## 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<br>**City of Foster City** | | | |
| B. Mailing Address<br>**100 Lincoln Centre Drive** | | | |
| C. City<br>**Foster City** | D. County<br>**San Mateo** | E. State<br>**CA** | F. Zip<br>**94404** |
| G. Contact Person<br>**Allen Smith** | H. E-mail address<br>**asmith@fostercity.org** | I. Title<br>**Maintenance Manager** | J. Phone<br>**650-286-3546** |

### 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: **Foster City Lagoon**
2. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger.
   Owner's name: _____
   Name of the conveyance system: _____
3. ☐ Directly to river, lake, creek, stream, bay, ocean, etc.
   Name of water body: _____

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

## V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: **Algae, submersed, floating, and emergent aquatic vegetation**

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

**Diquat Dibromide (Reward®)**
**Fluridone (Sonar Genesis®)**
**Hydrogen Peroxide/Dioxide (GreenClean Liquid 5.0®)**
**Imazamox (Clearcast®)**
**Peroxyacetic Acid (GreenClean Liquid 5.0®)**
**Sodium Carbonate Peroxyhydrate (PAK®27)**

Note – product names listed in parentheses are examples only 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: **Aquatic labeled adjuvants such as Liberate® and Competitor®**

## 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:** Louis Sun

**B. Signature:** _____ **Date:** 6/3/2022

**C. Title:** Public Works Director/City Engineer

**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** _____ |

# City of Foster City

**Aquatic Pesticide Application Plan (APAP)**

**For the**

**Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Water of the United States from Algae and Aquatic Weed Control Applications**

**Water Quality Order No. 2013-0002-DWQ**

**General Permit # CAG990005**


*Prepared for:*
**City of Foster City**
**100 Lincoln Centre Drive**
**Foster City, CA 94404**
**Contact: Allen Smith**
**(650) 286-3546**

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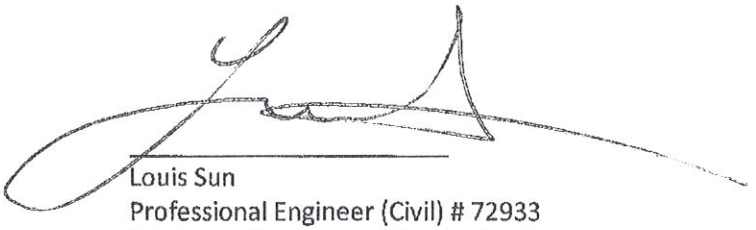
**1615 5th Street, Suite A**
**Davis, CA 95616**
**Contact: Stephen Burkholder**
**(530) 757-0941**

*Submitted to:*
**State Water Resources Control Board**
**Division of Water Quality**
**1001 I Street, 15th Floor**
**Sacramento, CA 95814**
**Contact: Gurgan Chand**
**(916) 341-5780**

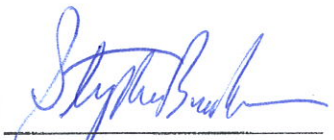
***CERTIFICATION***

***"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure 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 and imprisonment for knowing violations."***

Signed and Agreed:



Louis Sun
Professional Engineer (Civil) # 72933
Public Works Director/City Engineer
City of Foster City



Stephen Burkholder
Pest Control Adviser # 153644
Senior Biologist
Blankinship & Associates, Inc.

Michael S. Blankinship
Professional Engineer (Civil) # 64112
Pest Control Adviser # 75890
Blankinship & Associates, Inc.

## Limitations

The services used to prepare this document were performed consistent with our agreement with Waterworks Industries Inc., on behalf of the City of Foster City, and were rendered in a manner consistent with generally accepted professional consulting principles and practices using the level of care and skill ordinarily exercised by other professional consultants under similar circumstances at the same time the services were performed. No warranty, express or implied, is included. This document is solely for the use of the City of Foster City unless otherwise noted. **Any use or reliance on this document by a third party is at such party's sole risk.**

# City of Foster City

# 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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**List of Abbreviations**

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|---|---|
| AHAL | Aquatic Herbicide Application Log |
| APAP | Aquatic Pesticide Application Plan |
| BG | Background |
| BMPs | Best Management Practices |
| $^{o}C$ | Degrees Celsius |
| CEQA | California Environmental Quality Act |
| City | The City of Foster City |
| COC | Chain of Custody |
| CTR | California Toxics Rule |
| DO | Dissolved Oxygen |
| DPR | California Department of Pesticide Regulation |
| Event | Event Monitoring |
| FB | Field Blank |
| FD | Field Duplicate |
| FIB | Fecal Indicator Bacteria |
| ft/sec | Feet per second |
| IPM | Integrated Pest Management |
| IS/MND | Initial Study and Mitigated Negative Declaration |
| Lagoon | The Foster City Lagoon |
| MB | Method Blank |
| MRP | Monitoring and Reporting Program |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicates |
| NPDES | National Pollutant Discharge Elimination System |
| NOI | Notice of Intent |
| OSHA | California Occupational Safety and Health Administration |
| PCA | Pest Control Adviser |
| Permit | The Statewide General NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications |
| Policy | State Water Board Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California |
| Post | Post-event monitoring |
| PPE | Personal Protective Equipment |
| QAC | Qualified Applicator Certificate |
| QAL | Qualified Applicator License |
| QA/QC | Quality Assurance and Quality Control |
| %R | Percent Recovery |
| RPD | Relative Percent Difference |
| RWL | Receiving Water Limitation |
| RWMT | Receiving Water Monitoring Trigger |
| RWQCB | Regional Water Quality Control Board |
| SIP | State Implementation Policy |
| SWRCB | State Water Resources Control Board |
| USEPA | United Stated Environmental Protection Agency |
| WDID | Waste Discharge Identification |

## Aquatic Pesticide Application Plan

The State Water Resources Control Board (SWRCB) 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 (herein referred to as the "Permit") was adopted on March 5, 2013 and became active on December 1, 2013 (SWRCB 2013). The Permit, Water Quality Order No. 2013-0002-DWQ, expired November 30, 2018, and has been administratively continued until a new permit is adopted. As such, the Permit is still active and enforceable. 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 Policy, or SIP (SWRCB 2005)
- The California Toxics Rule (CTR)
- San Francisco Bay Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (RWQCB 2019)
- Permit-defined Receiving Water Limitations (RWLs) and Receiving Water Monitoring Triggers (RWMTs)

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 stormwater or irrigation runoff. The Permit allows enrollees to discharge residual algaecide and aquatic herbicide active ingredients, subject to discharge limitations and Basin Plan objectives. The Permit covers discharges of residues of 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).

