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# _____
	C. ☐ Change of ownership or responsibility: WDID# _____	

II. DISCHARGER INFORMATION

A. Name Firebaugh Canal Water District			
B. Mailing Address P.O Box 97			
C. City Mendota	D. County Fresno	E. State California	F. Zip 93640
G. Contact Person Jeff Bryant	H. E-mail address Bryant_jeff@sbcglobal.net	I. Title General Manager	J. Phone (559) 655 - 4761

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: Firebaugh Canal Water District Canals, Drains, and Laterals
2. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger.
   Owner's name: N/A
   Name of the conveyance system: N/A
3. Directly to river, lake, creek, stream, bay, ocean, etc.
   Name of water body: N/A

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

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: ____

Algae, submersed aquatic vegetation, floating and emergent aquatic vegetation.

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

2,4-D (Weedar®)
Diquat Dibromide (Reward®)
Endothall (Cascade®)
Flumioxazin (Clipper®)
Fluridone (Sonar®)
Glyphosate (Aquamaster®, Rodeo®)
Imazamox (Clearcast®)
Imazapyr (Habitat®)
Penoxsulam (Galleon SC®)
Sodium Carbonate Peroxyhydrate (GreenClean®)
Triclopyr (Renovate®)

Note: Names listed in parentheses are example product names and may change.

C. Period of Application: Start Date January 1 End Date December 31, for the life of the permit

D. Types of Adjuvants Used:
Various aquatic labeled non-ionic surfactants (Examples include, but not limited to: Competitor®, Agridex®, etc.)

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: JEFF BRYANT

B. Signature: Jeff Bryant **Date:** 3/20/2018

C. Title: GENERAL MANAGER

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** _____

Firebaugh Canal Water District

Aquatic Pesticide Application Plan (APAP)

For the

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

Water Quality Order No. 2013-0002-DWQ

General Permit # CAG990005

Prepared for:
Firebaugh Canal Water District
2412 Dos Palos Road
P.O. Box 97
Mendota, CA 93640
Contact: Jeff Bryant
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Prepared by:
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(530) 757-0941

Submitted to:
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814
Contact: Gil Vasquez
(916) 322-1400

CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direct supervision in accordance with a system designed to insure that qualified personnel properly gathered and evaluated 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 and imprisonment".

Signed and Agreed:

Jeff Bryant
General Manager
Firebaugh Canal Water District

Stephen Burkholder
Project Biologist
Blankinship & Associates, Inc.

Michael S. Blankinship
Licensed Professional Engineer (Civil) #C64112
Pest Control Adviser # 75890
Blankinship & Associates, Inc.

Firebaugh Canal Water District

Aquatic Pesticide Application Plan

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
Water Quality Order No. 2013-0002-DWQ
General Permit # CAG990005

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Aquatic Pesticide Application Plan

In March 2001, the State Water Resources Control Board (SWRCB) prepared Water Quality Order # 2001-12-DWQ which created Statewide General National Pollutant Discharge Elimination System (NPDES) Permit # CAG990003 for the discharges of aquatic herbicides to waters of the United States**.** The purpose of Order # 2001-12-DWQ was to minimize the areal extent and duration of adverse impacts to beneficial uses of water bodies treated with aquatic herbicides. The purpose of the general permit was to substantially reduce the potential discharger liability incurred for releasing water treated with aquatic herbicides into waters of the United States. The general permit expired January 31, 2004.

On May 20, 2004 the SWRCB adopted the statewide general NPDES Permit for Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States #CAG 990005. Dischargers were required to have the general permit to perform aquatic herbicide applications. In May 2009, the general permit expired, but was administratively continued until November 30, 2013.

The Statewide General NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications (herein referred to as the "Permit") was adopted on March 5, 2013 and will become available on December 1, 2013 (SWRCB 2013). The Permit requires compliance with the following:

- The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California, a.k.a. the State Implementation Plan, or SIP (SWRCB 2000)
- The California Toxics Rule (CTR)
- Applicable Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (WQOs) (CVRWQCB 2003)

Coverage under the Permit is available to single dischargers and potentially to regional dischargers for releases of potential and/or actual pollutants to waters of the United States. Dischargers eligible for coverage under the Permit are public entities that conduct resource or pest management control measures, including local, state, and federal agencies responsible for control of algae, aquatic weeds, and other organisms that adversely impact operation and use of drinking water reservoirs, water conveyance facilities, irrigation canals, flood control channels, detention basins and/or natural water bodies.

The Permit does not cover indirect or non-point source discharges, whether from agricultural or other applications of pesticides to land, that may be conveyed in storm water or irrigation runoff. The Permit only covers algaecides and aquatic herbicides that are applied according to label directions and that are registered for use on aquatic sites by the California Department of Pesticide Regulation (DPR).

Firebaugh Canal Water District (herein referred to as the "District") is located in the San Joaquin Valley of California. The District is in Fresno County and covers a service area of approximately 22,000 acres. Refer to **Figure 1**. The District's service area lies west of the city of Firebaugh and the San Joaquin River. The District is one of the four entities that comprise the San Joaquin River Exchange Contractors Water Authority. Its contract with the United Stated Bureau of Reclamation (USBR) supplies the four districts with irrigation water. Irrigated agriculture dominates the area. The main crops grown in the District include alfalfa, almonds, asparagus, cotton, melons, pistachio, and tomatoes.

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The District maintains and operates a system of approximately 45 miles of conveyances. Water in the District's system generally flows from south to the northwest, starting at the Mendota Pool and flowing through canals to approximately 11 miles west of Firebaugh at the tail end of the system. The District owns and operates a series of pumping facilities that draw water into its canal system from the Mendota Pool. Water moves through the open canal system once lifted into one of the District's three main canals by way of gravity and booster pumps. Flows are controlled with automated or manually controlled weirs. Water elevation in the District is monitored by an extensive network of SCADA, and water can be added to the canal from groundwater pumps or the Delta-Mendota Canal as needed to maintain a target elevation or flow. The main conveyances the District operates are the 1st Lift, 2nd Lift and 3rd Lift Canals, as well as the Comfort, Fourchy and Lorenzetti Laterals.

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

Efficient irrigation conveyance is critical to the functions of the District. However, the District's conveyances are prone to infestation by several floating and submersed aquatic weeds including pondweeds (sago, American, horned), *Egeria densa*, *Elodea*, water primrose, and planktonic and filamentous algae. The presence of these weeds and algae in District facilities can adversely impact water flow and reduce water capacity, create bank erosion in unlined conveyances, clogs siphons and pumps, and block screens, thus preventing delivery of irrigation water to a field. Many producers have taken steps to conserve water and maximize irrigation efficiency by using sprinklers, drip, and micro-irrigation systems that require water to be free and clear of algae or nuisance vegetation that could clog filter systems, sprinklers or drip lines.

The presence of algae and aquatic weeds adversely impact the District's operations. As such, the District has determined the need to use algaecides and aquatic herbicides to control problem aquatic vegetation and algae. The District's "project", as defined by the Permit, is the use of algaecides and aquatic herbicides to control algae and aquatic vegetation.

Using Integrated Pest Management (IPM) techniques, the District intends to apply algaecides and aquatic herbicides identified in the Notices of Intent to Comply (NOI) submitted to the SWRCB. For the purposes of applying to, and complying with the Permit, the District has created this APAP.

This APAP is a comprehensive plan developed by the District that describes the project, the need for the project, what will be done to reduce water quality impacts, and how those impacts will be monitored. Specifically, this APAP contains the following eleven (11) elements.

1. Description of the water system to which algaecides and aquatic herbicides are being applied;
2. Description of the treatment area in the water system;
3. Description of types of weed(s) and algae that are being controlled and why;

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4. Algaecide and aquatic herbicide products or types of algaecides and aquatic herbicides expected to be used and if known their degradation byproducts, the method in which they are applied, and if applicable, the adjuvants and surfactants used;

5. Discussion of the factors influencing the decision to select algaecide and aquatic herbicide applications for algae and weed control;

6. If applicable, list the gates or control structures to be used to control the extent of receiving waters potentially affected by algaecide and aquatic herbicide application and provide an inspection schedule of those gates or control structures to ensure they are not leaking;

7. If the Discharger has been granted a short-term or seasonal exception under State Water Board Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Policy) section 5.3 from meeting acrolein and copper receiving water limitations, provide the beginning and ending dates of the exception period, and justification for the needed time for the exception. If algaecide and aquatic herbicide applications occur outside of the exception period, describe plans to ensure that receiving water criteria are not exceeded because the Dischargers must comply with the acrolein and copper receiving water limitations for all applications that occur outside of the exception period;

8. Description of monitoring program;

9. Description of procedures used to prevent sample contamination from persons, equipment, and vehicles associated with algaecide and aquatic herbicide application;

10. Description of the Best Management Practices (BMPs to be implemented. The BMPs shall include, at the minimum:

    10.1. Measures to prevent algaecide and aquatic herbicide spill and for spill containment during the event of a spill;

    10.2. Measures to ensure that only an appropriate rate of application consistent with product label requirements is applied for the targeted weeds or algae;

    10.3. The Discharger's plan in educating its staff and algaecide and aquatic herbicide applicators on how to avoid any potential adverse effects from the algaecide and aquatic herbicide applications;

    10.4. Discussion on planning and coordination with nearby farmers and agencies with water rights diversion so that beneficial uses of the water (irrigation, drinking water supply, domestic stock water, etc.) are not impacted during the treatment period; and

    10.5. A description of measures that will be used for preventing fish kill when algaecides and aquatic herbicides will be used for algae and aquatic weed controls.

