Operation Plan -- Baumberg Complex Pond System 2 and 2C
(Eden Landing Ecological Reserve)
Hayward, Alameda County
(Revised December 2005)

Regional Water Quality Control Board
San Francisco Bay Region
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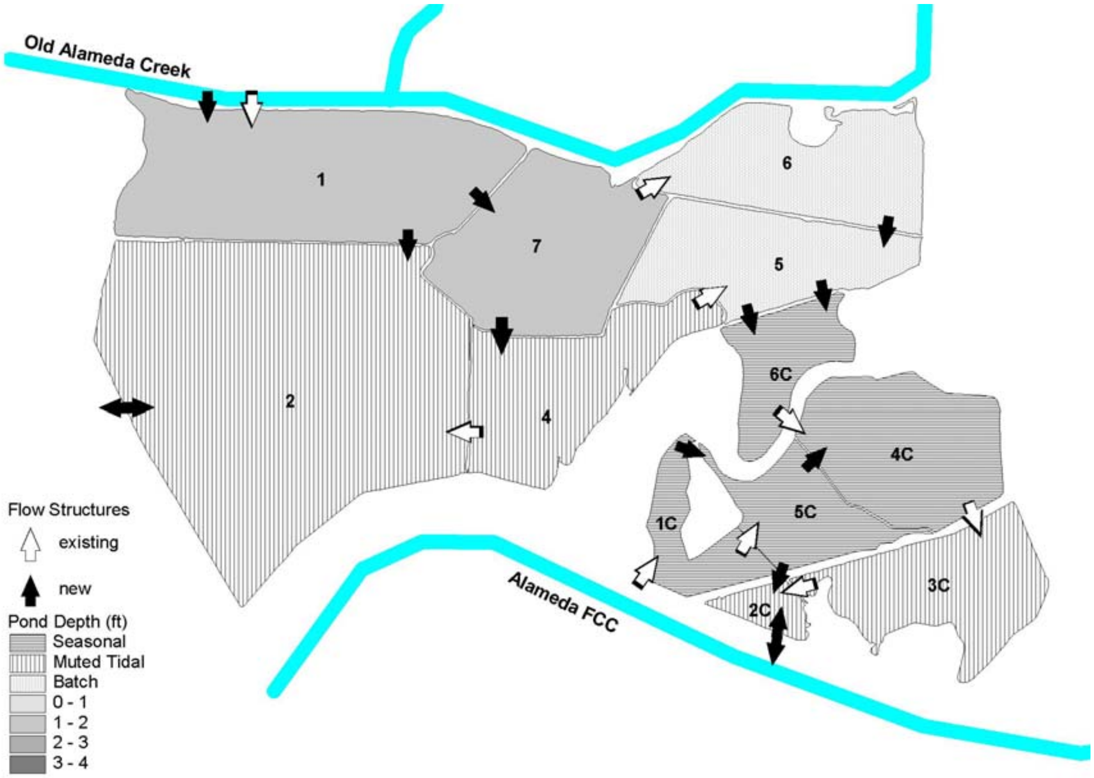

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Summary of Changes to the Operation Plan

Due to management constraints, Department of Fish and Game (DFG) proposes to link Pond Systems B2 and B2C. Ponds 6, 5, 6C, and 4C link the B2 and B2C subsystems. Water for these ponds would be supplied from the two subsystems. Ponds 6 and 5 would be managed ponds with year-round water. The ponds would be managed to have low salinity in the spring and allow evaporation to increase salinity during the summer, as batch ponds. The high salinity water in 6 and 5 would be diluted in the subsequent ponds and released during the winter to reduce the salinity for the next summer season. Ponds 6C and 4C would be seasonal ponds with winter open water, but would be dry during the summer. Ponds 1C and 5C would also be seasonal ponds with winter open water, but could be open water during the summer with pumped intake from Alameda Creek FCC. Ponds 1C, 5C, 4C, and 6C would be filled from the B2C subsystem in November with the onset of rainfall and increased gravity inflow.

For February through approximately August 2005, the Pond 2 system required operation at higher water levels than is described for the Initial Stewardship Plan (ISP) to accommodate levee maintenance and other improvements being completed using Cargil's floating dredge, the Mallard, which requires deeper water for floatation. Water levels will be maintained as high as possible with passive intake via the B2-1 and B2-10 structures, approximately at average elevation 5.0-feet NGVD, with no discharge. Once the maintenance work is completed, the water levels will be returned to ISP summer conditions via discharge to the bay or to the 2c subsystem. Routing the water to the 2c subsystem would be anticipated to help push remaining stagnant water in the upper 2c ponds to the B2c-14 discharge structure, to prepare the 2c system for transition to winter operations and improved water quality for subsequent seasons.

Additionally, monitoring data from 2004 in the Pond 2 system revealed problems with meeting the Final Order's Dissolved Oxygen (DO) requirements. A revised DO trigger, new Best Management Practices for low DO and a revised excursion reporting plan are described below.

Introduction

This Operations Plan describes the management activities required to meet the overall goals and objectives described in the Initial Stewardship Plan (ISP) and the requirement of the Regional Water Quality Control Board's (RWQCB) Final Order # **R2-2004-0018**. Detailed descriptions of Systems 2 and 2C as they are presently functioning are shown in the System Description section, Summer and Winter management activities are shown in the Management section, and the specific corrective measures required to adaptively manage the system are described in the Operations, Constraints, and Corrective Measures section.

Eden Landing Ecological Reserve (Baumberg Complex) Location

The Baumberg ponds consist of a 5,500-acre complex of evaporator ponds (B1-B14 of Figure 1) in the East Bay west of Hayward and Union City in Alameda County. Since the complex contains only evaporators, brine historically has been pumped for final treatment to the Newark plant or to the Redwood City plant through a pipeline paralleling the Dumbarton Bridge. The approach to the San Mateo Bridge and the Eden Landing Ecological Reserve, formerly known as the "Baumberg Tract," forms the northern boundary of the complex. The reserve was established in May 1996 to restore former salt ponds and crystallizers to tidal salt marsh and seasonal wetlands. Alameda Creek Flood Control Channel (FCC), also known as Coyote Hills Slough, and the Coyote Hills form the southern boundary. The Baumberg ponds were designated by regulation changes, Section 630, Title 14, California Code of Regulations, to be part of the Eden Landing Ecological Reserve.

Major drainages that discharge into the San Francisco Bay within the complex include Mount Eden Creek, North Creek, Old Alameda Creek, and Alameda Creek FCC. Alameda Creek FCC diverges from Old Alameda Creek in Union City to provide bypass capacity during large floods. Several hundred acres of extant tidal marsh front the San Francisco Bay, known as the Whale's Tail Marsh at the center of the complex. The marsh is located outboard of ponds 9, 8A, 2, and 1, where Mount Eden Creek and Old Alameda Creek discharge into the Bay. Prior to the acquisition, all ponds within this complex were under Cargill ownership and have now been transferred to DFG.

Pond System 2/2C

Pond System 2 is relatively large, 1,394 acres in size. It includes ponds 1 (337 acres), 2 (673 acres), 4 (175 acres) and 7 (209 acres) and is located on the southwest corner of the Eden Landing Ecological Reserve (Baumberg Complex). The average bottom elevation of these ponds is 2.3 NGVD. These ponds are most easily accessed from the Veasy Street Gate.

Pond system 2C is relatively large, 942 acres in size. It includes ponds 6 (176 acres), 5 (159 acres), 6C (78 acres), 4C (175 acres), 1C (66 acres), 5C (111 acres), 3C (153 acres), and 2C (24 acres) and is located on the southern boundary of the Eden Landing Ecological Reserve (Baumberg Complex). The pond bottom elevations range from 2.4 to 3.6 NGVD. These ponds are most easily accessed from the Veasey Street Gate. Pond 3c is still owned by Cargil.

Biological Resources

The following discussion separates the biological resource information for the Pond 2 and the 2c sub-systems; this general discussion highlights the resources and associated pond types, since the pond systems, though linked via water movement, will provide different habitats, as the water levels will be managed differently, primarily during summer.

Biological Resources- Pond 2

Many species are known to use the Pond 2 System; management and operations plans have been specifically designed to provide suitable habitat for numerous waterbird species and to avoid impacts to these species. The ponds of this system are characterized by lower salinities and pond depths of a foot or more. Consequently, this pond system typically supports waterfowl and picivorous birds including bufflehead, scaup, ruddy ducks, double crested cormorant, gull, white pelican, and least, Forster's, and Caspian terns.

Given pond depths, the ponds are generally not as heavily used by shorebirds as other shallower ponds in the system. Recurvid shorebirds such as black-necked stilt and American avocet may use small linear islands found in the ponds as nesting areas. Shorebirds and other waterbirds, including Canada goose, primarily use these ponds for roosting which occurs on the unvegetated levees within the system.

Since Pond 1 was historically a supplemental intake pond and under the ISP continues to be an intake pond, the ponds are characterized by lower salinities The Pond 2 system supports abundant fish populations. For a more complete discussion of these species and potential occurrence, see the Final EIR/EIS for the South Bay Salt Ponds Initial Stewardship Plan (April 2004).

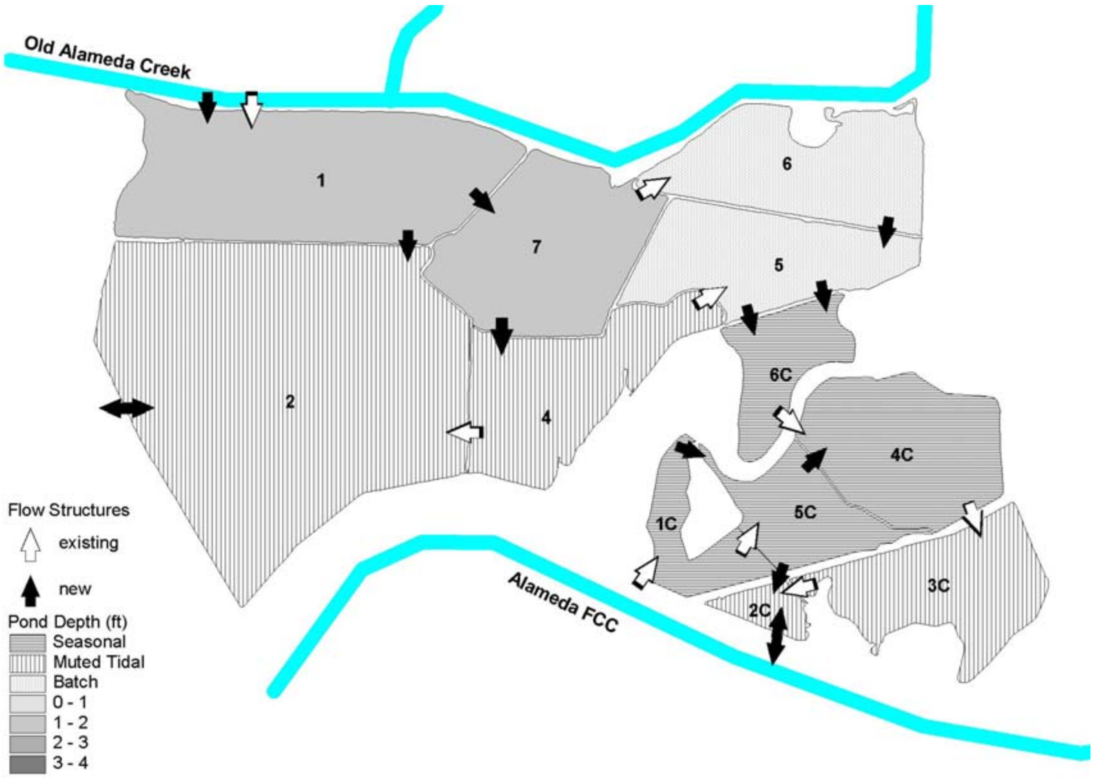
Biological Resources- Pond 2c

Various waterbird species are known to use the Pond 2c System; management and operations plans have been specifically designed to provide suitable habitat for numerous waterbird species and avoid impacts to these species. Ponds 6 and 5 would be managed ponds with year-round water. The ponds would be managed to have low salinity in the spring and allow increases in salinity during the summer as batch ponds and would be diluted in the subsequent ponds and released during the winter to reduce the salinity for the next summer season. Ponds 6c and 4c would be seasonal ponds with open water during the winter, but would be dry during the summer. Ponds 1c and 5c would also be seasonal ponds with winter open water, but could be open water during the summer with intake and supplemental pumping from Alameda FCC. Ponds 1c, 5c, 4c, and 6c would be filled in November with the onset of rainfall and increased gravity inflow.

