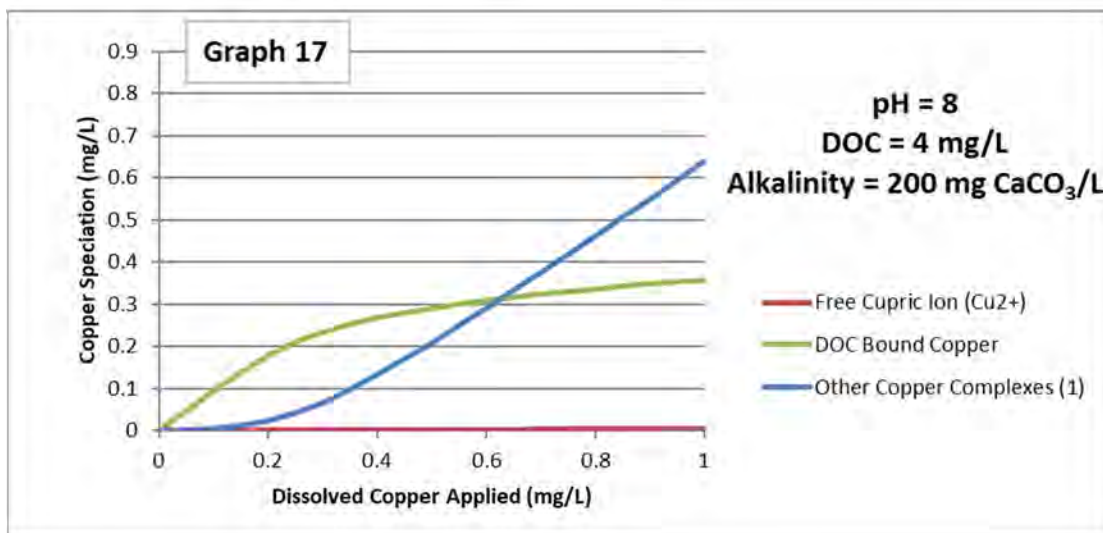
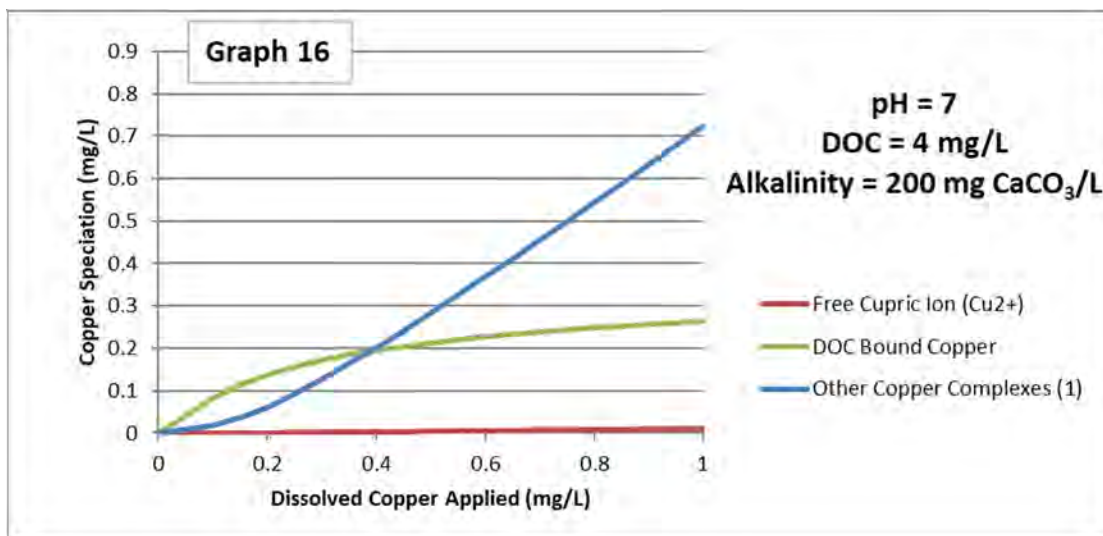