11. Examination of Possible Alternatives. Dischargers should examine the alternatives to algaecide and aquatic herbicide use to reduce the need for applying algaecides and herbicides. Such methods include:

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11.1. Evaluating the following management options, in which the impact to water quality, impact to non-target organisms including plants, algaecide and aquatic herbicide resistance, feasibility, and cost effectiveness should be considered:

11.1.1. No action;

11.1.2. Prevention;

11.1.3. Mechanical or physical methods;

11.1.4. Cultural methods;

11.1.5. Biological control agents; and

11.1.6. Algaecides and aquatic herbicides;

If there are no alternatives to algaecides and aquatic herbicides, Dischargers shall use the minimum amount of algaecides and aquatic herbicides that is necessary to have an effective control program and is consistent with the algaecide and aquatic herbicide product label requirements.

11.2. Using the least intrusive method of algaecide and aquatic herbicide application; and

11.3. Applying a decision matrix concept to the choice of the most appropriate formulation.

This APAP is organized to address the aforementioned 1 through 11 elements.

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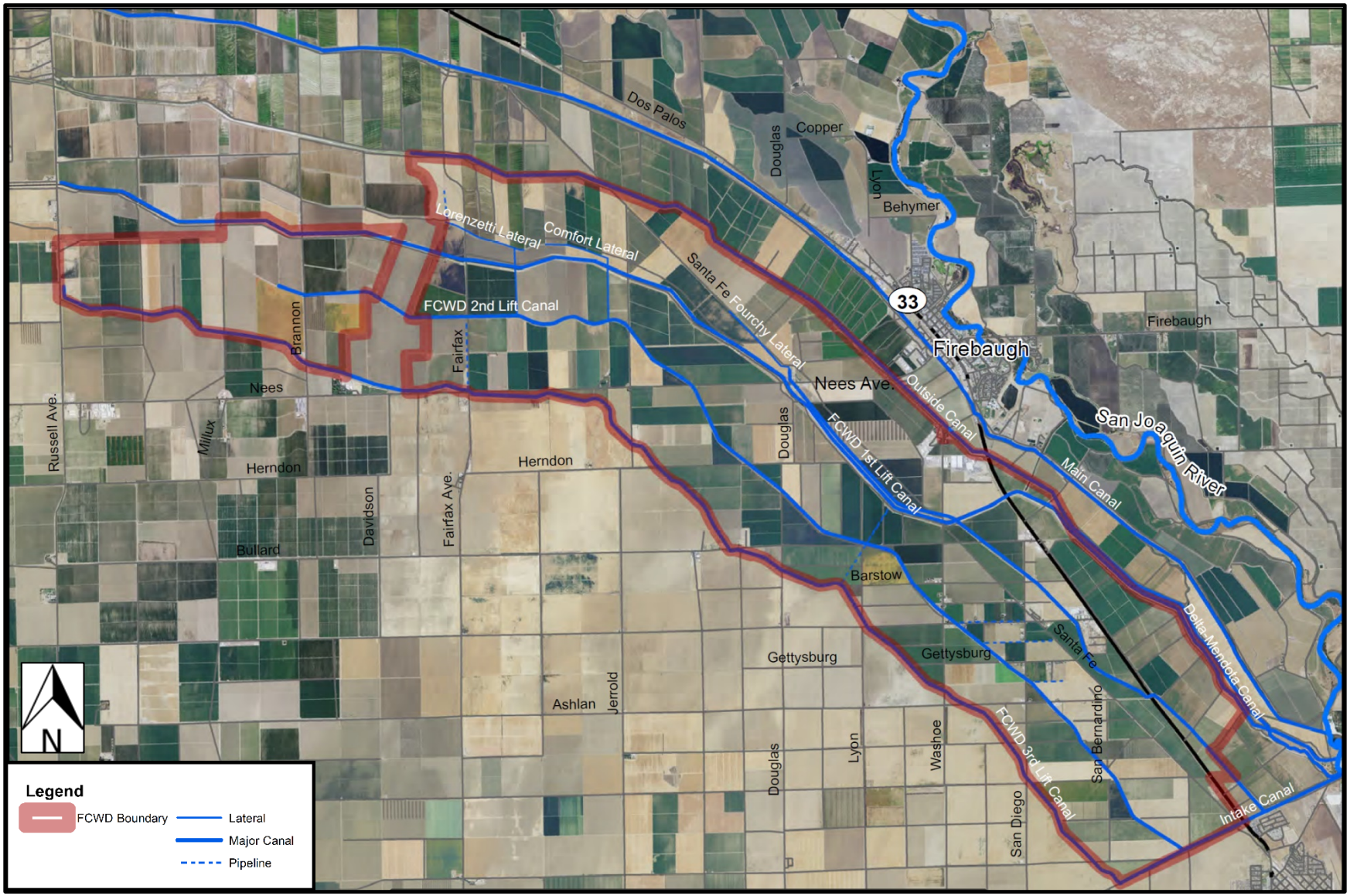

Source: Summers Engineering, Inc. Consulting Engineers, Hanford California, February 2012

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Firebaugh Canal Water District

Figure 1. Project Detail Map

Project	Figure
APAP	1
Date	
3/27/2018	

Element 1: Description of the Water System

The District maintains and operates a system of approximately 45 miles of conveyances. Water in the District's system generally flows from south to the northwest, starting at the Mendota Pool and flowing through canals to approximately 11 miles west of Firebaugh at the tail end of the system. The District owns and operates a series of pumping facilities that draw water into its canal system from the Mendota Pool. Water moves through the open canal system once lifted into one of the District's three main canals by way of gravity and booster pumps. Flows are controlled with automated or manually controlled weirs. Water elevation in the District is monitored by an extensive network of SCADA, and water can be added to the canal from groundwater pumps or the Delta-Mendota Canal as needed to maintain a target elevation or flow. The main conveyances the District operates are the 1st Lift, 2nd Lift and 3rd Lift Canals, as well as the Comfort, Fourchy and Lorenzetti Laterals.

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

Refer to **Figure 1**.

Element 2: Description of the Treatment Area

The District may apply algaecides or aquatic herbicides to its irrigation supply canals, laterals, or drainage facilities described in Element 1 if aquatic weeds or algae treatment thresholds are met.

Element 3: Description of Weeds and Algae

Nuisance aquatic vegetation found throughout the District's facilities include several submersed aquatic weeds including, but not limited to, pondweeds (sago, American, horned), *Egeria densa*, *Elodea*, water primrose, and planktonic and filamentous algae.

The presence of these weeds and algae in District facilities can adversely impact water flow and reduce water capacity, create bank erosion in unlined conveyances, clogs siphons and pumps, and block screens, thus preventing delivery of irrigation water to a field. Many producers have taken steps to conserve water and maximize irrigation efficiency by using sprinklers, drip, and micro-irrigation systems that require water to be free and clear of algae or nuisance vegetation that could clog filter systems, sprinklers or drip lines.

Aquatic vegetation and algae leave more water in the conveyance while the capacity is reduced. Higher water levels caused by aquatic vegetation and algae in congested conveyances increases water losses and decrease overall efforts at water conservation and irrigation efficiency.

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

Table 1 summarizes the algaecides and aquatic herbicides that may be used by the District.

Table 1: Algaecides and Aquatic Herbicides Expected to be Used

Herbicide	Application Method(s)	Adjuvant
2,4-D	Backpack sprayer, handgun, or boom sprayer	Various "Aquatic-labeled adjuvants
Diquat Dibromide	Submersed boom, handgun, or boom sprayer	Various "Aquatic"-labeled adjuvants
Endothall	Submersed boom/injection/drip, handgun or boom sprayer, or spreader (granules)	Not Applicable
Flumioxazin	Submersed boom/injection, handgun or boom sprayer.	Various "Aquatic"-labeled adjuvants
Fluridone	Submersed boom, boom sprayer, or spreader (granules)	Not Applicable
Glyphosate	Backpack sprayer, handgun, or boom sprayer	Various "Aquatic"-labeled adjuvants
Imazamox	Backpack sprayer, handgun, or boom sprayer	Various "Aquatic"-labeled adjuvants
Imazapyr	Backpack sprayer, handgun, or boom sprayer	Various "Aquatic"-labeled adjuvants
Penoxsulam	Backpack sprayer, handgun, or boom sprayer	Not Applicable
Sodium Carbonate Peroxyhydrate	Handgun, boom sprayer (liquid), or spreader (granules)	Not Applicable
Triclopyr	Backpack sprayer, handgun, or boom sprayer	Various "Aquatic"-labeled adjuvants

As required, aquatic-labeled adjuvants may be used to enhance the efficacy of an herbicide.

All herbicide applications are made in accordance with the product label. For example, an application of endothall to control algae in a canal will be made with an injection nozzle calibrated to deliver the correct amount of material per cubic foot per second (CFS) of water treated to achieve the desired target concentration in the canal.