The Foster City Lagoon (herein referred to as the "lagoon") is a man-made estuary, essentially following the shape of earlier sloughs in the area, located in the middle of the City of Foster City (herein referred to as the "City"), in San Mateo County, California (**Figure 1**). Completed in 1971, its sources of water are the South San Francisco Bay and the Belmont Slough watershed (via Belmont Slough) and stormwater runoff from the City's watershed. Serving the City as a floodwater detention basin and a recreation site, the lagoon seasonally experiences problems with excessive aquatic weed growth, algae blooms, and fecal indicator bacteria (FIB), especially near public beaches, which diminish or prevent recreational use.

As part of an Integrated Pest Management (IPM) approach, the City intends to apply algaecides and aquatic herbicides identified in the Notice of Intent to Comply (NOI) submitted to the SWRCB. For the purposes of applying to, and complying with, the Permit, the City has created this Aquatic Pesticide Application Plan (APAP).

This APAP is a comprehensive plan developed by the City 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;
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 or qualified applicator'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 kills due to residues of 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:
    - 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;

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.


| | DATE | DESCRIPTION | INIT. |
|---|---|---|---|
| | | | |

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Ag & Environmental Science & Engineering

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PROJECT:
City of Foster City Lagoon
2022 APAP

FIGURE: 1

DESCRIPTION:
Project Location Map

DATE:

## Element 1: Description of the Water System

The lagoon system is a man-made estuary, designed to withstand a 100-year storm, which divides the City. Shaped like the number two (2), it extends from north to south in a meandering alignment. Its surface area is approximately 212 acres. Approximately 200 feet wide along most of its length, the width of the lagoon extends to over 1,000 feet near Leo J. Ryan Park. The average depth of the lagoon is approximately 6 feet. Refer to **Figure 1**.

The primary function of the lagoon is to be a storm drainage detention basin for the City. Its sources of water include the South San Francisco Bay, the Belmont Slough watershed via Belmont Slough intake structure, and stormwater runoff from the City's watershed. The lagoon receives runoff from a watershed of approximately 2,313 acres.

Components of the system include an intake structure at the south end of the lagoon near Belmont Slough and a drainage pumping station at the north end of the lagoon near the San Francisco Bay along East Third Avenue. The drainage pump station includes two pumps, connected to a 66-inch steel pipe that discharges into a large, concrete forebay. Triple 5' by 12' box culverts connect the forebay under East Third Avenue and through the levee to the south San Francisco Bay. Flap gates are installed on the pipes so that no tidal waters can backflow into the lagoon. In the lagoon pump station's original design, pumping was the only mechanism by which lagoon water could be discharged. Thus, the lagoon at that time was physically separated from Bay waters and was completely independent of tidal cycles. The current lagoon control structures provide for a constant water surface elevation by setting of controls for the specified elevation, allowing discharge pumps to cycle on when needed to maintain the water level in the lagoon. The controls are adjustable so that a variety of water surface elevations may be obtained throughout the year.

The secondary function of the lagoon is recreational use. There are seven parks about the shoreline. These parks and their amenities make the lagoon the aesthetic and recreational centerpiece of the City. Contact and non-contact recreation occur in the lagoon.

The lagoon seasonally experiences problems with excessive aquatic weed growth, algae blooms, and high concentrations of bacteriological pollutants which prevent or diminish recreational use.

## Element 2: Description of the Treatment Area

The City may apply algaecides or aquatic herbicides to the areas described in Element 1 if aquatic weed or algae treatment thresholds are met or will be met based on historical experience.

The Permit defines the "application area" as the area to which algaecide or aquatic herbicides are directly applied. The Permit defines "treatment area" as the area being treated by the algaecide or aquatic herbicide and, therefore, the area targeted to receive an appropriate rate of active ingredient to control the target vegetation or algae. A treatment area may be located anywhere within the lagoon where an action level has been reached. Treatment areas are generally expected to be specific coves or sections within the lagoon, and not the entire waterbody.

## Element 3: Description of Weeds and Algae

Nuisance vegetation found in the lagoon includes emergent, floating, and submerged aquatic species, as well as algae. Submersed aquatic vegetation in the lagoon includes widgeongrass (*Ruppia cirrhosa*). Depending on water clarity and time of year, filamentous and planktonic algae may be present in the lagoon. The presence of these algae and aquatic weeds and others adversely impact the aesthetic and recreational uses of the lagoon, cause odors issues, and have the potential for negative health impacts (e.g., from HABs) for lagoon users and residents.

