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DIVISION OF WATER QUALITY

Attachment E – Notice of Intent

**WATER QUALITY ORDER NO. 2013-0002-DWQ
 GENERAL PERMIT NO. CAG990005**

**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**

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item. A. <input type="checkbox"/> New Applicator	<input checked="" type="checkbox"/> B. Change of Information: WDID# 9 000001070
C. <input type="checkbox"/> Change of ownership or responsibility: WDID#	

II. DISCHARGER INFORMATION

A. Name City of Escondido			
B. Mailing Address 201 North Broadway			
C. City Escondido	D. County San Diego	E. State California	F. Zip 92025
G. Contact Person Mr. Reed Harlan	H. E-mail address rharlan@ci.escondido.ca.us	I. Title Plant Superintendent	J. Phone (760) 839-6244

III. BILLING ADDRESS (Enter Information only if different from Section II above)

A. Name			
B. Mailing Address			
C. City	D. County	E. State	F. Zip
G. E-mail address	H. Title	I. Phone	

IV. RECEIVING WATER INFORMATION

A. Algaecide and aquatic herbicides are used to treat (check all that apply):	
1. <input checked="" type="checkbox"/>	Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger. Name of the conveyance system: Escondido Canal
2. <input type="checkbox"/>	Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger. Owner's name: _____ Name of the conveyance system: _____
3. <input checked="" type="checkbox"/>	Directly to river, lake, creek, stream, bay, ocean, etc. Name of water body: Lake Wohlford, Lake Dixon
B. Regional Water Quality Control Board(s) where treatment areas are located (REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region 9 (List all regions where algaecide and aquatic herbicide application is proposed.)	

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: _____ filamentous algae
B. Algaecide and Aquatic Herbicide Used: List Name and Active ingredients copper sulfate Cutrine Plus - chelated copper
C. Period of Application: Start Date December 15, 2014 End Date until the APAP expires
D. Types of Adjuvants Used: none

VI. AQUATIC PESTICIDE APPLICATION PLAN

Has an Aquatic Pesticide Application Plan been prepared and is the applicator familiar with its contents? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
If not, when will it be prepared? _____

VII. NOTIFICATION

Have potentially affected public and governmental agencies been notified? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

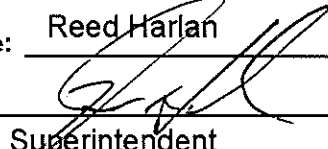
VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA

IX. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I certify that the provisions of the General Permit, including developing and implementing a monitoring program, will be complied with."

A. Printed Name: Reed Harlan

B. Signature: 

Date: 9/30/14

C. Title: Plant Superintendent

XI. FOR STATE WATER BOARD STAFF USE ONLY

WDID:	Date NOI Received:	Date NOI Processed:
Case Handler's Initial:	Fee Amount Received: \$	Check #:
<input type="checkbox"/> Lyris List Notification of Posting of APAP	Date _____	Confirmation Sent _____



Aquatic Pesticide Application Plan

Lakes Wohlford and Dixon and Associated Waterways City of Escondido Escondido, California

Presented to:

Mr. W. Russell Norman, P.E.
Water Resources Control Engineer
State Water Resources Control Board
1001 I Street
Sacramento, California 95814

Presented by:

SCS Engineers
8799 Balboa Avenue, Suite 290
San Diego, California 92123
(858) 571-5500

October 14, 2014
Project Number: 01214167.00

Offices Nationwide
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October 14, 2014

Mr. W. Russell Norman, P.E.
Water Resources Control Engineer
State Water Resources Control Board
1001 I Street
Sacramento, California 95814

Subject: Aquatic Pesticide Application Plan

**Site: Lakes Wohlford and Dixon and Associated Waterways
Escondido, California**

Dear Mr. Norman:

SCS Engineers (SCS) is pleased to present this Aquatic Pesticide Application Plan for Lakes Wohlford and Dixon and associated waterways on behalf of the City of Escondido. This Aquatic Pesticide Application Plan was prepared pursuant to Water Quality Order 2013-0002-DWQ and in accordance with the proposal and contract, fully executed on May 27, 2014, between SCS and the City of Escondido.

If you have any questions, please contact us at (858) 571-5500.

Sincerely,



George Liddle
Project Professional



Chuck Pryatel
Vice President

cc: Mr. Reed Harland, City of Escondido

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A Aquatic Pesticide Safety Data Sheets

1.0 INTRODUCTION

Nuisance growths of aquatic vegetation within Lake Dixon, Lake Wohlford, and the Escondido Canal (Project Area) have caused varying levels of negative impacts on beneficial uses. To ensure that nuisance growths of aquatic vegetation do not impact beneficial uses, aquatic pesticides are occasionally applied within the Project Area as part of a larger aquatic vegetation control program. This Aquatic Pesticide Application Plan (APAP) is intended to meet the regulatory requirements set forth by the State Water Resources Control Board (SWRCB).

1.1 REGULATORY BACKGROUND

In 2004, the State Water Resources Control Board (SWRCB) adopted the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States Permit No. CAG990005. Dischargers were required to have this permit to perform aquatic herbicide applications. In 2009, this permit expired, but was administratively continued until November 30, 2013.

In June 2013, the SWRCB adopted Water Quality Order 2013-0002-DWQ, which reissued the Statewide General NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications (General Permit) and took effect on December 1, 2013. The General Permit requires compliance with the following:

- The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California, a.k.a. the State Implementation Plan (SIP) (SWRCB, 2000)
- The California Toxics Rule (CTR) (EPA, 2000)
- San Diego Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (WQOs) (RWQCB, 1994)

The SIP assigns effluent limitations for CTR priority toxic pollutants. The General Permit prohibits discharges of those pollutants in excess of the effluent limitations outside the mixing zone.

1.2 PROJECT AREA

The Project Area consists of Escondido Canal, Lake Wohlford, and Lake Dixon, located in Escondido, San Diego County, California (Figure 1). The RWQCB has established beneficial uses for the Lakes (RWQCB, 1994). The City of Escondido (City) applies pesticides containing copper to control the growth of nuisance plants and algae within the Project Area (Appendix A). Copper is regulated as a priority toxic pollutant under the General Permit.

1.2.1 Escondido Canal

Escondido Canal is supplied with water via the Escondido Canal Diversion Dam from the San Luis Rey River. Escondido Canal is approximately 14 miles long, approximately 8 feet wide, and 6 feet in height, and the canal top is open the majority of its length. Escondido Canal is rated at a capacity of 70 cubic feet per second (cfs), but typically does not carry more than 50 cfs. This

water is delivered to Escondido Creek just upstream of Lake Wohlford (approximately 500 yards). Escondido Canal also supplies water, when available, to the Rincon Indian Reservation for use in hydroelectric power production after which it is returned to the San Luis Rey River.

Nuisance levels of filamentous algae along the walls and bottom of Escondido Canal impact water flow and volume. Historical methods that have been utilized for the control of filamentous algae include the use of the United States Environmental Protection Agency (EPA) and State of California Department of Pesticide Regulation (DPR) registered algaecides copper sulfate and Cutrine Plus, a chelated copper product.

1.2.2 Lake Wohlford

Lake Wohlford has a surface area of 224 acres when full, a holding capacity of 6,500 acre-feet, and a maximum depth of approximately 60 feet. Lake Wohlford serves as a drinking water reservoir, a hydroelectric power source, and offers recreational opportunities in the form of fishing, boating, and picnicking.

Lake Wohlford is located within the Lake Wohlford Hydrologic Subarea (904.63), in the Escondido Creek Hydrologic Area, in the Carlsbad Hydrologic Unit. Lake Wohlford is currently listed as having the following beneficial uses: MUN, AGR, REC1, REC2, WARM, COLD, WILD, and POW.

Water movement through Lake Wohlford occurs as water is delivered from Escondido Creek, or released through pipes for water supply purposes. A maximum of 70 cfs of water is delivered into and average flows of 15 million gallons released from Lake Wohlford on a daily basis, when the Escondido Canal is operating at normal production levels. Lake Wohlford is supplied with water delivered by the Escondido Canal from the San Luis Rey River and Escondido Creek and the Escondido Creek watershed, on a seasonal basis which is highly variable. Water is released to both the City's water treatment plant and the Lake Wohlford Trailer Park, a small community adjacent to Lake Wohlford. On rare occasions, water is discharged via the spillway or gates into the Escondido Creek. Discharges over the spillway can occur during periods of heavy rains. As Lake Wohlford can discharge into waters of the United States (Escondido Creek), compliance with the General Permit conditions is required for the use of any aquatic pesticides. Lake Wohlford is operated by the City of Escondido, Public Works Department, Lakes Division.

Nuisance growths of filamentous algae along shallow shoreline areas impact the beneficial uses. Historical methods that have been utilized for filamentous algae control include the use of the EPA- and DPR-registered algaecide copper sulfate, which was replaced by Cutrine Plus.

1.2.3 Lake Dixon

Lake Dixon has a surface area of 70 acres, a holding capacity of 2,600 acre-feet, a shoreline of approximately 2 miles, and a maximum depth of approximately 75 feet. Lake Dixon serves as a drinking water reservoir, and offers recreational opportunities in the form of fishing, boating, picnicking, and camping in the Lake Dixon Recreation Area.

Lake Dixon is located within the Escondido Hydrologic Subarea (904.62), in the Escondido Creek Hydrologic Area, in the Carlsbad Hydrologic Unit. Lake Dixon is currently listed as having the following beneficial uses: MUN, AGR, REC1, REC2, WARM, COLD, and WILD.

Water movement through Lake Dixon occurs as water is delivered, or released through pipes for water supply purposes. A maximum of 150 cfs of water from Lake Dixon, and average flows of 25 million gallons are released from Lake Dixon on a daily basis. Lake Dixon is supplied, in large part, with water delivered by the Colorado River and California Aqueducts. The flow from Lake Dixon is into the water treatment plant for delivery to customers. On rare occasions, water is discharged via a spillway or gates into Escondido Creek. Discharges or releases of water over the spillway can occur during winter rain flood events, maintenance activities, or emergency situations. Such discharges from Lake Dixon flow into Escondido Creek, which eventually flows to the San Elijo Lagoon and the Pacific Ocean. As Lake Dixon can discharge into waters of the United States (Escondido Creek), compliance with General Permit conditions is required for the use of any aquatic pesticides. Lake Dixon is operated by the City of Escondido, Public Works Department, Lakes Division.

Nuisance growths of submerged plants and filamentous algae along shallow shoreline areas impact the beneficial uses. Historical methods that have been utilized for the control of aquatic vegetation include the use of EPA- and DPR-registered algaecide copper sulfate, which was replaced by Cutrine Plus for filamentous algae control. Mechanical harvesting has historically been used for the control of submerged plants.

1.2.4 Gates and Control Structures

Lake Dixon and Lake Wohlford have gate structures as required by the Division of Safety of Dams for emergency release purposes. Escondido Canal has a series of turn-outs and sand traps, a sluice gate at the diversion dam, and a gate to control the supply of water to the Rincon Indian Reservation Power Turbine. All gates structures are inspected prior to any aquatic pesticide application to ensure that any discharges from the Project Area will not exceed the General Permit limitations.