The ponds of this system are characterized by various salinities, constant ponding of a foot or more in some ponds and draw down would be allowed in other ponds. In the winter, this pond system typically supports abundant waterfowl and picivorous birds including bufflehead, scaup, ruddy ducks, double crested cormorant, gull, white pelican, and terns. A number of these species can be observed using the ponds during the summer as well, depending on pond conditions. The largest concentration of nesting and over-wintering snowy plovers are found in the area north of Alameda Creek, primarily in the other pond systems north of Old Alameda Creek, some of which are managed to provide suitable habitat for snowy plovers. The seasonal ponds in the 2c system may be used by snowy plovers for nesting and foraging during the spring/summer, and shallower ponded areas may also be used by snowy plovers during the winter. The higher salinity (batch) ponds would provide high prey densities of brine shrimp, brine flies and reticulate water boatmen which would benefit salt pond specialist species such as phalaropes and eared grebes, among others.

Given shallower pond depths in a number of the ponds, especially during the spring and fall migrations, when management operations are transitioned to provide optimum habitat conditions, these ponds may be heavily used by shorebirds, as are other shallower ponds in the system. Shorebirds and other waterbirds, including Canada goose, primarily use these ponds for roosting which occurs on the un-vegetated levees within the system. Pond 1c was historically a supplemental intake pond and under the ISP continues to provide this ability, therefore the 1c and 2c ponds may be characterized by lower salinities. The Pond 2c system may support fish populations. Restricting intake to prevent salmonid entrainment may limit the ability to maintain salinities suitable for fish populations. For a more complete discussion of these species and potential occurrence, see the Final EIR/EIS for the South Bay Salt Ponds Initial Stewardship Plan (April 2004).

System Map



Objectives

The objective of the B2/2C system operation is to maintain year-round open water habitat in ponds 1, 2, 4, 5, 6, 7, 2C, and 3C and seasonal winter open water habitat in ponds 1C, 4C, 5C, and 6C. The proposed operation plan will introduce tidal circulation through ponds 1, 2, 2C, and 3C while maintaining discharge salinities to San Francisco Bay (pond 2 discharge) and Alameda FCC (pond 2C discharge) at less than 40 ppt.

Structures

The B2/2C system includes the following structures needed for water circulation in the ponds:

- Four 48" intake/outlet gates at the northwest end of pond 1 from Old Alameda Creek, near the San Francisco Bay
- Pond 1 30,000 gpm intake pump from Old Alameda Creek
- One 48" gate from 1 to 2

- One gap from 2 to 4 and remaining levee being allowed to deteriorate
- Two 48” intake/outlet gates at the west side of pond 2 to San Francisco Bay
- One 48” gate from 1 to 7
- One 48” gate from 7 to 4 (replaced gap, completed during 2005 maintenance)
- One 48” gate from 7 to 6
- Three 42” wood gates from 4 to 5. Only one of these gates is currently operable.
- One wood gate, and one 36” culvert from 5 to 6C (rust may hinder use)
- Two 30” siphons from 6C to 4C
- One gap from 4C to 5C
- Two 30” wood gates from 4C to 3C. Only one of these gates is currently operable.
- One gap from 3C to 2C
- One gap from 1C to 5C
- One 24” pipe from 1C to 5C
- One 7660 gpm intake pump from Alameda FCC inlet channel to 1C
- Two 48” intake/outlet gates at the south side of 2C to Alameda FCC
- Existing staff gages at all ponds except 4c, 1 and 2 (1 and 2 will have gages installed)

System Description

The B2/2C system operates as two connected subsystems. Ponds 1, 7, 4, and 2 operate as one circulation subsystem. Ponds 2C and 3C operate as a separate circulation subsystem. Ponds 6, 5, 6C, and 4C all operate as batch or seasonal ponds which link the two subsystems.

B2 Subsystem

Pond 1 has an intake culvert structure and an intake pump from lower Old Alameda Creek. The intake structure includes gates to allow for inflow at all four culverts, and discharge at two culverts. The inflow from pond 1 would circulate through 7 and 4 to the discharge at pond 2 during the winter, and in the summer, pond 7 could be closed off to allow limited flow from pond 1 to 2 and 7 and 4 could be seasonal. Pond 2 includes an outlet structure to San Francisco Bay. The pond 2 outlet structure includes combination gates for inflow and outflow through both culverts.

Pond B2C Subsystem

Pond B2C has a single intake/outlet structure to/from Alameda FCC. The structure includes two culverts with combination gates to allow both inflow and outflow. Ponds 1C and 5C have a separate intake pump (Cal Hill Pump) from an intake channel from Alameda FCC. The pump is available to supply summer water from the channel.

Batch-Seasonal Ponds

Ponds 6, 5, 6C, and 4C link the B2 and B2C subsystems. Water for these ponds would be supplied from the two subsystems. Ponds 6 and 5 would be managed ponds with year-round water. The ponds would be managed to have low salinity in the spring and allow summer evaporation to increase salinity during the summer. The high salinity water in 6 and 5 would be diluted in the subsequent ponds and released during the winter to reduce the salinity for the next summer season. Ponds 6C and 4C would be seasonal ponds with open water during the winter, but would be drawn down and mostly dry during the summer. Ponds 1C and 5C would also be seasonal ponds with winter open water, but could be open water during the summer with pumping from Alameda FCC. Ponds 1C, 5C, 4C, and 6C would be filled from the B2C subsystem in November.

Management Operations

Summer Operation

Both the B2 and B2C subsystems operate at lower water levels during the summer to increase gravity inflows at high tide and minimize pumping. The summer operation would normally extend from May through October.

B2 Subsystem

The summer operation is intended to provide circulation flow through ponds 1, 7, 4, and 2 to replace water lost to evaporation (approximately 20 acre-feet/day) during the summer season. The average total circulation inflow is approximately 55 cfs (daily average), or 110 acre-feet/day, with an outlet flow of about 45 cfs (90 acre-feet/day). The intake gates at pond 2 would also be opened to allow supplemental "muted tidal" inflow into pond 2. The total intake flow of approximately 110 acre-feet/day includes 65 acre-feet/day inflow at pond 1 and 45 acre-feet/day muted tidal inflow at pond 2.

Ponds 6 and 5 would be maintained at the same water level as pond 1, but would not include circulation flow during the summer. The connection from pond 7 would allow flows to ponds 6 and 5 to make up for evaporation during the summer. Pond 6C would be seasonal and closed off from 5 during the summer and 4C would be seasonally dry during summer.

B2C Subsystem

The summer operation is intended to provide circulation flow to and from ponds 2C and 3C to replace water lost to evaporation during the summer season. The estimated circulation flow at pond 2C is 26 cfs (daily average) or 52 acre-feet/day. This is a muted tidal circulation in and out of the intake/discharge structure. The muted tidal flow represents approximately 25 percent of the total volume in ponds 2C and 3C.

Ponds 1C and 5C are proposed to be seasonal ponds and dry during the summer. However, the Cal Hill pump is available to provide circulation water for 1C and 5C. The muted tidal circulation flow at 2C is sufficient to maintain salinity conditions with all four ponds in summer open water, but the pump to 1C would be needed essentially full time (8 to 12 hours per day at high tide) to maintain 1C and 5C below 40 ppt, which would increase operations and management costs and may not be practicable. Furthermore, maintaining salinities below 40 ppt may not be necessary since higher salinity water would be diluted prior to discharge via mixing in 3c and 2c.

Summer Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
System 2				
1	337	2.2	3.4	3.6
7	209	2.5	3.4	3.6
4	175	2.9	3.1	2.9
2	673	2.1	3.1	3.3
System 2C				
6	176	2.4	3.4	3.6
5	159	2.4	3.4	3.6
6C	78	2.8	-	
4C	175	3.2	-	
1C	66	3.6	-	
5C	111	3.4	-	
3C	153	2.9	3.3	3.6
2C	24	2.7	3.3	3.9

Summer Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
1 inlet	100 (4 gates)	*
1 outlet	0 (1 gate)	*
1 to 7	80	*
1 to 2	0	*
7 to 6	0	*
6 to 5	100	*
5 to 6C	0	*
6C to 4C (not operable)	0 dry	*
2 inlet	100 (2 gates)	*
2 outlet	70 (1 gate)	*
5C to 4C gap	n/a (Dry)	*
4C to 3C (limited operability)	0 4c dry	*
2C inlet	100 (2 gates)	*
2C outlet	100 (1 gate)	*

* To be determined in the field

The B2 subsystem summer gate settings are based on pond modeling and assume average evaporation conditions. The gate settings are intended to provide sufficient circulation flow to limit the summer salinity increases to between 5 and 10 ppt. The actual modeled conditions began at 30 ppt in the spring, and increased to 39 ppt in the fall, using relatively high summer intake salinity conditions from the summer of 1994. The pond operations may need to be adjusted to account for salinity conditions in the pond. (See salinity control section below)

Winter Operation

The winter operation is intended to provide minimal circulation flows in both subsystems. Evaporation is normally minimal during the winter. The winter operation is intended to limit large inflows during storm tide periods and to allow rainwater to drain from the system. Larger winter circulation flows may also significantly reduce salinity in the pond systems. In wet years, San Francisco Bay salinity levels may be below 15 ppt for an extended period. Low salinity in the shallow ponds in the spring may contribute to algal conditions and contribute to lower DO levels in late summer.

For the B2 subsystem, the estimated average total winter circulation inflow is approximately 8 cfs (daily average), or 16 acre-feet/day, with an outlet flow of about 10 cfs (20 acre-feet/day). The winter operation period would normally extend from November through April. The proposed gate settings are intended to limit the intake flow, and flow within the system.

For the B2C subsystem, the estimated average total winter circulation inflow is approximately 2 cfs (daily average), or 4 acre-feet/day, with an outlet flow of about 4 cfs (8 acre-feet/day). The winter operation period would normally extend from November through April. The proposed gate settings are intended to limit the intake flow, and flow within the system.

Typically beginning in November, the circulation flows from pond 1 and 2 would be partially diverted from pond 4 and/or 7 to go through ponds 6 and 5 to reduce the salinity in the batch ponds for the next year. This operation may continue at a reduced rate throughout the winter to maintain low salinity levels in the system.

Once the majority of the salinity in ponds 6 and 5 has been released, the water levels in the entire B2 subsystem would be increased to a winter operation level of 4.5 feet NGVD. This would reduce the circulation flow through the system and make the system easier to manage.

Similarly, in November, the water level in pond 2C would be raised to a higher level of approximately 4.5 feet NGVD for the winter. This would create open water back through ponds 6C, 4C, 1C, and 5C.

<u>Winter Pond Water Levels</u>

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
1	337	2.2	4.5	4.7
7	209	2.5	4.5	4.7
4	175	2.9	4.5	4.3
2	673	2.1	4.5	4.7
6	176	2.4	4.5	4.7
5	159	2.4	4.5	4.7
6C	78	2.8	4.5	4.7
4C	175	3.2	4.5	4.8
1C	66	3.6	4.5	5.6
5C	111	3.4	4.5	5.7
3C	153	2.9	4.5	4.8
2C	24	2.7	4.5	5.1

Winter Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
1 inlet	100 (2 gates)	*
1 outlet	0 (1 gate)	*
1 to 7	100	*
1 to 2	100	*
7 to 6	100	*
6 to 5	100	*
5 to 6C	100	*
6C to 4C (not operable)	100	*
2 inlet	0 (2 gates)	*
2 outlet	10 (1 gate)	*
5C to 4C Gap	n/a	*
4C to 3C (limited operability)	100	*
2C inlet	50 (1 gates)	*
2C outlet	100 (1 gate)	*

* To be determined in the field

Operations, Constraints, and Corrective Measures

Constraints

The primary constraint in operating this system is the ability to bring adequate Bay water into the ponds particularly in the summer to keep salinities below 40 ppt. The operational plan attempts to address this by using the B1 pump to augment inflow, when necessary.

