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FEB 20 2014
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. New Applicator (B.) Change of Information: WDID# 1A12159NSIS

C. ☐ Change of ownership or responsibility: WDID#

II. DISCHARGER INFORMATION

A. Name Pacificorp Energy			
B. Mailing Address 825 NE Multnomah, Suite 1500			
C. City Portland	D. County Multnomah	E. State OR	F. Zip 97232
G. Contact Person Tim Hemstreet	H. E-mail address tim.hemstreet@pacificorp.com	I. Title Proj. Manager	J. Phone 503-813-6170

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. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.
   Name of the conveyance system: _____
2. ☐ 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. ☑ Directly to river, lake, creek, stream, bay, ocean, etc.
   Name of water body: Iron Gate and Copco Reservoirs

B. Regional Water Quality Control Board(s) where treatment areas are located (REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region 1
(List all regions where algaecide and aquatic herbicide application is proposed.)

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: ____
Blue green algae / cyanobacteria (spec. Microcystis aeruginosa)

B. Algaecide and Aquatic Herbicide Used: List Name and Active ingredients

Green Clean Liquid / PRO - hydrogen peroxide
Sodium carbonate peroxyhydrate

C. Period of Application: Start Date May 1 End Date December 31
For life of permit

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?
☑ Yes ☐ No

If not, when will it be prepared? _____

VII. NOTIFICATION

Have potentially affected public and governmental agencies been notified? ☑ Yes ☐ No

VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal?
☐ YES ☐ NO ☑ 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: Mark Sturtevant

B. Signature: Mark Sturtevant **Date:** 2/14/2014

C. Title: Managing Director

XI. FOR STATE WATER BOARD STAFF USE ONLY

WDID:	**Date NOI Received:**	**Date NOI Processed:**
Case Handler's Initial:	**Fee Amount Received:** $	**Check #:**
☐ **Lyris List Notification of Posting of APAP**	**Date** _____	**Confirmation Sent** _____

Klamath Hydroelectric Project

Aquatic Pesticide Application Plan

for

Iron Gate and Copco Reservoirs

February 2014

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

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Introduction and Background

This Aquatic Pesticide Application Plan (APAP) has been developed to comply with the requirements of Water Quality Order No. 2013-0002-DWQ, Statewide General National Pollutant Discharge Elimination System Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications, General Permit No. CAG990005 (General Permit). Water Quality Order No. 2013-0002-DWQ was adopted by the State Water Resource Control Board on March 5, 2013 and became effective on December 1, 2013.

This APAP describes the project site, treatment area, algae nuisances to be controlled, algaecide products to be used and their rationale for selection, the monitoring program to be employed along with sample contamination prevention procedures, Best Management Practices to be followed, and an examination of possible alternatives to the use of aquatic algaecide. These APAP requirements are found in Section VIII.C of the General Permit.

Since 2008, PacifiCorp has conducted bench scale and pilot test applications of environmentally-safe hydrogen peroxide-based algaecides as a potential tool for the management of blue-green algae (cyanobacteria) conditions within Iron Gate and Copco reservoirs. Excessive algal concentrations, including concentrations of *Microcystis sp*., can impact beneficial uses and create public health concerns. PacifiCorp previously applied hydrogen peroxide-based algaecide (GreenClean Liquid) in Copco reservoir in 2012 and in Iron Gate reservoir in 2013 in small areas of the reservoirs as part of pilot projects to assess the potential role of this tool in managing nuisance algae conditions in high-use public access areas of the reservoirs. Algaecide application in these instances was conducted after enrollment in the NPDES General Permit contained in Water Quality Order No. 2004-0009-DWQ. PacifiCorp plans to continue to assess the effectiveness of algaecide within targeted areas of Iron Gate and Copco reservoirs in order to learn what role, if any, this management tool may play in improving water quality conditions and maintaining designated beneficial uses within project reservoirs, particularly in high-use areas of the reservoirs where algal conditions impact beneficial uses during the summer months.

Element 1: Description of the Water System

Aquatic algaecide may be applied to Iron Gate and Copco reservoirs, which are located along the Klamath River in Siskiyou County, California. Iron Gate reservoir is formed by Iron Gate dam which is located at River Mile (RM) 190.1 of the Klamath River and Copco reservoir is formed by Copco No. 1 dam, which is located at RM 198.6. PacifiCorp owns the Iron Gate and Copco No. 1 developments and operates the facilities and two other mainstem Klamath River hydroelectric developments (Copco No. 2 and J.C. Boyle) under a license from the Federal Energy Regulatory Commission (FERC) for Project No. 2082.

Iron Gate reservoir has a surface area at full pool of approximately 944 acres and a maximum depth of approximately 162 feet. The reservoir stretches 6.8 river miles upstream of the dam and the Copco No. 2 powerhouse, located at RM 196.8, discharges into Iron Gate reservoir. Iron Gate reservoir, shown in Figure 1, has a total storage capacity of 58,794 acre-feet. A number of campgrounds, boat ramps, picnic areas and other public use areas are located along Iron Gate reservoir and the reservoir provides the cold water source for the Iron Gate fish hatchery, which is owned by PacifiCorp and operated by the California Department of Fish and Wildlife. The reservoir is popular for fishing, boating, swimming, and waterskiing. The reservoir serves as a re-regulating reservoir for peaking flows from the upstream hydroelectric developments of the Klamath Hydroelectric Project and receives fluctuating flows from upstream and regulates these flows to provide stable flows to the Klamath River downstream of Iron

Gate dam. Flow releases from Iron Gate dam are made consistent with the requirements and directives of the U.S. Bureau of Reclamation's Klamath Project, which is located upstream of PacifiCorp's Klamath Hydroelectric Project.

Copco reservoir has a surface area at full pool of approximately 1,000 acres and a maximum depth of approximately 115 feet. The reservoir, shown in Figure 2, stretches 4.5 river miles upstream of Copco No. 1 dam and has a total storage capacity of 46,867 acre-feet. A number of boat ramps, picnic areas, private homes and public use areas are located along Copco reservoir.