2.0 2005 AQUATIC PESTICIDES APPLICATION PLAN

In 2005, Clean Lakes, Inc., prepared the *Integrated Aquatic Vegetation Management Plan* (2005 APAP). The 2005 APAP presents a survey of aquatic weeds and algae, an evaluation of the remedial alternatives, and details the application and monitoring program. This APAP is an update to the 2005 APAP, to reapply for coverage under the General Permit and in consideration of different conditions and practices within the Project Area. The following is a summary of relevant information from the 2005 APAP about aquatic vegetation impacts to the Project Area and an evaluation of remedial alternatives.

2.1 AQUATIC VEGETATION IMPACTS TO THE PROJECT AREA

Lake Dixon has a diverse native plant community, but is also the most impacted due to the presence of filamentous algae growths. Lake Wohlford and Escondido Canal reportedly develop filamentous algae growths that occasionally grow to nuisance proportions.

2.1.1 Problem Species

Eurasian watermilfoil has been found growing in widespread sections of Lake Dixon. Attempts to control this plant through harvesting have been implemented. Eurasian watermilfoil can fragment easily during harvesting, thus allowing it to spread and establish in other locations. A systemic herbicide is recommended to eradicate the plant throughout Lake Dixon, due to Eurasian watermilfoil's invasive nature. Some aquatic pesticides are labeled for use at lower concentrations within 0.25 miles of water intakes. Discussion with the water treatment plant would be required prior to initiating such an option.

Southern naiad has been found growing in Lake Dixon in small quantities mixed with Eurasian watermilfoil. Control measures are not recommended specifically for this plant at this time as the plant is not creating any negative impacts to beneficial uses within the Project Area.

Sago pondweed has been found growing in Lake Dixon in small quantities mixed with Eurasian watermilfoil. Control measures are not recommended specifically for this plant at this time as the plant is not creating any negative impacts to the beneficial uses within the Project Area.

Coontail has been found growing in portions of Lake Dixon at below nuisance levels. Control measures are not recommended at this time as the plant is not creating any negative impacts to the beneficial uses within the Project Area. The plant could, however, develop into nuisance levels in the future.

California bulrush or Southern bulrush and cattails have been found growing in several areas of Lake Dixon and Lake Wohlford. Emergent vegetation growing in Lake Dixon should be monitored, and control measures implemented if the plants spread. These emergent plants may block access to shoreline fisherman if they continue spreading along the shoreline and develop into dense stands. Due to the large fluctuation of the water level that occurs at Lake Wohlford, it is not expected that bulrush would become a nuisance, thus no control measures are recommended at this time. The bulrush stands should be monitored and controlled if they spread and impact the beneficial uses within the Project Area.

Attached algae have been found growing in an isolated section of Lake Dixon and should be allowed to grow, as they are considered beneficial, as long as they remain growing low to the bottom.

Filamentous algae problems develop at certain times of the year in Lake Dixon, primarily in areas where submerged aquatic plants are found. Filamentous algae growths have been observed in Lake Wohlford and the Escondido Canal. It has been reported that nuisance growths developed and impacted water delivery operations in the past. It is recommended that algae control be implemented on an as-needed basis in the Project Area.

2.1.2 Problem Investigation

The potential causes of nuisance aquatic vegetation problems within the Project Area are believed to be primarily related to nutrient loading and species introduction.

2.1.3 Management Goals and Activities Being Impacted

Escondido Canal is being managed for water supply to Lake Wohlford. Lake Dixon and Lake Wohlford are being managed for water storage and supply as well as for aesthetics, fisheries, and multiple use recreation. The management goals are thus the control of filamentous algae and aquatic vegetation species that have an impact on the beneficial uses within the Project Area as outlined above.

Escondido Canal

Filamentous algae growths have had occasional impacts to the beneficial uses of Escondido Canal. The main impacts to the beneficial uses associated with nuisance growths of filamentous algae are related to drinking water quality (decaying organic matter), impeding water flow, and potentially causing infrastructure damage when the algae breaks loose and develops into debris dams at gates or other structures. Algae control is recommended on an as-needed basis. The volume of water in the area targeted for algal control will vary based on discharge and flow rates within Escondido Canal.

Lake Wohlford

Filamentous algae growths have had occasional impacts to the beneficial uses of Lake Wohlford. The main impacts to the beneficial uses associated with nuisance growths of filamentous algae are related to drinking water quality (decaying organic matter), drinking water supply (clogging of screens and contamination of water treatment basins), aesthetics, and recreational fishing. Algae control is recommended on an as-needed basis around the shoreline areas. The volume of water in the area targeted for algal control will vary based on water levels within Lake Wohlford.

Lake Dixon

Filamentous algae growths have had occasional impacts to the beneficial uses of Lake Dixon. The main impacts to the beneficial uses associated with nuisance growths of filamentous algae are to drinking water quality (decaying organic matter), drinking water supply (clogging of screens and contamination of water treatment basins), shoreline and boat fishing access (fishing lines and props get tangled), and increased maintenance costs to rental boats due to props getting tangled. Algal control is recommended around the shoreline areas approximately 30 to 45 feet out from shore, for a total treatment area of approximately 11 acres. The volume of water in the area targeted for algal control will vary based on water levels within Lake Dixon, but typical water depths in the treatment areas will average approximately 6 to 7 feet.

2.2 EVALUATION OF REMEDIAL ALTERNATIVES

2.2.1 Aquatic Vegetation Control Options

Aquatic weed and algae control options can be broken down into four basic categories that include:

- Watershed Management
- Biological Control
- Physical and Mechanical Control
- Aquatic Herbicides and Algaecides

All appropriate aquatic plant management technologies within the context of the identified beneficial uses and impacted areas of the waterbodies have been evaluated, and include all available cultural, biological, mechanical, and aquatic herbicide/algaecide formulations.

Watershed Management

Watershed management is one of the most important control parameters as it deals with limiting nutrients and runoff into a lake system from the watershed. It entails implementing practices in the watershed that will support the reduction of nutrient and other pollutant runoff into the lake system. Residential and commercial development, with its increasing areas of concrete, asphalt and buildings, leaves more of the urban environment impermeable to rainwater. This leads to an increasing volume of runoff water and a reduced ability for water to naturally infiltrate back into the soil.

Much of the problem with urban lakes is with sediment, nutrient, and organic loading. Urban lakes are typically described as having an excessive growth of weeds and algae, and watershed management techniques, or implementation of removal/inactivation methods are required to address the problem.

Administrative Alternatives

Local governmental units have jurisdiction over land use around urban lakes and can therefore play a major role in the prevention of lake degradation. Several tools are available to control the use and misuse of this land including:

- Comprehensive plans to guide long-term growth;
- Zoning ordinances to regulate land use of private lands;
- Storm water and surface water management planning that considers data collection, land use, system site considerations, and design criteria for structures in setting goals for watershed runoff; and
- Rules for lake uses such as where, when and how a lake can be used recreationally to control shore line erosion, nutrient recirculation, and overuse.

Other administrative alternatives may include the development of fertilizer, yard waste, shoreline erosion and sedimentation control management programs.

Non-Structural Alternatives

Seasonal street cleaning, to capture sediments before they are conveyed through storm sewer systems to lakes, and urban best management practices (BMPs), such as buffer strips around water bodies to filter out sediments and reduce nutrients, are examples of non-structural alternatives. Chemical inactivation/precipitation of in-lake phosphorus, chemical control of algae, dredging of accumulated sediments, and mechanical harvesting of aquatic vegetation are additional examples.

Structural Alternatives

Storm water detention basins and wetland treatment systems are structural alternatives that detain runoff to control peak flow rates and control downstream flooding. They also allow pollutants to settle out of the water before reaching the lake. Diversions routing storm water away from the lake and in-lake aeration systems to oxygenate the water are other structural alternatives.

Biological Control

The triploid grass carp, *Ctenopharyngodon idella*, is a large herbivorous minnow from lowland rivers of the Pacific slope drainages of eastern Asia. The grass carp, as a biological control agent for aquatic plants, is considered an attractive long-term method for control of submerged aquatic plants. The grass carp has been used successfully for the control of *Hydrilla* in the Imperial Irrigation Districts water delivery system. One of the issues is the grass carp's impact on native fisheries, as well as the plant species that it prefers to eat. The California Department of Fish and Game (DFG) began issuing permits for the introduction of the grass carp in 2000 for use in lakes and ponds in California. Two of the biggest concerns the DFG has about grass carp are fish escaping the stocked waters and grass carp being deliberately introduced into natural waters. The introduction of a non-native species into a native environment can wreak havoc on existing species. The DFG will not issue a carp introduction permit for waters in the Federal Emergency Management Agency 100-year flood plain so their potential use in the Project Area is not foreseeable at this time.

Physical and Mechanical Control

Aeration and Water Quality Alteration

Aeration has been used for decades to circulate water and increase dissolved oxygen (DO) within lake and pond systems. In stratified lake systems where the bottom layers are anoxic during the summer months, a properly designed aeration system will limit nutrient recycling by supporting aerobic bacteria that support nutrient breakdown in bottom waters and the hydrosol. Aeration has proven to be a successful tool for reductions in algae growth in lakes and reservoirs, and is now being studied to evaluate its efficacy on the control of submerged vegetation. Systems vary in size and style from fountains to bottom bubbler diffuser type systems to hypolimnetic units that oxygenate the waters below the thermocline. Both Lake Dixon and Lake Wohlford have implemented this control technique.

Shading/Light Attenuation

A basic environmental manipulation for plant control is light reduction or attenuation. Shading has been achieved by algal growth, by application of natural or synthetic dyes, shading fabric or covers, and by establishing shade trees. During natural or cultural eutrophication, phytoplankton growth alone can shade macrophytes. To limit light penetration and in turn reduce plant and

algae growth, a lake dye can be added to a lake or pond system. Aquashade is a blend of blue and yellow dyes specifically designed to screen or shade portions of the sunlight spectrum (red-orange and blue-violet) required by underwater aquatic plant and algae growth. This action effectively inhibits photosynthesis in young, bottom weed growth. Aquashade, or a generic such as Cygnet Select, is primarily effective at depths of 2 feet or greater. Inhibition of planktonic algae blooms has also been proven. Aquashade is non-corrosive and will not stain bathing suits, fountain surfaces, or other water features at use dilution rates. Due to the limited areas of plant growth within Lake Dixon, this option is not recommended at this time. This option is not effective in moving waters such as the Escondido Canal, and Lake Wohlford maintains a high turbidity level year around according to reports and is devoid of submerged plants. This option would not be appropriate in the Project Area.

Benthic Barrier

Benthic barriers or other bottom-covering approaches are another physical management technique that has been in use for a substantial period of time. A benthic barrier covers plants with a layer of a growth-inhibiting substance or material. The Lake Dixon boat house areas could benefit from this option due to the limited areas involved, though sedimentation of the barrier due to high activity in this location might require an unreasonable and unacceptable amount of maintenance. Lake Wohlford and the Escondido Canal would not benefit from this option as no submerged rooted vegetation was reported in either body.

Draw Down

Draw down, or lake level manipulation can support the reduction of submerged aquatic plant growth when the plant's root system is exposed to winter freezing. Extreme water level fluctuations at Lake Wohlford may support the inability of submerged plants to establish in the Project Area. It is uncertain whether lake level fluctuation would be allowed at Lake Dixon due to recreational uses, or desirable from a drinking water production standpoint. Draw down should also consider fish spawning requirements in the spring.