Corrective Measures

Summer Water Level Control

The water level in ponds 1, 2 and 2C are the primary control for pond management. Low water levels in the ponds may expose portions of the pond bottoms. High water levels reduce the effective gravity inflow through the intake culverts because the flow is controlled by the period the high tide is higher than the pond water level.

The inlet gate settings and water levels in ponds 1 and 2 control the overall flow through the B2 subsystem. The outlet gate setting controls the water level in the pond 2. The connection gate settings from 1 to 7, 7 to 4, and 1 to 2 control the water level in pond 1. Routine operation would have the inlet gates fully open and one outlet gate at pond 2 set at less than 70 percent open. Because the normal water level in the pond is above mean water level in the bay, the outlet gate will discharge for more hours of the day than the duration of inflow through the inlet gates. The water level in the ponds should not have a noticeable variation during the day, but may vary by 0.5 feet during a month due to the influence of weak and strong tides.

The proposed summer pond water levels in ponds 1 and 2 are intended to be lower than the historic average pond water levels to maximize the gravity inflow to the ponds. For the period 1997 to 2003, the pond water levels in ponds 1 and 2 averaged 4.7 feet NGVD, and ranged from approximately 3.8 to 6.0 feet NGVD.

The water level in pond 2C is controlled by the amount the culverts are open on the intake and discharge. The water level in ponds 2C and 3C will vary by approximately 0.2 feet during the day and may vary by 0.5 feet during a month due to the influence of weak and strong tides.

Winter Water Level Control

The water level in the discharge ponds (B2 and B2C) are the primary controls for the pond system operation. The circulation flow is limited by both the intake and outlet gate settings. Routine winter operations would have the gates only partially open to reduce circulation during the winter. The reduced circulation flow would slow the change in the pond water levels due to winter storms or extreme tides.

During winter operations, if the water levels exceed approximately 4.50 ft NGVD, the pond 2 and pond 2C intakes should be closed to allow the excess water to drain. Note that without rainfall or inflow, it will take approximately one month to drain 0.5 ft from the pond system with the normal winter outlet gate settings. The outlet gate setting at pond 2 and at pond 2C can be adjusted to increase the outflow from the pond. Due to its remote location, the pond 2 structure is difficult to access during the winter due to wet or impassable unimproved levees.

Ponds 1C, 5C, 6C, and 4C are intended to be winter open water ponds. The ponds will be filled from pond 2C in November and rainfall during the season.

Salinity Control

The design maximum salinity for the discharge at pond 2 is 40 ppt. For routine operations the intake gates at pond 1 and pond 2 are fully open. The outlet setting at pond 2 was established to maintain minimum water levels in pond 2. The primary salinity control for the B2 subsystem is to turn on the pond 1 intake pump in drier years. The intake pump may be turned on when the salinity in pond 1 is above 37 ppt. Increased inflows will tend to increase the water level in pond 2 may require adjustment of the pond 2 outlet gate setting.

The design maximum salinity for the discharge at pond 2C is 40 ppt. For routine operations the intake gates at pond 2C are fully open. The primary salinity control for the B2C subsystem is to lower the elevation at pond 2C. The lower water level will increase the inflow and muted tidal circulation. The lower water level may expose portions of the pond bottom in 3C.

If ponds 1C and 5C are being maintained with summer open water by pumping at the Cal Hill intake pump, high salinity in pond 2C may also be controlled by adjusting circulation from 1C and 5C to 3c via 4c. The salinity in 1C and 5C would increase due to the reduced circulation.

Ponds 6 and 5 are batch ponds in the B2 subsystem. The water levels in the batch ponds are ultimately controlled by the water level in pond 1 via pond 7 and via ponds 2 and 4. Therefore, flow from pond 1 to 7 or from pond 2 to 4 will makeup evaporation losses in ponds 6 and 5. Over the course of the summer, the salinity level in ponds 6 and 5 will increase because there is no circulation through the ponds and minimal mixing between the ponds and ponds 7 and 4.

Based on estimates for normal evaporation rates, the salinity in ponds 6 and 5 will increase from 30 ppt to approximately 120 ppt between May and November. This is based on an average inflow salinity of 35 ppt from pond 7. The actual salinity would depend on the salinity in pond 1 and 7, and the evaporation conditions. Salinity levels higher than 135 ppt in ponds 6 and 5 may result in some gypsum precipitation in the ponds. If the late season salinity needs to be controlled, the inflows from pond 7 could be supplemented with pumped flows from the Continental pump at pond 8 to include lower salinity inflows. This may require a limited outflow from pond 5 to circulate water through pond 5. High salinity outflows from pond 5 to pond 4 and 2 may increase salinity in pond 2.

In November, at the end of the evaporation season, the higher salinity water in ponds 6 and 5 would be released into the ponds 4 and 2 from pond 5. The circulation from pond 5 should be controlled to maintain the salinity in pond 2 below 40 ppt. The flow from pond 5 to 4 should be approximately half the flow from 7 to 4. The preferred time for the release would be during a period of strong tides.

There is no minimum salinity proposed for the ponds in the B2/2C system.

The estimated flow rates for salinity control were based on modeling for a dry year with higher than normal salinity in South San Francisco Bay. The modeling also assumed a spring salinity of 30 ppt in the pond. If the high tide salinity at the intake is lower than approximately 20 ppt, or the pond salinity in the spring is lower than 30 ppt, the circulation flows can be reduced or closed off to increase the pond salinity during the summer. Similarly, the winter circulation flow may be reduced or closed off in wet years with low salinity in the pond.

Dissolved Oxygen Control

To ensure that dissolved oxygen levels at the discharge are not degrading receiving waters below Basin Plan objectives, a “trigger” for the continuous release is included in the operation plan. If dissolved oxygen (DO) levels at the pond discharge fall below the trigger value, Best Management Practices (BMPs) listed in this Operations Plan must be implemented.

The DO trigger is if dissolved oxygen at the discharge falls below the 10^{th} percentile of 3.3 mg/L (calculated on a weekly basis). This 10^{th} percentile trigger is based on dissolved oxygen levels found in Artesian Slough in July 1997. These values are the most relevant representation of natural dissolved oxygen variations in sloughs or lagoon systems currently available. The numerical DO trigger may be revised as additional monitoring data becomes available. Any revision must be approved by the RWQCB.

A letter from the RWQCB, dated March 25, 2005, described this DO trigger for reporting and action. Therefore, in evaluating compliance with the dissolved oxygen limit contained in Order No. R2-2004-0018, the Department will consider it a trigger for reporting and action if, at the point of discharge, the 10th percentile falls below 3.3 mg/L (calculated on a calendar weekly basis).

If a trigger event occurs, the discharger shall make a timely report to the Water Board, and implement BMPs described in this Operations Plan, as appropriate. These adaptive management techniques may include additional monitoring, controlling the flow rate of the intake or discharge, controlling the timing of the discharge, installation of baffles, aeration, or temporarily suspending the discharge. Timely notification is intended to be 24 hours after the monitoring/sample results are available.

BMPs include the closing of the discharge during periods of time when the diurnal pattern suggests that DO would be below the trigger (3.3 mg/L). For analysis of the 2004 data, as reported in the 2004 Self-Monitoring Report, ceasing discharge from 10pm to 10 am would avoid most of the excursions from the limit. If overnight DO levels in the pond are low, the outlet gates could be adjusted daily to allow discharge only during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m.

In the October 5, 2005 letter from regarding File No. 2199.9438 (RS), which requested the revisions/corrections incorporated herein, RWQCB stated that the Department should implement a DO corrective measure (BMP) that ceases nighttime discharges if the weekly 10th percentile value of pond discharge shows the trigger value of 3.3 mg/L, unless a more effective alternative can be implemented.

Daily discharge timing is not practicable due to staff and budget constraints. However, a similarly effective alternative can be implemented during periods when the weekly 10th percentile is at or below the trigger value. The alternative to daily discharge timing is weekly discharge timing. Closing the discharge for a period of days when overnight DO levels in the pond are known to be or are expected to be low, particularly when this corresponds with periods when overnight tides are low and would result in the majority of discharge volume, and/or with weak (neap) tide periods when intake is more limited, would provide equivalent protection of receiving waters as would daily closure of the outlet gates. By adjusting discharge gates on an approximately weekly basis (with the number of days being depending on duration of the neap tide cycle), this would allow for periods when no discharge would occur, or discharge would occur only during periods when discharge is mostly during the day, when pond DO levels are higher.

A possible consequence of ceasing discharge, while not resulting in discharge of low DO pond waters to receiving waters, is prolonged periods of depressed DO levels due to more limited intake, since without discharge pond water levels are higher and thereby duration and volume of intake is reduced. It appears that reducing residence time of water in the ponds improves overall DO levels. Therefore, allowing discharge, even at reduced volumes, would provide for some increased volume of intake. A discharge gate can be set to allow reduced discharge volumes versus discharge volumes that would be expected for normal operations. For example, a gate could be set at approximately 10 percent open (vs. normally 20% open) during strong (spring) tide periods, when the weekly 10th percentile is at or below the trigger value. Reduced discharge settings would reduce the volume of discharge water entering the receiving waters, and correspondingly minimize the extent to which low DO discharges could potentially affect receiving water quality. These reduced discharge volumes would allow for greater exchange of intake waters, since pond water levels would be lower than if no discharge occurred, which may also help to raise DO values.

Dissolved Oxygen BMPs

As noted above, there are a range of BMPs available to reduce potential impacts to the dissolved oxygen levels in the receiving waters (The evaluation of the effectiveness of the proposed BMPs is shown in the Revised 2004 Self-Monitoring Report). These BMPs are discussed below:

1. Slough Monitoring- Additional monitoring data may be collected in the Bay or Alameda FCC. The receiving water monitoring is not a BMP to improve the slough DO conditions, but is intended to collect data on the slough conditions and to identify the potential effects of the pond discharges. The slough data may be used to evaluate whether the slough conditions meet water quality objectives. The current discharge permit requires monthly receiving water monitoring. The frequency of the monitoring would be increased to provide additional data on receiving water conditions and the effects of the discharge.

2. Adjust Discharge Flow- When pond DO levels are less than the established discharge trigger, the discharge flow may be decreased to reduce the potential effects of the discharge in the receiving waters. Decreasing discharge flows is a reasonable corrective action for DO since the action (response) can be made proportional to the observed problem and since is likely to have an immediate effect. The degree of flow reduction should be related to the observed DO levels in the slough, diurnal fluctuations, and tidal cycles. Records would be kept of continuous monitoring data for the discharge and any slough monitoring data, as well as, the tide levels, pond water level, and gate settings. The records will be used to evaluate the effects of the discharge and to refine future operation plans.

3. Monthly Discharge Timing- When conditions result in ponds operating near the DO trigger, if overnight DO levels in the pond are expected to be low, the outlet gates could be adjusted based on the monthly tidal cycles to cease discharge during periods with higher high tides during the day and allow discharge during periods with higher high tides at night. Selecting periods for discharge with high tides at night would reduce the volume of discharge during the night when pond DO levels may be lower than ambient slough conditions.

4. Daily Discharge Timing- During summer, the best discharge time is from approximately 10 a.m. to 10 p.m. Depending on the daily tide cycle, the daily discharge volume may be released in less than an entire day. As daily discharge timing is not practicable due to limited staff availability, if overnight DO levels in the pond are expected to be low and this corresponds with weak tide periods, the outlet gates could be adjusted weekly to allow discharge only during periods when discharge is mostly during the day, when pond DO levels are higher and this corresponds with stronger tides. A higher high tide during the discharge period would reduce the outlet volume. Increased discharge flows at low tide to allow for this discharge timing may increase salinity locally in the receiving waters during the discharge periods. If the discharge timing reduces the overall daily outflow volume, the reduced flow would decrease circulation flows and may increase

salinity in the discharge pond. Therefore, the BMP for DO control may adversely affect the salinity control and must allow for conservative management.

5. Temporarily Cease Discharge- Temporarily stopping the pond discharge would prevent any effects on DO conditions in the receiving waters. However, long periods without circulation through the ponds would increase salinity conditions in the ponds. Without inflows to replace evaporation losses, the salinity in the B2 or B2C subsystems may double in four to six weeks, depending on weather conditions. This would likely have substantial adverse affects on the biological resources associated with the ponds and may also create substantial odor problems for the neighboring communities as the pond bottom dries, and may also have a negative effect on gypsum formation in the pond, as well as future salinity conditions in the pond when the pond is refilled. If a system pond may be closed off for extended periods without inflow, the pond should be allowed to be drained to avoid hypersaline conditions.