Figure 1: Map of Iron Gate Reservoir

Figure 2: Map of Copco Reservoir

Element 2: Description of the Treatment Area

The planned treatment area in Iron Gate reservoir consists of an enclosed portion of Long Gulch Cove, a small cove located in the southeast corner of the reservoir as indicated in Figure 1. Long Gulch Cove is shown in more detail below in Figure 3. Long Gulch Cove hosts a boat ramp and day use recreation area, but is not as heavily used as other public access areas on the north shore of the reservoir. A barrier curtain installed within the cove encloses an approximately 8 acre area of Long Gulch Cove and was previously used for algaecide testing conducted in 2013. The barrier curtain does not enclose the boat ramp or hinder access between the boat ramp and the remainder of the reservoir. Long Gulch Cove is an area with consistent algal blooms and algal accumulation during the late summer period and is therefore a favorable location for the pilot study of algaecide treatment.

No treatment locations within Copco reservoir are identified since there are currently no plans for treatment in Copco reservoir. However, treatment locations within Copco reservoir may be subsequently identified if further assessment of algaecide treatment indicates that water quality conditions could be improved in certain portions of Copco reservoir. Copco Cove, located within Copco reservoir, was previously treated in 2012 in a single treatment event as part of an initial field test of GreenClean to provide familiarization with the treatment process and study the effects of treatment.

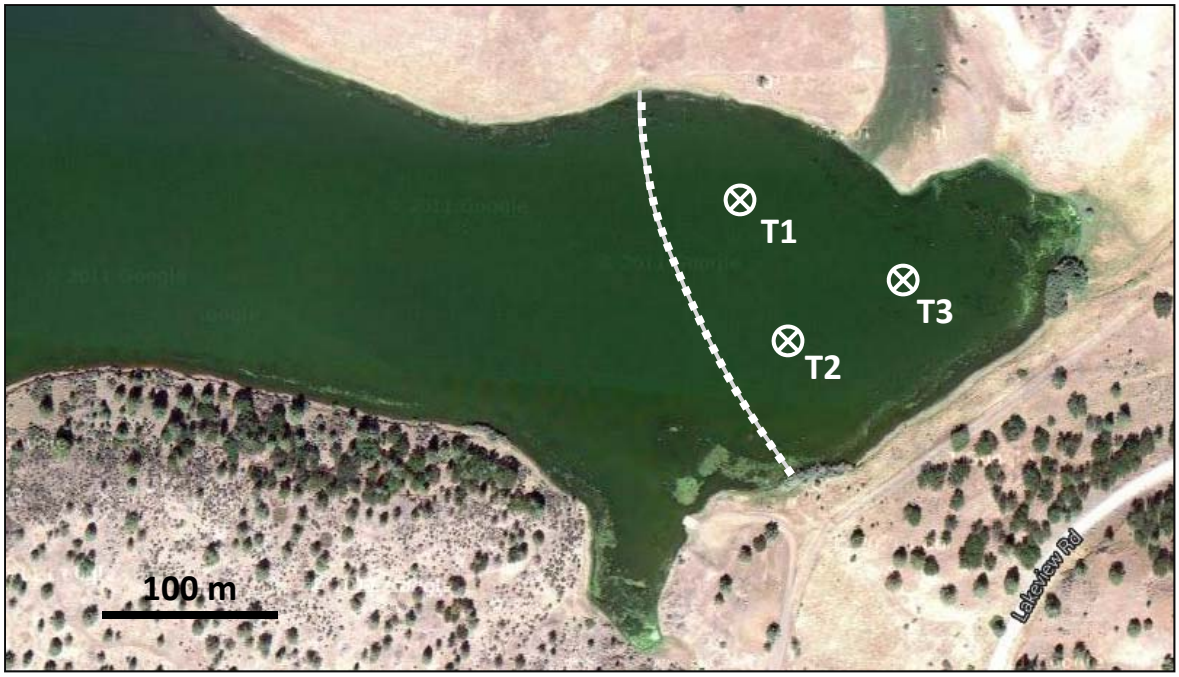

Figure 3. Long Gulch Cove and approximate location of divider curtain and monitoring locations (T1, T2, and T3). (Curtain location shown is approximate and may be adjusted during the algaecide application and related study.)

Element 3: Description of Algae Being Controlled

Blue-green algae (cyanobacteria), particularly *Microcystis sp.*, are the target algae to be controlled in the application study proposed by PacifiCorp. Cyanobacteria species are of primary concern as a target for control because certain types of these algae may produce toxins that can present a health hazard to humans and animals. Currently, Iron Gate and Copco reservoirs are seasonally posted with health advisories for cyanobacteria blooms. Additionally, the algaecide to be applied (GreenClean Liquid and GreenClean PRO) can be targeted specifically at blue-green algae by adjusting the rate of application, so targeting cyanobacteria with test applications is a focus of the applications.

Element 4: Algaecides Used, Known Degradation Byproducts, Application Methods, and Adjuvants

Hydrogen peroxide-based algaecide (GreenClean Liquid), an environmentally-safe algaecide manufactured by BioSafe Systems L.L.C., will be used in this application and will be applied within the water column and/or to the surface of the water consistent with label requirements. Application rates and dosages will be recommended by a licensed professional applicator based on site conditions and algal densities. Depending on site conditions and field observations, GreenClean PRO, a granular form of the algaecide, may also be used to treat near-shore areas where the ability to apply by boat may be limited due to shallow water depths. GreenClean PRO is a sodium carbonate peroxyhydrate-based algaecide that breaks down into sodium carbonate and hydrogen peroxide when applied to water. Other common brand names of the algaecide (PAK 27, Phycomycin) may also be employed or substituted for GreenClean.

Both GreenClean Liquid and GreenClean PRO use forms of hydrogen peroxide (sodium carbonate peroxyhydrate). After contact with water, the hydrogen peroxide breaks down harmlessly into water

and oxygen without any harmful byproducts. Hydrogen peroxide acts as an oxidizing agent to kill target algae. The U.S. Environmental Protection Agency fact sheet[1] for sodium carbonate peroxyhydrate states, "When the pesticide is applied in accordance with directions on the label, no harm is expected to birds, other terrestrial animals, freshwater fish, or freshwater invertebrates. In the case of non-target plants, no harm is foreseen if the label directions are followed." The General Permit does not have a monitoring trigger or a monitoring requirement for sodium carbonate peroxyhydrate. The algaecide has no receiving water limitations, biodegrades completely into oxygen and water, oxidizes algae quickly so there is no time for tolerance or mutational resistance to develop, and is certified for use in drinking water applications (compliant with NSF/ANSI Standard 60).