Hand Harvesting

Hand harvesting of aquatic vegetation by pulling, raking, cutting or digging can be accomplished in small shoreline areas. Re-growth from seeds and remaining underground plant parts can be expected. Manual removal of aquatic vegetation is time consuming, and is not cost-effective compared to other available options.

Sediment Removal

Dredging is usually not performed solely for aquatic plant management but to restore lakes that have been filled in with sediments, have excess nutrients, have inadequate hypolimnetic zones, need deepening, or require removal of toxic substances. However, lakes that are very shallow due to sedimentation typically do have excess plant growth. This method is effective in that dredging typically forms an area of the lake too deep for plants to grow, thus opening an area for riparian use. By opening more diverse habitats and creating depth gradients, dredging may also create more diversity in the plant community. Sandbars that develop in the Escondido Canal are typically removed every other year with the use of hand tools.

Diver Dredge

The diver dredging procedure is a mechanical control technology designed to control Eurasian watermilfoil. This technology has been used since the mid-1980s, and is effective at removing pioneer colonies of invasive aquatic plants.

Harvesting

Mechanical harvesting utilizes specialized equipment that cuts and removes aquatic vegetation to a depth of approximately 5 feet below the water level. When the harvester is full, it transports the harvested vegetation to an onshore unloading location where the plants are conveyed onto a trailer conveyor for stockpiling, or dumped on the shoreline, then taken for final disposal. The disadvantages to mechanical harvesting is that the process is expensive, time consuming (the daily harvesting rate is 1-2 acres), and the harvested materials must be hauled away for final disposal. As such, this equipment is often used in high-use/priority areas of lakes, to clear beaches and boat lanes or to provide fishing areas within heavy weed infestations. Aquatic plant harvesting is utilized within Lake Dixon, where an aquatic plant harvester is permanently stationed at the lake at this time. Equipment such as the “cookie cutter” is utilized for the control of emergent vegetation such as cattails and bulrush, and may be practical for the removal of emergent vegetation in some areas of the lake.

2.2.2 Aquatic Herbicide and Algaecide Control Options

Aquatic herbicides and algaecides sold in California must be registered with the EPA, as well as with DPR. Aquatic herbicides and algaecides are reviewed and regulated by the EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and recent amendments, and DPR.

Aquatic Vegetation Control Regulatory Requirements for Aquatic Pesticide Use

Compliance with the General Permit is required for the use of aquatic herbicides and or algaecides to any water body in California that is hydrologically connected to waters of the United States (Escondido Canal drains into Escondido Creek, Lake Wohlford and Lake Dixon on rare occasions discharge into drainage systems that are connected to waters of the United States).

In addition to the General Permit requirements, the DPR, as well as the County Agricultural Commissioner’s (CAC) Office, regulates the use of aquatic herbicides and algaecides. DPR requires written Pest Control Recommendations (issued by a licensed Pest Control Advisor) for herbicide use in Aquatics, Parks and Right of Ways; companies performing this type of work for hire are to have a Pest Control Business License and their staff are required to be licensed as Qualified Applicators or Certificate holders.

2.2.3 Integrated Aquatic Vegetation Control Recommendations

The recommended control strategy includes establishment of treatment thresholds, monitoring protocols to determine when thresholds are exceeded, and protocols to implement control measures when thresholds are exceeded in compliance with BMPs. The control recommendations to deal with exotic and nuisance aquatic vegetation growth present within the Project Area have been determined based on an evaluation of management options and recommended schedules for aquatic vegetation control will be developed on an as-needed basis.

Written Recommendations by a State of California Licensed Pest Control Advisor will be required after treatment protocols have been developed.

It is recommended that any filamentous algae growths that impact the beneficial uses of Lake Dixon and/or Lake Wohlford be treated with a chelated copper-based algaecide like Cutrine Plus. Copper sulfate should continue to be used as slug doses at two points along Escondido Canal. Should filamentous algae growths continue to impact Escondido Canal, a drip system could be set up to meter a liquid algaecide like Cutrine Plus.

A water monitoring plan (Water Monitoring Plan) should be prepared to identify key staff and contact information, the intended monitoring and sampling locations, specific procedures for monitoring and sampling, chemical analyses to be performed, quality assurance and quality control methods for field and laboratory analysis, and provided sample field forms. If circumstances dictate a change in the use of regulated aquatic pesticides in any part of the Project Area, the Water Monitoring Plan should be updated and sampling and analytical methods altered, as necessary.

3.0 APPLICATION PLAN

The use of aquatic pesticides within the City's aquatic vegetation control program is necessary to properly manage the resources and maintain beneficial uses that include water supply, flood control, recreation, aesthetics, boating access and fisheries. The aquatic vegetation control program is an undertaking necessary to control specific types of nuisance aquatic vegetation at an acceptable level in the treatment area that is being managed. The need for aquatic pesticide application events as part of this program vary from week to week and from season to season due to such things as water temperature, sunlight, and other factors. It is a balancing act between managing resources and impairing resources. This APAP, per the General Permit requirements, along with the other governmental regulatory programs described below, provides different elements to ensure this balancing act is successful.

Per FIFRA, the EPA has sole jurisdiction of pesticide label language. Label language and any changes thereto must be approved by EPA before the product can be sold in this country. As part of the labeling process, EPA evaluates data submitted by registrants to ensure that a product used according to label instructions will cause no harm (or "adverse impact") on non-target organisms that cannot be reduced (or "mitigated") with protective measures or use restrictions. Registrants are required to submit data on the effects of pesticides on target pests (efficacy) as well as effects on non-target pests. Data on nontarget effects include plant effects (phytotoxicity), fish and wildlife hazards (ecotoxicity), impacts on endangered species, effects on the environment, environmental fate, breakdown products, leachability, and persistence; however, FIFRA is not necessarily as protective of water quality as the Clean Water Act (CWA).

The DPR is responsible for reviewing the toxic effects of aquatic pesticide formulations and determining whether a pesticide is suitable for use in California's waters through a registration process. To do this, DPR also reviews data submitted by the registrants. While DPR cannot require manufacturers to make changes in labels, DPR can refuse to register products in California unless manufacturers address unmitigated hazards by amending the pesticide label.

Consequently, requirements that are specific for use in California are included in many pesticide labels that are approved by EPA.

DPR also licenses applicators of pesticides designated as a "restricted material". To legally apply these pesticides, the applicator must be a holder of a Qualified Applicator Certificate or work under the supervision of someone who is certified. For aquatic pesticides, the qualified Applicator Certificate must have the category "aquatic."

State regulations require that the CAC determine if a substantial adverse environmental impact will result from the proposed use of a restricted material. The CAC implements this by issuing Use Permits for the application of pesticides considered as restricted materials. In evaluating local conditions, the CAC may use information supplied by DPR, which suggests permit conditions that reflect minimum measures necessary to protect people and the environment. State regulations require that specific types of information be provided in an application to the CAC for a pesticide use permit. The CAC reviews the application to ensure that appropriate alternatives were considered and that any potential adverse effects are mitigated. The CAC also conducts pre-project inspections on at least 5 percent of projects.

3.1 PERMIT COVERAGE

The General Permit addresses the discharge of aquatic pesticides related to the application of copper-based aquatic pesticides to surface waters for the control of aquatic weeds. The General Permit regulates the discharge of pollutants associated with the application of aquatic pesticides to waters of the United States, as defined in the Clean Water Act (Title 40, Code of Federal Regulation [CFR] Section 230.3 (s)). Aquatic pesticides that are applied to application areas within waters of the United States in accordance with FIFRA label requirements and Use Permit restrictions are not considered pollutants. However, pollutants associated with aquatic pesticide application are covered under the General Permit. These include over-applied or misdirected pesticide products and pesticide residues. Residues are any pesticide byproduct, or breakdown product, or pesticide product that is present after the use of the pesticide to kill or control the target weed.

The General Permit does not cover agricultural storm water discharges or return flows from irrigated agriculture because these discharges are not defined as "point sources" and do not require coverage under an NPDES permit. The General Permit also does not cover other indirect or non-point source discharges from applications of pesticides, including discharges of pesticides to land that may be conveyed in storm water or irrigation runoff. The General Permit only regulates the discharge of certain pollutants related to applications of pesticides; however, it does include a re-opener statement specifying that the General Permit may be reopened for the specific purpose of modifying the list of pesticides whose associated discharge is regulated.

3.1.1 Water Quality Standards

The CWA defines water quality standards as "Provisions of state or federal law which consist of designated uses for the waters of the United States, water quality criteria for waters based upon such uses, and antidegradation policies. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the Act."

In California, Water Quality Control Plans designate the beneficial uses of waters of the State and WQOs to protect those uses. The Water Quality Control Plans are adopted by the State and Regional Water Quality Control Boards through a formal administrative rulemaking process, and, upon approval by the EPA, the WQOs for waters of the United States (generally surface waters) become State water quality standards. The EPA has established water quality criteria in California for priority pollutants in the National Toxics Rule and the CTR. The CTR criteria are also water quality standards.

3.1.2 Effluent Limitations

NPDES permits for discharges to surface waters must meet all applicable provisions of sections 301 and 402 of the CWA. These provisions require controls that utilize best available technology economically achievable (BAT), best conventional pollutant control technology (BCT), and any more stringent controls necessary to reduce pollutant discharge and meet water quality standards.

Title 40, CFR Section 122.44 states that if a discharge causes, has the reasonable potential to cause, or contributes to an excursion (Reasonable Potential) of a numeric or narrative water quality criterion, the permitting authority must develop effluent limits as necessary to meet water quality standards. Title 40, CFR Section 122.44(k)(3) allows these effluent limits to be requirements to implement BMPs if numeric effluent limits are infeasible. It is infeasible for the SWRCB to establish numeric effluent limitations in this General Permit because the application of aquatic pesticides is not necessarily considered a discharge of pollutants according to the Talent decision¹. The regulated discharge is the discharge of pollutants associated with the application of aquatic pesticides. These include over-applied and misdirected pesticide product and pesticide residue. At what point the pesticide becomes a residue is not precisely known and varies depending on such things as target weed, water chemistry, and flow. Therefore, in the application of aquatic pesticides, the exact effluent is unknown. It would be impractical to treat the numerous short duration intermittent pesticide releases to surface waters from many different locations; and treatment, in many cases, may render the pesticide useless for aquatic weed control. Therefore, the effluent limitations contained in the General Permit are narrative and include requirements to develop and implement this APAP that describes appropriate BMPs, including compliance with all pesticide label instructions, and to comply with receiving water limitations.

The BMPs required herein constitute BAT and BCT and will be implemented to minimize the area and duration of impacts caused by the discharge of aquatic pesticides in the treatment area and to allow for restoration of water quality and protection of beneficial uses of the receiving waters to pre-application quality following completion of a treatment event.

Once an aquatic pesticide has been applied to an application area, the pesticide product can actively treat the target species within the treatment area. During the treatment event, the aquatic pesticide is at a sufficient concentration to actively kill or control target weeds. When active ingredient concentrations are below this effective concentration, the aquatic pesticide becomes a residue. The minimum effective concentration, and the time required to reach it, vary due to site specific conditions, such as flow, target species, and water chemistry. The receiving water

¹ *Headwaters Inc. v. Talent Irrigation District*, 243 F.3d 526 (9th Cir. 2001) No. 99-35373.

limitations require that an application event does not result in an exceedance of water quality standards in the receiving water. The receiving water includes:

- Anywhere outside of the treatment area at any time, and
- Anywhere inside the treatment area after completion of the treatment event.