Element 5: Discussion of Factors Influencing Herbicide Use

Treatment of aquatic vegetation and algae by the District is determined by the application of IPM. One of the primary operational goals of the IPM program is to establish a general and reasonable set of control measures that not only aid in managing aquatic vegetation populations, but also address public health & safety, economic, legal, and aesthetic requirements. An action threshold level is the point at which action should be taken to control aquatic vegetation before the conveyance is significantly impacted; moreover, established action threshold levels may change based on public expectations. A central feature of IPM is to determine when control action is absolutely necessary and when it is not, for

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the presence of some aquatic vegetation species may be a sign of a well-balanced, flourishing ecosystem. Examples of when or how thresholds are met are when vegetation impedes flow, decreases capacity, or creates a nuisance. Typical problems associated with aquatic vegetation or algae blooms are adverse impacts to water quality or a reduction in the District's conveyance capabilities. If vegetation or algae equals or exceeds a threshold, a control method is implemented. Control methods may include mechanical, cultural controls, biological, and/or chemical, consistent with the District's IPM techniques. Algaecide and aquatic herbicide use may or may not be employed as a last resort control method, and is considered a critical part of the IPM program. For some aquatic weed varieties, herbicides offer the most effective (i.e. long-lasting or least labor intensive) control; sometimes, they may be the only control available.

Algaecide and aquatic herbicide applications may also be made prior to threshold exceedance. For example, based on predicted growth rate and density, historical algae and aquatic weed trends, weather, water flow, and experience. Aquatic weeds or algae may reasonably be predicted to cause future problems. Accordingly, they may be treated soon after emergence or when appropriate based on the algaecide and aquatic herbicide to be used. Even though algae and aquatic weeds may not be an immediate problem at this phase, treating them before they mature reduces the total amount of algaecide and aquatic herbicide needed because the younger aquatic weeds are more susceptible and there is less plant mass to target. Furthermore, treating aquatic weeds and algae within the ideal time frame of its growth cycle ensures that the selected control measures will be most effective. Managing aquatic weed populations before they produce seeds, tubers or other reproductive organs is an important step in a comprehensive aquatic weed control program. Generally, treating aquatic weeds earlier in the growth cycle results in fewer controls needed and less total herbicide used. Selection of appropriate algaecide and aquatic herbicide(s) and rate of application is done based on the identification of the algae and aquatic weed, its growth stage and the appearance of that algae or aquatic weed on the product label as a plant it controls.

The selection of and decision to use an algaecide or aquatic herbicide is based on the recommendation of a California Department of Pesticide Regulation (CDPR)-licensed Pest Control Adviser (PCA). The PCA considers a variety of control options that may include mechanical and/or cultural techniques that alone or in combination with algaecide or aquatic herbicide use are the most efficacious and protective of the environment.

Evaluating alternative control techniques is part of the District's IPM approach; therefore an alternative treatment may be selected as part of a test program. Alternative control techniques include mechanical vegetation removal (i.e. manually, or with an excavator) or dredging. A more detailed description of each of these is presented in **Element 10** and **Element 11** of this document.

In general, alternative control techniques are more expensive, labor intensive, less effective, may cause temporary water quality degradation, and/or contributes to the spread of algae or aquatic weeds. The equipment and labor required to perform these techniques is not always readily available. This may cause delays in removal leading to increased plant material to remove and increased cost.

Element 6: Gates and Control Structures

The District operates and maintains numerous irrigation delivery gates, water elevation control structures, and weirs throughout its facilities. Gates and control structures are operated both manually

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by canal tenders as well as remotely via automation. As applicable or necessary, District staff will close gates, valves or other structures during an algaecide or aquatic herbicide application to control the extent, if any, that receiving waters will be affected by residual algaecides or aquatic herbicides.

To evaluate the presence of leaks, control structures within the treatment area will be inspected prior to and during the application, as applicable or necessary. **Figure 2,** Aquatic Herbicide Application Log is the form used to document this inspection. If leaks develop on closed valves or gates, they will be stopped as soon as practicable.

Element 7: State Implementation Policy (SIP) Section 5.3 Exception

The Permit allows the District to apply for a SIP Section 5.3 Exception for the use copper and/or acrolein. The District has not applied for a SIP Section 5.3 Exception.

Element 8: Description of Monitoring Program

Attachment C of the Permit presents the Monitoring and Reporting Program (MRP). The MRP addresses two key questions:

> Question No. 1: Does the residual algaecides and aquatic herbicides discharge cause an exceedance of the receiving water limitations?
>
> Question No. 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?

Attachment C of the Permit provides MRP guidelines that the District will use to meet the aforementioned goals.

8.1 Data Collection

Visual monitoring will be performed for all algaecide and aquatic herbicide applications at all sites and be recorded by qualified personnel.

Figure 2 (Aquatic Pesticide Application Log) or its equivalent, **Figure 3** (Aquatic Herbicide Field Monitoring & Sampling Form MOVING Water) or its equivalent or **Figure 4** (Aquatic Herbicide Field Monitoring & Sampling Form STATIC Water) will be used.

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Fig. 2 Aquatic Herbicide Application Log

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****IMPORTANT** To Be Completed <u>EVERY TIME</u> an Aquatic Herbicide Application is Made**

App. Start: Time _____ Date _____

App. End: Time _____ Date _____

Application Location _____

Agency _____ Personnel _____

Air Temperature (F°) _____ Wind Speed (mph) _____ Target Weeds _____

Treatment Area Size (choose one):

☐ Acres _____ ☐ Linear Feet _____

Herbicide #1 Used _____ Rate/Target Conc. _____ Units _____ Total Amt. Applied _____ Units _____

Herbicide #2 Used _____ Rate/Target Conc. _____ Units _____ Total Amt. Applied _____ Units _____

Adjuvant #1 Used _____ Rate/Target Conc. _____ Units _____ Total Amt. Applied _____ Units _____

Adjuvant #2 Used _____ Rate/Target Conc. _____ Units _____ Total Amt. Applied _____ Units _____

Method of Application _____ Application Made (Circle One) **With** water flow / **Against** water flow / **Not Applicable**

Waterbody Type (Circle One) lined canal / unlined canal / creek / drain / ditch / basin / reservoir / lake / pond or list Other: _____

Water Flow (ft/sec, cfs) _____ Water Depth (ft) _____ Water Temperature (F°) _____

Percent Weed Cover _____ Water Sheen (Circle One) yes / no

Water Color (Circle One) none / blue / green / brown Water Clarity (Circle One) poor / fair / good

Please enter any other information regarding the application in the space provided below:

I (sign name) _____ certify that the APAP has been followed.

For Regulatory Review and Approval Purposes Only
Unauthorized Duplication Prohibited

Fig.3

Page 1/4

Aquatic Herbicide Field Monitoring & Sampling Form – Moving Water

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****IMPORTANT** Attach Relevant Aquatic Herbicide Application Log (AHAL) Form**

Agency:_____ **Site Name:**_____

SAMPLE #1: Background (BG)

Collect upstream of, or in treatment area within 24 hours of the treatment starting.

Draw Sample Location and include identifiable points of reference (optional)

N

Scale: 1"≈

Sampler Name:_____

Date:_____ Time: _____

Herbicide Applied (Surfactants?):_____

Approximate Water Speed (ft/sec):_____

Sample Waypoint or GPS Coordinates_____

_____

Target Vegetation:_____

Site Description:_____

DO (mg/L):_____ EC (µs/cm):_____

pH:_____ Turbidity (NTU):_____

Temp (*C):_____ "----------" = Not available

DO YOU NOTICE*	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Floating Material			
Settleable Substances			
Suspended Material			
Bottom Deposits			
Taste and Odors			
Water coloration			
Visible Films, Sheens or Coatings			
Fungi, Slimes, or Objectionable Growths			
Aquatic Community Degradation			

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Fig.3 Page 2/4

Aquatic Herbicide Field Monitoring & Sampling Form – Moving Water

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Agency:_____ **Site Name:**_____

SAMPLE # 2: Event Monitoring (Event)

Collect immediately downstream of treatment area shortly after application, but after sufficient time has elapsed such that treated water would have exited the treatment area. The timing for the collection of this sample will be a site-specific estimation based on flow rates and size of the treatment area, and duration of treatment.

Collect
Field Blank and Duplicate Samples as Needed

Sampler Name:_____

Date:_____ Time:_____

Sample Waypoint or GPS Coordinates_____

_____

Approximate Water Speed (ft/sec):_____

DO (mg/L):_____ EC (µs/cm):_____

pH:_____ Turbidity (NTU):_____

Temp (*C):_____

Draw Sample Location and include identifiable points of reference (optional)

N

Scale: 1" ≈

DO YOU NOTICE	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Water Leaving the Treatment Area			
Adverse Incident * (See Page 4)			
Settleable Substances			
Suspended Material			
Bottom Deposits			
Tastes and Odors			
Water Coloration			
Visible Films, Sheens, or Coatings			
Fungi, Slimes, or Objectionable Growths			
Aquatic Community Degradation			
Floating Material			

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Fig.3

Aquatic Herbicide Field Monitoring & Sampling Form – Moving Water

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Agency:_____ **Site Name:**_____

SAMPLE # 3:
Post-Event Monitoring (Post)

Collect in treatment area within 7 days of application, or when treatment is deemed complete.

Sampler Name:_____

Date:_____ Time:_____

Sample Waypoint or GPS Coordinates_____

_____

Approximate Water Speed (ft/sec):_____

DO (mg/L):_____ EC (µs/cm):_____

pH:_____ Turbidity (NTU):_____

Temp (*C):_____

Comments_____

_____

Draw Sample Location and include identifiable points of reference (optional)

N

Scale: 1" ≈

DO YOU NOTICE	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Adverse Incident			
Settleable Substances			
Suspended Material			
Bottom Deposits			
Taste and Odors			
Water Coloration			
Visible Films, Sheens or Coatings			
Fungi, Slimes, or Objectionable Growths			
Aquatic Community Degradation			
Floating Material			

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Aquatic Herbicide Field Monitoring & Sampling Form – Moving Water

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Definitions

Adverse Incident: Adverse Incident means a situation where the Discharger observes upon inspection or becomes aware of in which:

- A person or non-target organism may have been exposed to an algaecide or aquatic herbicide residue; and
- The person or non-target organism suffered an adverse or toxic effect.