6. Installation of Baffles- A series of flow diversion baffles could be installed at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake. This measure may be appropriate in circumstances where deeper borrow ditches are conveying pond waters to the discharge, and when there is significant algae build up in the pond and particularly at the discharge.

7. Mechanically harvest dead algae- Dead algae could be harvested where it is accumulating near the discharge location. If extensive mats are noted in the pond, mechanically harvesting dead algae on a pond wide basis would not be practicable. However, harvesting dead algae where it is accumulating near the discharge location could be performed in conjunction with installation of baffles to prevent build up.

8. Aeration- Aeration could occur within the discharge ponds near the outlet structures following installation of bubbler/diffuser systems or floating mechanical aerators. The effectiveness of such aerators is currently being evaluated by U.S. Fish and Wildlife Service in the Alviso ponds. Limitations with such a measure include the following: Cost of acquiring, maintaining and operating aerators, floating aerators typically require water depths of 6 feet or more and diffuser systems are more effective with deeper water than the two feet or lower depths in ponds 2 and 2C. Aeration systems would require design studies to evaluate the size and configuration of the aeration equipment and preferred operation. Construction for aeration at the discharge structures would also require an evaluation of electrical supplies, pond dredging, and segmentation of a portion of the pond to control aeration ‘contact time’. Implementation of an aeration program would require six months to a year to implement, and would only be implemented if the aerators being installed at the Alviso ponds are shown to be effective.

pH Control

The pH of the discharge is related to the DO of the discharge. If the pH of the discharge falls outside the range of 6.5-8.5 an analysis of the impact of discharge pH on the receiving water waters will be performed. If pH in the receiving waters exceeds 8.5, samples for ammonia will be collected from the receiving waters for analysis. If it is determined that discharge is impacting receiving water pH, the above corrective measures will be implemented.

Avian Botulism Control

If summer monitoring shows that DO levels in the pond drop to one mg/L, circulation will be increased as described above, to attempt to improve water quality conditions and prevent conditions which may result in avian botulism. Additionally, to reduce the likelihood of a severe outbreak of this disease, when large numbers of dead bird carcasses are found in the ponds or discovered in nearby receiving waters, coordinated regional efforts will be made to promptly collect and bury or burn carcasses.

Mobilization of Inorganics and/or the Methylation of Mercury Control

The operations plan for ponds 1 and 2 includes constant flooding (no change in Redox potential). Inorganics and methyl mercury levels will be monitored as required in the WDRs. If levels are found to rise, further analysis of the cause and mitigation measures will be developed if the need arises. If summer water levels in ponds 4 or 7 are found to increase methyl mercury levels, DFG will notify the Regional Water Quality Control Board (RWQCB) and consult to determine the best approach to addressing the issue.

In late summer and early fall of 2003 and 2004, USGS completed baseline sampling of sediments for total mercury and methyl mercury in the Eden Landing (Baumberg Complex) ponds. USGS analyzed 20 composite sediment samples from Eden Landing salt ponds collected in January 2005. Overall, total mercury concentrations were low. Pond B1 had one of the highest total mercury concentration in the study. Concentrations of methyl mercury were lowest in this system in B7. Further sampling and analysis of the situation is being conducted at this time. Summarizing comparison among all seasons and ponds during 2003 – 2005, for total mercury, no Eden Landing pond contained concentrations exceeding 1.0μg/g. On average, methyl mercury concentrations did not differ significantly between seasons among ponds sampled in both seasons. Pre- and post discharge data are not yet sufficient to determine the potential impacts of management operations. Additional samples will be collected in winter 2005-2006 and again in late summer 2006, and focus on locations where depth gradients result in exposed mudflats in portions of these ponds, as well as locations which contained the highest levels of methyl mercury prior to discharge and are now being managed as seasonal. If summer water levels in Ponds B4 and B7 are found to increase methyl mercury levels, according to the methyl mercury study done by USGS, the Department will notify RWQCB and consult to determine the best approach to addressing the issue.

Monitoring and Adaptive Management Action Plan

Pond Management Monitoring

The system monitoring will require weekly site visits to record pond and intake readings of salinity and pond water levels. Monitoring will also include visual inspections to locate potential algae buildup or signs of avian botulism, as well as inspections of water control structures, siphons and levees. The management monitoring parameters are listed below.

Weekly Monitoring Program for Pond Management

Pond Location	Parameter
1	Pond Water Level, Salinity, Gate Settings, Pump Operations
7	Pond Water Level, Salinity, Gate Settings
4	Pond Water Level, Salinity, Gate Settings
2	Pond Water Level, Salinity, Gate Settings
6	Pond Water Level, Salinity, Gate Settings
5	Pond Water Level, Salinity, Gate Settings
6C	Pond Water Level, Salinity, Gate Settings
4C	Salinity, Gate Settings
1C	Pond Water Level, Salinity
5C	Pond Water Level, Salinity
3C	Pond Water Level, Salinity
2C	Pond Water Level, Salinity, Gate Settings

Water Quality

The Water Board discharge permit requires additional water quality monitoring. The specifics of the water quality monitoring program are detailed in the Self Monitoring Program document. A summary is presented below:

Continuous Pond Discharge Sampling: Continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, CO) installed in ponds prior to their initial discharge dates, typically in place May through November. Salinity, pH, temperature, and dissolved oxygen collected at 15-minute intervals with a sensor and circulator warm-up period of 2 minutes. Data downloaded weekly and Sondes were serviced to check battery voltage and data consistency.

Receiving Water Sampling (Initial Release and Continuous Circulation):*Bay receiving water* quality measurements collected after initial discharge and then monthly in San Francisco Bay outside the water control structure in ponds from July 2004 until October 2004.

Pond Management Sampling (for Initial Release and Continuous Circulation): In-pond water quality measurements conducted monthly in discharge ponds. One sampling location to be established for each salt pond; parameters to be measured are salinity, pH, turbidity, temperature, and dissolved oxygen. Readings collected from the near-surface at a depth of approximately

25cm. This was conducted in 2004 from May through July 2004 (i.e., two months prior to the initial discharge of ponds) and continued through the summer months, and repeated for 2005.

Chlorophyll-a sampling (for Continuous Circulation Monitoring): USGS collected chlorophyll samples monthly in Baumberg salt ponds in September and October 2004. Chlorophyll-a sampling was discontinued for 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples to be collected annually, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels).

Communication of Monitoring Results and Violations

During the 2004 monitoring season, some data gaps resulted due to greater-than-expected water level fluctuations and due to down-time for the continuous data recorders to allow for maintenance and poor communication regarding potential water quality violations were also noted. To address these issues, communications protocols have been improved and monitoring devices have been installed in more appropriate locations and water depths. Spare data recorders have also been purchased to replace devices during servicing periods.

The Department is required by the Final Order to contact the RWQCB when violations occur. The Department must contact the RWQCB to alert them about the potential DO violations. Standard Provisions and Reporting Requirements, state that the Department must notify RWQCB staff by phone within 24 hours, and follow-up with a written report within 5 business days, of receiving and reviewing the data. While there were difficulties and misunderstandings in complying with these requirements in 2004, it is not anticipated to be an issue in 2005.

The USGS will forward raw data to the Reserve Manager the day it is collected. The Reserve Manager will call the RWQCB within 24 hrs of receiving the information to alert them of a potential violation. Once the USGS has had time to analyze the data and delete false readings from the data set, the reserve Manager will contact the RWQCB staff via phone and follow up with via email with information regarding the status of the potential violation.

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Operation Plan -- Baumberg Complex Pond System 8A

Hayward, Alameda County
(Revised December 2005)

Regional Water Quality Control Board
San Francisco Bay Region
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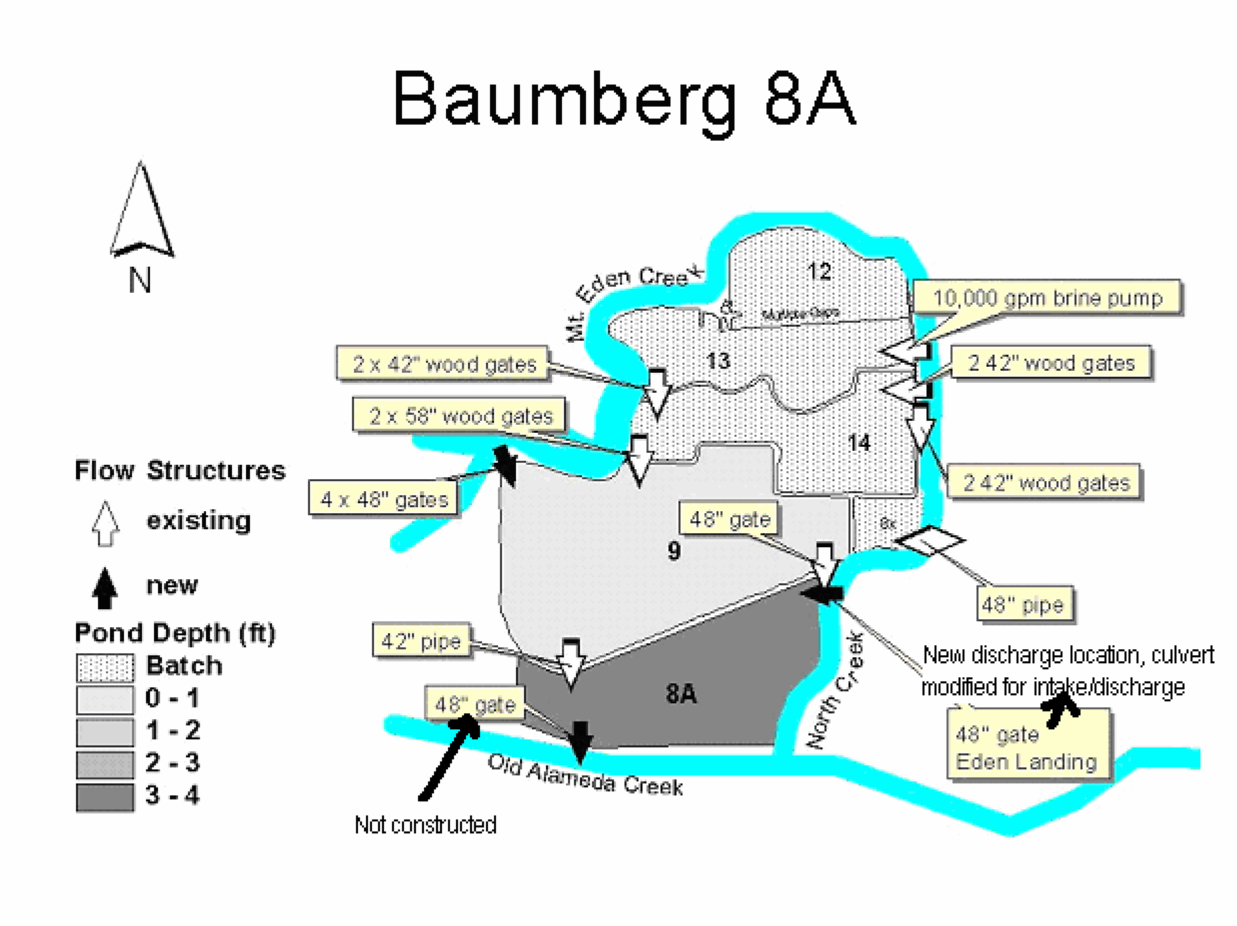

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Summary of Changes from ISP System Design

Due to high construction costs, the new discharge structure described in the ISP at Pond 8A was not built. The supplemental intake gate in the northeast corner of Pond 8A was retrofitted to act as an intake/discharge structure. The change is not expected to materially affect operations or potential impacts described in the ISP or Report of Waste Discharge.