In recognition of the variability in the temporal extent of a treatment event, the General Permit does not require it to be discretely defined. Instead, post-event monitoring of the water is required no more than 1 week from the time of aquatic pesticide application.

To protect all designated beneficial uses of the receiving water, the most protective (lowest) and appropriate (to implement the CTR criteria and WQOs in the *Water Quality Control Plans*) limit should be selected as the water quality limit for a particular water body and constituent. In many cases, water quality standards include narrative, rather than numerical, WQOs. In such cases, numeric water quality limits from the literature or publicly available information may be used to ascertain compliance with these standards.

Copper

Copper-based aquatic pesticides are used to control algal and aquatic plant growth. For copper, the freshwater aquatic life protection objective (in *Water Quality Control Plans*) and criterion (from CTR) are applicable. The resulting numeric limit shall be used to assess impacts from pollutants associated with aquatic pesticide application on the quality of waters of the State and the beneficial uses that they are able to support. The absence of WARM or COLD criteria for a constituent does not mean that those beneficial uses or other beneficial uses are absent in the receiving water. It simply means that there are no State or EPA-based numeric WQOs or criteria to implement those beneficial uses.

There are many different formulations, and application methods vary from pitching water-soluble tablets to direct injection of copper-based liquid products. Copper-based aquatic pesticide labels recommend applications of copper to 1,000 micrograms per liter ($\mu\text{g/L}$) or more. Applicable water quality criteria for fresh and salt water, discussed below, are less than 1,000 $\mu\text{g/L}$. Limitations are required for discharges that have the reasonable potential to cause an exceedance of applicable criteria or WQOs. Copper is a priority pollutant and the criteria for dissolved copper are specified in Table (b)(1) of the CTR. Criteria are established for maximum and continuous discharges in fresh water. Conversion factors were also used to convert dissolved copper limitations to the total copper limitations assigned in the General Permit. The continuous or chronic criterion has been chosen in this case because it is the most protective considering that in many cases aquatic pesticides are applied several times per season and the limitation is for pesticide residue in receiving waters. Freshwater copper criteria need to be adjusted for water hardness and may significantly differ from one system to another. Water hardness must be determined by the calculation or titration method. It is necessary to specify a range of total copper limitations in the General Permit because of the possible variations in freshwater hardness statewide. The total copper limitation must be calculated using the following equation (EPA, 2000):

$$\text{CCC} = \text{WER} \times (\text{Acute Conversion Factor}) \times (\exp\{m_C[\ln(\text{hardness})] + b_C\})$$

Where CCC is the criterion continuous concentration, WER is the water-effect ratio, exp is the base e exponential function, and the Acute Conversion Factor, m_C , and b_C are metal-specific values provided by the EPA.

For copper, this limit is set by the following formula:

$$CCC_{Cu} = 1.0 \times 0.960 \times e^{0.8545(\ln(\text{hardness})) - 1.702}$$

Which simplifies to:

$$CCC_{Cu} = 0.960e^{0.8545(\ln(\text{hardness})) - 1.702}$$

Where hardness is input as hardness as calcium carbonate, in milligrams per liter, and which outputs the criterion continuous concentration in micrograms per liter.

Hardness as calcium carbonate concentration measurements were taken during 2013 at Lake Wohlford, Lake Dixon, and the Escondido Canal. The mean hardness as calcium carbonate concentrations were calculated for each water body, in milligrams per liter (mg/L).

Lake Wohlford:	155 mg/L
Lake Dixon:	192.5 mg/L
Escondido Canal*:	155 mg/L

Based on these mean hardness as calcium carbonate concentrations, in order to be in compliance with this General Permit, the criterion continuous concentrations for dissolved copper were calculated for each water body, in $\mu\text{g/L}$.

Lake Wohlford:	13.02 $\mu\text{g/L}$
Lake Dixon:	15.71 $\mu\text{g/L}$
Escondido Canal*:	13.02 $\mu\text{g/L}$

* Water in Escondido Canal is derived from Lake Wohlford.

Dissolved copper concentrations in samples collected during 2013 were analyzed. In all samples analyzed, dissolved copper was not detected above the reporting limits. However, the reporting limit for dissolved copper for the analytical method used was 0.05 mg/L, or 50 $\mu\text{g/L}$. As the reporting limit is above the calculated CCC_{Cu} limit established at the mean concentrations of hardness as calcium carbonate for all of the water bodies, these data cannot be used to conclusively establish that the program in 2013 met this water quality criterion. In the future, the City will analyze environmental samples collected from Lake Wohlford, Lake Dixon, and Escondido Creek using EPA Method 200.8, with a reporting limit of 1 $\mu\text{g/L}$, so that the concentration of dissolved copper may be conclusively demonstrated to be below the CCC_{Cu} at the typical hardness values encountered in the Project Area. Based on correspondence with Mr. W. Russell Norman, of the SWRCB, the need to submit California Environmental Quality Act documentation as part of the APAP and Notice of Intent (NOI) package to obtain a SIP exception may be placed on hold pending the collection of additional dissolved copper concentration data with the lower reporting limit, to establish that there is no exceedance of the effluent limitations.

3.2 CHARACTERIZATION OF TREATMENT PROJECT

Aquatic pesticide applications will be implemented on an as-needed basis in areas of the Project Area where nuisance aquatic vegetation growth has the potential to impact the beneficial uses. The areas within the Project Area where treatment would be implemented are outlined above.

3.2.1 Aquatic Vegetation Community

A description of the plant and algae types found within the Project Area, as well as the recommended control strategies are outlined above.

3.2.2 Factors Influencing the Decision to Use Aquatic Pesticides

The decision to implement aquatic vegetation control treatments is based on the plants' growth stage as well as its potential to impact the beneficial uses of a specific area. If systemic herbicides are used to control submerged vegetation, control measures will be implemented when the plants are young (approximately 6-12 inches), so that they can be controlled prior to developing into nuisance growths, and thus having negative impacts on the beneficial uses. When submerged vegetation is treated with systemic herbicides in an early growth stage, there is less plant biomass that is controlled and thus decomposing, and this helps reduce and protect against impacts to DO depletion from decomposing biomass. If contact herbicides are used to control submerged vegetation, treatment will be timed to reduce plant growth prior to them reaching nuisance proportions, and thus impacting the beneficial uses. The attached algae found growing in the system (*Chara*) will be allowed to grow and spread as it provides good habitat for the aquatic organisms, as well as supports nutrient uptake required to limit other algae species from proliferating. Treatment for the control of *Chara* may be implemented in the event the algae impact the beneficial uses.

3.2.3 Aquatic Pesticides Available for Use and Application Methods

Algae control will be obtained primarily through the use of an approved chelated copper algaecide such as Cutrine Plus. Aquatic herbicide and algaecide applications will be performed utilizing BMPs by licensed personnel in accordance with Pest Control Recommendations issued by a DPR Pest Control Advisor. Applications will be performed from a boat that is specifically designed with a pumping and metering system for aquatic herbicide and or algaecide applications. Application equipment should be utilized when available that meters the herbicide or algaecide product rate, incorporating the boat's position and speed.

3.2.4 Application Areas

Aquatic herbicide applications will be limited to the shoreline areas of the Project Area where aquatic plant growths impact the beneficial uses. The entire Project Area may at times require treatment for the control of algae.

Updated aquatic vegetation maps will be developed that document the areas of species identification, targeted nuisance species, areas targeted for control, and surrounding features of interest (e.g. overflow, irrigation intake).

3.2.5 Aquatic Vegetation Control Alternatives

All appropriate aquatic plant management technologies within the context of the identified beneficial uses and impacted areas within the Project Area have been evaluated, and include all available cultural, biological, mechanical, and aquatic herbicide/algaecide formulations.

3.2.6 Aquatic Pesticide Application Rates

Aquatic herbicide and algaecide treatments will be determined based on the following:

Site Characteristics

The areas targeted for submerged vegetation control will be determined prior to an application. The areas targeted for algae control will be based on algae growth and densities that develop and require treatment. Water movement through the treatment area includes a potential seasonal flow during the rainy season with daily discharge, and static conditions unless discharges are made from the Project Area during the summer months. Applications will not be performed when there is the potential for discharges.

Assessment of Beneficial and Adverse Impacts

The current objectives of the aquatic vegetation control program are to keep nuisance growths from impacting beneficial uses of the Project Area. Escondido Canal acts as a water transfer system for the City of Escondido, while Lake Wohlford and Lake Dixon provide an aesthetic environment for park and lake users, and water holding systems for domestic, agricultural, and power production uses. The Project Area also serves as a catch basin for the watershed. Nuisance growths of aquatic plants and algae also have an adverse impact on the aesthetic environment while providing a breeding habitat for vectors.

4.0 MONITORING AND REPORTING PROGRAM

Dischargers must comply with the Monitoring and Reporting Program (MRP) outlined in the General Permit. The goals of the MRP are to:

- Determine compliance with the receiving water limitations and other requirements specified in the General Permit;
- Measure and improve the effectiveness of the APAP;
- Support the development, implementation, and effectiveness of BMPs;
- Assess the chemical, physical, and biological impacts on receiving waters resulting from aquatic pesticide applications;
- Assess the overall health and evaluate long-term trends in receiving water quality;
- Demonstrate that water quality of the receiving waters following completion of resource or weed management projects are equivalent to pre-application conditions;

- Identify and characterize aquatic pesticide application projects conducted by the discharger; and
- Assess that projects that are monitored are representative of all pesticides and application methods used by the discharger.

The Water Monitoring Plan will identify key staff and contact information, the intended monitoring and sampling locations, specific procedures for monitoring and sampling, chemical analyses to be performed, quality assurance and quality control methods for field and laboratory analysis, and provided sample field forms.

4.1 AQUATIC PESTICIDE MONITORING

Monitoring activities will be performed for a minimum of six application events or for as many applications as occur in a year if there are less than six application events, over multiple years if necessary, at representative locations.

4.1.1 Water Quality Parameters

Water quality parameters such as pH, DO, and temperature will be measured by appropriate instrumentation within the manufacturer's tolerances. These parameters will be measured at the same sites where water samples for aquatic herbicides are retrieved. These parameters will be measured at the same depths from which the water samples for aquatic herbicides are retrieved, within +/- 0.5 meters. Data and deviations will be recorded on field notes.

4.1.2 Sample Analysis

All sample analyses must be conducted at a laboratory certified for such analyses by the California Department of Health Services. All analyses are to be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants" (Guidelines), promulgated by the EPA (Title 40 Code of Federal Regulations part 136).

Hardness can be assessed by the calculation or titration method and should be included in the analytical suite for laboratory analysis. Field analysis for the parameters of temperature, DO, and pH will be performed using a calibrated, portable multi-parameter meter. These meters can measure pH, oxidation/reduction potential (ORP), DO, conductivity, total dissolved solids (TDS), salinity, and temperature. Water clarity will be measured using a standard Secchi disk.

When samples are collected, a chain of custody form will be completed, and the samples will be delivered to a State of California Certified Laboratory for analysis per the General Permit's requirements.

4.1.3 Sampling Procedures

Samples will be collected using sampling procedures which minimize loss of monitored constituents during sample collection and analysis and maintain sample integrity.