Adverse or Toxic Effect: An "adverse or toxic effect" includes any impact that occurs within waters of the United States on non-target organisms as a result of algaecide or aquatic herbicide residue discharge. Examples of these effects may include:

- Distressed or dead juvenile and small fishes
- Washed up or floating fish
- Fish swimming abnormally or erratically
- Fish lying lethargically at water surface or in shallow water
- Fish that are listless or nonresponsive to disturbance
- Stunting, wilting, or desiccation of non-target submerged or emergent aquatic plants
- Other dead or visibly distressed non-target aquatic organisms (amphibians, turtles, invertebrates, etc.)

An "adverse or toxic effect" also includes any adverse effects to humans (e.g., skin rashes) or domesticated animals that occur either directly or indirectly from a discharge to waters of the United States that are temporally and spatially related to exposure to algaecide and aquatic herbicide residue (e.g. vomiting, lethargy).

Settleable Substances: Presence of settleable substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.

Suspended Material: Presence of suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

Bottom Deposits: Presence of bottom deposits in amounts that cause nuisance or adversely affect beneficial uses.

Tastes and Odors: Presence of taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses or domestic or municipal water supplies.

Water coloration: Presence of coloration that causes nuisance or adversely affects beneficial uses.

Visible films, sheens, or coatings: Presence of oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water that cause nuisance, or that otherwise adversely affect beneficial uses.

Fungi, slimes, or objectionable growths: Presence of fungi, slimes, or objectionable growths in concentrations that cause nuisance or otherwise adversely affect beneficial uses.

Aquatic community degradation: Aquatic communities and populations, including vertebrates, invertebrates, and non-target plant species to be degraded.

Floating material: Presence of floating material in amounts that cause nuisance or adversely affect beneficial uses.

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Fig.4

Aquatic Herbicide Field Monitoring & Sampling Form – Static Water

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****IMPORTANT** Attach Relevant Aquatic Herbicide Application Log (AHAL) Form**

Agency:_____ **Site Name:**_____

SAMPLE #1: Background (BG)

Collect upstream of, or in treatment area within 24 hours of the treatment starting.

Draw Sample Location and include identifiable points of reference (optional)

N

Scale: 1" ≈ _____

Sampler Name:_____

Date:_____ Time: _____

Herbicide Applied (Surfactants?):_____

_____

Sample Waypoint or GPS Coordinates_____

_____

Target Vegetation:_____

Site Description:_____

DO (mg/L):_____ EC (µs/cm)_____

pH:_____ Turbidity (NTU):_____

Temp (*C):_____ "--------" = Not Available

DO YOU NOTICE*	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Floating Material			
Settleable Substances			
Suspended Material			
Bottom Deposits			
Taste and Odors			
Water coloration			
Visible Films, Sheens or Coatings			
Fungi, Slimes, or Objectionable Growths			
Aquatic Community Degradation			

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Fig.4 Aquatic Herbicide Field Monitoring & Sampling Form – Static Water

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Agency:_____ **Site Name:**_____

SAMPLE # 2: Event Monitoring (Event)

Collect 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 timing for the collection of this sample will be a site-specific estimation based on size of the treatment area, and duration of treatment.

Draw Sample Location and include identifiable points of reference (optional)

N

Scale: 1" ≈

Collect Field Blank and Duplicate Samples as Needed

Sampler Name:_____

Date:_____ Time:_____

Sample Waypoint or GPS Coordinates_____

_____

Length of Treated Area (ft):_____

Application Start Date: _____ Start Time:_____

Application End Date: _____ End Time: _____

DO (mg/L):_____ EC (µs/cm)_____

pH:_____ Turbidity (NTU):_____

Temp (*C):_____

Spill? Describe _____

DO YOU NOTICE	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Water Leaving the Treatment Area			
Adverse Incident* (See Page 4)			
Settleable Substances			
Suspended Material			
Bottom Deposits			
Tastes and Odors			
Water Coloration			
Visible Films, Sheens, or Coatings			
Fungi, Slimes, or Objectionable Growths			
Aquatic Community Degradation			
Floating Material			

Date Field Blank (FB) Collected: _____ Date Field Duplicate (FD) Collected: _____

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Fig.4

Aquatic Herbicide Field Monitoring & Sampling Form – Static Water

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Agency:_____ **Site Name:**_____

SAMPLE # 3:
Post-Event Monitoring (Post)

Collect within treatment area within 7 days of application, or when treatment is deemed completed.

Draw Sample Location and include identifiable points of reference (optional)

N

Scale: 1" ≈ _____

Sampler Name:_____

Date:_____ Time:_____

Sample Waypoint or GPS Coordinates_____

_____

DO (mg/L):_____ EC (µs/cm)_____

pH:_____ Turbidity (NTU):_____

Temp (*C):_____

Comments_____

_____

_____

_____

DO YOU NOTICE	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Adverse Event			
Settleable Substances			
Suspended Material			
Bottom Deposits			
Taste and Odors			
Water coloration			
Visible Films, Sheens or Coatings			
Fungi, Slimes, or Objectionable Growths			
Aquatic Community Degradation			
Floating Material			

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Aquatic Herbicide Field Monitoring & Sampling Form – Static Water

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Definitions

Adverse Incident: Adverse Incident means a situation where the Discharger observes upon inspection or becomes aware of in which:

- A person or non-target organism may have been exposed to an algaecide or aquatic herbicide residue; and
- The person or non-target organism suffered an adverse or toxic effect.

Adverse or Toxic Effect: An "adverse or toxic effect" includes any impact that occurs within waters of the United States on non-target organisms as a result of algaecide or aquatic herbicide residue discharge. Examples of these effects may include:

- Distressed or dead juvenile and small fishes
- Washed up or floating fish
- Fish swimming abnormally or erratically
- Fish lying lethargically at water surface or in shallow water
- Fish that are listless or nonresponsive to disturbance
- Stunting, wilting, or desiccation of non-target submerged or emergent aquatic plants
- Other dead or visibly distressed non-target aquatic organisms (amphibians, turtles, invertebrates, etc.)

An "adverse or toxic effect" also includes any adverse effects to humans (e.g., skin rashes) or domesticated animals that occur either directly or indirectly from a discharge to waters of the United States that are temporally and spatially related to exposure to algaecide and aquatic herbicide residue (e.g. vomiting, lethargy).

Settleable Substances: Presence of settleable substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.

Suspended Material: Presence of suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

Bottom Deposits: Presence of bottom deposits in amounts that cause nuisance or adversely affect beneficial uses.

Tastes and Odors: Presence of taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses or domestic or municipal water supplies.

Water coloration: Presence of coloration that causes nuisance or adversely affects beneficial uses.

Visible films, sheens, or coatings: Presence of oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water that cause nuisance, or that otherwise adversely affect beneficial uses.

Fungi, slimes, or objectionable growths: Presence of fungi, slimes, or objectionable growths in concentrations that cause nuisance or otherwise adversely affect beneficial uses.

Aquatic community degradation: Aquatic communities and populations, including vertebrates, invertebrates, and non-target plant species to be degraded.

Floating material: Presence of floating material in amounts that cause nuisance or adversely affect beneficial uses.

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8.2 Monitoring Locations and Frequency

Water quality sampling for glyphosate will be conducted for one application event from each environmental setting (flowing water and non-flowing water) per year. No water quality sampling is required for applications of products that contain sodium carbonate peroxyhydrate. For applications of all other algaecides and aquatic herbicides listed on the Permit, the District will collect samples from a minimum of six application events for each active ingredient in each environmental setting per year. If there are less than six application events in a year for an active ingredient, the District will collect samples for each application event in each environmental setting.

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 District will reduce the sampling frequency for that active ingredient to once per year in that environmental setting. If after sampling frequency is reduced the annual sampling shows exceedances of the applicable receiving water limitation/trigger, the District will be required to return to sampling six applications the next year. Sampling frequency will remain at this level until six consecutive sampling events again show concentrations below the applicable receiving water limitation/trigger, at which point sampling frequency may be reduced to once annually.

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 per the District's IPM approach. **Figure 3** and **Figure 4** are the forms used to document sampling.

8.2.1 Sample Locations

Sampling will include background, event, and post-event monitoring as follows:

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

Event Monitoring: The event monitoring (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 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 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 no later than one week after the application, or when the treatment is deemed complete.

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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 District 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. See **Figure 3** and **Figure 4** for the field sampling forms to be used.

8.3 Sample Collection

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 necessary, an intermediary sampling device (e.g., Van-Dorn style sampler or long-handled sampling pole) will be used for locations that are difficult to access. Long-handled sampling poles with attached sampling container will be inverted before being lowered into the water to the desired sample depth, where it will be turned upright to collect the sample. Appropriate cleaning technique is discussed in section 8.8.4.