Clean Lakes Inc., a professional applicator licensed in California, will conduct the algaecide application (http://www.cleanlake.com/) using a LittLine Littoral Zone Treatment vessel that employs GPS technology to track treatment location, date and time, and boat speed when applying liquid algaecide. If used, granular algaecide will be applied using a spreader to provide a uniform, controlled dispersal of known quantities of algaecide.

No adjuvants are included in these algaecides and no separate adjuvants will be used. Technical information sheets for GreenClean Liquid and GreenClean PRO are included in Appendix A.

Algaecide applications will be performed by Clean Lakes, Inc., or an equivalently qualified applicator, and will employ Best Management Practices (BMP's) by licensed personnel in accordance with Pest Control Recommendations (PCR) issued by a State of California, Department of Pesticide Regulation (DPR) Pest Control Advisor. Clean Lakes, Inc. application staff holds State of California, Department of Pesticide Regulation (DPR), Pest Control Advisor licenses and Qualified Applicator Licenses or Certificates.

Element 5: Discussion of factors influencing the decision to select algaecide applications for algae control

Factors influencing the decision to select algaecide application for algae control are listed below:

- The seasonal presence of excessive algal densities (blooms and windblown accumulations) due to loading from upstream sources, including the algae *Microcystis sp.*, which can produce the toxin microcystin, in project reservoirs.
- The seasonal posting of project reservoirs with health advisories for cyanobacteria blooms.
- The effectiveness of hydrogen-dioxide and sodium carbonate peroxyhydrate-based algaecides in improving water quality conditions in other waterbodies (including drinking water reservoirs and lakes and reservoirs used for public recreation).
- The lack of potentially harmful degradation byproducts associated with hydrogen dioxide-based algaecides as compared to other common algaecides (e.g., copper-based algaecides).

It should be noted that PacifiCorp is planning to continue test applications of environmentally-safe algaecide in order to determine the potential role that algaecide application may play as part of its larger strategy to contribute to improvements in water quality conditions in project reservoirs and the Klamath River downstream of Iron Gate reservoir. PacifiCorp has not committed to the use of algaecide as an ongoing means of improving water quality and is not including algaecide as a component of a reservoir water quality management plan at this time. The intent of these test applications is to learn about potential effectiveness of algaecide application in limited areas of project reservoirs, which will

[1] http://www.epa.gov/opp00001/chem_search/reg_actions/registration/fs_PC-128860_01-Sep-02.pdf

guide decisions about potential ongoing use of algaecide as a water quality management tool in combination with other reservoir management strategies and actions.

As noted above, specific treatment criteria have not been defined because algaecide treatments will be conducted as part of a pilot study to assess treatment effectiveness. However, there are manufacturer guidelines regarding treatment levels for varying algal densities. Visual observation and prior monitoring results will be used to make decisions regarding treatment frequency and application rates. Treatment decisions will be made by the qualified algaecide applicator based on field observations and professional experience, and in compliance with label instructions. Factors influencing hydrogen peroxide-based algaecide application rates include the following:

- Type of Algae Present
- Amount of Algae Growth
- Light Intensity
- Water Quality and Clarity, and
- Amount of Organic and Inorganic Matter

Information gained from this pilot study will be useful in identifying future treatment criteria if the application of algaecide proves effective in controlling densities in the test area(s) or results in information useful for additional pilot test applications to provide information regarding the potential use of algaecide as a tool for improving reservoir water quality conditions.

Element 6: Gates or control structures to be used to control the extent of receiving waters potentially affected by algaecide

Not applicable. There are no gates or control structures that will be used to control the extent of receiving water potentially affected by algaecide. The algaecide to be employed in the test application has no receiving water limitations. A barrier curtain employed in this study will isolate a test area in which algaecide will be applied, but the barrier is not intended to control the extent of receiving waters potentially affected by the algaecide in this pilot study but rather to isolate the treatment area so local treatment effects can be evaluated.

Element 7: State Implementation Policy Section 5.3 Exception

Not applicable.

Element 8: Monitoring Program Description

The monitoring and reporting provisions of the General Permit requires that dischargers comply with the Monitoring and Reporting Program (MRP) outlined in Attachment C of the General Permit. The MRP must be designed to address two key questions:

> Question 1: Does residual algaecide and aquatic herbicide discharge cause an exceedance of receiving water limitations?
>
> Question 2: Does the discharge of residual algaecides and aquatic herbicides, including active ingredients, inert ingredients, and degradation byproducts in any combination cause or contribute to an exceedance of the “no toxics in toxic amount” narrative toxicity objective?

General Monitoring Requirements

Samples and measurements collected as described below will be representative of the nature of the monitored discharge and treatment area. All laboratory analyses will be conducted at a laboratory certified for such analyses by the California Department of Public Health in accordance with California Water Code section 13176. Laboratories that perform sample analyses will be identified in all monitoring reports. PacifiCorp's Quality Assurance-Quality Control Program in effect for all Klamath Basin water quality sampling will be used and applied to all onsite field measurements such as electric conductivity, pH, turbidity, and temperature. All analyses will be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants," promulgated by the U.S. EPA in title 40 Code of Federal Regulations (40 C.F.R.) 136 or equivalent methods that are commercially and reasonably available.