It should be noted that all of the ponds in the system were operated as batch ponds for the existing salt making operations. In 2001 and 2002 during the construction for North Creek and the Eden Landing restoration, salinity levels in the system were higher than in previous years. It was expected that the water in North Creek would be diluted by rainfall. Delays in construction on the Eden Landing Restoration Project and allowing time for treatment of non-native *Spartina alternaflora* and its hybrids may have led to an unanticipated rise in salinity in the North Creek channel; the source of North Creek water was Pond 8A and has only since had rainfall added. Leaching of salts from the new levees may have also contributed to the salts in the channel. The North Creek channel, along the historic alignment, was constructed by developing a new levee in Pond 8A and topping an existing levee between Pond 8 and 8A by the Mallard, Cargill's floating dredge. As part of the Eden Landing Restoration Plan, the channel was scheduled to be breached to Old Alameda Creek in 2004; the breach was completed April 29, 2005.

The closed channel, still holding water from Pond 8A, had an approximate salinity value of 60 ppt in late-April 2005. Pond 8A itself had slightly lower salinity, approximately 40 ppt. This salinity level was likely lower than the waters in North Creek because the transfer standard for Pond 8A resulted in the pond being transferred "dry" and residual salts were diluted by rainfall since the pond has a large surface area compared to the North Creek channel, and limited intake had occurred via flows originating from the Pond 9 intake structure during the previous winter when intake salinity was under 30 ppt. After discussion with RWQCB staff, we treated the breach of North Creek to Old Alameda Creek as an initial release from Pond 8A and followed the monitoring requirements of the Final Order for this breach. The volume of water from this release was less than 10% of the 8A system waters described in the ISP, although since it was an uncontrolled release in a 150-foot breach rather than via water control structure discharge, the water was released in a shorter period of time, and residence time in the Old Alameda Creek receiving waters was expected to be much shorter duration. Once the "breach" initial release was completed, operation of the 8A system began.

Introduction

This Operations Plan describes the management activities required to meet the overall goals and objectives described in the Initial Stewardship Plan and the requirement of the Regional Water Quality Control Board's (RWQCB) Final Order. A detailed description of System 8A as it is presently configured and expected to function is shown in the System Description section. Summer and winter management activities are shown in the Management section, and the specific corrective measures required to adaptively manage the system are described in the Operations, Constraints, and Corrective Measures section.

Eden Landing Ecological Reserve (Baumberg Complex) Location

The Baumberg ponds consist of a 5,500-acre complex of evaporator ponds (B1-B14 of Figure 1) in the East Bay west of Hayward and Union City in Alameda County. Since the complex contains only evaporators, brine historically has been pumped for final treatment to the Newark plant or to the Redwood City plant through a pipeline paralleling the Dumbarton Bridge. The approach to the San Mateo Bridge and the Eden Landing Ecological Reserve, formerly known as the "Baumberg Tract," forms the northern boundary of the complex. The reserve was established in May 1996 to restore former salt ponds and crystallizers to tidal salt marsh and seasonal wetlands. Alameda Creek Flood Control Channel (also known as Coyote Hills Slough) and the Coyote Hills form the southern boundary. The Baumberg ponds were designated by regulation changes, Section 630, Title 14, California Code of Regulations, to be part of the Eden Landing Ecological Reserve.

Major drainages that discharge into the San Francisco Bay within the complex include Mount Eden Creek, Old Alameda Creek, and Alameda Creek Flood Control Channel. Alameda Creek Flood Control Channel diverges from Old Alameda Creek in Union City to provide bypass capacity during large floods. Several hundred acres of extant tidal marsh front the San Francisco Bay, known as the Whale's Tail Marsh at the center of the complex. The marsh is located outboard of ponds 9, 8A, 2, and 1, where Mount Eden Creek and Old Alameda Creek discharge into the Bay. Prior to the acquisition, all ponds within this complex were under Cargill ownership and have now been transferred to DFG.

Pond System 8A

Is relatively large, 1,008 acres in size. See Table 1 for the acreages and bottom elevations of the individual ponds in the 8A System. These Ponds are most easily accessed from the Eden Landing Road gate.

Table 1. Pond Size and Bottom Elevations

Pond	Area (acres)	Bottom Elevation (ft NGVD)
9	356	2.6
8A	256	4.0
12	99	2.9
13	132	3.1
14	156	3.5
Total/Average	1,008	3.0

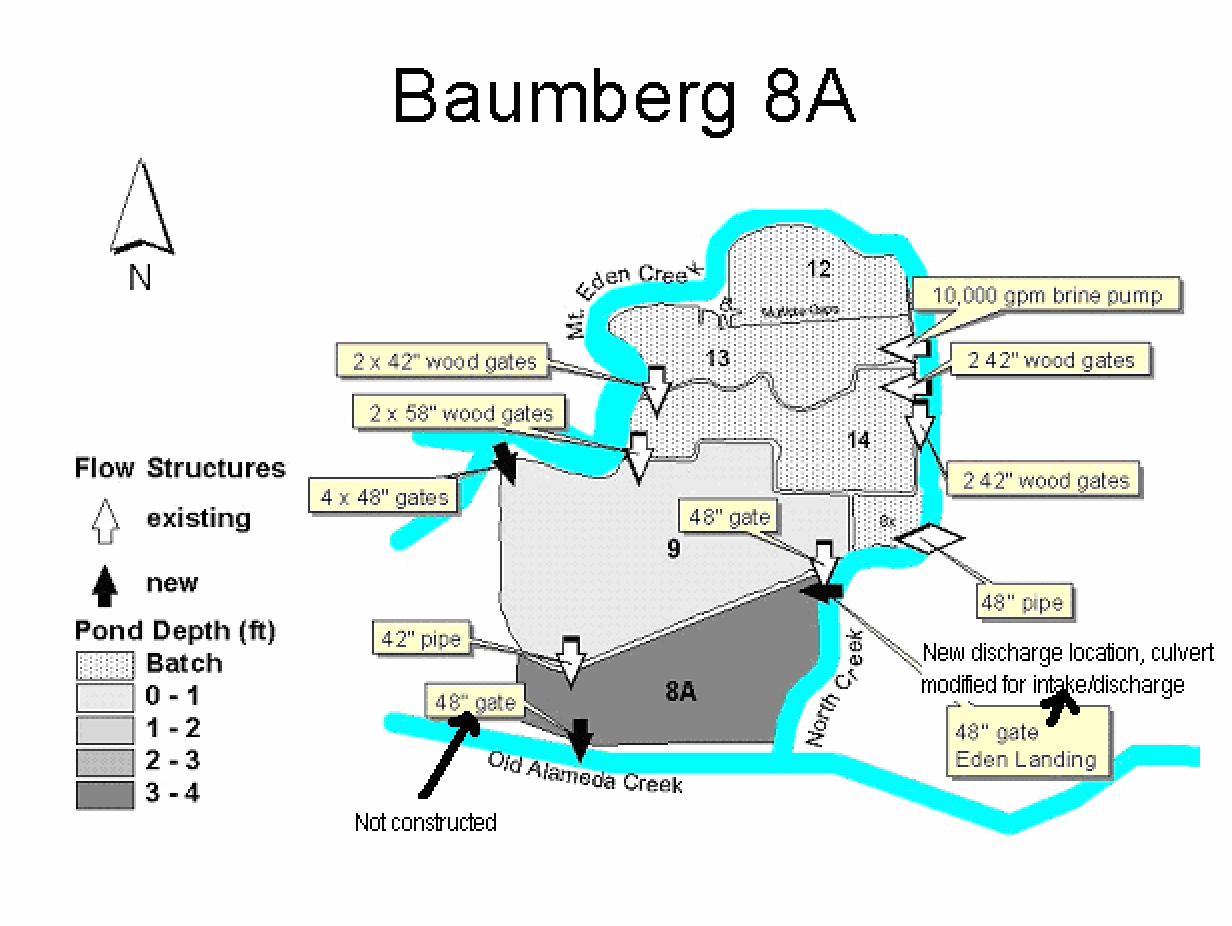
Biological Resources

Various waterbird species are known to use the Pond 8A System; management and operations plans have been specifically designed to provide suitable habitat for numerous waterbird species and avoid adverse impacts. Since Ponds 9 and 8A would be managed ponds with year-round open water, shorebirds would use shallower pond areas, while waterfowl and wading birds may use deeper pond areas. Summer operations will likely only provide open water in Pond 8A within the borrow ditches because it has a high bottom elevation. Pond 8A may be managed as muted tidal. The ponds would be managed to have low salinity in the spring and maintain salinity within continuous circulation salinity levels during the summer. Ponds 12, 13 and 14 would be seasonal ponds with open water during the winter, but would become dry during the summer. Pond 8x is a small pond that would be used as a batch pond reservoir for the 10, 000-gpm pump (aka #2 Brine Pump) to provide water for ponds 12, 13 and 14 to provide suitable water levels for waterbirds during the fall migration season, or would be operated as muted tidal resulting in shallow water and mudflat habitat. Ponds 12, 13 and 14 would typically be filled in November with the onset of rainfall and increased gravity inflow.

The ponds of this system are characterized by various salinities, ranging from low to medium, constant ponding of less than one foot in system ponds (9, 8A) and draw down would be allowed in other ponds (8x, 12, 13 and 14). In the winter, this pond system would typically support abundant waterfowl including bufflehead, scaup, Northern shoveler, and ruddy duck; and picivorous birds may find suitable habitat, such as double crested cormorant, gull, white pelican, and terns. A number of these species may be observed using the ponds during the summer as well, depending on pond conditions. The largest concentration of nesting and over-wintering snowy plovers are found in the area north of Alameda Creek, some of which are managed to provide suitable habitat for snowy plovers. The seasonal ponds in the 8A system may be used by snowy plovers for nesting and foraging during the spring/summer, and shallower ponded areas may also be used by snowy plovers during the winter. The higher salinity (batch) pond operations could provide high prey densities of brine shrimp, brine flies and reticulate water boatmen to benefit salt pond specialist species such as phalaropes and eared grebes.

Given shallower pond depths in a number of the ponds that would result from limited intake in high pond bottom areas, especially important during the spring and fall migrations, management operations would be transitioned according to such seasonal use to provide optimum habitat conditions. These ponds may be heavily used by shorebirds for foraging areas, as are other shallower ponds in the system. Shorebirds and other waterbirds may also use these ponds for roosting, which may occur on the un-vegetated levees within the system and on remnants of wooden structures. The Pond 8A system may support fish populations in system ponds. No restrictions on intake are expected since salmonid entrainment is not anticipated to be an issue, as Old Alameda Creek is not suitable spawning habitat due to the barrier to passage that is found at the 20 Tide Gate crossing structure approximately 3 miles upstream from the mouth. North Creek is similarly not suitable for salmonids. Once North Creek is breached into the Eden Landing restoration site and vegetated tidal marsh develops, nursery habitat for fish may be provided, but salmonid use is not expected. For a more complete discussion of these species and potential occurrence, see the Final EIR/EIS for the South Bay Salt Ponds Initial Stewardship Plan (April 2004).

System Description



Objectives

- Establish tidal circulation through ponds 9 and 8A
- Allow portions of 8A to dry-down in summer
- Establish ponds 12, 13, and 14 as seasonal ponds or winter batch ponds
- Manage for different water surface elevations summer vs. winter
  Summer water elevations lower than winter elevations to increase gravity inflow
- Operate water levels lower than exiting levels
- Maintain discharge salinity at levels below 40 ppt
- Allow reversal of intake and outlet flow to better maintain constant water levels, drain ponds after storm events, or serve as a contingency should gates fail.

Structures:

- New 4x48" gated intake at pond 9 from Mount Eden Creek
- Existing internal connections from
  Pond 13 to 14, 2x42" wood gates
  Pond 14 to 9, 2x58" wood gates
  Pond 9 to 8A, 42" pipe and 48" gate
- Existing multiple levee gaps between pond 12 and 13 (abandoned levee)

- Existing 10,000 gpm brine pump (aka #2 Brine Pump) at pond 13 would be used as an intake pump from pond 8x or from Mount Eden Creek extension to pond 13
- Possibly modify connections from pond 9 to 8A to include fixed weirs
- Retrofit 48" supplemental intake gate at 8A from North Creek to allow discharge (constructed as part of Eden Landing Ecological Reserve Restoration project)
- Existing staff gages in all ponds

System Description

System Ponds

The system 8A intake is located at the northwest end of pond 9 and includes four 48" gates from Mount Eden Creek near the bay. Due to high construction costs, the new discharge structure described in the ISP at Pond 8A was not built, rather, the system outlet is located at the northeastern end of pond 8A, with one 48" gate into North Creek; this supplemental intake gate in Pond 8A was retrofitted to act as an intake/discharge structure. This change is not expected to materially affect the operations or potential impacts described in the ISP or Report of Waste Discharge. The normal flow through the system is from pond 9 to 8A. Flow from pond 9 to 8A is controlled by two gates, a 42 pipe on the west, and a 48" gate on the east. The existing structures from pond 9 to 8A may need to be replaced and could include fixed weirs to maintain a minimum depth in pond 9, if necessary. The existing system is expected to function adequately.