8.4 Field Measurements

In conjunction with sample collection, where possible, dissolved oxygen and temperature will be measured in the field. Turbidity, electrical conductivity, pH, temperature and dissolved oxygen values must be recorded for each sample, and can be measured in the field using field meters as available, or analyzed in the laboratory if necessary. Water quality meters are calibrated according to manufacturer's specifications at the recommended frequency, and checked with a standard at regular intervals (typically once per month) to evaluate instrument performance. If the calibration is outside the manufacturer's specifications, the meter will be recalibrated. Logbooks are maintained for all instruments to document calibration.

8.5 Sample Preservation and Transportation

If preservation is required for the monitored constituent, the preservative will be placed in the sample container by the container vendor prior to sample collection. Once a sample is collected and labeled it will immediately be placed in a dark, cold (~4° C) environment, typically a cooler with ice. Delivery to the laboratory should occur on the same day or the next day as the sample collection.

8.6 Sample Analysis

Table 2 shows the constituents that each sample must be analyzed for.

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Table 2: Required Sample Analysis

Analyte	EPA Method	Reporting Limit	Hold Time (Days)	Container	Chemical Preservative
Temperature[1]	N/A	N/A	N/A	N/A	N/A
Dissolved Oxygen[1]	360.1 or 360.2	0.0 mg/L	1	1L Amber Glass	None
Turbidity[2]	180.1	0.00 NTU	2	100 mL HDPE	None
Electrical Conductivity[2]	120.1	0 µS/cm	28	100 mL HDPE	None
pH[2]	150.1 or 150.2	1-14	Immediately	100 mL HDPE	None
*2,4-D	8151, 8150A, 615	0.5 µg/L	7	1L Amber Glass	None
*Diquat	549	40 µg/L	7	500 mL brown HDPE	H_2SO_4
*Endothall	548.1	40 µg/L	7	500 mL Amber Glass or 2 x 40 mL VOA	None
*Flumioxazin	[3]	[3]	[3]	[3]	[3]
*Fluridone	SePRO FasTest, HPLC	1 ug/L	7	30 ml Amber HDPE or 2 x 40 mL VOA	None
*Glyphosate	547	0.5 µg/L	14	2 x 40 mL VOA	None
*Imazamox	HPLC	50 ug/L	14	1L Amber Glass or 2 x 40 mL VOA	None
*Imazapyr	532m	100 ug/L	14	1 L Amber Glass	None
Nonylphenol[4]	550.1m	0.5 µg/L	7	2 x 40 mL VOA	None
*Penoxsulam	532m	20 ug/L	7	1 L Amber Glass	None
*Triclopyr	8151, 8150A, 615	0.5 µg/L	7	1L Amber Glass or 2 x 40 mL VOA	None

Notes:
* Signifies algaecide or aquatic herbicide active ingredient. Chemical analysis is only required for the active ingredient(s) used in treatment.
Analysis not required for algaecides and aquatic herbicides containing sodium carbonate peroxyhydrate.
EPA Methods are taken from NEMI 2004.
[1]Field measured.
[2]Maybe field or laboratory measured.
[3]Flumioxazin analysis is pending setup of a laboratory method
[4]Required only when a nonlyphenol-based surfactant is used.
HPLC – High Performance Liquid Chromatography.
m – Modified extraction or analysis technique.

8.7 Reporting Procedures

An annual report for each reporting period, from January 1 to December 31 will be prepared by March 1 of the following year and will be submitted to the appropriate RWQCB. In years when no algaecides or aquatic herbicides are used, a letter stating no applications will be sent to the appropriate RWQCB in lieu of an annual report.

The annual report will contain the following information as described in Attachment C of the Permit:

1. An Executive Summary discussing compliance or violation of the 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 algaecide or aquatic herbicide application.

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The District will collect and retain all information on the previous reporting year. When requested by the Deputy Director or Executive Officer of the applicable RWQCB, the District will submit the annual information collected, including:

1. An Executive Summary discussing compliance or violation of the Permit and the effectiveness of the APAP to reduce or prevent the discharge of pollutants associated with herbicide applications;
2. A summary of monitoring data, including the identification of water quality improvements or degradation as a result of algaecide or aquatic herbicide application, if appropriate, and recommendations for improvement to the APAP (including proposed BMPs) and monitoring program based on the monitoring results. All receiving water monitoring data shall be compared to applicable receiving water limitations and receiving water monitoring triggers;
3. Identification of BMPs and a discussion of their effectiveness in meeting the Permit requirements;
4. A discussion of BMP modifications addressing violations of the Permit;
5. A map showing the location of each treatment area;
6. Types and amounts of aquatic herbicides used at each application event during each application
7. Information on surface area and/or volume of treatment area and any other information used to calculate dosage, concentration, and quantity of each 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 Aquatic Herbicide Application Logs (AHALs, **Figure 2**).

The District will report to the SWRCB and appropriate RWQCB any noncompliance, including any unexpected or unintended effect of an algaecide or aquatic herbicide that may endanger health or the environment. The Twenty-Four Hour Report will be provided orally, by way of a phone call, to the SWRCB and appropriate RWQCB within 24 hours from the time the District becomes aware of any noncompliance. The Twenty-Four Hour Report will include the following information:

1. The caller's name and telephone number;
2. Applicator name and mailing address;
3. Waste Discharge Identification (WDID) number;
4. How and when the District became aware of the noncompliance;
5. Description of the location of the noncompliance;
6. Description of the noncompliance identified and the USEPA pesticide registration number for each product the District applied in the area of the noncompliance; and
7. Description of the steps that the District has taken or will take to correct, repair, remedy, cleanup, or otherwise address any adverse effects.

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If the District is unable to notify the SWRCB and appropriate RWQCB within 24 hours, the District will do so as soon as possible and provide a rationale for why the District was unable to provide notification of noncompliance within 24 hours.

In addition to the Twenty-Four Hour Report, the District will provide a written submission within five (5) days of the time the District becomes aware of the noncompliance. The Five-Day Written Report will contain the following information:

1. Date and time the District contacted the State Water Board and the appropriate Regional Water Board notifying of the noncompliance and any instructions received from the State and/or Regional Water Board; information required to be provided in Section D.1 (24-Hour Reporting);
2. 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);
3. Location of incident, including the names of any waters affected and appearance of those waters (sheen, color, clarity, etc.);
4. Magnitude and scope of the affected area (e.g. aquatic square area or total stream distance affected);
5. Algaecide and aquatic herbicide 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;
6. 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);
7. Laboratory tests performed, if any, and timing of tests. Provide a summary of the test results within five days after they become available;
8. If applicable, explain why the District believes the noncompliance could not have been caused by exposure to the algaecides or aquatic herbicides from the District's application; and
9. Actions to be taken to prevent recurrence of adverse incidents.

The Five Day Written Report will be submitted within five (5) days of the time the District becomes aware of the noncompliance unless SWRCB staff or Regional Water Board staff waive the above described report if an oral report has been received within 24 hours.

8.8 Sampling Methods and Guidelines

The purpose of this section is to present methods and guidelines for the collection and analysis of samples necessary to meet the APAP objective of assessing adverse impacts, if any, to beneficial uses of water bodies treated with algaecides and aquatic herbicides.

This section describes the techniques, equipment, analytical methods, and quality assurance and quality control procedures for sample collection and analysis. Guidance for the preparation of this chapter included: NPDES Storm Water Sampling Guidance Document (USEPA 1992); Guidelines and Specifications for Preparing Quality Assurance Project Plans (USEPA 1980); and U.S. Geological Survey, National Field Manual for the Collection of Water Quality Data (USGS 1995).

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8.8.1 Surfacewater Sampling Techniques

As discussed in Section 8.3, 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 necessary, an intermediary sampling device (e.g., Van-Dorn style sampler or long-handled sampling pole) will be used for locations that are difficult to access. Long-handled sampling poles with attached sampling container will be inverted before being lowered into the water to the desired sample depth, where it will be turned upright to collect the sample. Appropriate cleaning technique is discussed in Section 8.8.4.

During collection, the samples will be collected in a manner that minimizes the amount of suspended sediment and debris in the sample. Surface water grab samples will be collected directly by the sample container or by an intermediary container in the event that the sample container cannot be adequately or safely used. Intermediary samplers will be either poly (plastic/HDPE), stainless steel or glass. Any container that will be reused between sites will be washed thoroughly and triple rinsed before collection of the next sample, see Section 8.8.4. Alternatively, disposable poly or glass intermediary sample containers can be used.

8.8.2 Sample Containers

Clean, empty sample containers with caps will be supplied in protective cardboard cartons or ice chests by the primary laboratory. The containers will be certified clean by either the laboratory or the container supplier. To ensure data quality control, the sampler will utilize the appropriate sample container as specified by the laboratory for each sample type. Sample container type, holding time, and appropriate preservatives are listed in **Table 2**. Each container will be affixed with a label indicating a discrete sample number for each sample location. The label will also indicate the date and time of sampling and the sampler's name.

8.8.3 Sample Preservation

Samples will be collected with bottles containing the correct preservative(s), refrigerated at four (4) degrees Celsius (C), stored in a dark place, and transported to the analytical laboratory. If needed, preservatives shall be added to sampling bottles before sampling occurs by the laboratory supplying the containers and performing the analysis. Refer to **Table 2**.

8.8.4 Sampling Equipment Cleaning

In the event that sampling equipment will be used in more than one location, the equipment will be thoroughly cleaned with a non-phosphate cleaner, triple-rinsed with distilled water, and then rinsed once with the water being sampled prior to its first use at a new sample collection location.

8.8.5 Sample Packing and Shipping

All samples are to be packed and transported the day the samples are collected to provide ample time for samples to be analyzed within the required holding time.