## 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 City.

**Table 1: Algaecides and Aquatic Herbicides That May Be Used**

| Herbicide | Application Method(s) | Adjuvant | Degradation Byproducts |
|---|---|---|---|
| Diquat Dibromide | Submersed boom, handgun, or boom sprayer | Various "Aquatic" labeled adjuvants | No major degradants[1] |
| Fluridone | Backpack sprayer, handgun, submersed boom, spreader, or boom sprayer | Not Applicable | N-methyl Formamide[2] |
| Hydrogen Peroxide[3] | Handgun, boom sprayer, injection | Not Applicable | Water and oxygen |
| Imazamox | Backpack sprayer, handgun, or boom sprayer | Various "Aquatic" labeled adjuvants | Nicotinic acid and imazamox parent chemicals[4] |
| Peroxyacetic Acid | Handgun, boom sprayer, injection | Not Applicable | Oxygen, carbon dioxide, water, and acetic acid[5] |
| Sodium Carbonate Peroxyhydrate | Handgun, boom sprayer (liquid), or spreader (granules) | Not Applicable | Sodium carbonate, water, and oxygen[6] |

[1] USEPA 1995

[2] NMF was identified as the major degradant of fluridone when applied to water bodies (USEPA 2004). Minor degradants may include: 1-methyl-3-(4-hydroxyphenol)-5-[3-trifluoromethyl)phenyl]- 4[1H]-pyridone and 1,4-dihydro-1-methyl-4-oxo-5-[3-(trifluoromethyl)phenyl]-3-pyridine (West *et al. 1983* as cited in McLaren/Hart, 1995), and benzaldehyde, 3-(trifluoromethyl)-benzaldehyde, benzoic acid and 3-(trifluoromethyl)- benzoic acid (Saunders and Mosier, 1983 as cited in McLaren/Hart, 1995).

[3] Hydrogen Dioxide is a synonym for Hydrogen Peroxide and shares the same CAS number (CAS No. 772-84-1).

[4] The major degradant in the environment is CL 354,825 (Nicotinic acid, 5-hydrody-6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl). Other metabolites include AC 312,622 (demethylated parent with intact ring structures and two carboxylic acid groups) and AC 354,825 (demethylated, decarboxylated parent with intact rings and one carboxylic acid group) (USEPA 2008).

[5] USEPA 1993-A

[6] USEPA 2002

As needed or recommended, aquatic-labeled adjuvants may be used to enhance the efficacy of a selected product. Currently, the City only uses adjuvants that are not nonylphenol-based.

All herbicide applications are made in accordance with the product label. For example, an application of sodium carbonate peroxyhydrate granules to the lagoon will be made with a spreader calibrated to deliver the correct amount of material per acre-foot of water treated to achieve the desired target concentration.

## Element 5: Discussion of Factors Influencing Herbicide Use

Treatment of aquatic vegetation and algae by the City 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 algae or 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 algae or aquatic vegetation before the waterbody is significantly impacted. In urban waterbodies like the City's lagoon, established action threshold levels may change over time based on public expectations, or pressure from residents and lagoon users. Examples of when thresholds are met are when weeds or algae cause management challenges, nuisance conditions, or result in complaints from lagoon users.

Problems regularly associated with aquatic vegetation or algae blooms are typically associated with impediments to contact (swimming, kite surfing) and non-contact recreation (boating) in the lagoon. Additional nuisance conditions include aesthetic impacts and odors from fragmented widgeongrass or floating algae mats. If the presence or biomass of aquatic 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 City's IPM approach to lagoon management. 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 types of aquatic pests, algaecides or aquatic 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 early in the algae bloom cycle based on the anticipated activity of the algaecide and aquatic herbicide to be used. Even though algae or aquatic weeds may not be an immediate nuisance at this phase, treating them before they mature reduces the total amount of algaecide and aquatic herbicide needed because the younger aquatic weeds or algae populations early in the bloom cycle are more susceptible and there is less biomass to target. Furthermore, treating aquatic weeds and algae within the ideal time frame of its growth cycle is a critical component in the effective implementation of the selected control measures.

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 like widgeongrass early in the growth cycle results in fewer controls needed and less total herbicide used. Selection of appropriate algaecide and aquatic herbicide(s) and application rate(s) is done based on the identification of the algae and aquatic weed, its growth stage, and label language indicating that the product is registered for use in the site and on the species of interest.

The selection of and decision to use an algaecide or aquatic herbicide is based on the recommendation of a DPR-licensed Pest Control Adviser (PCA). The PCA may consider a variety of control options such as 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 City's IPM approach; therefore, an alternative treatment may be selected and implemented, or used as part of a test program. Alternative control techniques likely to be implemented include mechanical removal (e.g., with an aquatic weed harvester), application of dye, hydraulic flushing or water exchange, and dredging. A more detailed description of alternative control techniques is presented in **Element 11** of this document.

In general, alternative control techniques are more expensive, labor intensive, and not as effective, and may cause temporary water quality degradation and/or further spread algae or aquatic weeds. The equipment and labor required to perform these techniques is not always readily available, which can cause delays in removal and subsequently result in additional plant material to remove and higher cost.

## Element 6: Gates and Control Structures

The City operates and maintains the intake and outfall structures in the lagoon. Stormwater flows may enter the lagoon uncontrolled via culverts, drainage inlets, and storm drains, with and without flap gates. The intake structure located on Belmont Slough is equipped with tide gates and three reinforced concrete pipes which permit flow of water from slough into the lagoon at high tide. Flap gates on the lagoon side of the pipes prevent backflow or siphoning from the lagoon back to Belmont Slough.

The outfall structure is located on the San Francisco Bay, just north of Highway 92 in the Foster City Corporate Yard. Water may be discharged over fixed elevation weirs that are adjusted seasonally. City staff maintains the lagoon at lower water levels during winter and spring months for increased stormwater storage capacity, and raises water levels in the summer to allow for boating and recreation in the lagoon and at its beaches. The lagoon becomes a channel for approximately 0.45 miles where water can flow from the main body of the lagoon to the outfall structure.

If products containing hydrogen peroxide, peroxyacetic acid, and/or sodium carbonate peroxyhydrate are applied, outfall pumps will not be turned off. Prior to the application of products with other active ingredients, City staff will manually turn off and lock out discharge pumps to prevent pump operation and potential discharges if applied in the lagoon north of Highway 92. The duration of shutoff will be determined by the active ingredient applied, application location within the lagoon relative to the outfall, and product rate applied.