Ponds 9 and 8A have different operating conditions for the summer and winter. Due to the elevation of the ponds, the inflows are limited to high tides. The operating water levels in the ponds would be lower during the summer to increase the gravity inflow into the system during the higher evaporation season. The water level in pond 9 would be approximately 3.4 ft NGVD during the summer, and 4.6 ft NGVD during the winter. During the summer, the majority of the pond bottom in 8A would be dry, but the borrow ditch areas will convey water. Since Pond 9 has a lower bottom elevation than Pond 8A, the minimum water level in pond 9 would be controlled by adjusting intake and discharge gates, rather than at the connections to pond 8A. The pond connections are culverts rather than fixed weirs, as described in the ISP, and are currently not operable. The western culvert gate is rusted open, and the eastern culvert gate is rusted closed. It is anticipated that because of the different pond bottom elevations, active management will be required to achieve target water levels via adjusting intake and discharge gates. Because of the high bottom elevations in pond 8A, it would be only partially wet during the summer.

Seasonal Ponds

Ponds 12, 13, and 14 are seasonal ponds expected to partially fill with rain water during the winter and to evaporate completely during the summer. The rainfall may be supplemented with water from North Creek, if needed and could receive water from Mt. Eden Creek if a berm is modified. Pond 8x includes a culvert to North Creek (slide gate on North Creek and weir box in 8x) to build up a batch water supply for the brine pump at pond 13. Pond 8x may be operated as muted tidal and provide very shallow water levels and mudflat. The typical bottom elevations in pond 8x are above normal high tides, but the borrow ditch areas will convey water regularly.

Management Operations

Pond 8A, with the retrofitted culvert in the north-east corner, will act as a supplemental intake pond under the ISP during the summer, the main intake being located in the north-west corner of Pond 9. Pond 9 currently has very limited intake capability due to the constricted channel in the historic Mt. Eden Creek, which is largely high marsh dominated by perennial pickleweed. Once Mt Eden Creek is restored to tidal action and a small channel is excavated to connect Mt. Eden Creek to the Pond 9 intake structure, the Pond 9 structure will provide the primary intake capability. In the interim, the retrofitted culvert in the north-east corner of 8A, will act as the main tidal intake via North Creek.

Summer Operation

The summer operation is intended to provide circulation flow to makeup for evaporation during the summer season. The summer average total circulation inflow is approximately 38 cfs, or 76 af/day. The summer operation would normally extend from May through October.

Summer Gate Settings

* to be determined in field

Gate	Setting (% open)	Setting (in, gate open)
9 intakes	100	*
9 – 8A	100	*
8A intake	100	*
8A outlet	100*	*
13 - 14	0	
14 - 9	0	

Winter Operation

The winter operation is intended to provide some circulation flow and to maintain the water levels in ponds 9 and 8A near the historic levels for habitat values. The winter operation period would normally extend from November through April.

Winter Gate Settings

* to be determined in field

Gate	Setting (% open)	Setting (in, gate open)
9 intakes	100*	
9 – 8A	100*	
8A intake	100*	
8A outlet	100*	
13 - 14	100*	
14 - 9	0*	

Operation, Constraints, and Corrective Measures

Operation

System 8A includes salinity group 3 ponds and would have a maximum initial discharge salinity of 135 ppt. If the salinity in the system were at the maximum at the start of bay water circulation, the discharge salinity would start at 135 ppt and decrease to be similar to the modeled conditions in a few months. Since we are treating the breach of North Creek to Old Alameda Creek as an initial release from Pond 8A, we expect that the proposed operations, as described herein, would result in less initial discharge volume of lower salinity and a shorter residence time in the receiving waters than as described in the ISP. We expect the monitoring results to confirm this outcome, and are following the monitoring requirements of the Final Order for this breach, because the volume of water from this release is less than 6% of the 8A system waters described in the ISP and is also lower salinity. The main difference in the proposed operations and the operations described in the ISP is that initial release is via an uncontrolled discharge in a 150-foot breach rather than via a water control structure discharge. The water will be released in a shorter period of time, and residence time in the Old Alameda Creek receiving waters is expected to be much shorter duration. After the "breach discharge" is completed, continuous circulation operations will be implemented.

Constraints

The primary constraint in operating this system is the ability to bring adequate Bay water into the ponds particularly in summer to keep salinities below 40 ppt. The operation plan attempts to address this by managing water levels lower than existing conditions for salt making and by operating the system as muted tidal via the intake/discharge structure in Pond 8A. Muted tidal operations will help ensure pond salinities are low at the end of the rainy season and to maintain sufficiently low salinities until the onset of the next season's rainfall. During the summer evaporation season, the ponds must operate at a lower water level to maximize the inflows to the system to maintain continuous discharge salinities because of the high bottom elevations. The low summer water levels will provide habitat conditions according to management goals for shorebirds, including breeding habitat for western snowy plover.

While the Pond 8A system may support fish populations in system ponds, no restrictions on intake are expected since salmonid entrainment is not anticipated to be an issue. Old Alameda Creek is not suitable spawning habitat due to the barrier to passage that is found at the 20 Tide Gate crossing structure approximately 3 miles upstream from the mouth. North Creek is similarly not suitable for salmonids as it is only a 1 mile long tidal slough and currently ends at the levee boundary of the Eden Landing restoration site. While the levee may be breached in the fall of 2005 to restore tidal action into the site, it will take a number of years for vegetated marsh to develop due to low elevations in the former crystallizer ponds, and would only provide open water and potential fish nursery habitat, but not suitable spawning habitat.

Corrective Measures

Summer Water Level Control

The water levels in system 8A are expected to be actively managed during the summer. In pond 9 the water level will be controlled by adjusting intake and discharge gates, rather than the two fixed weirs at the connections to 8A that were described in the ISP. The four intake gates are expected to be set fully open to allow as much inflow as possible. Muted tidal operations via the intake/discharge structure in 8A will help ensure pond salinities are low. During periods of low tides, the water level in pond 9 may drop below the target elevation due to evaporation from the pond exceeding intake capability, but salinity is expected to remain near 40 ppt.

During the summer, pond 8A would be mostly dry although waters will be maintained in the borrow ditches. The inflows from pond 9, with the supplemental intake at the intake/discharge structure are expected to provide circulation within the borrow ditches. The average water level in the borrow ditches would be approximately 2.0 ft NGVD, but may vary by as much as one foot higher or lower due to tides. The average bottom elevation for pond 8A is 4.0 ft NGVD.

The water levels in ponds 12, 13, and 14 would generally be affected by seasonal rainfall and the ponds are expected to be dry during the summer.

Winter Water Level Control

The water level in 8A is the primary control for the pond system. The system flow is limited by the intake capacity. Normal winter operation would have the intake gate fully open. Water levels would be controlled by the outlet gate setting. The normal water level in 8A should be at 4.5 ft NGVD. The level may vary by 0.2 ft due to the influence of weak and strong tides, storm tides, and rainfall inflows.

Salinity Control

The summer salinity in the system will increase from the intake at pond 9 to the outlet at 8A, due to evaporation within the system. The design maximum salinity for the discharge at 8A is 40 ppt. In case of increasing salinity in ponds 9 and 8A, the method to increase the intake flow and control salinity is to maintain muted tidal operations via the Pond 8A intake/discharge structure. During an extreme event such as gate failure or other problems, Pond 8A can completely drained and closed off from intake, and pond 9 may be drained back to Mount Eden Creek via two combination gates on the inboard side or could be allowed to evaporate. The residual salt would be dissolved and diluted in the next winter season and would be expected to be suitable for discharge. Because the discharge pond acts as muted tidal in the borrow ditches, the discharge salinity will be at or above the salinity in Old Alameda Creek during the summer in most years.

Dissolved Oxygen Control

To ensure that dissolved oxygen levels at the 8A discharge is not degrading receiving waters below Basin Plan objectives, a revised "trigger" for the continuous release is included in the operation plan. If dissolved oxygen levels at a pond discharge fall below the trigger value, Best Management Practices (BMPs) listed in this Operations Plan must be implemented.

The DO trigger is if dissolved oxygen at the discharge falls below the 10^{th} percentile of 3.3 mg/L (calculated on a weekly basis). This 10^{th} percentile trigger is based on dissolved oxygen levels found in Artesian Slough in July 1997. These values are the most relevant representation of natural dissolved oxygen variations in sloughs or lagoon systems currently available. The numerical DO trigger may be revised as additional monitoring data becomes available. Any revision shall be approved by the RWQCB.

A letter from the RWQCB, dated March 25, 2005, described this DO trigger for reporting and action. Therefore, in evaluating compliance with the dissolved oxygen limit contained in Order

No. R2-2004-0018, the Department will consider it a trigger for reporting and action if, at the point of discharge, the 10th percentile falls below 3.3 mg/L (calculated on a calendar weekly basis).

If a trigger event occurs, the discharger shall make a timely report to the Water Board, and implement BMPs described in this Operations Plan, as appropriate. These adaptive management techniques may include additional monitoring, controlling the flow rate of the intake or discharge, controlling the timing of the discharge, installation of baffles, aeration, or temporarily suspending the discharge. Timely notification is intended to be 24 hours after the monitoring/sample results are available.

BMPs include the closing of the discharge during periods of time when the diurnal pattern suggests that DO would be below the trigger (3.3 mg/L). For analysis of the 2004 data, as reported in the 2004 Self-Monitoring Report, ceasing discharge from 10pm to 10 am would avoid most of the excursions from the limit. If overnight DO levels in the pond are low, the outlet gates could be adjusted daily to allow discharge only during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m.

In the October 5, 2005 letter from regarding File No. 2199.9438 (RS), which requested the revisions/corrections incorporated herein, RWQCB stated that the Department should implement a DO corrective measure (BMP) that ceases nighttime discharges if the weekly 10th percentile value of pond discharge shows the trigger value of 3.3 mg/L, unless a more effective alternative can be implemented.

Daily discharge timing is not practicable due to staff and budget constraints. However, a similarly effective alternative can be implemented during periods when the weekly 10th percentile is at or below the trigger value. The alternative to daily discharge timing is weekly discharge timing. Closing the discharge for a period of days when overnight DO levels in the pond are known to be or are expected to be low, particularly when this corresponds with periods when overnight tides are low and would result in the majority of discharge volume, and/or with weak (neap) tide periods when intake is more limited, would provide equivalent protection of receiving waters as would daily closure of the outlet gates. By adjusting discharge gates on an approximately weekly basis (with the number of days being depending on duration of the neap tide cycle), this would allow for periods when no discharge would occur, or discharge would occur only during periods when discharge is mostly during the day, when pond DO levels are higher.

A possible consequence of ceasing discharge, while not resulting in discharge of low DO pond waters to receiving waters, is prolonged periods of depressed DO levels due to more limited intake, since without discharge pond water levels are higher and thereby duration and volume of intake is reduced. It appears that reducing residence time of water in the ponds improves overall DO levels. Therefore, allowing discharge, even at reduced volumes, would provide for some increased volume of intake. A discharge gate can be set to allow reduced discharge volumes versus discharge volumes that would be expected for normal operations. For example, a gate could be set at approximately 10 percent open (vs. normally 20% open) during strong (spring) tide periods, when the weekly 10th percentile is at or below the trigger value. Reduced discharge settings would reduce the volume of discharge water entering the receiving waters, and correspondingly minimize the extent to which low DO discharges could potentially affect receiving water quality. These reduced discharge volumes would allow for greater exchange of intake waters, since pond water levels would be lower than if no discharge occurred, which may also help to raise DO values.