Designated Beneficial Uses

The Iron Gate Hydrologic Subarea (105.37) is listed in Chapter 2 of the North Coast Basin Plan as having the following existing beneficial uses:

FRSH Freshwater Replenishment
NAV Navigation
POW Hydropower Generation
REC-1 Water Contact Recreation
REC-2 Non-Contact Water Recreation
COMM Commercial and Sport Fishing
WARM Warm Freshwater Habitat
COLD Cold Freshwater Habitat
WILD Wildlife Habitat
RARE Rare, Threatened, or Endangered Species
MIGR Migration of Aquatic Organisms
SPWN Spawning, Reproduction, and/or Early Development
SHELL Shellfish Harvesting
AQUA Aquaculture

The Copco Lake Hydrologic Subarea (105.38) is listed in Chapter 2 of the North Coast Basin Plan as having the following existing beneficial uses:

MUN Municipal and Domestic Supply
AGR Agricultural Supply
IND Industrial Service Supply
FRSH Freshwater Replenishment
NAV Navigation
POW Hydropower Generation
REC-1 Water Contact Recreation
REC-2 Non-Contact Water Recreation
COMM Commercial and Sport Fishing
WARM Warm Freshwater Habitat
COLD Cold Freshwater Habitat
WILD Wildlife Habitat
RARE Rare, Threatened, or Endangered Species
MIGR Migration of Aquatic Organisms
SPWN Spawning, Reproduction, and/or Early Development

AQUA Aquaculture

Algaecide applications, as per manufacture guidelines and applicator's BMPs, are consistent with supporting these beneficial uses. Algaecide applications will be monitored by field staff to ensure that existing beneficial uses are not impaired as a result of algaecide application. Visual monitoring as indicated below will be useful for assessing potential impacts.

Monitoring Logical Framework

The purpose of the pilot study during which algaecide will be applied is to determine the effectiveness of environmentally-safe algaecide at preventing and managing algal bloom development in the approximately 8 acre treatment area shown in Figure 3. Given the geographic and hydrographic features of the proposed pilot test application site in a lake/reservoir environment, the fact that the test area will be isolated from the main reservoir by a barrier curtain, and the very short (nearly immediate) breakdown of hydrogen peroxide into oxygen and water upon application, there is little concern regarding potential algaecide residues or degradation byproducts in the proposed application. The General Permit also states that there are no receiving water limitations, monitoring triggers, or monitoring requirements for sodium carbonate peroxyhydrate due to the lack of toxicity associated with potential algaecide residuals and degradation byproducts. As stated in the General Permit (p. D-29):

> After contact, the hydrogen peroxide breaks down into water and oxygen.
>
> U.S. EPA has waived toxicity testing for freshwater fish and invertebrate during the registration process. According to the U.S. EPA fact sheet, when the pesticide is applied in accordance with directions on the label, no harm is expected to freshwater fish or freshwater invertebrates.
>
> There are no toxicity data for sodium carbonate peroxyhydrate in U.S. EPA's Ecotoxicity Database. Therefore, this General Permit does not have a monitoring trigger or a monitoring requirement for sodium carbonate peroxyhydrate.

Additionally, the use of this environmentally-safe algaecide is not occurring in conjunction with other algaecide or pesticide applications with active ingredients or degradation byproducts that may have the potential for adverse consequences. This eliminates concerns regarding cumulative or indirect effects.

Accordingly, the monitoring framework is directed at evaluating algaecide effectiveness and documenting that there are no adverse impacts to beneficial uses or water quality as a result of algaecide application. Given the lack of toxicity associated with hydrogen peroxide-based algaecide, and the fact that there are no water use restrictions following treatment that would impact reservoir recreation, water contact, fishing, or other beneficial uses there is little potential for adverse impacts from the proposed pilot study.

During study planning related to prior test applications, concern has been expressed related to the potential for the application of algaecide to lyse Microcystis cells and release intracellular microcystin, a toxin which may be present in Microcystis and other cyanobacteria, into the water column. Increases of dissolved microcystin have been observed when cyanobacteria blooms are treated with copper sulfate-based algaecides (Kenefick et al., 1993; Jones and Orr, 1994). However, recent research (Barrington, et al. 2013, Matthijis, et al. 2011) has indicated that hydrogen peroxide application to cyanobacteria blooms can rapidly reduce both cyanobacteria (as indicated by chlorophyll *a*) and microcystin concentrations in waterbodies while promoting more favorable phytoplankton assemblages. These studies are consistent with the idea that hydrogen peroxide, a strong oxidant, is able to oxidize microcystin during or immediately following cell lysis. PacifiCorp's prior tests of hydrogen peroxide in bench scale testing of reservoir waters and field application in test locations are consistent with these findings. The research by Barrington, et al. (2013) and Matthijs et al. (2011) also indicates that other

environmental effects (bacterial activity, UV radiation through isomerization, etc.) also contribute to the oxidation of dissolved microcystins following hydrogen peroxide treatment. As described in Matthijs et al. (2011), other research (Lawton et al., 1999; Liu et al., 2002; Rodrıguez et al., 2007, 2008) has demonstrated that the products of the oxidation of forms of microcystin (-LR and –RR congeners) are non-toxic, and thus no longer present a danger for public health.

Other concerns expressed with algaecide treatment has been that nutrients will be released as a result of cell lysis and contribute to additional algal growth. Nutrient release upon cell lysis and cell death will occur with any algaecide or pesticide application. Additionally, algal growth in Klamath River reservoirs is not nutrient-limited such that additional bioavailable nutrients would exacerbate seasonal algal conditions. Further, cell lysis will result in some algal biomass sinking to the reservoir bottom, where nutrients within the biomass will not be available in the photic zone for uptake as algal biomass. Regardless, in the worst case, released nutrients would only be able to form the same amount of cyanobacteria that was eliminated through treatment.

Monitoring Locations and Sample Types

Monitoring location(s) will be situated within the treatment area in which algaecide is applied. The proposed monitoring locations for the Long Gulch Cove site are as shown in Figure 3. At each of the three monitoring locations, at least three samples will be collected for each treatment event: Background, Event, and Post-Event. Background samples will typically be conducted the day of the treatment prior to the treatment (e.g., 1- 2- hours). Event samples will be conducted immediately following treatment. Post-Event samples will typically be collected the day after treatment (24 hours), but no more than 7 days following the treatment. Sample types for the Background, Event, and Post-Event samplings are listed below in Table 1.