**Figure 2**, the Aquatic Herbicide Application Log (AHAL), is the form used to document conditions prior to and during application of aquatic herbicides and algaecides.

# Fig. 2 Aquatic Herbicide Application Log

**For Client Use Only**



****IMPORTANT** To Be Completed EVERY TIME an Aquatic Herbicide Application is Made**

App. Start: Time _____ Date _____

App. End: Time _____ Date _____

Application Location _____

Agency _____ Personnel _____

Air Temperature (Fº) _____ 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 (Fº) _____

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.

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

The Permit allows the City to apply for a SIP Section 5.3 Exception for the use copper or acrolein. If an exception is granted, it will be noted in the annual report, and this section will be amended to describe the exception period as outlined in the required California Environmental Quality Act (CEQA) documentation. The City does not currently have a SIP 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 City will use to meet the aforementioned goals.

### 8.1 Data Collection

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

**Figure 2** (AHAL) or its equivalent and **Figure 3** (Aquatic Herbicide Field Monitoring & Sampling Form) or its equivalent will be used.

# Figure 3: Aquatic Herbicide Field Monitoring & Sampling Form



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

## SAMPLE #1: Background Monitoring (Background)

**Collect upstream of or just outside of treatment area at time of treatment, or within in treatment area within 24 hours of the treatment starting.**

### Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

Environmental Setting (circle one): Flowing | Static

### Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Monitoring Location: _____

GPS Coordinates: _____

Sketch monitoring location or describe location with identifiable points of reference (required if GPS coordinates not provided).

### Section 3: Water Quality Characteristics

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec)*: _____

** Water speed only required for flowing water.*

### Section 4: Site Observations *(Refer to Definitions Sheet and mark a response for each field)*

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

# Figure 3: Aquatic Herbicide Field Monitoring & Sampling Form



## SAMPLE #2: Event Monitoring (Event)

**Collect just outside of the treatment area immediately after the application of herbicide(s), 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.**

**Is water leaving the treatment area?** ☐ **Yes** ☐ **No**

*If no water is leaving the treatment area, complete sections 1, 2, and 4, skip section 3, and do not collect a sample.*

### Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

Environmental Setting (circle one): Flowing | Static

### Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Monitoring Location: _____

GPS Coordinates: _____

Sketch monitoring location or describe location with identifiable points of reference (required if GPS coordinates not provided).



### Section 3: Water Quality Characteristics

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec)*: _____

** Water speed only required for flowing water*

### Section 4: Site Observations (*Refer to Definitions Sheet and mark a response for each field)*

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

# Figure 3: Aquatic Herbicide Field Monitoring & Sampling Form



****For each active ingredient, one Field Duplicate and one Field Blank must be collected per environmental setting (moving water vs static water) per year****

## SAMPLE #3: Post-Event Monitoring (Post)

**Collect from inside treatment area within 7 days of application, or when treatment is deemed complete.**

### Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

Environmental Setting (circle one): Flowing | Static

### Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Monitoring Location: _____

GPS Coordinates: _____

Sketch monitoring location or describe location with identifiable points of reference (required if GPS coordinates not provided).

### Section 3: Water Quality Characteristics

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec)*: _____

** Water speed only required for flowing water*

### Section 4: Site Observations (*Refer to Definitions Sheet and mark a response for each field)*

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

# Figure 3: Aquatic Herbicide Field Monitoring & Sampling Form



**** For each active ingredient, one Field Duplicate (FD) and one Field Blank (FB) must be collected per environmental setting (moving water vs static water) per year****

## Field Duplicate (FD) Sample:

**Collect at same location and time as the monitoring sample (if possible collect with event or post-event sample) and using the same sampling technique.**

### Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

### Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Monitoring Location: _*See (circle one): BG / Event / Post*_

GPS Coordinates: _*See (circle one): BG / Event / Post*_

Sketch monitoring location or describe location with identifiable points of reference (required if GPS coordinates not provided).

### Section 3: Water Quality Measurements

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec)*: _____

** Water speed only required for flowing water*

### Section 4: Site Observations (*Refer to Definitions Sheet and mark a response for each field)*

***See (circle one): BG / Event / Post***

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

# Figure 3: Aquatic Herbicide Field Monitoring & Sampling Form



**** For each active ingredient, one Field Duplicate (FD) and one Field Blank (FB) must be collected per environmental setting (moving water vs static water) per year****

## Field Blank (FB) Sample:

**Prepare using distilled water at the monitoring site immediately prior to or immediately after the collection of the monitoring sample.**

### Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

### Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____



### Section 3: Water Quality Measurements

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec): ____N/A____

### Section 4: Site Observations *(Refer to Definitions Sheet and mark a response for each field)*

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

## 8.2 Monitoring Locations and Frequency

For application of algaecides and aquatic herbicides listed on the NOI, the City will collect samples from a minimum of six application events for each active ingredient per year. If there are less than six application events in a year for an active ingredient, the City will collect samples for each application event.

Water quality sampling is required for applications of products that contain sodium carbonate peroxyhydrate, peroxyacetic acid, and/or hydrogen peroxide; however, no chemical analysis for these active ingredients is needed. If applications of sodium carbonate peroxyhydrate, peroxyacetic acid, and/or hydrogen peroxide are made, the City will collect samples consistent with Permit requirements and analyze them for the field parameters of pH, dissolved oxygen (DO), temperature, turbidity, and electrical conductivity.

If the results from six consecutive sampling events show concentrations that are less than the applicable RWL or RWMT in an environmental setting, the City will reduce the sampling frequency for that active ingredient to one per year in that environmental setting. If the annual sampling shows exceedances of the applicable RWL or RWMT, the City will be required to return to sampling six applications the next year, and until sampling may be reduced again.

Sites will be chosen to represent the variations in treatment that occur, including algaecide or aquatic herbicide use, hydrology, environmental setting, conveyance or impoundment type, seasonal, and regional variations. The exact location(s) of sample site(s) will be determined after site scouting is conducted and a decision to make an aquatic herbicide application is made per the City's IPM approach. **Figure 3** is the form used to document sampling.