Dissolved Oxygen BMPs

As noted above, there are a range of BMPs available to reduce potential impacts to the dissolved oxygen levels in the receiving waters. These BMPs are discussed below (Evalution of the effectiveness of the BMPs is shown in the Revised Self Monitoring Report- 2004):

1. Slough Monitoring- Additional monitoring data may be collected in the Bay or Old Alameda Creek. The receiving water monitoring is not a BMP to improve the slough DO conditions, but is intended to collect data on the slough conditions and to identify the potential effects of the pond discharges. The slough data may be used to evaluate whether the slough conditions meet water quality objectives. The current discharge permit requires monthly receiving water monitoring. The frequency of the monitoring would be increased to provide additional data on receiving water conditions and the effects of the discharge.

2. Adjust Discharge Flow- When pond DO levels are less than the established discharge trigger, the discharge flow may be decreased to reduce the potential effects of the discharge in the receiving waters. Decreasing discharge flows is a reasonable corrective action for DO since the action (response) can be made proportional to the observed problem and since is likely to have an immediate effect. The degree of flow reduction should be related to the observed DO levels in the slough, diurnal fluctuations, and tidal cycles. Records should be kept of continuous monitoring data for the discharge and any slough monitoring data, as well as, the tide levels, pond water level, and gate settings. The records will be used to evaluate the effects of the discharge and to refine future operation plans.

3. Monthly Discharge Timing- The intake/outlet structures have reserve capacity for discharge. If overnight DO levels in the pond are low, the outlet gates could be adjusted based on the monthly tidal cycles to cease discharge during periods with higher high tides during the day and allow discharge during periods with higher high tides at night. Selecting periods for discharge with high tides at night would reduce the volume of discharge during the night when pond DO levels may be lower than ambient slough conditions.

4. Daily Discharge Timing- If overnight DO levels in the pond are low, the outlet gates could be adjusted daily to allow discharge only during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m. The actual period may be shorter to allow for operator schedules. Depending on the daily tide cycle, the daily discharge volume may be released in less than an entire day. As daily discharge timing is not practicable due to limited staff availability, if overnight DO levels in the pond are expected to be low and this corresponds with weak tide periods, the outlet gates could be adjusted weekly to allow discharge only during periods when discharge is mostly during the day, when pond DO levels are higher and this corresponds with stronger tides. A higher high tide during the discharge period would reduce the outlet volume. Increased discharge flows at low tide to allow discharge timing may increase salinity locally in the receiving waters during the discharge periods. If the discharge

timing reduces the overall daily outflow volume, the reduced flow would decrease circulation flows and may increase salinity in the discharge pond. Therefore, the BMP for DO control may adversely affect the salinity control.

5. Temporarily Cease Discharge- Temporarily stopping the pond discharge would prevent any effects on DO conditions in the receiving waters. However, long periods without circulation through the ponds would increase salinity conditions in the ponds. With inflows to replace evaporation losses, the salinity in the ponds may double in four to six weeks, depending on weather conditions. Without inflows, the ponds would begin to dry out and be mostly dry in 4 to six weeks with summer evaporation rates. This would likely have substantial adverse affects on the biological resources associated with the ponds and may create odors as the pond bottom dries, and also have a negative effect on gypsum formation in the pond, and future salinity conditions in the pond when the pond is refilled. If the pond system were to be closed off for extended periods without significant inflow, the pond first should be drained to avoid hypersaline conditions.

6. Installation of Baffles- A series of flow diversion baffles could be installed at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake. This measure may be appropriate in circumstances where deeper borrow ditches are conveying pond waters to the discharge, and when there is significant algae build up in the pond and particularly at the discharge.

7. Mechanically harvest dead algae- Dead algae could be harvested where it is accumulating near the discharge location. If extensive mats are noted in the pond, mechanically harvesting dead algae on a pond wide basis would not be practicable. However, harvesting dead algae where it is accumulating near the discharge location could be performed in conjunction with installation of baffles to prevent build up.

8. Aeration- Aeration could occur within the discharge ponds near the outlet structures following installation of bubbler/diffuser systems or floating mechanical aerators. The effectiveness of such aerators is currently being evaluated by U.S. Fish and Wildlife Service in the Alviso ponds. Limitations with such a measure include the following: Cost of acquiring, maintaining and operating aerators, floating aerators typically require water depths of 6 feet or more and diffuser systems are more effective with deeper water than the shallow summer depths in ponds 8A and 9. Aeration systems would require design studies to evaluate the size and configuration of the aeration equipment and preferred operation. Construction for aeration at the discharge structures would also require an evaluation of electrical supplies, pond dredging, and segmentation of a portion of the pond to control aeration 'contact time'. Implementation of an aeration program would require six months to a year to implement, and would only be implemented if the aerators being installed at the Alviso ponds are shown to be effective.

pH Control

The pH of the discharge is related to the DO of the discharge. If the pH of the discharge falls outside the range of 6.5-8.5 an analysis of the impact of discharge pH on the receiving water waters will be performed. If pH in the receiving waters exceeds 8.5, samples for ammonia will be collected from the receiving waters for analysis. If it is determined that discharge is impacting receiving water pH, the above corrective measures will be implemented.

Avian Botulism Control

If summer monitoring shows that DO levels in the pond drop to one mg/L, circulation will be increased as described above, to attempt to improve water quality conditions and prevent conditions which may result in avian botulism. Additionally, to reduce the likelihood of a severe outbreak of this disease, when large numbers of dead bird carcasses are found in the ponds or discovered in nearby receiving waters, coordinated regional efforts will be made to promptly collect and bury or burn carcasses.

Mobilization of Inorganics and/or the Methylation of Mercury Control

The operations plan for Ponds 8A and 9 includes constant flooding conditions, except in the summer months in Pond 8A which would be mostly dry except in the borrow ditches (no change in Redox potential). The exposed portion of Pond 8A is not expected to result in methylation because the pond bottom has a significant gypsum layer. Inorganics and methyl mercury levels will be monitored as required in the WDRs. If levels are found to rise, further analysis of the cause and mitigation measures will be developed if the need arises. Ponds 12, 13, and 14 are seasonal or batch ponds and Pond 8X may be operated as seasonal, batch or muted tidal. If seasonal pond operations are found to increase methyl mercury levels, DFG will notify the Regional Water Quality Control Board (RWQCB) and consult to determine the best approach to addressing the issue.

In late summer and early fall of 2003 and 2004, USGS completed baseline sampling of sediments for total mercury and methyl mercury in the Eden Landing (Baumberg Complex) ponds. USGS analyzed 20 composite sediment samples from Eden Landing salt ponds collected in January 2005. Overall, total mercury concentrations were low. Concentrations of methyl mercury were highest in this system in B12. Ponds B12 and B14 had concentrations above the average concentration for all Eden Landing samples, and were generally lower than those in the Alviso Complex ponds. Further sampling and analysis of the situation is being conducted at this time. Summarizing comparison among all seasons and ponds during 2003 – 2005, for total mercury, no Eden Landing pond contained concentrations exceeding 1.0µg/g. On average, methyl mercury concentrations did not differ significantly between seasons among ponds sampled in both seasons. Pre- and post discharge data are not yet sufficient to determine the potential impacts of management operations. Additional samples will be collected in winter 2005-2006 and again in late summer 2006, and focus on locations where depth gradients result in exposed mudflats in portions of these ponds, as well as locations which contained the highest levels of methyl mercury prior to discharge and are now being managed as seasonal. If summer water levels in Ponds B4 and B7 are found to increase methyl mercury levels, according to the methyl mercury study done by USGS, the Department will notify RWQCB and consult to determine the best approach to addressing the issue.

Monitoring and Adaptive Management Action Plan

Communications

Communication between the USGS field crew and the Department has been greatly improved. Information is flowing rapidly from the USGS field data collectors to the Department, which in turn is reporting to and discussing issues with the RWQCB staff as they arise. Procedures have been put in place to ensure that all violations will be communicated to the board via phone and/or email within 24 hours of detection.

During the 2004 monitoring season, some data gaps resulted due to greater-than-expected water level fluctuations and due to down-time for the continuous data recorders to allow for maintenance and poor communication regarding potential water quality violations were also noted. To address these issues, communications protocols have been improved and monitoring devices have been installed in more appropriate locations and water depths. Spare data recorders have also been purchased to replace devices during servicing periods.

The Department is required by the Final Order to contact the RWQCB when violations occur. The Department must contact the RWQCB to alert them about the potential DO violations. Standard Provisions and Reporting Requirements, state that the Department must notify RWQCB staff by phone within 24 hours, and follow-up with a written report within 5 business days, of receiving and reviewing the data. While there were difficulties and misunderstandings in complying with these requirements in 2004, it is not anticipated to be an issue in 2005.

The USGS will forward raw data to the Reserve Manager the day it is collected. The Reserve Manager will call the RWQCB within 24 hrs of receiving the information to alert them of a potential violation. Once the USGS has had time to analyze the data and delete false readings from the data set, the reserve Manager will contact the RWQCB staff via phone and follow up with via email with information regarding the status of the potential violation.

Initial Release during North Creek Breach

Delays in construction on the Eden Landing Restoration Project resulted in the postponed North Creek breach date, which occurred April 29, 2005 (originally scheduled to be breached to Old Alameda Creek in 2004). The North Creek channel, along the historic alignment, was constructed by developing a new levee in Pond 8A and topping of an existing levee between Pond 8 and 8A by the Mallard, Cargill's floating dredge. The delay may have contributed to an unanticipated rise in salinity in the North Creek channel. The closed channel had an approximate salinity value of 60 ppt in late-April 2005. Pond 8A itself had slightly lower salinity, approximately 40 ppt. This salinity level was likely lower than the waters in North Creek because the transfer standard for Pond 8A resulted in the pond being transferred "dry" and residual salts were diluted by rainfall since the pond has a large surface area compared to the North Creek channel, and limited intake has occurred via flows originating from the Pond 9 intake structure during the previous winter when intake salinity was under 30 ppt. After discussion with RWQCB staff, we treated the breach of North Creek to Old Alameda Creek as an initial release from Pond 8A and followed the monitoring requirements of the Final Order for this breach. This provided the opportunity to collect data and perform analysis on conditions in receiving waters prior to and after a breach to inform future breach actions.

The volume of water from this release was less than 6% of the 8A system waters described in the ISP, although since it was an uncontrolled release in a 150-foot breach rather than via water control structure discharge, the water was released in a shorter period of time, and residence time in the Old Alameda Creek receiving waters was expected to be much shorter duration. We estimated that the closed North Creek Channel is holding 17,000,800 gallons of water (54-acre feet), which is substantially less than 1,000-2,000-acre feet expected to be held in the 8A System. Because the initial release was through a breach not a culvert, the salinity impacts may be of greater intensity but much shorter duration and less volume and was expected to result in less adverse affects to receiving waters.

Pond Management Monitoring

The system monitoring will require weekly site visits to record pond and intake readings of salinity and pond water levels. Monitoring will also include visual inspections to locate potential algae buildup or signs of avian botulism, as well as inspections of water control structures, siphons and levees. The management monitoring parameters are listed below.

Weekly Monitoring Program for Pond Management

Location	Parameter
9 intakes	Salinity
9	Depth, Salinity, Observations
8A	Depth, Salinity, Observations
12	Depth, Salinity, Observations
13	Depth, Salinity, Observations
14	Depth, Salinity, Observations

Water Quality

The Water Board discharge permit requires additional water quality monitoring. The specifics of the water quality monitoring program are detailed in the Self Monitoring Program document. A summary is presented below. The only variance from the water quality monitoring relates to the pond management samples, taken in the month concurrent with initial release, rather than two months prior. RWQCB staff was consulted and the same-month sampling was acceptable.

Continuous Pond Discharge Sampling: Continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, CO) installed in ponds prior to their initial release dates and through November. Salinity, pH, temperature, dissolved oxygen, etc. is collected at 15-minute intervals with a sensor and has a circulator warm-up period of 2 minutes. Data is downloaded weekly and Sondes are serviced to check battery voltage and data consistency.

Receiving Water Sampling (Initial Release and Continuous Circulation): *slough water* quality measurements were collected prior to initial discharge and then monthly outside the water control structures in ponds, within the slough, from May 2005 until October 2005.