4.1.4 Sampling Protocols

If the water depth is 6 feet or greater the sample will be collected at a depth of 3 feet. If the water depth is less than 6 feet the sample will be collected at the approximate mid-depth. As appropriate, an intermediary sampling device (e.g., Van-Dorn style sampler, long-handled sampling pole, peristaltic pump) may be used.

Samples will be retrieved, stored, logged, and shipped to a third party laboratory for analysis under chain of custody procedures.

Materials for Sampling

In field:

- New or laboratory-supplied sampling bottles with appropriate preservative, one per sample
- Cooler(s) sufficient to hold bottles, with ice- or gel-packs
- Nitrile or latex gloves
- Subsurface grab sampler and/or a peristaltic pump
- Depth finder or marked pole
- Multi-parameter meter for temperature, pH, DO, etc.
- Field data sheets and clipboard
- Sheet with sample tags
- A clean boat and a transport vehicle

In office:

- Refrigerator

Precautions to be Taken to Prevent Contamination of the Sample

- Wearing of disposable gloves while taking the sample
- Wearing of clean, freshly laundered clothing
- All materials used for sample collection shall be kept far from herbicide storage areas. This includes sample bottles, gloves, coolers, and the refrigerator
- Pre-treatment samples shall be stored in a different cooler from treated samples.

Method to Take a Single Sample

The samples will be simple grab samples collected by submersing a bottle to the desired depth or by use of a peristaltic pump.

- When approaching a sampling location, care will be taken to not stir up sediments.
- The sample will be collected at a discrete depth of either half the total depth or 3 feet, whichever is shallower. A grab sampler extension may be used, if appropriate. If sampling depth is beyond reach of the grab sampler, the sample will be taken as close to the desired depth as possible.

- When using a peristaltic pump, the intake tubing will be lowered to the desired depth and the pump will be activated to rinse the pump system with three times the tubing volume of water from the sample location.
- Once the bottle is full, it will be capped.
- The bottle will be dried and labeled and the sample identifier recorded on the field data sheet.
- The bottle will be placed in the appropriate cooler. The bottles will be kept in contact with ice packs.
- In the office, the bottle will be placed into a refrigerator.

Notes:

- For a spot treatment, a sketch map will be made showing the site of the treatment and the location of the sample relative to the treated area
- A Global Positioning System (GPS) reading will be taken, noting the waypoint number, or noting the latitude and longitude in World Geodetic System 1984 datum to six decimal places, or providing a Trimble data filename where the sample point is stored

Submitting Samples to the Laboratory

- Samples will be submitted within 48 hours of taking sample
- Samples will be packed in a cooler with ice packs between each bottle
- Chain of Custody (COC) form will be filled out, being sure to note the sample numbers that are submitted in the shipment

If the samples are shipped to the lab, the courier will sign the COC and a copy will be made before sending out the shipment. If the samples are delivered to the lab, the delivering person will have receiving person sign the COC form and make a copy before turning over the shipment.

Quality Specifications for Water Samples

Water samples for assessment of aquatic herbicide residues will be collected according to the Water Monitoring Plan. All data will be recorded as accurately as possible using the instruments described below. Data readings within the tolerances established below will be considered acceptable.

- For location, +/- 1 meter for land-based sampling and +/- 5 meters for water-based sampling
- For depth, +/- 1 meter
- For times specified in the Water Monitoring Plan in hours, +/- 0.5 hours
- For times specified in the Water Monitoring Plan in days, +/- 1 day if 14 days or less after application/treatment, and +/- 2 days for more than 14 days after application/treatment
- Locations will be verified by GPS within +/- 5 meters or the precision of the system; whichever is less at the time of sampling.
- Depths will be verified with meter sticks, tape measure, a marked rope, or long poles marked every 0.5 meters, or by a depth finder.

- Timings will be verified by using quartz clocks synchronized once a month with the United States Navy Observatory or GPS.
- All locations, depths, and timings will be recorded on appropriate forms. Any deviations will be recorded and explained.

4.1.5 Training on Sampling Techniques

All personnel performing water sampling will have been trained before water sampling is scheduled to begin. A training session will be held reviewing sampling technique; equipment and instrument calibration, maintenance, and operation; sample storage and delivery; and proper use of COC and other forms; and other records and deviations.

4.1.6 Receiving Water Monitoring

Treatment Maps

For each application at each site, a treatment map will be developed with a convenient scale showing the application area, treatment area, immediately adjacent untreated areas (if entire water body is not treated), and water bodies receiving treated water. The information on surface area and/or volume of application area and treatment area and any other information used to calculate dosage and quantity of each pesticide used at each application site will be included with the map data. The sampling locations will be noted on the treatment maps along with the GPS coordinates for each sampling site.

Control Structure Inspections

Prior to every application, an inspection of the integrity of the discharge valves will be performed to confirm that treated water will not be discharged.

Aquatic Pesticide Monitoring Frequency

Water quality sampling for aquatic pesticides application will be conducted for each application event from each environmental setting (flowing water and non-flowing water) per year.

If the results from six consecutive sampling events show concentrations that are less than the applicable receiving water limitation/trigger in an environmental setting, the City will reduce the sampling frequency for that active ingredient to one per year in that environmental setting. If the annual sampling shows exceedances of the applicable receiving water limitation/trigger, the City will be required to return to sampling six applications the next year.

Sites will be chosen to represent the variations in treatment that occur, including algaecide or aquatic herbicide use, hydrology, and environmental setting, conveyance or impoundment type, seasonal, and regional variations. The exact location(s) of sample site(s) will be determined after site scouting and a decision to make an aquatic herbicide application are made.

Aquatic Pesticide Monitoring

The following monitoring will be performed for each sampling:

- Background monitoring samples
- Event monitoring samples
- Post-event monitoring samples

Background Monitoring

In non-moving water, the background (BG) sample is collected within the treatment area at the time of the application event, or in the treatment area within 24 hours prior to the start of the application. In moving water, the BG sample is collected upstream of the treatment area at the time of the application event, or in the treatment area within 24 hours prior to the start of the application.

Event Monitoring

The event monitoring (Event) sample for non-flowing (static) water is collected immediately outside the treatment area immediately after the application event, but after sufficient time has elapsed such that treated water would have exited the treatment area.

The Event sample for flowing water is collected immediately downstream of treatment area immediately after the application event, but after sufficient time has elapsed such that treated water would have exited the treatment area.

The location and timing for the collection of the Event sample may be based on a number of factors including, but not limited to algae and aquatic weed density and type, flow rates, size of the treatment area and duration of treatment.

Post-Event Monitoring

The post-event monitoring (Post) sample is collected within the treatment area within one week after the application, or when the treatment is deemed complete.

One full set of three samples (i.e., BG, Event and Post) will be collected during each treatment from the representative site(s) treated within the Lakes and Canal according to the monitoring frequency and locations described earlier.

Additionally, one Field Duplicate (FD) and one Field Blank (FB) will be collected and submitted for analysis for each analyte, once per year or at a rate of 10 percent. The FD and FB samples will be collected at the Event site immediately after application.

The list of monitoring parameters is presented (Table 1).

4.1.7 Description of Best Management Practices to be Implemented

A variety of approaches will be utilized to minimize the impacts of aquatic pesticides used while still achieving their goals.

Techniques that help reduce pesticide impacts include:

- Non-pesticide control methods as outlined above have been reviewed, and will be implemented based on efficiencies.
- Pre-treatment surveys will be carried out to identify potential treatment areas and timing
- Adjustments will be made to treatment protocols based upon day of treatment survey results
- Choice of pesticides based on toxicity
- Attempts will be made to time treatments when no water is being discharged
- Aquatic pesticide use rates are limited to comply with receiving water limitations

From among the few alternative aquatic herbicides available, the most effective and safest options have been selected for use in this program. Herbicide application personnel know the strengths and weaknesses of the various available options, and take them into consideration when choosing a treatment protocol for a specific site.

In order to avoid inadvertent or accidental soil or water contamination with aquatic herbicides, application personnel follow the storage, transport, and spill control procedures recommended by the DPR and the EPA.

Over applications are avoided by following the specific product labels for the aquatic pesticides used in the program. Application equipment is routinely cleaned and calibrated, and all label directions and DPR guidelines are followed as to acceptable application weather conditions. Applications are not made in winds above 10 miles per hour.

The various BMPs being implemented ensure that the MRP will meet the requirements of the General Permit.

Licensing

All crew leaders and biologists that apply or supervise the application of aquatic pesticides will be certified or licensed by the DPR.

Notification

Applications of aquatic pesticides within the Project Area are not anticipated to affect beneficial uses outside the treatment area. Applications will not be performed if discharges from the Project Area are anticipated. However, if discharges outside of the treatment area appear likely to occur while the most recent data indicate the potential for a discharge above the effluent limitations, either new monitoring and sampling will be performed before the anticipated release to demonstrate compliance with the effluent limitations or potentially affected downstream users, as determined by the City, will be notified.

Site Evaluations

Both preliminary and secondary site evaluations will be a major aspect of the MRP.

Alternative Treatments

This APAP considers a number of potential alternative control strategies, and alternative non-herbicide options will be implemented when conditions are suitable.

Treatment Conditions

Every application will be made according to label directions and other requirements as directed by DPR or the CAC, which not only specify the amounts and situations where pesticides may be applied, but the atmospheric and environmental conditions under which they may be applied. If there are conditions where it is determined that the treatment would be ineffective, application staff will wait for other conditions or use a different treatment method.

Post-Treatment

Surveys will also be carried out for post-treatment assessment of treatment efficacy and non-target impacts. Survey crews will be instructed to look for possible non-target impacts that can be seen with the naked eye that would include damage to plants on the shore line and evidence of fish die-offs.

- The applicator will follow all pesticide label instructions and any Use Permits issued by a CAC.
- The applicator will be licensed by DPR or work under the supervision of someone who is licensed if the aquatic pesticide is considered a restricted material;
- The discharger will comply with effluent limitations
- The discharger will implement and follow this APAP;
- The discharger will comply with applicable receiving water limitations; and
- The discharger will comply with the monitoring and reporting requirements.

Receiving Water Limitations

No treatments will be made within the Project Area if any potential exists to cause or contribute to an exceedance of receiving water limitations.

Relevant Effluent Limitations:

Copper, in $\mu\text{g/L}$ (all designations): $0.960e^{0.8545(\ln(\text{hardness}))-1.702}$

Toxicity (all designations): Applications shall not cause or contribute to toxicity.

- The discharge of wastes, other than as described in the General Permit, is prohibited, unless authorized by a separate NPDES permit.
- The discharge of wastes shall not cause or contribute to conditions of nuisance or pollution.
- The discharge shall not cause or contribute to long-term adverse impacts on beneficial uses of waters of the United States.
- The discharger shall apply pesticides in accordance with this APAP.

Aquatic Pesticide Use Requirements

- License Requirements: Dischargers must be licensed by DPR if such licensing is required for the aquatic pesticide application project
- Application Requirements: The pesticide use must be consistent with FIFRA pesticide label instructions and any Use Permits issued by the CAC.
- Application Schedule: When requested, the discharger shall provide a phone number to persons who request the discharger's application schedule. The discharger shall provide the requester with the most current application schedule and inform the requester if the schedule is subject to change. Information may be made available by electronic means.