### 8.2.1 Sample Locations

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

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

**Event Monitoring:** The Event 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 within one week after the application, or within one week after treatment is deemed complete.

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

Additionally, one Field Duplicate (FD) and one Field Blank (FB) sample will be collected and submitted for analysis for each analyte, once per year. The FD and FB samples will most likely be collected during Event

Monitoring. See **Figure 3** 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 for intermediary sampling containers that will be used in more than one location (e.g., Van-Dorn style sampler) is discussed in **Element 8.8.4**.

## 8.4 Field Measurements

In conjunction with sample collection, temperature and DO will be measured in the field. Turbidity, electrical conductivity, and pH may be measured in the field using field meters as available, or analyzed in the laboratory. Turbidity, pH, and DO meters are calibrated according to manufacturer's specifications at the recommended frequency, and checked with a standard prior to each use. Conductivity meters are calibrated by the manufacturer and will be checked according to manufacturer's specifications with standards throughout the year (typically once per month) to evaluate instrument performance. If the calibration is outside the manufacturer's specifications, the conductivity probe will be recalibrated. Calibration logs are maintained for all instruments to document calibration.

## 8.5 Sample Preservation and Transportation

Samples may be collected directly into preserved containers, or collected in unpreserved containers, and preserved at the laboratory upon receipt if the analytical method requires preservation. 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 as soon as practicable after sample collection.

## 8.6 Sample Analysis

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

**Table 2: Required Sample Analysis**

| Constituent | Analytical Method[1] | Reporting Limit | Hold Time (Days) | Container | Chemical Preservative |
|---|---|---|---|---|---|
| Temperature[2] | SM 2550B, 4500-OG | N/A | Immediately | N/A | None |
| Dissolved Oxygen[2] | SM 4500-OG | 0.0 mg/L | Immediately | N/A | None |
| Turbidity[3] | EPA 180.1, SM 2130B | 0.00 NTU | 2 | 125 mL Glass or HDPE | None |
| Electrical Conductivity[3] | EPA 120.1 | 0.0 µS/cm | 1 if unpreserved; 28 if preserved | 250 mL Glass or HDPE | None[5] |
| | SM 2501B | | 28 | 500 mL Glass or HDPE | None |
| pH[3] | EPA 150.2 | 1-14 | Immediately | 100 mL Glass or HDPE | None |
| | SM4500H+B | | 0.08 (2 hours) | | |
| Nonylphenol[4] | EPA 550.1m, GC/MS | 0.5 µg/L | 7 | 2 x 40 mL VOA | None |
| *Diquat | EPA 549.2 | 4.0 µg/L | 7 | 500 mL Amber HDPE | $H_2SO_4$ |
| *Fluridone | SePro FasTest, HPLC | 1.0 to 5.0 µg/L | 28 | 2 x 40 mL VOA | None |
| *Imazamox | HPLC | 50 µg/L | 14 | 2 x 40 mL VOA | None |

**Notes:** mg/L = milligrams per liter; NTU = nephelometric turbidity unit; mL = milliliter; HDPE = high-density polyethylene; µS/cm = microsiemens per centimeter; GC/MS = gas chromatography-mass spectrometry; µg/L = micrograms per liter; VOA = volatile organic analysis HPLC = high performance liquid chromatography; m = modified extraction or analysis technique; $H_2SO_4$ = sulfuric acid; CFR = Code of Federal Regulations.

* Signifies algaecide or aquatic herbicide active ingredient. Chemical analysis is only required for the active ingredient(s) used in treatment. Active ingredient analysis not required for algaecides and aquatic herbicides containing sodium carbonate peroxyhydrate, peroxyacetic acid, and/or hydrogen peroxide; field parameters must be measured and reported.

[1] Examples of methods commonly used for sample analysis. Method details obtained from NEMI (2021). Analytes may be analyzed using analytical methods described in 40 CFR Part 136 or equivalent methods that are commercially and reasonably available and that provide quantification of sampling parameters and constituents sufficient to evaluate compliance with applicable effluent limits and to perform reasonable potential analysis. Equivalent methods must be more sensitive than those specified in 40 CFR Part 136 if the method is available in 40 CFR Part 136, and must be approved for use by the Regional Water Board Executive Officer. Methods not specified in 40 CFR Part 136 may include modifications to methods specified in 40 CFR Part 136 or other methods as deemed appropriate by the analytical laboratory.

[2] Field measured.

[3] May be field or laboratory measured.

[4] Required only when adjuvant ingredients are represented by the surrogate nonylphenol.

[5] Preservation via filtration through a 0.45 micron filter and storage at 4˚C.

## 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.

The City or its consultant 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 City 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 AHALs (**Figure 2**).

The City 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 City 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 discharger became aware of the noncompliance;
5. Description of the location of the noncompliance;
6. Description of the noncompliance identified and the United States Environmental Protection Agency (USEPA) pesticide registration number for each product the discharger applied in the area of the noncompliance; and
7. Description of the steps that the discharger has taken or will take to correct, repair, remedy, cleanup, or otherwise address any adverse effects.

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

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

1. Date and time the City 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 (Twenty-Four Hour Report) of the Permit;
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 USEPA 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 discharger believes the noncompliance could not have been caused by exposure to the algaecides or aquatic herbicides from the City'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 City becomes aware of the noncompliance unless SWRCB or RWQCB 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).

### 8.8.1 Surfacewater Sampling Techniques

As discussed in **Element 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.

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 HDPE, stainless steel, glass, or other suitable material. Any container that will be reused between sites will be washed thoroughly and triple rinsed before collection of the next sample, as discussed in **Element 8.8.4**. Alternatively, disposable poly or glass intermediary sample containers may 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 and Filtering

Samples may either be collected with bottles containing the correct preservative(s), or collected in unpreserved bottles and preserved upon receipt at the analytical lab. If filtration is required, it must be done prior to sample preservation. After collection, samples will be refrigerated at approximately four (4) degrees Celsius (°C), stored in a dark place, and transported to the analytical laboratory. 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.