Table 1: Background, Event, and Post-Event Monitoring Parameters

Sample Type	Constituent/Parameter	Units	Sample Method	Minimum Sampling Frequency	Required Analytical Test Method
Visual	1. Monitoring area description (pond, lake, open waterway, channel, etc.) 2. Appearance of waterway (sheen, color, clarity, etc.) 3. Weather conditions (fog, rain, wind, etc.) 4. Floating or suspended matter 5. Discoloration 6. Bottom deposits 7. Aquatic life 8. Visible films, sheens, or coatings 9. Fungi, slimes, or objectionable growths 10. Potential nuisance conditions	N/A	Visual Observation	1	N/A
Physical	1. Temperature[2]	°F	Grab[4]	5	6
	2. pH[3]	Number			

Sample Type	Constituent/Parameter	Units	Sample Method	Minimum Sampling Frequency	Required Analytical Test Method
	3. Turbidity[3]	NTU			
	4. Electrical Conductivity[3] @ 25°C	µmhos/cm			
Chemical	1. Dissolved oxygen[2]	mg/L	Grab[4]	5	6
	2. Chlorophyll *a*	µg/L			
	3. Microcystin	µg/L			

Notes:

1 All applications at all sites.

2 Field testing.

3 Field or laboratory testing.

4 Samples shall be collected at three feet below the surface of the water body or at mid water column depth if the depth is less than three feet.

5 Collect samples from a minimum of six application events in each environmental setting (flowing water and non-flowing water) per year. If there are less than six application events in a year, collect samples during each application event.

6 Pollutants shall be analyzed using the analytical methods described in 40 C.F.R. part 136.

The proposed monitoring locations depicted in Figure 3 should be sufficient to determine compliance with General Permit conditions and to answer the two key questions listed above regarding algaecide residuals. As described in Attachment D (p. D-29) of the General Permit, sodium carbonate peroxyhydrate does not have a monitoring trigger or monitoring requirement. PacifiCorp may add additional monitoring locations to the treatment area for the purpose of assessing treatment effectiveness. Although additional monitoring locations are not believed to be necessary to assess compliance with General Permit conditions, any additional monitoring results obtained for evaluating pilot project performance will be used to assess compliance with the General Permit and will be reported in the Annual Monitoring Report described below, or as otherwise required under the General Permit.

Meteorological conditions will be monitored with a handheld meteorological station or a nearby station prior to each sampling event during the experiment, including wind speed and approximate direction. The treatment area will consist of a portion of the cove that is isolated by a vertical curtain from the main lake (Figure 3).

Samples will be collected using project Standard Operating Procedures and the Quality Assurance Project Plan that PacifiCorp uses for all water quality monitoring in the Klamath Basin. Monitoring records will include the date, location (GPS coordinate), and time of sample collection or measurement, and the individual performing the collection. Laboratory records will include the dates of the analyses, laboratory performing the analysis, analyses methods used, and the results of the analyses. All laboratory analyses will be conducted by a laboratory certified by the California Department of Public Health.

Monitoring Records

Records of monitoring will be retained for a minimum of three (3) years. Records of monitoring information to be retained will include the following:

1. The date, exact place, and time of sampling or measurements;
2. The individuals who performed the sampling or measurements;
3. The dates analysis were performed;
4. The individuals who performed the analyses;
5. The analytical techniques or methods used; and
6. Results of analyses.

Reporting Requirements

PacifiCorp will furnish to the Regional Water Board, State Water Board, or U.S. EPA within a reasonable time, any information which the Regional Water Board, State Water Board, or U.S. EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this General Permit or to determine compliance with this General Permit. Upon request, PacifiCorp will also furnish to the Regional Water Board, State Water Board, or U.S. EPA copies of records required to be kept by this General Permit. (40 C.F.R. §122.41(h); Wat. Code, §13267.)

Annual Information Collection

Information on the previous reporting year beginning January 1 and ending December 31 will be collected and retained, and provided to the Deputy Director or Executive Officer of the North Coast Regional Water Board, if requested:

1. An executive summary discussing compliance or violation of this General Permit and the effectiveness of the APAP to reduce or prevent the discharge of pollutants associated with algaecide applications;
2. A summary of monitoring data, including the identification of water quality improvements or degradation as a result of the algaecide application, if appropriate, and recommendations for improvements to the APAP [including proposed best management practices (BMPs)] and monitoring program based on the monitoring results. All receiving water monitoring data shall be compared to receiving water limitations and receiving water monitoring triggers;
3. Identification of BMPs currently in use and a discussion of their effectiveness in meeting the requirements in the General Permit;
4. A discussion of BMP modifications addressing any violations of this General Permit;
5. A map showing the location of each treatment area;
6. Types and amounts of algaecides and aquatic herbicides used at each application event;
7. Information on surface area and/or volume of treatment areas and any other information used to calculate dosage, concentration, and quantity of each algaecide and aquatic herbicide used;
8. Sampling results shall 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 area (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 shall be tabulated so that they are readily discernible; and

9. Summary of algaecide application log.

Annual Monitoring Report

An annual monitoring report will be submitted to the Deputy Director of the State Water Resources Control Board and the Executive Director of the North Coast Regional Water Quality Control Board regarding activities conducted from the January 1 through December 31 reporting period by March 1 of the following year. The annual report will contain the information specified in Attachment C of Order No. 2013-0002-DWQ and will include a summary of the past year's activities and a certification that activities were conducted in compliance with General Permit requirements.

The annual report will contain the following information:

1. An executive summary discussing compliance or violation of this General Permit and the effectiveness of the APAP; and

2. A summary of monitoring data, including the identification of water quality improvements or degradation as a result of the algaecide or aquatic pesticide application.

Twenty-Four Hour Report

PacifiCorp will report to the State Water Board and North Coast Water Board any noncompliance, including any unexpected or unintended effect of an algaecide use that may endanger health or the environment. Any information will be provided orally within 24 hours from the time of becoming aware of the circumstances and will include the following information:

a. The caller's name and telephone number;

b. Applicator name and mailing address;

c. Waste Discharge Identification (WDID) number;

d. The name and telephone number of a contact person;

e. How and when PacifiCorp became aware of the noncompliance;

f. Description of the location of the noncompliance;

g. Description of the noncompliance identified and the U.S. EPA pesticide registration number for each product applied in the area of the noncompliance; and

h. Description of any steps that have been taken or will be taken to correct, repair, remedy, cleanup, or otherwise address any adverse effects.

If unable to notify the State and the North Coast Water Board within 24 hours, PacifiCorp will do so as soon as possible and also provide the rationale for why such notification was not provided within 24 hours.