Measures for Preventing Fish Kills

Application of pesticides is targeted at nuisance algae growths associated with the near-shore zone. The majority of the volume of water in the Project Area will not be subject to direct application of copper-based pesticides. These distal areas will have significantly lower concentrations of copper and are directly accessible to fish in the treatment area. Aquatic pesticides will be applied in accordance with label instructions to minimize the application quantity and maximize efficacy. This includes managing droplet size, avoiding uneven distribution, and applying during favorable weather conditions, when feasible. Because nuisance algal growth affects the beneficial uses within the Project Area, application of pesticides will be proactive, which will minimize the quantity of decaying algae that results and which may threaten oxygen levels.

Post-treatment monitoring will include visual inspection of the treatment area and downstream from the treatment area for evidence of fish kills.

Public Notice Requirements

Every calendar year, prior to the first application of aquatic pesticides, the City shall notify potentially affected governmental agencies. The notification includes the following information:

- A statement of the discharger's intent to apply aquatic pesticide(s);
- Name of pesticide(s);
- Purpose of use;
- General time period and locations of expected use;
- Any water use restrictions or precautions during treatment; and
- A phone number that interested persons may call to obtain additional information from the discharger.

Pesticide Application Log

The discharger shall maintain a log for each aquatic pesticide application. The application log shall contain, at a minimum, the following information:

- Date of application;
- Location of application;
- Name of applicator;

- List of gates or control structures in the treatment area that may discharge to surface waters, if applicable;
- Time of gate or control structure closure and reopening, include any calculations used to determine closure and reopening times, if applicable;
- Application details, such as water temperature, flow or level of water body, time application started and stopped, and aquatic pesticide application rate and concentration;
- Visual monitoring assessment; and
- Certification that applicator(s) followed the APAP.

Waste Discharge Requirements

Discharges shall not cause or contribute to an exceedance of any CTR criteria or applicable WQO in a State or RWQCB *Water Quality Control Plan* in the receiving water. No assessable adverse impacts are expected from the use of the aquatic pesticides in the Project Area.

APAP Updates

This APAP will be updated as the General Permit conditions change, and or as new control technologies are developed and become available.

General Permit Compliance

This APAP was developed in part to comply with the General Permit. Compliance with the General Permit is required for the use of aquatic herbicides and or algaecides to any water body in California that is hydrologically connected to waters of the United States (the bodies within the Project Area fit into this category as they drain to water of the US).

The following items have been, or will be, completed per the General Permit requirements:

- An NOI for the NPDES Permit for the Discharge of Aquatic Pesticides to Waters of the United States will be filed with the RWQCB prior to any pesticide treatments.
- BMPs for all aquatic herbicide and algaecide treatments have been developed and are outlined in this APAP.
- A water monitoring plan should be developed which will identify key staff and contact information; the intended monitoring and sampling locations; specific procedures for monitoring and sampling; chemical analyses; quality assurance and quality control methods for field and laboratory analysis; and sample field forms.
- This APAP will be submitted to the RWQCB.

4.2 REPORTING REQUIREMENTS

All reports will be submitted to the RWQCB. All reports submitted in response to the Water Quality Order's will comply with the provisions stated in "Standard Provisions and Reporting for Waste Discharge Requirements (NPDES)", section B, Monitoring and Reporting Requirements of the General Permit. The annual reports will contain the following information:

- An Executive Summary discussing General Permit compliance or violation and the effectiveness of the APAP to reduce or prevent the discharge of pollutants associated with aquatic pesticide applications;
- A summary of monitoring data, including the identification of water quality improvements or degradation, and recommendations for improvements to the APAP (including proposed BMPs) based on the monitoring results. All receiving water monitoring data shall be compared to applicable water quality standards;
- Identification of BMPs and a discussion of their effectiveness in meeting the General Permit requirements;
- A discussion of BMP modifications addressing violations of this General Permit;
- A map showing the location of each application and treatment area;
- Types and amounts of aquatic pesticides used at each application event during each application;
- Information on surface area and/or volume of the treatment areas and any other information used to calculate dosage and quantity of each pesticide used;
- List of gates in the treatment area that may discharge to surface waters; time of gate closure and reopening, include any calculations used to determine closure and reopening times, if applicable;
- Sampling results for all required monitoring under the General Permit MRP and any additional sampling conducted in compliance with section A.3 of the General Permit's MRP. Sampling results will indicate the name of the sampling agency or organization, detailed sampling location information (including latitude and longitude or township/range/section if available), detailed map or description of each sampling site (i.e., address, cross roads, etc.), collection date, name of constituent/ parameter and its concentration detected, minimum levels, method detection limits for each constituent analysis, name or description of water body sampled, and a comparison with applicable water quality standards, description of analytical QA/quality control plan. Sampling results will be tabulated so that they are readily discernible;
- Recommendations to improve the monitoring program, BMPs, and APAP to ascertain compliance with this General Permit; and
- Proposed changes to the APAP and monitoring program.

4.2.1 Quality Assurance Audits and Personnel

The City of Escondido will provide a Quality Assurance Officer and the Certified Laboratory will provide a Quality Assurance Officer. In addition, the RWQCB is welcome to provide third-party validation of the sampling procedures.

4.2.2 Methods for Data Summarization, Analysis, Review, and Reporting

All data will be included in the final report. The final report will also contain narrative and numerical summaries as appropriate. Final data reports will also be reviewed by a Quality Assurance Officer.

4.3 RETENTION OF RECORDS

Records of all monitoring information including all calibration and maintenance records, copies of all reports required by the General Permit, and records of all data used to complete the application for the General Permit will be retained. Records will be maintained for a minimum of 3 years from the date of the sampling, measurement, or report.

This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the RWQCB Executive Officer.

4.3.1 Monitoring Records

Records of monitoring information will include the following:

- The date, exact place, and time of sampling or measurements;
- The individuals who performed the sampling or measurements;
- The dates analyses were performed;
- The individuals who performed the analyses;
- The analytical techniques or method used; and
- The results of such analyses.

4.3.2 Data Storage

Field forms will be retained in hard copy and electronic formats, and a copy of the field forms will be included as an Appendix to the annual report.

4.3.3 Device Calibration and Maintenance

All monitoring instruments and devices that are used by the discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary for their continued accuracy.

5.0 REFERENCES CITED

U.S. Environmental Protection Agency (EPA), 2000. EPA Water Quality Standards, Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California. May 2000.

Regional Water Quality Control Board, San Diego (RWQCB), 1994. Water Quality Control Plan for the San Diego Basin. September 8, 1994. Amended April 4, 2011.

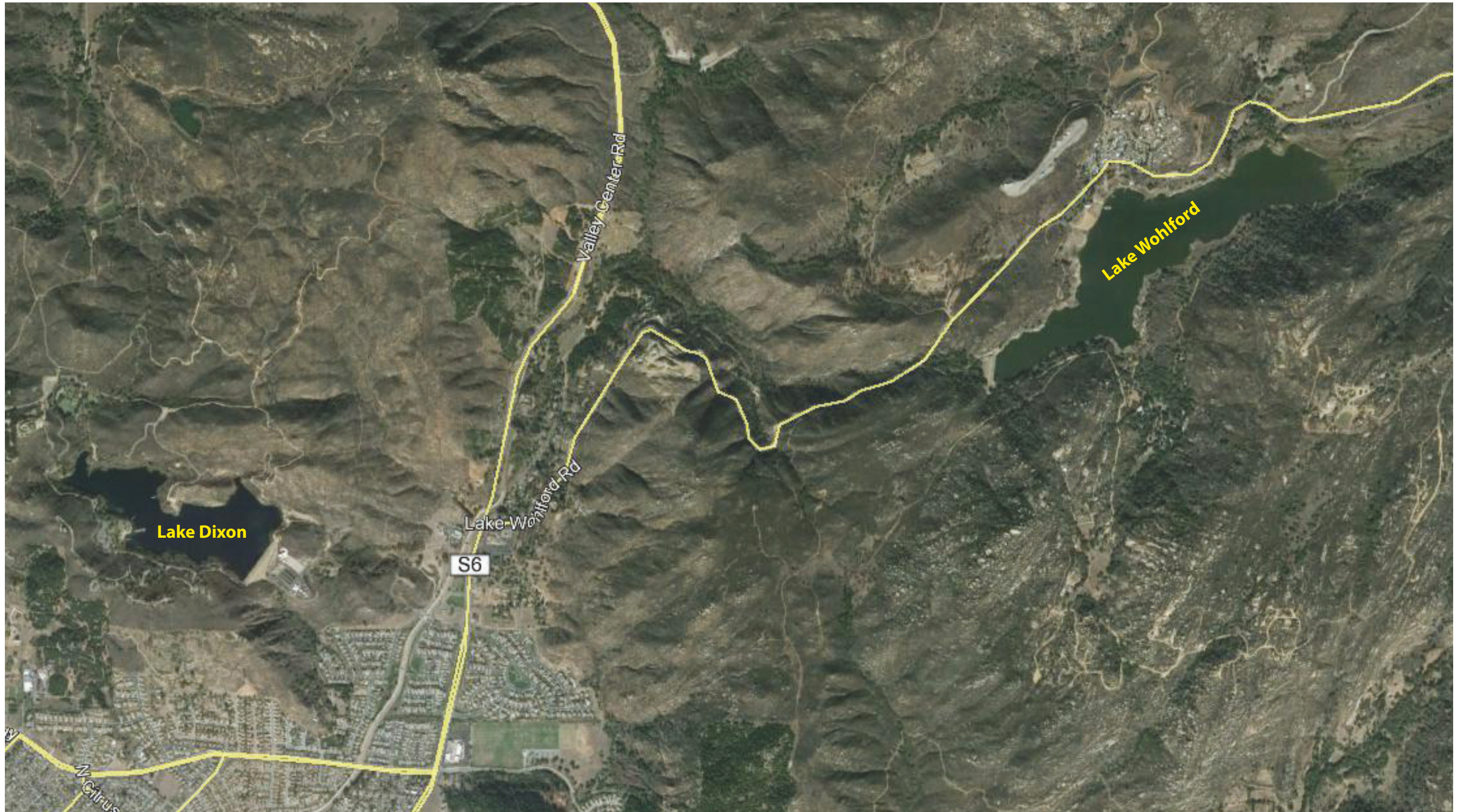
California State Water Resources Control Board (SWRCB), 2000. The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California. March 2000. Amended February 24, 2005.

**Table 1 - Monitoring Parameters
Lake Wohlford, Lake Dixon, and Associated Waterways
Escondido, California**

Parameter Type	Constituent / Parameter	Monitoring Method	Laboratory Method
Visual	1. Site description (lake, open waterway, channel, estimate of vegetation density as a percent, etc.) 2. Appearance of waterway (sheen, color, clarity, etc.) 3. Weather conditions (sky, precipitation, etc.) 4. Water clarity	Visual observation / Secchi disk	NA
Physical	1. Temperature 2. Turbidity 3. Electrical conductivity / salinity	Grab sample	See EPA Guidelines
Chemical	1. Total copper 2. Dissolved copper 3. pH 4. Hardness, as CaCO ₃	Grab sample	See EPA Guidelines

NOTES:

- NA = not applicable
- EPA = U.S. Environmental Protection Agency
- CaCO₃ = calcium carbonate



Reference: Google Earth Aerial Photograph
Escondido, California - November 2013

Disclaimer: This figure is based on available data. Actual conditions may differ. All locations and dimensions are approximate.