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, bound logbook or other suitable recording media must be maintained by members of the sampling team to provide a record of sample location, significant events, observations, and measurements taken during sampling. Sample records are intended to provide sufficient data and observations to enable project team members to reconstruct events that occurred during the sampling and must be legible, factual, detailed, and objective. As appropriate and at the discretion of the City field staff, observations and measurements can be supplemented with pictures of site conditions at the time of sampling.

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** 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 or 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.

### 8.9.3 Flow Estimation

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

### 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 confirm 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

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

The label will contain information on the specific project (e.g., Erkenbrack Park Beach), the unique individual sample ID (e.g., Imazamox BG), the date and time the sample was collected, and the name of the sampler (e.g., S. Burkholder).

### 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.

### 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)
- DO meter (optional – for measuring DO)
- Zip lock style bags for paperwork
- Non-phosphate cleaner (e.g., Liqui-Nox®)
- Deionized or distilled water
- Ice or blue ice packs
- Clear Mailing Tape
- Cooler for samples
- Grab pole or Van-Dorn style sampler
- Gloves
- Rubber boots or waders
- Smartphone with stopwatch
- 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 RPD. In general, laboratory RPD values of less than 25% will be considered acceptable.

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 **Element 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%. 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.

### 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.

### 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 value for analytes in the FB is less than the detection limit for the compounds of interest, or an expected, previously determined, BG value.

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

### 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 values for analytes in the MB are zero or an expected, previously determined, BG values.

#### *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 %R. Acceptable values of %R range from 75% to 125% for most analyses. 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% for most analyses. 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

### 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 typically consists of a MS, MSD, and 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 **Element 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.

### 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 not be done in close proximity to 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 **Element 8.8.4**. Gloves will be changed between sites.

## Element 10: Description of BMPs

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

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. 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.

### 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 algaecides or aquatic herbicides are spilled, they will be prevented from entering any water bodies to the extent practicable. The City staff or its qualified application contractor's 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 DPR 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 City's PCA and/or qualified staff scout sites to evaluate the extent to which algae or aquatic weed treatment thresholds have been exceeded. Thresholds are met when weeds or algae cause management challenges, nuisance conditions or result in complaints from lagoon users. Problems regularly associated with aquatic vegetation or algae blooms are typically associated with impediments to contact (swimming, kite surfing) and non-contact recreation (boating) in the lagoon. Additional nuisance conditions include aesthetic impacts and odors from fragmented widgeongrass or floating algae mats.

If a location is deemed to have exceeded a threshold, or given 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 and/or qualified City staff or qualified application contractor 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 City or its qualified application contractor staff, the PCA prepares a written recommendation, including rates of application, and any warnings or conditions that relate to the application. 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 USEPA, CalEPA, California Occupational Safety and Health Administration (Cal/OSHA), DPR, and the local Agricultural Commissioner. The City's PCA and DPR-licensed Qualified Applicator Certificate (QAC) or Qualified Applicator License (QAL) holders regularly monitor updates and amendments to the label so that applications are in accordance with label directions. Some examples of label instructions include avoiding applying under conditions of high wind and calibrating application equipment as needed to achieve the desired application rate. 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 City will utilize QALs, QACs, City staff or its qualified application contractor under the supervision of QALs or QACs to make applications or supervise recommended applications. The City or its qualified application contractor 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 City staff or its qualified application contractor's 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 Due to Residues of Algaecides and Aquatic Herbicides

It is important to acknowledge that the use of aquatic herbicides and algaecides, even when used according to label instructions, may result in unavoidable fish kills. Nonetheless, measures will be taken to reduce the likelihood of fish kills as described below. Generally, the concentration of residual aquatic herbicides and algaecides (i.e., the concentration of the aquatic herbicide or algaecide present after the treatment is complete) is not sufficiently high to result in fish kills. Fish mortality after an application is most often due to lack of available DO from decaying biomass in the waterbody.

### 10.5.1 Applications Made According to Label

All algaecide or aquatic herbicide applications are made according to the product label in accordance with regulations of the USEPA, CalEPA, DPR, Cal/OSHA and the local Agricultural Commissioner. Precautions on the product label to reduce impacts to fish populations will be followed. For example, label prescribed limitations on the maximum area treated during dense algae blooms or macrophyte growth will be followed to prevent dead algae or aquatic weeds from decaying and subsequently depressing the DO level. Depressed DO may adversely impact fish populations.

### 10.5.2 Written Recommendations Prepared by PCA

Prior to application, a PCA and/or City staff or its qualified application contractor 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 City staff or its qualified application contractor, the PCA prepares a written recommendation, including rates of application, and any warnings, conditions or limitations to the application.

### 10.5.3 Applications Made by Qualified Personnel

As appropriate, and consistent with applicable regulations, the City will utilize QACs or QALs, or an application contractor with QALs to make applications or supervise applications 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 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 management challenges, nuisance conditions or result in complaints from lagoon users. Problems regularly associated with these pests include impacts to contact (swimming, kite surfing) and non-contact recreation (boating), nuisance odors, and aesthetic impacts from floating weed fragments or algae mats in the lagoon.

Physical/mechanical, cultural, biological, and chemical management options that are considered by the City for the control of algae and/or aquatic weeds are described below.