**Notes:**

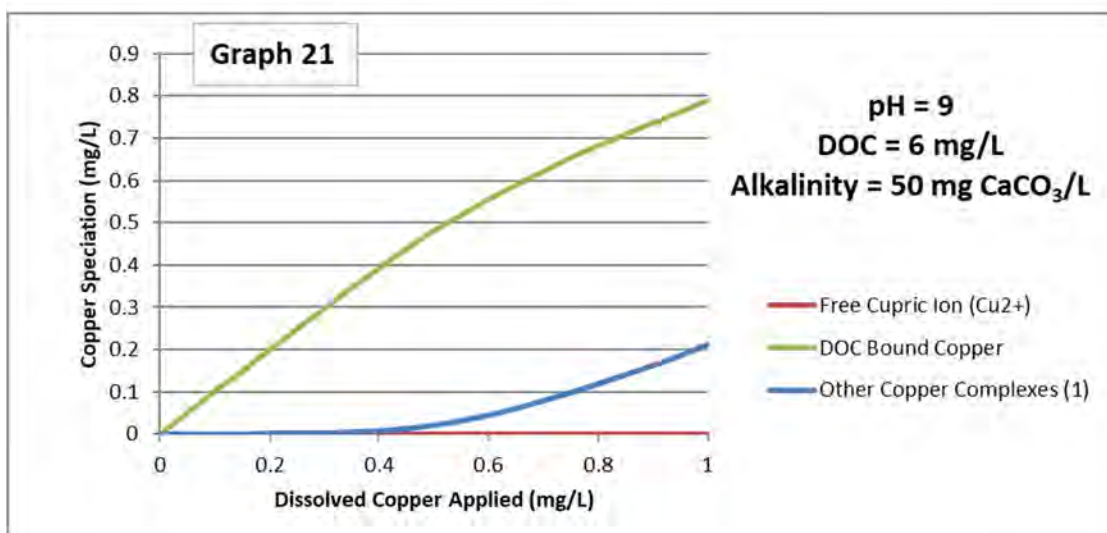
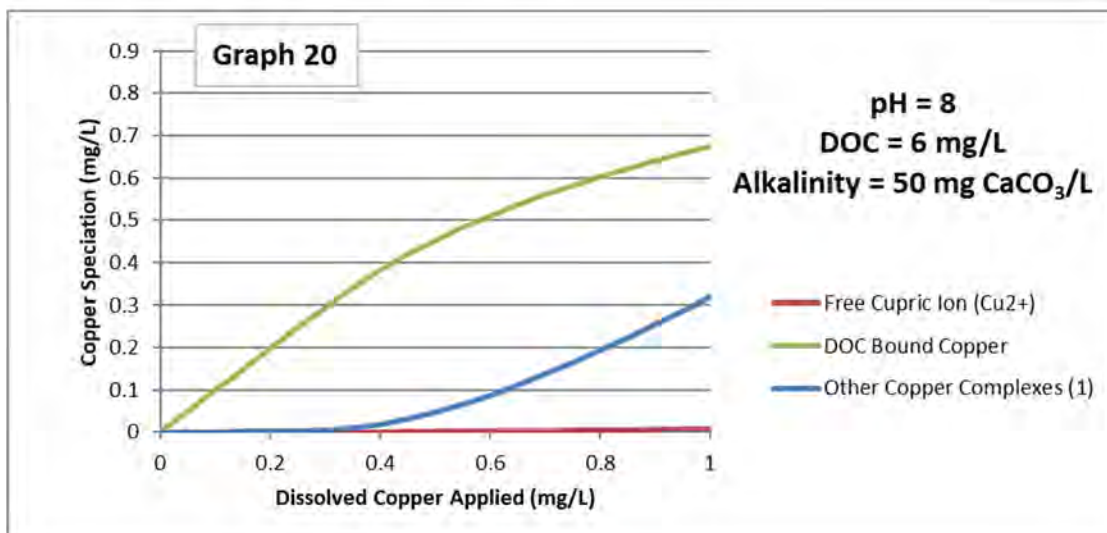
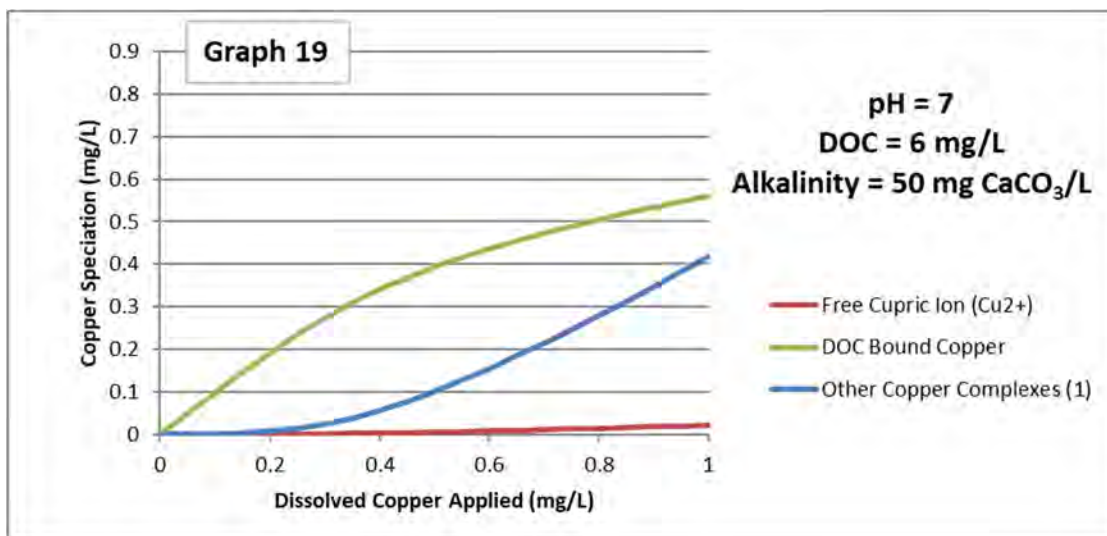
- 1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: CuCO<sub>3</sub>, CuHCO<sub>3</sub><sup>3+</sup>, and Cu(OH)<sub>2</sub>.