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Ice will be included in coolers containing samples that require temperature control. Samples will be packaged in the following manner:

1. Sample container stickers will be checked for secure attachment to each sample container.
2. The sample containers will be placed in the lined cooler. Bubble-wrap, suitable foam padding, or newspaper will be placed between sample containers to protect the sample containers from breakage during shipment and handling.
3. The Chain of Custody (COC) will be placed inside a plastic bag and placed inside the cooler. The COC will indicate each unique sample identification name, time and place of sample collection, the sample collector, the required analysis, turn-around-time, and location to which data will be reported.
4. The cooler will then be readied for pick-up by a courier or delivered directly to the laboratory.

8.9 Field Sampling Operations

8.9.1 Field Logbook

A 3-ring binder or bound logbook will be maintained by members of the sampling team to provide a record of sample location, significant events, observations, and measurements taken during sampling. Observations and measurements should be supplemented with pictures of site conditions at the time of sampling if possible. Field logbooks are intended to provide sufficient data and observations to enable project team members to reconstruct events that occurred during the sampling. The field logbook entries will be legible, factual, detailed, and objective.

When recording observations in the field book, the sampling team will note the presence or absence of:

1. Floating or suspended matter;
2. Discoloration;
3. Bottom deposits;
4. Aquatic life;
5. Visible films, sheens, or coatings;
6. Fungi, slimes, or objectionable growths; and
7. Potential nuisance conditions.

See **Figure 3** and **Figure 4** for the forms to be used to record relevant field data when sampling.

8.9.2 Alteration of Sampling Techniques

It is possible that actual field conditions may require a modification of the procedures outlined herein. Specifically, water levels, weather, other environmental parameters and hazards including stream flow, rainfall, and irrigation water use may pose access and/or sampling problems. In such instances, variations from standard procedures and planned sampling locations and frequencies will be documented by means of appropriate entry into the field logbook.

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8.9.3 Flow Estimation

A flow meter calibrated according to the manufacturer's directions will be placed as close to the center of the stream or creek as possible and a reading taken in feet per second (ft/sec). Alternatively, the time a common floating object (branch, leaf, etc.) travels a known distance will be estimated and represented in ft/sec. A minimum distance of approximately 25 feet will be used. Flow estimation measurements will be made for all moving water sampling locations.

8.9.4 Chain-of-Custody (COC)

The COC record will be employed as physical evidence of sample custody. The sampler will complete a COC record to accompany each sample shipment from the field to the laboratory. The COC will specify: time, date, location of sample collection, specific and unique sample number, requested analysis, sampler name, required turn-around-time, time and date of sample transaction between field and laboratory staff, preservative, if any, and name of receiving party at the laboratory.

Corrections to the COC will be made by drawing a line through, initialing, and dating the error, and entering the correct information. Erasures are not permitted.

Upon receipt of the samples, laboratory personnel will check to insure that the contents of the ice chest(s) are accurately described by the COC. Upon verification of the number and type of samples and the requested analysis, a laboratory representative will sign the COC, indicating receipt of the samples.

The COC record form will be completed in duplicate. Upon sample delivery, the original copy will be left with the laboratory and a copy will be kept by the sampler, three-hole punched, and placed in the field logbook.

8.9.5 Sample Label

The label will contain information on the specific project (i.e. Firebaugh Canal Water District), the unique individual sample ID (i.e. Comfort Lateral – BG), the date and time the sample was collected, and the name of the sampler (i.e. S. Burkholder).

Prior to sampling, a water resistant label will be completed with waterproof ink and will be affixed to the appropriate container.

8.9.6 Corrections to Documentation

Documents will not be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement or correction. If an error is made on a document used by an individual, that individual will make corrections by making a line through the error and entering the correct information. The erroneous information will not be obliterated. Corrections will be initialed and dated.

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8.9.7 Document Control

A central file location will be established and used to store documentation such as the filed logbook and laboratory data.

8.9.8 Sample Kit

Prior to departing to the field to collect samples, the following equipment will be prepared for use:

- Laboratory-supplied sampling bottles (one set for each sample to be collected plus spares, plus QA/QC samples)
- Sample labels (one for each sample to be collected plus spares)
- Sharpie® Pen or other permanent, water-proof ink marker
- Chain of Custody forms
- Field data logbook
- Flow meter (optional – for moving water applications)
- Zip lock style bags for paperwork
- Non-phosphate cleaner (i.e. Liqui-Nox®)
- Deionized or distilled water
- Ice or blue ice packs
- Clear Mailing Tape
- Cooler for samples
- Grab pole or Van-Dorn style sampler
- Disposable Latex or Nitrile Gloves
- Rubber boots or waders
- Stop or wrist watch
- Camera

8.10 Quality Assurance and Quality Control (QA/QC)

The purpose of quality assurance and quality control (QA/QC) is to assure and control the quality of data generated during sample collection and analysis as described earlier in this document. Quality assurance and quality control are measured in a variety of ways, as described below.

8.10.1 Precision

Precision is a measure of the reproducibility of measurements under a given set of conditions. It is a quantitative measure of the variability of a group of measurements compared to the average value of the group and is expressed as the relative percent difference (RPD). Sources of error in precision (imprecision) can be related to both laboratory and field techniques. Specifically, lack of precision is caused by inconsistencies in instrument setting, measurement and sampling techniques, and record keeping.

Laboratory precision is estimated by generating analytical laboratory matrix spike (MS) and matrix spike duplicate (MSD) sample results and calculating the relative percent difference (RPD). In general, laboratory RPD values of less than 25% will be considered acceptable.

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Field precision is estimated by collecting field duplicates (FDs) in the field and calculating RPD. In general, field RPD values of less than 35% will be considered acceptable. Refer to the discussion of FDs in section 8.10.5.

8.10.2 Accuracy

Accuracy is a measure of how close data are to their true values and is expressed as percent recovery (%R), which is the difference between the mean and the true value expressed as a percentage of the true value. Sources of error (inaccuracy) are the sampling process, field contamination, preservation, handling, sample matrix effects, sample preparation, analytical techniques, and instrument error.

Laboratory accuracy is estimated using reference standards, matrix spike (MS) and matrix spike duplicates (MSD) samples. Acceptable accuracy is generally between 75 and 125% recovery of the spiked concentration. Refer to the earlier discussion of MS and MSD.

8.10.3 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. The completeness objective is that the sufficiently valid data is generated to allow for submittal to the SWRCB and RWQCB. Completeness will be assessed by comparing the number of valid sample results to the number of samples collected. The objective for completeness is $\geq$ 80 %.

8.10.4 Representativeness

Representativeness refers to a sample or group of samples that reflects the predominant characteristics of the media at the sampling point. The objective in addressing representativeness is to assess whether the information obtained during the sampling and analysis represents the actual site conditions. Permit requirements of sampling each application at 10 % of all sites treated is assumed to meet the representativeness criteria

8.10.5 Field Duplicate

The purpose of a field duplicate (FD) is to quantify the precision, or reproducibility, of the field sampling technique. It involves the duplication of the technique used for a particular field sample collection method and the subsequent comparison of the initial and duplicate values. This comparison is measured as the relative percent difference (RPD). RPD is calculated as follows:

RPD = [(Sample1 – Sample2) / (Average of Samples 1 and 2)] X 100

An acceptable field RPD value is $\leq$ 35%.

The FD is collected at the same time as the actual field sample and one FD per year will be collected per analyte.

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8.10.6 Field Blank

The purpose of the field blank (FB) is to assure that the field sampling technique, equipment, or equipment cleaning technique or materials do not impart a false positive or negative result during the collection of the sample. A FB will be prepared with distilled water and allowed to come into contact with the sampling device in a manner identical to the actual sample. The only acceptable values for analytes in the FB is less than the detection limit for the compounds of interest, or an expected, previously determined, background value.

The FB will be collected at the same time as the actual field sample and one FB per year will be collected per analyte.

8.10.7 Laboratory Quality Assurance and Quality Control

Laboratory precision and accuracy will be monitored by a series of laboratory-generated quality control samples. As long as sufficient sample volume is collected and submitted to the laboratory, no additional effort is required by field activities to generate laboratory quality control samples. Each set of field samples will have associated with it one each from the following set of laboratory quality control samples.

8.10.7.1 Method Blank

The purpose of the method blank (MB) is to assure that the analytical technique does not impart a false positive result during the preparation or analysis of the sample. A method blank will be prepared by the laboratory from high purity distilled or deionized water. The only acceptable value for analytes in the MB is less than the detection limit for the compounds of interest, or an expected, previously determined, background value.

8.10.7.2 Matrix Spike

The purpose of a matrix spike (MS) is to quantify accuracy and to assure that the analytical technique does not impart a false negative or positive result during the preparation or analysis of the sample. It involves the introduction of the analyte (or an analyte surrogate) of interest into the actual sample matrix and then quantitating it.

The amount detected divided by the amount added to the matrix is expressed as a percent recovery (%R). Acceptable values of %R range from 75% to 125%. Percent recovery is calculated as follows:

%R = [(Spike Amount Detected - Sample Value) / Amount Spiked] x 100

8.10.7.3 Matrix Spike Duplicate

The purpose of a matrix spike duplicate (MSD) is to quantify laboratory precision. An acceptable RPD is less than or equal to 25%. The MSD involves duplication of the MS resulting in two data points from which relative percent difference (RPD) is calculated as follows:

RPD = [(MS – MSD) / (Average of MS and MSD)] X 100

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8.10.8 Data Validation

Data validation will use data generated from the analytical laboratory and the field. References that can be used to assist in data validation include USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA 1994) and USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 1999).