SCS ENGINEERS

Environmental Consultants
8799 Balboa Avenue, Suite 290
San Diego, California 92123

PROJECT AREA
City of Escondido
Escondido, California

Project No.:
01214167.00

Figure 1

Date Drafted:
8/12/14

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

Chemical Name: Copper Sulfate Pentahydrate

Product Use: For Commercial Use

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

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 (703) 527-3887

General Comments

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

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

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

Component Related Regulatory Information

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

Component Information/Information on Non-Hazardous Components

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

*** Section 3 - Hazards Identification ***

Emergency Overview

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

Hazard Statements

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

Potential Health Effects: Eyes

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

Potential Health Effects: Skin

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

Potential Health Effects: Ingestion

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

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

Potential Health Effects: Inhalation

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

HMIS Ratings: Health Hazard: 2* Fire Hazard: 0 Physical Hazard: 1

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

*** Section 4 - First Aid Measures ***

First Aid: Eyes

Immediately flush eyes with large amounts of room temperature water, occasionally lifting the lower and upper lids, for at least 15 minutes. If symptoms persist after 15 minutes of irrigation, seek medical attention.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 4 - First Aid Measures (Continued) ***

First Aid: Skin

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

First Aid: Ingestion

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

First Aid: Inhalation

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

First Aid: Notes to Physician

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

*** Section 5 - Fire Fighting Measures ***

Flash Point: Not flammable

Method Used: Not applicable

Upper Flammable Limit (UEL): Not applicable

Lower Flammable Limit (LEL): Not applicable

Auto Ignition: Not applicable

Flammability Classification: Not applicable

Rate of Burning: Not applicable

General Fire Hazards

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

Hazardous Combustion Products

Sulfur oxides and copper fumes.

Extinguishing Media

Use methods for surrounding fire.

Fire Fighting Equipment/Instructions

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

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

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

*** Section 6 - Accidental Release Measures ***

Containment Procedures

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

Clean-Up Procedures

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

Evacuation Procedures

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

Special Procedures

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

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 7 - Handling and Storage ***

Handling Procedures

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

Storage Procedures

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

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

Exposure Guidelines

A: General Product Information

Follow the applicable exposure limits.

B: Component Exposure Limits

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

ACGIH: 1 mg/m³ TWA (dusts & mists)
0.2 mg/m³ TWA (fume)

OSHA: 1 mg/m³ TWA (dusts & mists)
0.1 mg/m³ TWA (fume)

NIOSH: 1 mg/m³ TWA (dusts & mists)
0.1 mg/m³ TWA (fume)

DFG MAKs 1 mg/m³ TWA Peak, 2•MAK 15 minutes, average value, 1-hr interval (copper and inorganic copper compounds)

0.1 mg/m³ TWA Peak, 2•MAK 15 minutes, average value, 1-hr interval (fume)

Engineering Controls

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

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.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

Personal Protective Equipment: Respiratory

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/m³: Dust and mist respirator.

Up to 10 mg/m³: Any dust and mist respirator except single-use and quarter mask respirators or any SAR.

Up to 25 mg/m³: SAR operated in a continuous-flow mode or powered air-purifying respirator with a dust and mist filter(s).

Up to 50 mg/m³: 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/m³: 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/m³.

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.

*** 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.

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

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

Chemical Stability

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

Chemical Stability: Conditions to Avoid

Avoid high temperatures, exposure to air and incompatible materials.

Incompatibility

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

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 11 - Toxicological Information ***

Acute and Chronic Toxicity

A: General Product Information

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

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

B: Component Analysis - LD₅₀/LC₅₀

Copper Sulfate Pentahydrate (7758-99-8)

Oral-rat LD₅₀ = 330 mg/kg (testing done June 2006, Consumer Product Testing Co., Inc.); Intraperitoneal-Rat LD₅₀: 18,700 mg/kg; Intraperitoneal-rat LD₅₀: 20 mg/kg; Subcutaneous-rat LD₅₀: 43 mg/kg; Intravenous-rat LD₅₀: 48900 µg/kg; Unreported-rat LD₅₀: 520 mg/kg; Oral-mouse LD₅₀: 369 mg/kg; Intraperitoneal-Mouse LD₅₀: 33 mg/kg; Intraperitoneal-mouse LD₅₀: 7182 µg/kg; Intravenous-mouse LD₅₀: 23300 µg/kg

B: Component Analysis - TDLo/LDLo

Copper Sulfate Pentahydrate (7758-99-8)

Oral-man LDLo: 857 mg/kg; Oral-Human LDLo: 50 mg/kg; Behavioral: somnolence (general depressed activity); Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Blood: hemorrhage; Oral-Human TDLo: 11 mg/kg; Gastrointestinal: gastritis; Gastrointestinal: hypermotility, diarrhea, nausea or vomiting; Oral-Human TDLo: 272 mg/kg; liver, kidney, Blood effects; Oral-Human LDLo: 1088 mg/kg; Oral-child : 150 mg/kg; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular ; necrosis); Blood: other hemolysis with or without anemia; unknown-Man LDLo: 221 mg/kg; Oral-Woman TDLo: 2400 mg/kg/day; Gastrointestinal tract effects; DNA Inhibition-Human: lymphocyte 76 mmol/L; Oral-woman LDLo: 100 mg/kg; Vascular: Blood pressure lowering not characterized in autonomic section; Liver: hepatitis (hepatocellular necrosis), diffuse; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Oral-Human LDLo: 143 mg/kg; Pulmonary system effects, Gastrointestinal tract effects ;Oral-rat TDLo: 915 mg/kg/1 year-intermittent: Cardiac: changes in coronary arteries; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Oral-rat TDLo: 157 mg/kg/6 weeks-intermittent: Endocrine: changes in adrenal weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases; Oral-rat TDLo: 7530 mg/kg/30 days-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Blood: changes in erythrocyte (RBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels:- multiple enzyme effect; Oral-rat TDLo: 2 gm/kg/20 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases, Enzyme inhibition, induction, or change in blood or tissue levels; Intraperitoneal-rat TDLo: 791 mg/kg/18 weeks-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Intraperitoneal-rat TDLo: 7500 µg/kg: female 3 day(s) after conception: Reproductive: Fertility: other measures of fertility; 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 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: postimplantation mortality (e.g. dead and/or resorbed implants per total number of implants), Specific Developmental Abnormalities: Central Nervous System, body wall

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

Carcinogenicity

A: General Product Information

Copper Sulfate Pentahydrate (7758-99-8)

Cytogenetic Analysis-Rat/ast 300 mg/kg

B: Component Carcinogenicity

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

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

Epidemiology

No information available.

Neurotoxicity

Has not been identified.

Mutagenicity

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

Teratogenicity

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

Other Toxicological Information

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

*** Section 12 - Ecological Information ***

Ecotoxicity

A: General Product Information

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

B: Ecotoxicity

Copper Sulfate Pentahydrate (7758-99-8)

LC₅₀ (*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)); LC₅₀ (*Leopmis cyanellus*, Green Sunfish) = 1.1 g, 3,510 µg/L at °C; LC₅₀ (*Pimephales promelas*, Fat-head minnow) = 1.2 g, 838 µg/L at 18°C; LC₅₀ (*Crassius auratus*, Goldfish) = 0.9 g, 1380 µg/L at 18°C; LC₅₀ (*Crassius auratus*, Goldfish) = 0.1-2.5 mg/L; LC₅₀ (*EEL*) = 0.1-2.5 mg/L; LC₅₀ (*Salmo gairdneri*, Rainbow trout) = 1.6 g, 135 µg/L at 18°C; LC₅₀ (*Salmo gairdneri*, Rainbow trout) 48 hours = 0.14 ppm; LC₅₀ (*Daphnia magna*) no time specified = 0.182 mg/L; LC₅₀ (*Salmo gairdneri*, Rainbow trout) no time specified = 0.17 mg/L; LC₅₀ (*Lepomis machochirus*, Blue gill) no time specified = 1.5 g, 884 µg/L at 18°C; LC₅₀ (Stripped Bass) 96 hours = 1 ppm or lower; LC₅₀ (Prawn) 48 hours = 0.14; LC₅₀ (Shrimp) 96 hours = 17.0 ppm copper; LC₅₀ (Blue Crab) 96 hours = 28 ppm copper; LC₅₀ (Oyster) 96 hours = 5.8 ppm copper; LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.060 ppm copper (at 32.5°C; 0.066 ppm copper static bioassay); LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.09 ppm copper (at 27.3°C; 0.066 ppm copper static bioassay); LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.39 ppm copper (at 20.3°C; 0.066 ppm copper static bioassay)

Environmental Fate

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

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** 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 – Transportation 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 July 24, 2009 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, IB8, IP2, N20

Packaging: 172.213

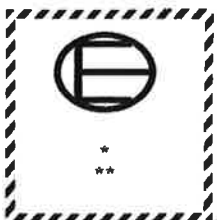
RQ Quantity: For a single package less than the RQ of 10lb (4.54 kg), the RQ designation should be not be used.

Additional Shipping Information

Limited Quantity Shipments: Shipments, except for air, need not be marked with the Proper Shipping Name of the contents, but shall be marked with the UN Number (3077) of the contents, preceded by the letters "UN", placed within a diamond. The width of the line forming the diamond shall be at least 2 mm; the number shall be at least 6 mm high. The total weight of each outer packaging cannot exceed 30 kg (66 pounds.) .

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 1kg (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.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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 – Transportation Information Air ***

50th 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.

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: 911

Passenger & Cargo Aircraft Maximum Net Quantity: 400 kg

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

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

Cargo Aircraft Only Packing Instruction: 911

Cargo Aircraft Only Maximum Net Quantity: 400 kg

Excepted Quantities: E1

Special Provisions: A97, A158

ERG Code: 9L

Limited Quantity Shipments: Shipments for air must be marked with the Proper Shipping Name, Environmentally Hazardous Substance, solid, n.o.s. (cupric sulfate), and shall be marked with the UN Number (3077) preceded by the letters "UN", placed within a diamond. The width of the line forming the diamond shall be at least 2 mm; the number shall be at least 6 mm high. The total weight of each outer packaging cannot exceed 30 kg.

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.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 14 – Transportation Information Vessel ***

Amendment 34-08 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: Class 9 (Miscellaneous Dangerous Goods)

Packing Group: III

Special Provisions: 179,274,335,909

Limited Quantities: 5 kg

Excepted Quantities: E1

Packing Instructions: P002/LP02

Provisions: PP12

IBC Instructions: IBC08

IBC Provisions: B2

EmS: F-A, S-S

Stowage and Segregation: Category A.

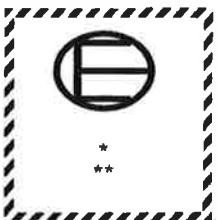
Marine Pollutant: This material is considered a marine pollutant by the IMO and shipments of the material must carry the new marking



Refer to IMO Amendment 34-08 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 the UN Number (3077) of the contents, preceded by the letters "UN", placed within a diamond. The width of the line forming the diamond shall be at least 2 mm; the number shall be at least 6 mm high. The total weight of each outer packaging cannot exceed 30kg.