**Notes:**

- 1) "Other Copper Complexes" 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>3+</sup>, and Cu(OH)<sub>2</sub>.

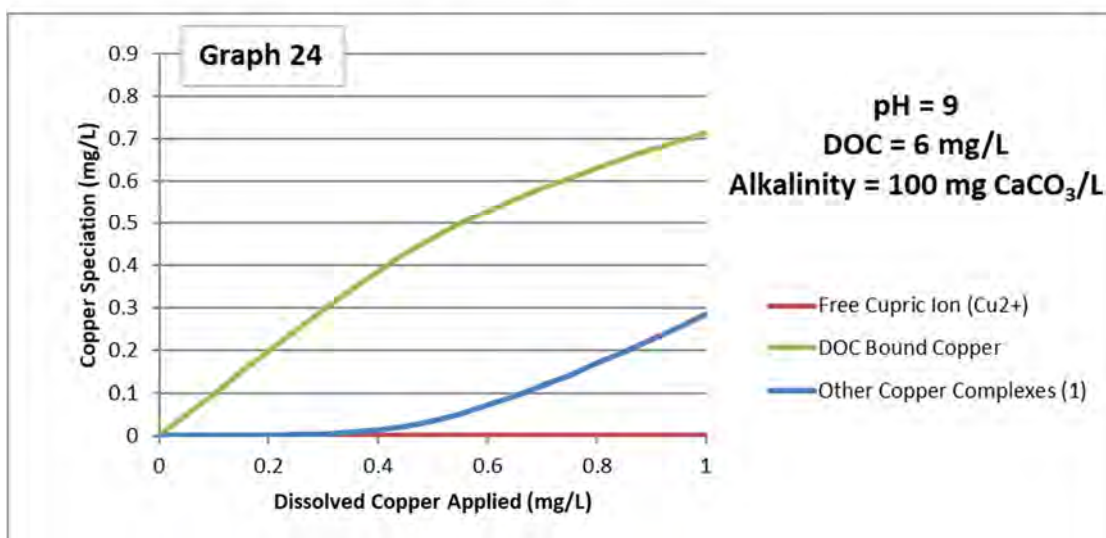
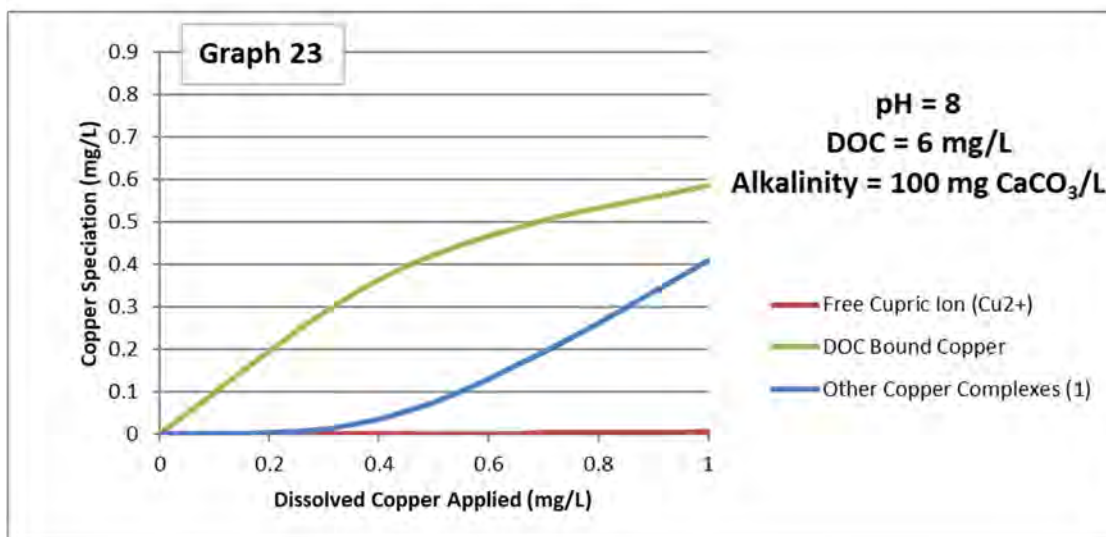
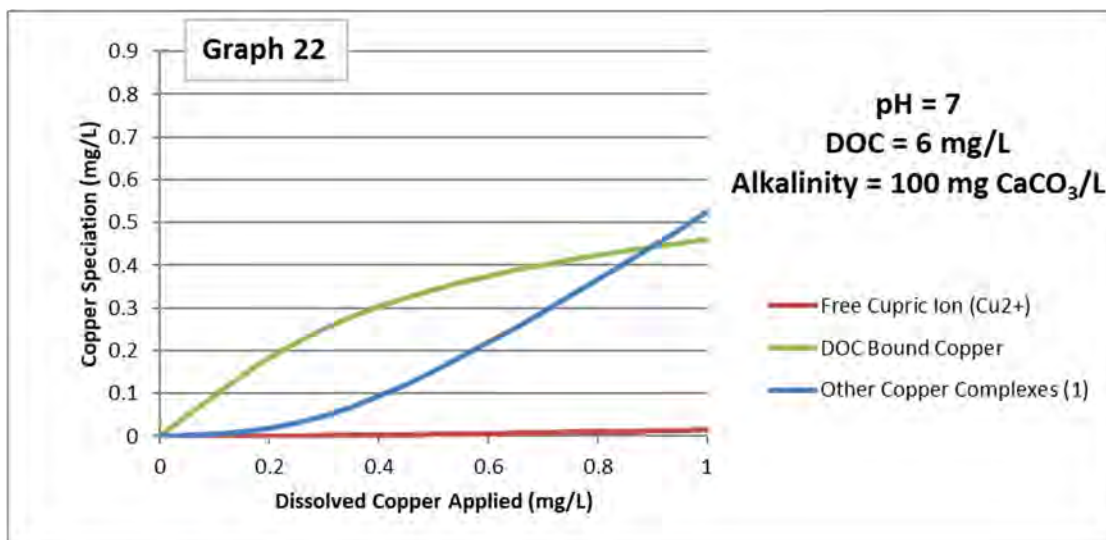
**Notes:**