Five-Day Written Report

PacifiCorp will provide a written submission within five (5) days from becoming aware of any noncompliance with the General Permit. The written submission shall contain the following information:

a. Date and time the State Water Board and the appropriate North Coast Regional Water Board contacts were notified of the noncompliance and any instructions received from the

State and/or North Coast Regional Water Board; information required to be provided in Section D.1 (24-Hour Reporting);

b. A description of the noncompliance and its cause, including exact date and time and species affected, estimated number of individual and approximate size of dead or distressed organisms (other than the pests to be eliminated);

c. Location of incident, including the names of any waters affected and appearance of those waters (sheen, color, clarity, etc);

d. Magnitude and scope of the affected area (e.g. aquatic square area or total stream distance affected);

e. Algaecide application rate, intended use site (e.g., banks, above, or direct to water), method of application, and name of algaecide and herbicide product, description of algaecide and herbicide ingredients, and U.S. EPA registration number;

f. Description of the habitat and the circumstances under which the noncompliance activity occurred (including any available ambient water data for aquatic algaecides and aquatic herbicides applied);

g. Laboratory tests performed, if any, and timing of tests. Provide a summary of the test results within five days after they become available;

h. If applicable, an explanation of why PacifiCorp believes the noncompliance could not have been caused by exposure to the algaecides or aquatic herbicides from PacifiCorp's application; and

i. Actions to be taken to prevent recurrence of adverse incidents.

The State Water Board staff or North Coast Regional Water Board staff may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours.

Element 9: Procedures to Prevent Sample Contamination

The following steps and actions will be taken to prevent sample contamination from persons, equipment, vessels and vehicles associated with algaecide, as follows:

- If possible, sample collection will not be performed from, or in close proximity to, the vessel used for algaecide treatment. If another sampling boat is not available, sample collection will not occur when algaecide is present on the boat.
- Sampling will be performed in a manner that prevents contact with algaecide application equipment, storage containers, or personal protective equipment that may have come in contact with algaecide product.
- If multiple sampling locations are required, sampling equipment will be thoroughly cleaned and triple-rinsed with uncontaminated water, and then rinsed with water being sampled prior to being used at a new sample location.
- During sample bottle handling and sample collection, disposable rubber gloves will be used to collect a water sample. These personal protective equipment gloves will be replaced between monitoring locations and sampling events (Background, Event, and Post-Event).

Element 10: Description of BMPs

Although the algaecide to be employed (hydrogen peroxide) does not have adverse impacts related to potential product residuals or degradation byproducts, and the treatment area consists of only a small portion of the reservoir, a variety of best management practices (BMPs) will be followed to minimize the risk of a spill, ensure public safety, protect environmental resources, and assure public awareness regarding the algaecide treatment(s). These techniques, practices, and BMPs include the following.

- BMPs to reduce potential impacts of algaecide treatment(s):
    - A pre-treatment survey will be carried out to identify potential issues within treatment areas or with the timing of treatment activities.
    - Adjustments will be made to treatment protocols and timing based upon survey results.
    - From the aquatic algaecides available, the safest available algaecide option has been selected for testing as part of the planned pilot study.
    - Algaecide application rates will conform to the EPA label and will be as limited as possible to achieve treatment objectives.
    - The algaecide applicator will develop and implement an Aquatic Invasive Species Assurance Program that meets all applicable aquatic invasive species requirements including all federal, state, or local laws, regulations, rules or standards regarding aquatic invasive species.
    - The algaecide applicator will develop and implement a site-specific safety plan organized consistent with OSHA standards.
- In order to avoid inadvertent or accidental soil or water contamination with aquatic pesticides, application personnel follow the storage, transport, and spill control procedures per U.S. EPA and Division of Pesticide Regulation (DPR) rules, regulations and label instructions.
- Over application will be avoided by following the specific product labels for the aquatic algaecide used. Algaecide quantities required for each treatment are calculated at the office and only sufficient material to carry out the treatment is brought onsite for the day's application.
- Application equipment from the professional applicator is routinely cleaned and maintained, and all label directions and DPR guidelines are followed as to acceptable application methods as well as weather conditions. Surface applications are not made in winds above 10 miles per hour.
- The various BMP's being implemented will ensure that treatment application will meet the requirements of the General Permit for the use of algaecide.
- Licensing: The algaecide applicator and crew will be certified and/or licensed by DPR as required.
- Notification: As detailed elsewhere in this document, whenever pesticides are used potentially affected users in the area are informed of the treatments so that means can be taken to avoid using the treated water.
- Treatment Conditions: If there are conditions where it is determined that the treatment would be ineffective, the application will not be conducted and application will wait for more favorable treatment conditions.

- Post-treatment: Surveys will also be carried out for post-treatment assessment of treatment efficacy and non-target impacts as part of Post-Event sampling. Sampling crews will be instructed to look for possible non-target impacts that can be seen with the naked eye, such as impacts to fish.
- The applicator will follow all pesticide label instructions and all General Permit requirements and will comply with effluent and receiving water limitations;
- The discharger's applicator and sampling personnel will follow this Aquatic Pesticide Application Plan (APAP);
- The discharger's applicator will comply with the monitoring and reporting requirements outlined in this APAP.
- Application Schedule. When requested, the discharger will 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.
- Public Notice Requirements. As required by the General Permit, every calendar year, at least 15 days prior to the first application of aquatic algaecide, the Discharger will notify potentially affected public agencies. The notification will include the following information:
    - A statement of the discharger's intent to apply algaecide or aquatic herbicide(s);
    - Name of algaecide and or aquatic herbicide to be used;
    - 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.

Element 11: Examination of Possible Water Quality Control Alternatives

PacifiCorp is studying, in combination with algaecide, a number of other control alternatives that may further contribute to the management of algal conditions within project reservoirs. As such, the use of algaecide treatment under the General Permit for this pilot study does not represent the incorporation of algaecide treatment into permanent plans for water quality management in project reservoirs. However, in order to evaluate algaecide as a potential tool contributing to improvements in water quality conditions, field testing of algaecide treatments are necessary. This will allow for assessments of treatment effectiveness and determinations of how algaecide treatment may, or may not, fit into a broader strategy of actions to improve reservoir water quality conditions.