### 11.1.1 No Action

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

### 11.1.2 Prevention

*Sediment Dredging*

Removal of accumulated sediment in the lagoon by dredging could reduce nutrient loading, and potentially reduce algae and aquatic weed issues. Sediment builds up in the lagoon naturally over time from erosion, breakdown of organic material, soil transported by stormwater runoff, and as suspended sediment settles after flowing in from Belmont Slough. The sediment often contains nutrients like nitrogen or phosphorus, and under certain conditions, these nutrients can be released back into the water column. These nutrients can be like fertilizer for algae and aquatic plants, fueling their growth. Sediment also reduces the lagoon's water capacity and depth. The lagoon was last dredged in 2004 and the City is working on long-term plans and funding to dredge the lagoon again. After the 2004 dredging, the frequency of complaints and City staff time spent managing nuisance algae blooms and widgeongrass were almost eliminated. The lagoon was dredged to reestablish the summer water depth at about six (6) feet, which has allowed for effective use of dye and thermal insulation to increasing ambient temperature. Challenges associated with removing sediment by dredging include cost, having sufficient access to all parts of the lagoon, disposal location for dredged material, and regulatory permitting.

*Aeration and Oxygenators*

Aerators and oxygenators are designed to increase DO and enhance mixing in the water column. Low DO at the lagoon bottom can result in anaerobic degradation of organic matter that resuspends phosphorus from the sediment and is available to increase algal growth. Increasing water column DO is also beneficial to fish present in the lagoon.

A benefit of aeration is increased water column mixing. This technique is most effective in deeper waterbodies (e.g., over 10 feet) and those that are thermally stratified. Aeration systems are generally either bottom diffusers that produce aeration at discreet locations or weighted tubing with perforations to release air bubbles. The bubbles released by aeration equipment serve to vertically mix the water column. This disrupts vertical temperature stratification and as a result lessens the conditions conducive to algal and aquatic plant growth.

Aeration may be beneficial near beaches, but further study of the DO and temperature profile of the lagoon are needed. It is currently unknown if the lagoon has challenges with low DO during summer or fall. The lagoon likely experiences frequent mixing due to the afternoon winds prevalent in the area. The City intends to begin monitoring DO at locations throughout the lagoon to make informed management decisions, which will influence the decision to further consider aeration.

### *Reduction of Light*

The application of dye products to reduce sunlight penetration of the water column can reduce aquatic plant and algae growth by limiting their ability to photosynthesize. This control practice is currently in used at the lagoon and has been effective at reducing widgeongrass and algae issues over the last ten or more years.

### *Nutrient Management*

Nutrient management involves limiting the introduction of or reducing existing levels of nutrients in water that support aquatic vegetation and algae growth.

City staff has tried reducing the water column nutrient load and FIB levels in the lagoon during the summer months by a 7-day cycle of water exchange in which the lagoon water would be pumped out and replaced with Bay water from Belmont Slough. The use of this method to increase the degree of lagoon water exchange and lower nutrient concentrations may reduce the growth of widgeongrass and algae but is not expected to control it to levels that won't impair recreational use of the lagoon. When flushing was conducted in 2021, the City's focus was on reducing FIB levels and did not measure changes in nutrient content. Flushing did not have an effect on concentrations of FIB in the lagoon. Additional limitations to this approach are that dye would need to be reapplied, and a hydraulic study of the lagoon has not been completed to know how much of the lagoon volume would be displaced during the 7-day fill and flush cycle.

During the late spring and summer, waterfowl are the primary source of high FIB levels in the lagoon. Domestic, hybrid, and wild species of waterfowl are attracted to public beaches by the well-meaning people who feed them. Feeding wildlife or waterfowl in a manner that disrupts their normal behavior patterns is illegal and prohibited by California Code of Regulations Title 14, section 251.1. The City should discourage park users and residents from feeding by posting signs prohibiting waterfowl feeding and a public education program through social media and display boards at beaches and parks, to educate the public as to why the waterfowl should not be fed. If necessary, a domesticated waterfowl removal program can be instituted with the cooperation of California Department of Fish and Game. This may

include hunting and/or a capture and euthanasia system and can be an effective strategy for reducing the number of resident waterfowl. It is important to gain public support for this type of lethal wildlife management before implementation. Also, as new individuals will continually migrate to the site, it is important to pair this waterfowl control method with habitat modification and waterfowl hazing options that include, but are not limited to, fencing, tall vegetation and/or native ground cover, noise making devices and trained dogs (Maslo 2013).

Installation of floating islands with roots that extend into the water column that are capable of taking up nutrients has been considered as a technique to remove nutrients from the water column in the lagoon. The plants growing in the artificial islands remove nutrients that would otherwise be used by aquatic plants or algae. The islands can also act as a habitat for terrestrial and aquatic species and pollinator-friendly plants, increasing biodiversity in the lagoon. Challenges and limitations with this approach include impacts to aesthetics of the lagoon, potential disruption of boat and kite board travel, island maintenance and harvesting necessary to remove nutrients from the system, and ineffectiveness on nutrients in sediment. The removal rate of nutrients from the lagoon by floating islands is low and any benefit would be localized to the root zone of the plants. As a result, installation of floating islands is not expected to make a significant change in the amount of nutrients available.

Removal of phosphorus from the water column is an alternative approach to nutrient management. This approach to nutrient management can be accomplished applying phosphorus-binding agents like alum or Phosloc®, which strip phosphorus from the water column as they sink to the bottom and into sediment. Issues with this approach include the need to obtain a permit from the RWQCB, the cost of the product, and the need to collect water and sediment samples to determine the application rate. In addition, phosphorus in the sediment will be minimally or un-affected.

### *Public Outreach*

Public outreach will inform and educate residents of the lagoon area and users of the lagoon public parks and spaces, making them important stakeholders in the management of the lagoon. An outreach campaign may include, but not be limited to using webpage postings, flyers, invoice inserts, mailers or signage advising community members on the benefits of avoiding feeding wildlife, over-fertilizing or over-watering lawns, putting grass clippings and yard debris in or near drainage inlets (DI), and picking up and properly disposing of pet waste.

### *Native Species Establishment*

No appropriate submersed aquatic native plants have been found to establish within lakes, reservoirs, or lagoons to out-compete aquatic weed species like widgeongrass without creating new or similar problems. Aquatic vegetation in the lagoon must be controlled to maintain the aquatic weed density tolerances established by the City. As such, this control alternative is not considered suitable for implementation in the lagoon.