- 1) "Other Copper Complexes" 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>3+</sup>, and Cu(OH)<sub>2</sub>.

**Notes:**

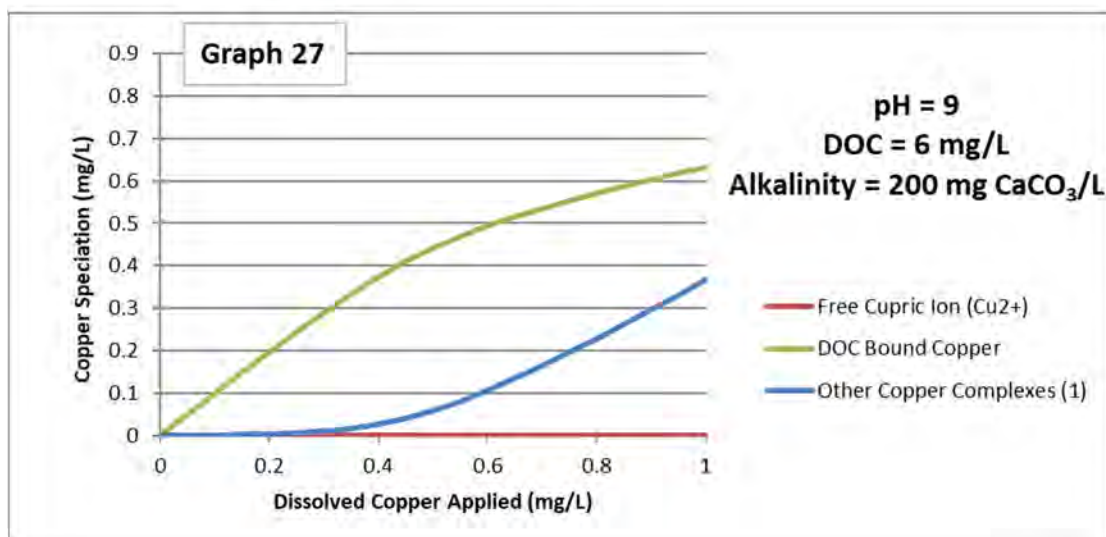
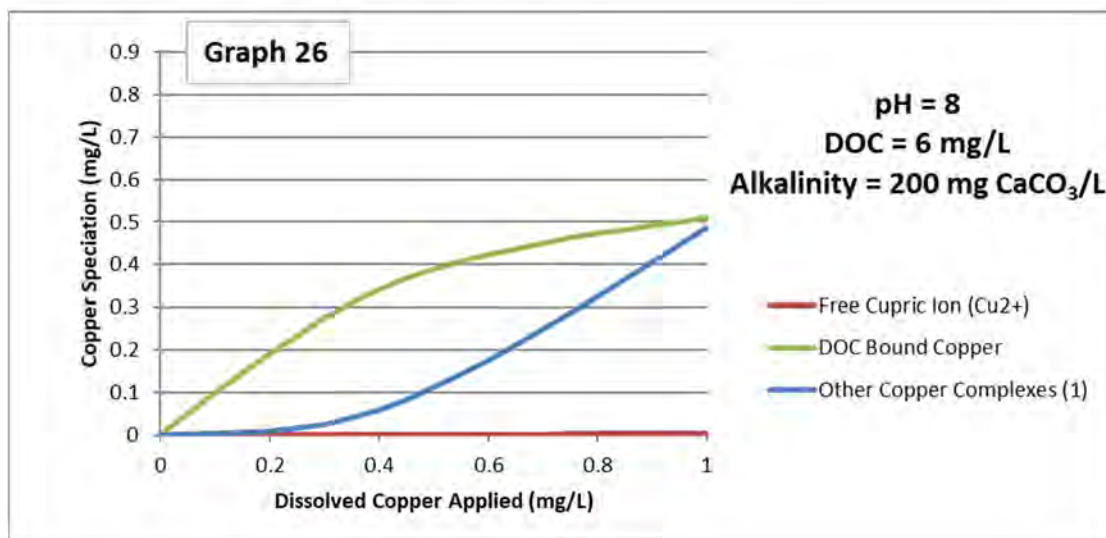
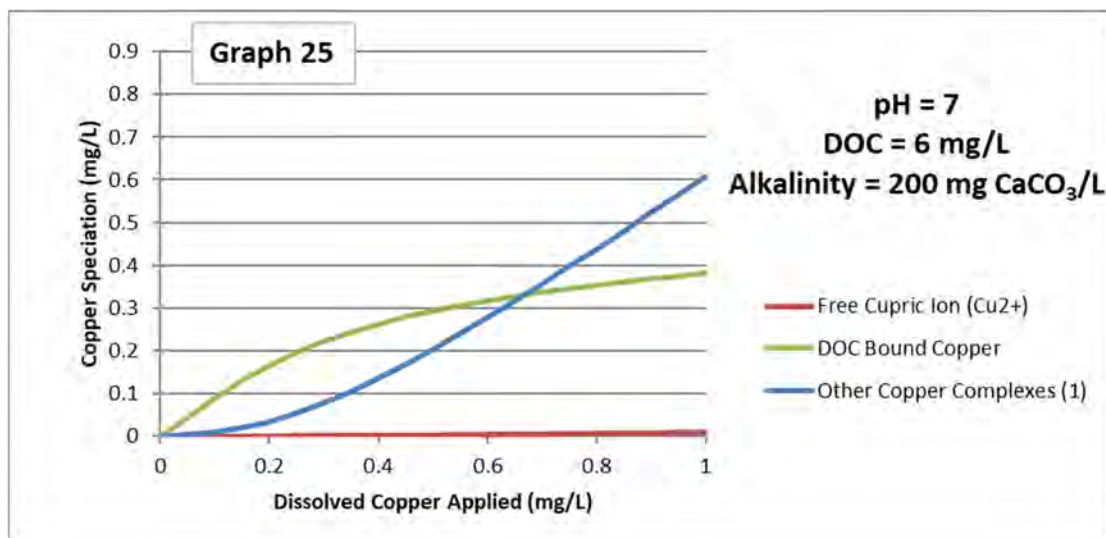
- 1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: CuCO<sub>3</sub>, CuHCO<sub>3</sub><sup>3+</sup>, and Cu(OH)<sub>2</sub>.





**Notes:**

- 1) "Other Copper Complexes" 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>3+</sup>, and Cu(OH)<sub>2</sub>.

**Notes:**

- 1) "Other Copper Complexes" 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>3+</sup>, and Cu(OH)<sub>2</sub>.

## **2. References**

U.S. Environmental Protection Agency (USEPA). 2007. Aquatic Life Ambient Freshwater Quality Criteria – Copper. 2007 Revision. Office of Water. Washington D.C.