PacifiCorp has evaluated and continues to evaluate other alternatives for managing water quality conditions in project reservoirs. These alternatives are described below:

No Action

The alternative of not investigating or pursuing means to improve water quality conditions in project reservoirs related to excessive algal densities exists, however, PacifiCorp does not view No Action as a feasible alternative given the important information that will be gathered related to public health concerns and algal conditions that develop in the Klamath River system and project reservoirs on a seasonal basis.

Mechanical Circulation

PacifiCorp has previously investigated the use of mechanical circulation devices (e.g. Pond Doctors and SolarBees) through testing of these devices in project reservoirs in 2007 and 2008. PacifiCorp continues to explore the potential use of these systems, or other circulation systems such as air lift pumps and axial flow pumps as a potential tool to improve water quality conditions and create conditions within project reservoirs that are unfavorable to nuisance algae growth. Field testing to date has not shown success and the use of mechanical circulation does not currently present an alternative to algaecide treatment, but may be promising as a means to maintain algaecide treatment effectiveness and persistence. PacifiCorp plans further study of mechanical circulation in this context, and as a stand-alone technology for management of algal conditions within targeted reservoir areas.

Lake Divider/Barrier Curtains

PacifiCorp has previously investigated the use of lake divider curtains (also known as barrier curtains or turbidity curtains) to improve algal conditions in localized reservoir areas. Deployment of a turbidity curtain on the Iron Gate log boom in Iron Gate reservoir occurred in 2008, but this curtain deployment was not shown to be effective in reducing algal concentrations near the Iron Gate intake. Thus, implementation of a lake divider curtain is not an alternative to the investigation of algaecide treatment. However, a lake divider (barrier) curtain has been deployed in Long Gulch Cove and will be an element of ongoing studies to monitor the effectiveness of algaecide treatment by controlling advection of algae into the planned treatment area, but the deployment of a barrier curtain by itself is not currently viewed as an alternative to planned algaecide assessment. Pursuant to other ongoing studies, PacifiCorp is continuing to evaluate the possible placement of barrier curtain(s) to improve water quality conditions near the Iron Gate intake.

Copper-Based Algaecide

As an alternative to hydrogen peroxide-based algaecide, PacifiCorp has previously tested copper-based algaecides in off-site bench scale studies conducted from 2008 to 2011. Although effective at controlling and eliminating algae, the alternative of using copper-based algaecide is not being pursued given environmental concerns related to the use of copper and concerns with potential effects from algaecide residues and degradation byproducts and the related potential for harm to aquatic life.

Nutrient Reduction

PacifiCorp is involved in basin-wide planning efforts with the State Water Resources Control Board, the North Coast Regional Water Quality Control Board, the Oregon Department of Environmental Quality, and the U.S. EPA on pilot projects and studies to reduce nutrients in the Klamath River which drive algal blooms in project reservoirs. These efforts are focused on source control and nutrient reduction efforts that may occur through the development of constructed treatment wetlands in the Upper Klamath basin, diffuse source treatment wetlands, and other means of source control and nutrient reduction. Ongoing efforts include planning for a demonstration wetland facility for nutrient removal in the Upper Klamath basin, investigation of nutrient reduction methods for Upper Klamath Basin source waters,

implementation of a phosphorus reduction pilot project in the Upper Klamath basin, and other efforts. Nutrient reduction efforts, if successful, will occur over a long time frame and do not offer an immediate alternative to the investigation of algaecide as a potential water quality management tool.

Biological Control

There are no known means of cyanobacteria bloom control, which is the focus of the pilot study, with biological methods such as the introduction of vegetation-eating fish (e.g. tilapia, carp) that can be a means of control for filamentous algae or nuisance aquatic weeds. As such, biological control is not a viable alternative to the investigation of algaecide as a means to manage cyanobacteria blooms.

Dam Removal

PacifiCorp is a signatory to the Klamath Hydroelectric Settlement Agreement, which provides for the potential removal of PacifiCorp's mainstem hydroelectric facilities, including Iron Gate and Copco No. 1 dams. Dam removal under the KHSA is not anticipated to occur until 2020. Thus, project removal (and elimination of project reservoirs) is not a current alternative to investigating algaecide treatment as a potential water quality improvement technique for project reservoirs during the interim period prior to potential project removal.

Alternatives Summary

Since the purpose of PacifiCorp's in-reservoir pilot study of algaecide treatment is to gather information to assist in identifying effective, feasible, and environmentally protective management methods, which may be used in combination with other available management tools, the alternatives described above cannot provide the information necessary to assess the potential effectiveness of algaecide nor can they be feasibly implemented at the current time in a manner that would reduce the need to explore algaecide treatment as a means of contributing to water quality improvements. In the planned pilot testing, the algaecide application will use an unobtrusive method of application (from a boat) and only hydrogen peroxide-based algaecide will be employed, so there are no decisions that will be taken regarding the use of less environmentally safe algaecide formulations.

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Appendix A: GreenClean Liquid and GreenClean PRO Technical Information Sheets

BioSafe Systems L.L.C.

BROAD SPECTRUM ALGAECIDE/BACTERICIDE

GREENCLEAN® LIQUID

- ***Broad Spectrum*** Controls a broad range of filamentous & planktonic algae
- ***Copper Alternative*** May be used in copper-restricted areas
- ***Contact Algaecide*** Kills algae on contact
- ***Liquid Formula*** The power of oxidation with the ease of a liquid application
- ***Reduced-Risk Chemistry*** Ideal for ponds with sensitive fish populations

GreenClean® Liquid is an alternative to copper-based chemistries and can be applied in copper sensitive areas without runoff or use restrictions. Through its patented formula, GreenClean Liquid immediately begins fighting algae blooms, releasing vital oxygen into the water body as it biodegrades. The professional strength formula quickly tackles the toughest algae problems and is perfect for spot or full volume treatments.

GreenClean Liquid's Chemistry

GreenClean Liquid's ability to destroy algae comes from its one-of-a-kind formulation. Its activated peroxygen chemistry utilizes a stabilized form of hydrogen peroxide (H_2O_2) and peroxyacetic acid (PAA). Working together, PAA and hydroxyl free radicals (OH) break down algae cell walls and then annihilate the cell from the inside out. The reaction works quickly, eliminating any chance of mutational resistance.