Excepted Quantities: The maximum quantity of this material per inner receptacle is limited to 30g per receptacle and the aggregate quantity of this material per completed package does not exceed 1,000g. Maximum number of packages per Cargo Transport Unit (CTU) shall not exceed 1,000 packages. 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 29 kg. The completed package must meet a drop test. The requirements are found in 3.5.3.1. Packages must not be opened or otherwise altered until it is no longer in commerce and a 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 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)

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

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	Excepted	No	Yes

Although this compound is not on the TSCA Inventory, it is excepted 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 excepted.

C: Component Analysis - WHMIS IDL

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

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

ANSI Labeling (Z129.1):

WARNING! MAY BE HARMFUL OR FATAL IF SWALLOWED. CAUSES SKIN AND EYE IRRITATION. HARMFUL IF INHALED. Keep from contact with clothing. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing dusts or particulates. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH-approved respiratory protection, as appropriate. **FIRST-AID:** In Case of Contamination of Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. In Case of Contamination of Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue to rinse eye. If Inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible. If Ingested: Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. Call a poison control center or doctor for treatment advice. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In the event of a medical emergency, you may also contact The National Pesticide Information Center at 1-800-858-7378. **IN CASE OF FIRE:** Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

Labeling Information for Pesticide Use of Product:

DANGER! HAZARD TO HUMANS AND DOMESTIC ANIMALS.

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

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

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

ENVIRONMENTAL HAZARDS: This product is toxic to fish. Direct application of Copper Sulfate to water may cause a significant reduction in populations of aquatic invertebrates, plants and fish. Do not treat more than one-half of lake or pond at one time in order to avoid depletion of oxygen from decaying vegetation. Allow 2 weeks between treatments for oxygen levels to recover. Trout and other species of fish may be killed at application rates recommended on this label, especially in soft or acid waters. However, fish toxicity generally decreases when the hardness of the water increases. Do not contaminate water by cleaning of equipment or disposal of wastes. Consult local State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

STORAGE AND DISPOSAL: PROHIBITIONS: Do not contaminate water, food or feed by storage or disposal. Open burning and dumping is prohibited. Do not re-use empty containers. Keep pesticide in original container. Do not put concentrate or dilutions of concentrate in food or drink containers. Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use, according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance. Completely empty bag of product into application equipment. Dispose of empty bag in a sanitary landfill or by incineration, or if allowed by State and local authorities, by burning. If burned, avoid smoke.

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

AGRICULTURAL USE REQUIREMENTS: Use this product only in accordance with its labeling and with the Worker Protection Standard, CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries and greenhouses, and handlers of agricultural pesticides. The Standard contains requirements for the training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted-entry interval. These requirements only apply to uses of this product that are covered under the Worker Protection Standard. Do not apply this product in a way that will contaminate workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Do not allow worker entry into treated areas during the restricted interval (REI) of 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, waterproof gloves, shoes, plus socks and protective eyewear.

Labeling Information for Pesticide Use of Product (continued):

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

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

EPA REG. NO. 56576-

EPA EST. NO. 52117-MX-001

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 16 - Other Information ***

Other Information

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

Key/Legend

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

Contact: Sue Palmer-Koleman, PhD

Contact Phone: (713) 896-9966

Revision log 07/24/00 4:24 PM SEP Changed company name, Sect 1 and 16, from Corporation to Ltd.

07/27/00 2:49 PM SEP Added "Fine 200, FCC IV, Very High Purity" to synonyms, Section 1

08/23/00 3:15 PM SEP Added "Copper Sulfate Crystals" to synonyms, Section 1

05/31/01 9:31 AM HDF Checked exposure limits; made changes to Sect 9; overall review, add SARA 311/312 Haz Ratings.

06/01/01 7:28 AM HDF Added text to label information from EPA Approved Label

07/24/01 4:31 AM CLJ Add Shipments by Air information to Section 14, Changed contact to Sue, non-800 Chemtrec Num.

09/18/01 11:34 AM SEP Added Domestic Transportation Exception, Sect 14

10/05/01 3:30 PM SEP Deleted Alternate Shipping Name, Sect 14

02/15/02 11:01 AM: HDF Revision of SARA Chronic Hazard Rating to "Yes".

2/21/02 4:21 PM HDF Added more information on Marine Pollutant Markings and Limited Quantity Shipments

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

This is the end of MSDS # C1-121A

E M E R G E N C Y

FOR CHEMICAL EMERGENCY: SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CALL
CHEMTREC - DAY or NIGHT - (800) 424-9300

Product Name:

AB CUTRINE PLUS**SECTION I - GENERAL INFORMATION**

Manufacturer's Name:

APPLIED BIOCHEMISTS
W175 N11163 Stonewood Drive
Suite 234
Germantown, WI 53022-4799
(800) 558-5106

Trade Name & Synonyms:

AB CUTRINE PLUS

Chemical Name & Synonyms:

CHELATED ELEMENTAL COPPER

Generic Description:

COPPER - ALGICIDE

Formula:

PROPRIETARY

D.O.T. Proper Shipping Name:

CORROSIVE LIQUID NOS (Copper Ethanolamine Complex)

D.O.T. Hazard Class:

EIGHT

U.N. or N.A. Identification #:

UN 1760, PG III

D.O.T. Emergency Response Guide (1996 ed.): 154

Hazardous Mat'ls ID System Values (HMIS): Health -2 Flammability -0 Reactivity -1 Personal Protection -B

Nat'l Fire Protection Assn. (NFPA 704M): Health -1 Flammability -0 Reactivity -1 Specific Hazard:

SECTION II - HAZARDOUS INGREDIENTS

<u>Hazardous Component(s)</u>	<u>CAS#</u>	<u>PEL</u>	<u>TLV</u>
Copper Carbonate	12069-69-1	1 mg/m ³	1 mg/m ³
Monoethanolamine	141-43-53	ppm	3 ppm
Triethanolamine	102-71-6	NOT ESTABLISHED	NOT ESTABLISHED

Ingredients listed in this section have been determined to be hazardous as defined in 29 CFR 1910.1200. Materials determined to be health hazards are listed if they comprise 1% or more of the composition. Materials identified as carcinogens are listed if they comprise 0.1% or more of the composition. Information on proprietary materials is available as provided in 29 CFR 1910.1200 (i) (1).

SECTION III - PHYSICAL DATA

Boiling Point (F):	212°F	Specific Gravity (water = 1):	1.1 - 1.2
Vapor Pressure (mm Hg):	NOT DETERMINED	% Volatile (by Volume):	NOT DETERMINED
Vapor Density (air = 1):	> 1	Evaporation Rate:(<u>Ether = 1</u>)	< 1
Melting Point (F):	NOT APPLICABLE	pH:	10.0-11.0
Solubility in Water:	MISCIBLE IN WATER		
Appearance & Odor:	BLUE VISCOUS LIQUID. SLIGHT AMINE ODOR.		

SECTION IV - FIRE & EXPLOSION DATA

Flash Point :	NOT DETERMINED	Method:	TAG CLOSED CUP
Extinguishing Media:	CO ₂ , H ₂ O, DRY CHEMICAL. POLYMER FOAM FOR LARGE FIRES		
Special Fire Fighting Procedures:	USE NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS.		
Unusual Fire & Explosion Hazards:	NONE		

SECTION V - REACTIVITY DATA

Stability -	<u> </u> Unstable	<u> X </u> Stable
Conditions to Avoid:	AVOID CONTACT WITH STRONG ACIDS AND NITRATES.	
Incompatibility (Materials to Avoid):	STRONG ACIDS AND NITRITES.	
Hazardous Decomposition Products:	OXIDES OF NITROGEN	
Hazardous Polymerization:	<u> </u> Will Occur	<u> X </u> Will Not Occur
Conditions to Avoid:	CONTACT WITH STRONG ACIDS AND NITRITES.	

AB CUTRINE PLUS
 =====
SECTION VI - HEALTH HAZARD DATA
 =====

Acute Health Hazards: LD_{50(RAT)} = 1930mg/Kg: CORROSIVE TO SKIN
 Chronic Health Hazards: NONE KNOWN
 Signs & Symptoms of Exposure: CONTACT WITH SKIN AND EYES, VAPORS OR MISTS MAY CAUSE IRRITATION WITH PAIN, COUGHING AND DISCOMFORT TO EYES, NOSE, THROAT AND CHEST.

Medical Conditions Generally Aggravated by Exposure: MAY CAUSE SKIN SENSITIZATION.

Chemical Listed as Carcinogen or Potential Carcinogen by:

National Toxicology Program:	Yes:	No:	✓
I.A.R.C. Monographs:	Yes:	No:	✓
O.S.H.A.	Yes:	No:	✓

Emergency & First Aid Procedures: FOR PRINCIPLE ROUTE OF ENTRY, SEE APPROPRIATE EMERGENCY PROCEDURES BELOW.
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

Route of Entry: Inhalation: REMOVE TO FRESH AIR. ADMINISTER OXYGEN IF NECESSARY.
 Eyes: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION.
 Skin: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. WASH CLOTHES THOROUGHLY BEFORE REUSE.
 Ingestion: IF INGESTED, GET IMMEDIATE MEDICAL ATTENTION.

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SECTION VII - SPILL OR LEAK PROCEDURES
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Steps to be Taken in Case Material is Released or Spilled: SOAK UP WITH APPROPRIATE ABSORBENT THAT DOES NOT CONTAIN CLAYS. GROUND CORNCOB IS THE IDEAL ABSORBENT. DO NOT FLUSH INTO SANITARY SEWERS.
 Waste Disposal Methods: INCINERATE IN A FURNACE. MORE THAN 5 (FIVE) GALLONS, CONTACT LOCAL AUTHORITIES FOR DIRECTIONS.

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SECTION VIII - SPECIAL PROTECTION AND CONTROL MEASURES
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Respiratory Protection (Specify Type): NOT REQUIRED

Ventilation -	Local Exhaust:	ACCEPTABLE	Special Exhaust::	NOT REQUIRED
	Mechanical Exhaust:	ACCEPTABLE	Other Exhaust:	NOT REQUIRED

Protective Equipment - Gloves: RUBBER Eye Protection: SPLASH GOGGLES OR FACE SHIELD

Other Protective Equipment: EYEWASH AND SAFETY SHOWER SHOULD BE AVAILABLE WITHIN THE IMMEDIATE WORKING AREA.

Work or Hygienic Practices: USE SAFE CHEMICAL HANDLING PROCEDURES SUITABLE FOR THE HAZARDS PRESENTED BY THIS MATERIAL.

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SECTION IX - SPECIAL PRECAUTIONS
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Precautions to be Taken in Handling and Storage: STORE AT TEMPERATURES BETWEEN 32°F AND 100°F. DO NOT STORE IN DIRECT SUNLIGHT
 Other Precautions: DO NOT CONTAMINATE WATER, FOOD OR FEED BY STORAGE, DISPOSAL OR CLEANING OF EQUIPMENT. STORE IN A COOL, DRY PLACE.

KEEP OUT OF REACH OF CHILDREN
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THESE DATA ARE OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, IS HEREBY MADE. THE RECOMMENDED INDUSTRIAL HYGIENE AND SAFE HANDLING PROCEDURES ARE BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTEXT OF THE INTENDED USE AND DETERMINE WHETHER THEY ARE APPROPRIATE.

JK Date of Last Revision: 10/08/03