The purpose of data validation is to ensure that data collected are of sufficient quality for inclusion in reports to the RWQCB. In order to serve this purpose, the following information must be available in order to evaluate data validity:

1. Date of sample collection – required to uniquely identify sample and holding time.
2. Location of samples – required to identify sample.
3. Laboratory QA/QC procedures – required to assess analytical accuracy, precision, and sample integrity. A laboratory QA/QC sample set consists of a MS, a MSD, and a MB. A laboratory QA/QC sample set will be analyzed by the laboratory for each field sample batch. Sufficient sample volume and number will be supplied to the laboratory in order to prepare and evaluate the laboratory QA/QC sample set.
4. Analytical methods – required to assess appropriateness and acceptability of analytical method used.
5. Detection limits – required to assess lower limit of parameter identification.
6. Holding times, preservation, and dates of extraction and analysis – required to assess if a sample was extracted and analyzed within the specified time limits and if a sample was stored at the appropriate temperature.
7. Field QA/QC procedures – required to assess field precision and sample integrity. A field QA/QC sample set consists of FB and FD samples. A field QA/QC sample set will be analyzed by the laboratory for one sampling event per year. Sufficient sample volume and number will be collected in the field and supplied to each laboratory in order to prepare and evaluate the field QA/QC sample set.

8.10.9 Data Qualification

Data collected for compliance with the Permit will be qualified through the Analytical Lab Validation process described in 8.10.7. This process will ensure all data has been thoroughly reviewed and qualified as valid. During the data validation process, data qualifiers will be used to classify sample data. The following qualifiers will be used:

A - Acceptable. The data have satisfied each of the requirements and are quantitatively acceptable (i.e., valid) and will be used in reports.

R - Reject. Data not valid. This qualifier will be used for samples that cannot be uniquely identified by date of collection or sample location or that fail holding time or, detection limit requirements. Invalid data will not be presented in reports submitted to the RWQCB.

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8.10.10 Corrective Action

If previously described criteria for valid data are not met, then corrective action as follows will be taken:

1. The laboratory will be asked to check their quality assurance/quality control data and calculations associated with the sample in question. If the error is not found and resolved, then:

    a. The extracts or the actual samples, which will be saved until the data are validated, will be reanalyzed by the laboratory if they are within holding time limitations. These new results will be compared with the previous results. If the error is not found and resolved, then:
    b. If field analytical equipment is used, then calibration records will be reviewed. If the error is not found, then:
    c. The sampling procedure and sample preparation will be re-checked and verified. If the procedures appear to be in order and the error is not resolved, then:
    d. The data will be deemed invalid and not used.

2. Upon discovery of the source of an error, every attempt will be made to address the cause of the error and remedy the problem.

8.10.11 Data Reporting

The results of sampling and analysis will be summarized in the Annual Report. The data will be tabulated so that they are readily discernible.

Element 9: Procedures to Prevent Sample Contamination

Sample collection will be done no closer than 50 feet from application equipment and preferably upwind. Sampling will be done in a manner that prevents contact with algaecide or aquatic pesticide application equipment, containers or personal protective equipment (PPE). Care will be taken by samplers to minimize contact with any treated water or vegetation.

In the event that sampling equipment will be used in more than one location, the equipment will be thoroughly cleaned with a non-phosphate cleaner, triple-rinsed uncontaminated water, and then rinsed once with the water being sampled prior to its first use at a new sample collection location, as described in Section 8.8.4. Gloves will be changed between sites.

Element 10: Description of BMPs

The District employs the following BMPs to ensure the safe, efficient and efficacious use of algaecides and aquatic herbicides.

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10.1 Measures to Prevent Spills and Spill Containment in the Event of a Spill

Applicators take care when mixing and loading algaecides and aquatic herbicides and adjuvants. All label language is followed to ensure safe handling and loading of algaecides and aquatic herbicides. Application equipment is regularly checked and maintained to identify and minimize the likelihood of leaks developing or failure that would lead to a spill. If possible, algaecides and aquatic herbicides will be mixed and loaded in the District's yard before leaving for the application site(s).

If algaecides or aquatic herbicides are spilled, they will be prevented from entering any waterbodies to the extent practicable. District staff is trained to contain any spilled material and are familiar with the use of absorbent materials such as kitty litter, "pigs" and "pillows". Spills will be cleaned up according to label instructions, and all equipment used to remove spills will be properly contained and disposed of or decontaminated, as appropriate. Applicators will report spills as required by District policy and in a manner consistent with local, state and federal requirements.

10.2 Measures to Ensure Appropriate Use Rate

The following BMPs help ensure the appropriate algaecide and aquatic herbicide application rate is used.

10.2.1 Site Scouting

Prior to treatment, the District's PCA and/or qualified staff scout sites to evaluate the extent to which acceptable algae or aquatic weed thresholds have been exceeded. Thresholds are based on maintaining flow and conveyance system capacity, ensuring delivery of high quality irrigation water, and prevention of nuisance odors.

If a location is deemed to have exceeded a threshold, or the algae or aquatic weed population is anticipated to exceed a threshold based on site and weather conditions, historic aquatic weed growth, or other information, an algaecide or aquatic herbicide application is considered. If the application can be made without negatively impacting the water quality, then an application is made.

10.2.2 Written Recommendations Prepared by PCA

Prior to application, a PCA licensed by California Department of Pesticide Regulation (DPR) and/or qualified District staff scout the area(s) to be treated, makes a positive identification of pest(s) present, checks applicable product label(s) for control efficacy, and in collaboration with the District staff, the PCA prepares a written recommendation, including rates of application, and any warnings or conditions that limit the application so that non-target flora and fauna are not adversely impacted. Licensed PCAs must complete 40 hours of continuing education every 2 years to stay licensed, and therefore are up-to-date on the latest techniques for pest control.

10.2.3 Applications Made According to Label

All algaecide and aquatic herbicide applications are made according to the product label in accordance with regulations of the U.S. EPA, CalEPA, Cal OSHA, DPR, and the local Agricultural Commissioner. The District's PCA and DPR-licensed Qualified Applicator Certificate (QAC) or Qualified Applicator License

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(QAL) holders regularly monitor updates and amendments to the label so that applications are in accordance with label directions. Licensed QALs and QACs must complete 20 hours of continuing education every 2 years to stay licensed, and therefore are up-to-date on the latest techniques for pest control.

10.2.4 Applications Made by Qualified Personnel

As appropriate, consistent with applicable regulations, the District will utilize QALs, QACs, or District staff under the supervision of QALs or QACs to make applications or supervise applications recommended by the PCA. These District staff have knowledge of proper equipment loading, nozzle selection, calibration, and operation so that spills are minimized, precise application rates are made according to the label, and only target plants are treated.

10.3 The Discharger's plan in educating its staff and herbicide applicators on how to avoid any potential adverse effects from the herbicide applications

See information above on the continuing education requirements of District staff responsible for selection and application of algaecides and aquatic herbicides.

10.4 Application Coordination to Minimize Impact of Application on Water Users

As required by the algaecide and aquatic herbicide label, water users potentially affected by any water use restrictions will be notified prior to an application being made. As necessary, gates, weirs, etc. will be closed to prevent discharge of residual algaecide or aquatic herbicides.

10.5 Description of Measures to Prevent Fish Kills

10.5.1 Applications Made According to Label

All aquatic herbicide applications are made according to the product label in accordance with regulations of the U.S. EPA, CalEPA, DPR, Cal OSHA and the local Agricultural Commissioner. Precautions on the product label to prevent fish kills will be followed. For example, limitations on the surface water area treated will be followed to prevent dead algae or aquatic weeds from accumulating and then decaying and subsequently depressing the dissolved oxygen (DO) level. Depressed DO may adversely impact fish populations.

10.5.2 Written Recommendations Prepared by PCA

Prior to application, a DPR licensed PCA and/or District staff scouts the area to be treated, makes a positive identification of pest(s) present, checks applicable product label(s) for control efficacy, and in collaboration with District staff, the PCA prepares a written recommendation, including rates of application, and any warnings or conditions that limit the application so that fish are not adversely impacted.

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10.5.3 Applications Made by Qualified Personnel

As appropriate, consistent with applicable regulations, the District will utilize QACs, QALs, or District staff under the supervision of QALs or QACs to make applications or supervise recommended by the PCA. These applicators have knowledge of proper equipment loading, nozzle selection, calibration, and operation so that spills are minimized, precise application rates are made according to the label, and only target algae or vegetation are treated. Calibration ensures that the correct quantity and rate of herbicide is applied.

Element 11: Examination of Possible Alternatives

11.1 Evaluation of Other Management Options

Treatment of algae and aquatic weeds is determined by the application of Integrated Pest Management (IPM). For example, if a population of aquatic weeds equals or exceeds a threshold, an algaecide or aquatic herbicide application is made. Thresholds are met when aquatic weeds or algae cause problems, typically associated with capacity, flow impediment, sediment build-up, or odor.

Algaecide and aquatic herbicide applications may also be made prior to threshold exceedance. For example, based on predicted growth rate and density, weather, water availability, and historical records and experience, aquatic weeds may reasonably be predicted to cause future problems. Accordingly, they may be treated soon after emergence. Even though aquatic weeds may not be an immediate problem at this phase, treating them before they mature reduces the amount of algaecide and aquatic herbicide needed because the younger aquatic weeds are more susceptible and there is less plant mass to target. Timing herbicide application so that plants are controlled before they can develop mature reproductive structures is critical to prevent the spread of nuisance species. Selection of appropriate algaecides and aquatic herbicides and rate of application is done based on the identification of the algae or aquatic weed and the appearance of that algae or aquatic weed on the product label.