GreenClean Liquid's Applications

GreenClean Liquid is versatile and can be used for:

Water Treatment: Use GreenClean Liquid to treat filamentous and planktonic algae in ponds, lakes, reservoirs (including potable water systems), water features and irrigation systems.

Aquaculture: Use GreenClean Liquid in all aquaculture applications to control algae and off-flavor causing cyanobacteria (blue-green algae).

Benefits of GreenClean Liquid

- *Fast Acting* Begins working within 60 seconds of application, results can be seen in 24 – 48 hours.
- *No Restrictions* Waters can be used without interruption after treatment.
- *No Bioaccumulation* Biodegrades completely.
- *No Mutational Resistance* Oxidizes algae quickly, no time for tolerance build up to occur.
- *Releases Oxygen* Adds oxygen into the water column as it works – effects last for several hours.
- *Certified* EPA approved, OMRI Listed, and NSF/ANSI Standard 60 certified for drinking water.

OMRI Listed Organic Materials Review Institute

NSF Maximum use for potable water 20 mg/L

See reverse side for application rates.

Application Rates

GreenClean Liquid is labeled for rates up to 30 gallons per acre foot of water.

Method of Application

GreenClean Liquid is a concentrate and is diluted at a rate up to 1:5 for spray applications. GreenClean Liquid is a contact algaecide. For best results on thick algae mats, use a non-ionic penetrator/surfactant or break the mats manually to allow for solution penetration. Use non-ionic polymers for drift control and sinking.

Targeted Species	Gallons Per Surface Acre
Cyanobacteria	1 - 5
Filamentous	5 - 10
Extreme Density	Up to 30

Available in 2.5, 5, 30, 55, and 275 gallons.

Factors*

- Type of Algae Present
- Amount of Algae Growth
- Light Intensity
- Water Quality and Clarity
- Amount of Organic and Inorganic Matter

Non-Factors

- Salinity
- Water pH

*The above factors will determine the amount of GreenClean Liquid. The higher the dosage of GreenClean Liquid, the higher the control level. Repeat applications may be necessary.

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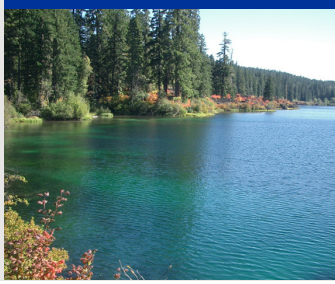
Technical Bulletin

GreenClean® PRO

Granular Algaecide/Fungicide



- *Reduced-Risk Chemistry* Ideal for ponds with sensitive fish populations
- *Contact Algaecide* Kills algae on contact
- *Copper Alternative* May be used in copper restricted areas
- *Granular Algaecide* Effective against submerged algae
- *Algaestat* Use at low rates as a preventative program

GreenCleanPRO® is the only peroxide based algaecide with a broad spectrum label. This professional strength formula eliminates a broad spectrum of algae on contact. GreenCleanPRO is an integral part of an entire water management system. It can be used by itself, in conjunction with biological products, or in rotation with other algaecides to help maintain clear, algae-free waters. GreenCleanPRO is designed for use in lakes, ponds and other large bodies of water as well as on non-painted surfaces* such as beaches, docks, and walkways.

GreenCleanPRO's Chemistry

GreenCleanPRO's active ingredient is Sodium Carbonate Peroxyhydrate, commonly called percarbonate. Percarbonate is a stabilized peroxygen chemistry that acts as a powerful algaecide without harming the environment.

Mode of Action

GreenCleanPRO works through a powerful oxidation reaction. The peroxygen chemistry in GreenCleanPRO reacts with natural elements of surface waters, creating hydroxyl free radicals. Hydroxyl free radicals are strong oxidizers that destroy algal cell membranes, chlorophyll and unsaturated fatty acids, providing immediate control of algae.

Benefits of GreenCleanPRO

- *Fast Acting* Initial results can be seen within 60 seconds of application.
- *No Restrictions* Waters can be used without interruption after treatment.
- *No Bioaccumulation* Biodegrades completely.
- *No Mutational Resistance* Oxidizes algae on contact, no time for tolerance build up to occur.
- *Releases Oxygen* Adds 13% bio-available oxygen - effects last for several hours.
- *Certified* EPA approved, OMRI Listed, and NSF/ANSI 60 certified for drinking water.

OMRI™ Listed
Organic Materials Review Institute

NSF®

See reverse side for application rates.

* Hard surface treatment not approved in California.

GreenCleanPRO Program

STEP 1	STEP 2	STEP 3
Shock Treatment Spring/Early Summer	Maintenance Treatments Every 2 - 4 weeks	Spot Treatment As needed. Can be applied to perimeter only.

GreenCleanPRO Rates and Target Species

Targeted Species*	Pounds Per Acre Foot
Blue-Green Algae	3 - 16
Blue-Green Algae and some species of Green Algae	17 - 30
Blue-Green Algae More Species of Green Algae, and Some Species of Diatoms	31 - 50
Controls All Blue-Green Algae, Green Algae, and Diatoms	51 - 90

Dosage Rate Factors

Factors*

- Type of Algae Present
- Amount of Algae Growth
- Light Intensity
- Water Quality and Clarity
- Temperature of Water
- Amount of Inorganic and Organic Matter

Non-Factors

- Salinity
- Water pH

** The above factors will determine the amount of GreenCleanPRO. The higher the dosage of GreenCleanPRO, the higher the control level. Repeat applications may be necessary. Only available for blue-green algae control in California.*

GreenCleanPRO's Effect on Non-Target Organisms

When used at the labeled rates, GreenCleanPRO will not harm fish (including sensitive fish such as trout and koi), plants, or aquatic life.

As shown in the following study, even when GreenCleanPRO was applied at almost twice the highest labeled rate, **there was 0% fish mortality.**

Results of the Static Acute Exposure of Rainbow Trout to GreenCleanPRO

GreenCleanPRO lbs./acre-foot	24 Hour % Mortality
Control	0
90	**0**
152	0
249	85

Testing was conducted by Springborn Laboratories in Wareham, Massachusetts. Study NO. 13780.6100.

BioSafe Systems L.L.C.

For additional information on GreenCleanPRO call us toll-free at 1.888.273.3088.

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Please read and follow label directions. AQ10-24 3.10