### 11.1.3 Mechanical or Physical Methods

*Mechanical Cutting and Harvesting*

Mechanical cutting and harvesting consists of direct harvesting of the aquatic plants in the lagoon and/or removing unattached plants that drift into intensively used areas or otherwise become a nuisance. Generally, these techniques are very labor intensive. Mechanical removal places personnel at risk of general water and boating hazards, 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 algaecides or 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, vegetation is not at an appropriate growth stage, or if the lagoon's recreational activities are significantly impacted. 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 waste trucking and disposal or for obtaining permits. Waste must be either hauled wet to a landfill, or hauled wet and allowed to dewater and dry out at an upland site before disposal at a landfill. Trucking and tipping costs are higher for wet material and can greatly increase the cost of mechanical harvesting.

Widgeongrass can be spread through fragmentation, and mechanical control has the potential to increase the distribution of it throughout the lagoon. Environmental impacts due to the use of mechanical techniques include the creation of water-borne sediment and turbidity due to equipment working in the water. Disturbing sediment may cause additional problems such as expansion of areas vulnerable to aquatic weed establishment, fragmentation and re-establishment of aquatic weeds, and siltation.

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

*Benthic Barriers*

Benthic barriers are essentially blankets that are placed on the bottom of the lagoon to prevent emergence of submersed aquatic vegetation like widgeongrass in targeted locations. The benthic barriers are made from negatively buoyant materials and typically deployed as sheets and laid out on the bottom of the waterbody and weighted or pinned to the lagoon bottom. These systems provide immediate and season-long control of all aquatic vegetation where they are placed.

One significant drawback to this alternative control is the generally high costs of materials. Benthic barriers cost from $0.75 to $1.00 per square foot installed. The barriers generally need to be removed at the end of each growing season and reinstalled in the spring. Regular maintenance and inspections are required to keep the barriers clean of any buildup of sediment that could allow for widgeongrass growth on top of the barrier. The City is not currently considering the use of benthic barriers because widgeongrass has not been an issue in recent years.

*Hand Removal*

Similar to the mechanical harvesting discussed above, hand removal of detached widgeongrass nuisance drift is conducted by City staff on an as-needed basis. This option has proven effective in localized areas of accumulation of widgeongrass and will be implemented to address accumulation of aquatic weeds around park beaches, docks, coves or other infrastructure. Hand removal is not generally effective for algae control. While removing small patches of algae by hand from the swimming beaches may be possible, this is not a practical approach for most of the lagoon.

*Raking/netting*

Widgeongrass can be removed by raking or removing it from the lagoon with a net. As with many nuisance aquatic plants, it will re-establish from any remaining plant roots or dislodged fragments. While raking small patches of algae from the swimming beaches may be possible, this is not a practical approach for most of the lagoon. As such, this control method should be combined with other options described in this section for longer-term control.

### 11.1.4 Cultural Methods

Cultural control refers to practices that reduce pest establishment, reproduction, dispersal, and survival. One of the most important cultural methods is prevention, discussed in **Element 11.1.2** above.

*Control Application Timing*

Modifying the timing of algaecide and aquatic herbicide and non-herbicide controls to prevent plants from reaching reproductive growth stages can reduce the amount of aquatic herbicides used. This includes making applications before the biomass of algae or aquatic vegetation is high enough to require higher algaecide or aquatic herbicide application rates, a larger application area, or additional applications to maintain algae or aquatic weed populations below threshold levels.

*Water Level Manipulation*

Increasing the water level in the lagoon to reestablish summer water depth at about six (6) feet will allow for effective use of dye and thermal insulation from changes in ambient temperature. It may also result in a small decrease in the shallow areas favored by filamentous algae. However, there is not enough freeboard available to make this the sole means of control, therefore this would not result in an adequate degree of control and would require additional control methods.

### 11.1.5 Biological Control Agents

*Grazing*

Goats and sheep are often used for grazing in and along riparian areas or shorelines. Grazing may be suitable for emergent and terrestrial weeds, but is not suitable for submerged aquatic weeds or algae. Therefore, this option is not a suitable alternative control for the lagoon.

*Herbivorous Fish*

Stocking of herbivorous fish like triploid grass carp has been successful against some submersed aquatic plants in freshwater systems, but is largely prohibited in California due to concerns about fish escaping impoundments. There are no known herbivorous fish that could tolerate the lagoon salinity. As such, this option is not a suitable alternative control.

*Bio-manipulation*

Bio-manipulation utilizes various natural mechanisms that can reduce planktonic algae through predation. 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 is difficult to accomplish and can be affected by many variables, making it an inconsistent method to implement. Nuisance algae in the lagoon has been limited to filamentous species in the past, so this approach would not result in improved conditions and is not currently being considered for implementation in the lagoon.

### 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 City staff or its qualified application contractor. The PCA may consider 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 City's IPM approach; therefore, an alternative treatment may be selected as part its program. In general, alternative control techniques are expensive, labor intensive, not as effective, and/or may cause temporary water quality degradation. The equipment and labor required to perform these techniques is not always readily available. This may cause delays in control or removal leading to increased quantities of plant material to remove, and subsequently higher removal cost.

The quantity or rate 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, density, and historical growth patterns of aquatic weeds or algae, water presence, and goal of the application. All of 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 City may use a variety of application vehicles or vessels including specialized mechanized vehicles (e.g., City application and inspection patio boat, truck-mounted application equipment, or backpack and handheld equipment, etc.). Boats may be used to apply algaecides or aquatic herbicides by making broadcast applications or using a spreader or boom to apply granules or liquids. Combined with the need

to hold, safely transport and properly apply algaecides and aquatic herbicides, the City'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 City staff or its qualified application contractor 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 refers to the 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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