11.1.1 No Action

As feasible, this technique is used. For example, consistent with the IPM program used by the District, a threshold is typically reached prior to treatment. Prior to reaching a threshold, no control is considered.

11.1.2 Prevention

Habitat Modification

After the removal of non-native terrestrial and emergent invasive species, the introduction and re-establishment of native species has been successful at the waters' edge in some cases. This technique is intended to provide competition for non-desirable species and reduce the need for algae and aquatic weed abatement only around the perimeter of the water bodies (i.e., upper canal banks), but is not possible within conveyances themselves. Limitations to this approach include availability of suitable native species, availability of labor to plant native species, and safe access to banks for work crews.

The District will also consider other habitat modifying techniques appropriate for the individual target areas; for example, dredging, oxygenation or aeration, shading with dyes, and bio-manipulation. In areas

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where sedimentation has significantly impacted the capacity of the water body, dredging can increase the water volume, reduce organic matter generated in the water body, and remove nutrient-containing sediment. Aeration, oxygenation and mixing are methods that can mechanically add oxygen directly to the water, and can result in the reduction of nuisance algae growth; this is typically applicable to static waterbodies, and not conveyance systems like those managed by the District.

Shading the water column using non-toxic, inert dyes can reduce unwanted submerged plants and algae. Use of dyes works on algae and submerged vegetation by limiting their ability to photosynthesize when the dye is present, but is not a long-term solution and can only be used in systems with little or no water exchange (inflow/outflow). This method is not suitable in the District's system.

Bio-manipulation utilizes various natural mechanisms that can reduce suspended algae, and involves increasing biological controls in the habitat. The biological controls are typically done by top-down or bottom-up changes to the food-web structure aimed at increasing populations of algae-consuming zooplankton. Bio-manipulation may be more efficient when used in conjunction of other habitat modification methods.

A potential method for the control of submersed aquatic vegetation is the use of aquatic weed mats. These mats can be secured to the bottom of the standing water body with soil nails or like devices and provide a physical and sunlight penetration barrier to aquatic weeds growing in soil in the bottom of static water bodies. This method is not suitable in the District's system.

Native Species Establishment

No appropriate submersed aquatic native plants have been found to establish within ponds to out-compete aquatic weed species and not create similar or other operational problems. As such, aquatic vegetation in District facilities must be removed or controlled to maintain the aquatic weed density tolerances established by the District.

After the removal of emergent non-native invasive species, the introduction and re-establishment of native species has been successful along the banks or margins of streams and rivers. This technique provides competition for non-desirable species, creates habitat, and may reduce the long-term need for emergent aquatic weed abatement. Limitations to this approach include availability of suitable native species, availability of labor to plant native species, and irrigate and cultivate until the native plant stand is established, and safe access to banks for work crews. Plant characteristics such as growth patterns and the potential to invade areas where they are not wanted must be considered as well as the timing for introduction of native plants. This technique is expensive, takes many years, may be subject to expensive and time-consuming regulatory agency (i.e., California Department of Fish and Wildlife, Corps of Engineers, etc.) approval, and may not be feasible in all areas.

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11.1.3 Mechanical or Physical Methods

Mechanical Removal

Mechanical removal in the District's conveyance system may include various methods such as the use of hand or motor-driven cutting tools, pulling a large chain through the water, or removing weeds with an excavator.

Generally, these techniques are very labor intensive per unit acre or length of water treated. Mechanical removal places personnel at risk of general water, boating, slip, trip and fall hazards, poisonous wildlife, drowning, risks the spilling of motor oil and fuel, and can increase air pollution. The cost per area of mechanical removal is significantly higher than the cost of labor, product and equipment of the application of aquatic herbicides. The increased cost of mechanical aquatic weed abatement does not include the cost of the aforementioned risks (pollution abatement, workman's compensation claims, etc.).

In some instances, the use of mechanical techniques may be necessary when the use of algaecides or aquatic herbicides is not practical, or vegetation is not at an appropriate growth stage. Blankinship & Associates estimates that mechanical removal is 10 to 25 times more expensive than using chemical controls. This additional expense does not include the cost for transportation, disposal, or for obtaining permits.

Environmental impacts due to the use of mechanical techniques include the creation of water-borne sediment and turbidity due to people and equipment working in the water. This suspended sediment can adversely affect aquatic species by lowering dissolved oxygen and preventing light penetration. Disturbing sediment or conveyance banks may cause additional problems including, but not limited to, new areas for aquatic weed establishment, fragmentation and re-establishment of aquatic weeds, and siltation. Many species the District hopes to control can be spread through fragmentation, and mechanical control has the potential to increase the distribution of the problem vegetation. Mechanically removed plants that fragment must be manually removed from the water, or there is a risk of the dislodged material traveling downstream and clogging structures such as gates and weirs, which could lead to overtopping and bank failure. Waste must be taken to traditional landfills and cannot be taken to green waste disposal due to the concern that redistribution of the material may occur and subsequently result in re-establishment.

Mechanical removal has been, and will continue to be used by the District, as feasible, to remove vegetation in some areas. While effective in the short-term, regrowth or reemergence of vegetation is common.

Controlled Burns

This option is most suitable for some types of emergent and terrestrial weeds, and is not appropriate for submerged aquatic vegetation. This option is generally not a suitable alternative control method for aquatic vegetation in the conveyances maintained by the District because wet or submerged aquatic vegetation will not burn.

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Grazing

This option is most suitable for emergent and terrestrial weeds, and is not suitable for submerged aquatic weeds or algae. Impacts to water quality from animal feces, increases in turbidity, nutrients, and bank erosion, and impacts to desirable species make this option unfeasible in some cases. The cost of hiring grazing animals is also generally more costly than chemical control alternatives. This option is not a suitable alternative control in the District's facilities. The nature of the conveyance system, presence of traffic, and lack of fencing limits where grazing could be implemented within the system. Grazing will be considered as an alternative control, as feasible.

Tilling or Discing

This option is not suitable for the control of aquatic or riparian vegetation because tilling or discing exposes erodible soils. The District generally avoids tilling and discing in and around its conveyance so as not to encourage erosion of banks and sedimentation.

11.1.4 Cultural Methods

Cultural methods used to reduce the amount of aquatic herbicides used include modifying the timing of algaecide and aquatic herbicide and non-herbicide controls to prevent plants from reaching reproductive growth stages. Another cultural method is making applications before the density of algae or aquatic vegetation is high enough to require higher algaecide or aquatic herbicide application rates or additional applications to maintain algae or aquatic weed populations below threshold levels.

11.1.5 Biological Control Agents

Goats and sheep are often used for grazing in and along riparian areas and levees. As discussed previously, grazing may be suitable for emergent and terrestrial weeds and is not suitable for submerged aquatic weeds or algae. Impacts to water quality from animal feces, increases in turbidity, nutrients, and bank erosion, and impacts to desirable species make this option unfeasible in some cases. The cost of hiring grazing animals is also generally more costly than algaecide and aquatic herbicide control alternatives. This option is not a suitable alternative control in the District's facilities. The nature of the conveyance system, presence of traffic, and lack of fencing limits where grazing could be implemented. Grazing will be considered as an alternative control, as feasible.

11.1.6 Algaecides and Aquatic Herbicides

The selection of and decision to use an algaecide or aquatic herbicide is based on the recommendation of a PCA in collaboration with District staff. The PCA considers a variety of control options that may include mechanical and cultural techniques that alone or in combination with chemical controls are the most efficacious and protective of the environment.

Evaluating alternative control techniques is part of the District's IPM approach; therefore an alternative treatment may be selected as part its program. Alternative control techniques and detailed description of each of these is presented in Section 11.1. In general, alternative control techniques are expensive,

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labor intensive, not as effective, and cause temporary water quality degradation. The equipment and labor required to perform these techniques is not always readily available as it is required during a busy general maintenance period for the District. This may cause delays in removal leading to increased plant material to remove and increased cost.

The quantity of algaecide and aquatic herbicide required for an application is determined by a PCA that has followed the label directions in making a recommendation. The rate at which an algaecide and aquatic herbicide is used is highly variable and depends on the type, time of year, location, and density and type of aquatic weeds, water presence, and goal of the application. All these factors are considered by the PCA prior to making a recommendation for an application.

11.2 Using the Least Intrusive Method of Aquatic Herbicide Application

The District uses a variety of application methods including specialized mechanized vehicles (trucks, all-terrain vehicles, trailers, etc.) and personnel with backpack sprayers to make algaecide and aquatic herbicide applications. Combined with the need to hold, safely transport and properly apply algaecides and aquatic herbicides, the District's techniques are the least intrusive as feasibly possible.

Please refer to **Table 1** for application methods.

11.3 Applying a decision matrix concept to the choice of the most appropriate formulation.

As previously stated, a PCA and/or qualified District staff scouts the area to be treated, makes a positive identification of pest(s) present, checks appropriate algaecide and aquatic herbicide product label(s) for control efficacy, and then the PCA prepares a written recommendation. The written recommendation includes rates of application, and any warnings or conditions that limit the application.

The PCA may also recommend that an adjuvant be used to enhance the efficacy of the algaecide or aquatic herbicide.

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