Pond Management Sampling (for Initial Release and Continuous Circulation): In-pond water quality measurements twice monthly in discharge ponds from May through July 2004 (i.e., two months prior to the initial release of ponds. One sampling location to be established for each salt pond; parameters to be measured are salinity, pH, turbidity, temperature, and dissolved oxygen. Readings collected from the near-surface at a depth of approximately 25cm.

Chlorophyll-a sampling (for Continuous Circulation Monitoring): USGS collected chlorophyll samples monthly in Baumberg salt ponds in September and October 2004. Chlorophyll-a sampling was discontinued for 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples to be collected annually, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels).

Communication of Monitoring Results and Violations

During the 2004 monitoring season down-time for the continuous data recorders led to data gaps and poor communication regarding potential water quality violations. Spare data recorders have been purchased to replace devices during servicing.

The Department is required by the Final Order to contact the RWQCB when violations occur. The Department did not contact the RWQCB to alert them about the potential DO violations. Standard Provisions and Reporting Requirements, state that the Department must notify RWQCB staff by phone within 24 hours, and follow-up with a written report within 5 business days.

Raw data will generally be reviewed the day it is collected. The Department will call the RWQCB within 24 hrs of receiving the information to alert them of a potential violation. Once there has been sufficient time to analyze the data and delete false readings from the data set, the Department will contact the RWQCB staff via email with information regarding the status of the potential violation.

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DRAFT
Operation Plan -- Baumberg Complex Pond System 6A (Eden Landing Ecological Reserve) Hayward, Alameda County

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Regional Water Quality Control Board
San Francisco Bay Region
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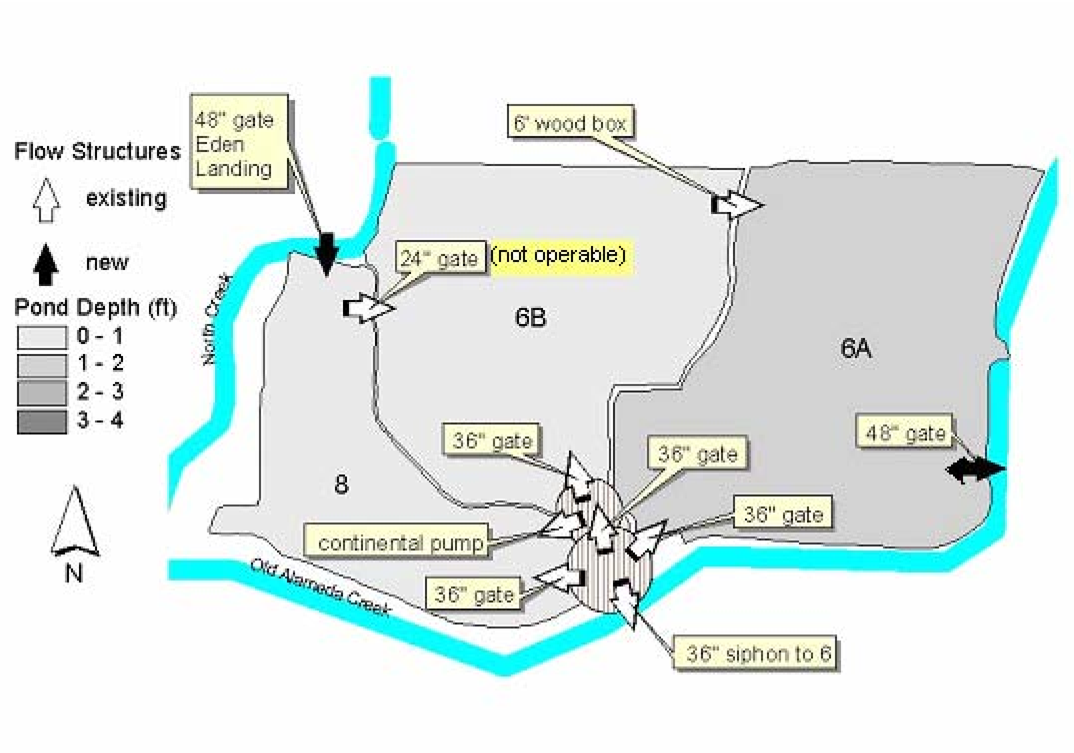

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Introduction

This Operations Plan describes the management activities required to meet the overall goals and objectives described in the Initial Stewardship Plan and the requirement of the Regional Water Quality Control Board's (RWQCB) Final Order. Detailed descriptions of System 6A as it is presently functioning, is shown in the System Description section, Summer and Winter management activities are shown in the Management section, and the specific corrective measures required to adaptively manage the system are described in the Operations, Constraints, and Corrective Measures section.

Eden Landing Ecological Reserve (Baumberg Complex) Location

The Eden Landing Ecological Reserve (Baumberg Complex) ponds consist of a 5,500-acre complex of former evaporator ponds in the East Bay west of Hayward and Union City in Alameda County. Since the complex contained only evaporators, brine historically had been pumped to the Coyote Hills (Newark) ponds and routed from there to the Newark plant or to the Redwood City plant, through a pipeline paralleling the Dumbarton Bridge, for final processing. The approach to the San Mateo Bridge (Hwy 92) and the original 835-acre Eden Landing Ecological Reserve, formerly known as the "Baumberg Tract," forms the northern boundary of the complex. The reserve was established in May 1996 to restore former salt ponds and crystallizers to tidal salt marsh and seasonal wetlands. The site is bordered on the east by residential and commercial areas of the Cities of Hayward, Union City and Fremont. Alameda Creek Flood Control Channel (also known as Coyote Hills Slough) and the Coyote Hills form the southern boundary. San Francisco Bay borders the site to the west.

Major drainages that discharge into the San Francisco Bay within the complex include Old Alameda Creek and Alameda Creek Flood Control Channel. Alameda Creek Flood Control Channel diverges from Old Alameda Creek in Union City to provide bypass capacity during large floods. Several hundred acres of extant tidal marsh front the San Francisco Bay, known as the Whale's Tail Marsh at the center of the complex. The marsh is located outboard of ponds 9, 8A, 2, and 1, where Mount Eden Creek and Old Alameda Creek discharge into the Bay. North Creek, which connects to Old Alameda Creek, is the source of intake at Pond 8, and will also provide tidal flows in the original 835-acre Eden Landing Ecological Reserve, (Baumberg Tract). Prior to the acquisition, all ponds within this complex were under Cargill ownership and have now been transferred to DFG.

Pond System 6A

The Baumberg System 6A consists of 3 ponds: ponds 8 (intake), 6B and 6A (outlet); the acreages and average bottom elevations are shown in Table 1. In addition, the existing control structures include two control ponds ("donuts") located between the three ponds and a pump (Continental Pump) and pump house near Old Alameda Creek. The donuts are shown in the system map, but not to scale, to indicate existing structures and direction of flow. The actual size of the donut ponds are each less than 1 acre. As shown in the plan, the south donut is connected by gated culverts to ponds 8 and 6A, to the north donut and the siphon to pond 6 across Old Alameda Creek. The north donut is connected to pond 6B and the south donut. The north donut was the source for water for the Continental pump, which pumped up into pond 8. For the salt making operations, the control ponds and pump were used to transfer water to and from pond 6.

For the initial stewardship conditions, the pump is not expected to be used and the siphon would not be required. These ponds are most easily accessed from the Veasy Street Gate.

Table 1. Pond Size and Bottom Elevations

Pond	Area (acres)	Bottom Elevation (ft NGVD)
8	180	3.7
6B	284	2.1
6A	340	0.9
Total/Average	804	2.0

Biological Resources

Many waterbird species are known to use the Pond 6A System; management and operations plans have been specifically designed to provide suitable habitat for numerous waterbird species during different seasons and avoid adverse impacts. The ponds have varying pond bottom elevations, as well as substantial variation of topography within each pond, much of which is from remnants of previous uses. The management of the system would generally be seasonal.

Ponds in the 6A system will be managed with open water in the winter, providing shorebirds with suitable foraging habitat in shallower pond areas, while waterfowl and wading birds may use deeper pond areas. Summer operations will likely only provide open water via muted tidal flow in portions of Pond 6A varying from deeper water in borrow ditches and shallow water or dry bottom areas, and open water in Pond 6B within the borrow ditches because it has a higher bottom elevation. Pond 8 would be dry in the summer because intake to maintain open water is not possible due to the high pond bottom elevation. The ponds would be managed to have low salinity in the winter and spring and maintain salinity within continuous circulation salinity levels during the winter. The ponds would typically be filled in November with the onset of rainfall and increased gravity inflow. Operations would likely begin in late October, bringing water into ponds 8 and 6B to provide suitable water levels for waterbirds during the fall migration season, and pond 6A could be operated as muted tidal year round or allowed to draw down resulting in shallow water, mudflat and salt pan habitat.

The ponds of this system are characterized by seasonal management, with varying salinities ranging from low to medium, with year-round muted tidal operation possible in pond 6A which will provide fairly constant ponding of less than one foot and draw down would be allowed in the other ponds (6B, 8). Some water may be moved into the borrow ditches within pond 8 and/or 6B to produce brine flies and maintain suitable foraging habitat for western snowy plovers. As seasonal ponds, the primary purpose will be to provide suitable foraging habitat for shorebirds, and, particularly in the spring and summer, to provide salt pan habitat as suitable nesting for the western snowy plover. The seasonal ponds in the 6A system may be used by snowy plovers for nesting and foraging during the spring/summer, and shallower ponded areas may also be used by snowy plovers during the winter. The largest concentration of nesting and over-wintering snowy plovers are found in the ponds north of Alameda Creek, some of which are managed to provide suitable habitat for snowy plovers, including those ponds in the 6A system. Higher salinity (batch) pond operations could provide high prey densities of brine shrimp, brine flies and reticulate water boatmen to benefit salt pond specialist species such as phalaropes and eared grebes, although batch pond operations are not currently proposed, as higher salinity foraging areas within the ponds will result from seasonal operations.

In the winter, this pond system would typically support abundant waterfowl including bufflehead, scaup, Northern shoveler, and ruddy duck; and picivorous birds may find suitable habitat, such as double crested cormorant, gulls, white pelican, and terns.

Given shallower pond depths in a number of the ponds that would result from limited intake in high pond bottom areas, especially important during the spring and fall migrations, management operations would be transitioned according to such seasonal use to provide optimum habitat conditions. These ponds may be heavily used by shorebirds for foraging areas, as are other shallower ponds in the system. Shorebirds and other waterbirds may also use these ponds for roosting, which may occur on the un-vegetated levees within the system and on remnants of wooden structures. The Pond 6A system may support fish populations in system ponds in the fall, winter and early spring. No restrictions on intake are expected since salmonid entrainment is not anticipated to be an issue, as Old Alameda Creek is not suitable spawning habitat due to the barrier to passage that is found at the 20 Tide Gate crossing structure approximately 3 miles upstream from the mouth. North Creek is similarly not suitable for salmonids. Once North Creek is breached into the Eden Landing restoration site and vegetated tidal marsh develops, nursery habitat for fish may be provided, but salmonid use is not expected. For a more complete discussion of these species and potential occurrence, see the Final EIR/EIS for the South Bay Salt Ponds Initial Stewardship Plan (April 2004).

System Description

Objectives

The Baumberg System 6A consists of 3 ponds: ponds 8 (intake), 6B and 6A (outlet) as shown in Figure 1. The objectives for the system include:

- Establish ponds 8, 6B and 6A as seasonal or seasonally muted tidal pond (6A only)
- Manage for different water surface elevations summer vs. winter
  Drain ponds in late spring for seasonal operation, or
  Lower the water levels in late spring and allow muted tidal flow into pond 6A
  Maintain open water during the winter
- Operate water levels lower than existing levels
- Maintain discharge salinity at levels below 40 ppt.

Water Control Structures

The proposed system includes:

- New 48” gravity intake at pond 8 from North Creek

- Existing internal connection between
  - Pond 8 to 6B, via two 36” gates connecting the north control pond to the ponds
  - Ponds 6B and 6A, 6’ box
  - Ponds 8 and 6A, via two 36” gates connecting the south control pond to the ponds
- New 48” gravity intake/discharge to pond 6A at Old Alameda Creek
- Existing Continental Pump (not expected to be used)
- siphon under Old Alameda Creek from pond 6A to 6 (not expected to be used)
- Existing staff gages at all ponds

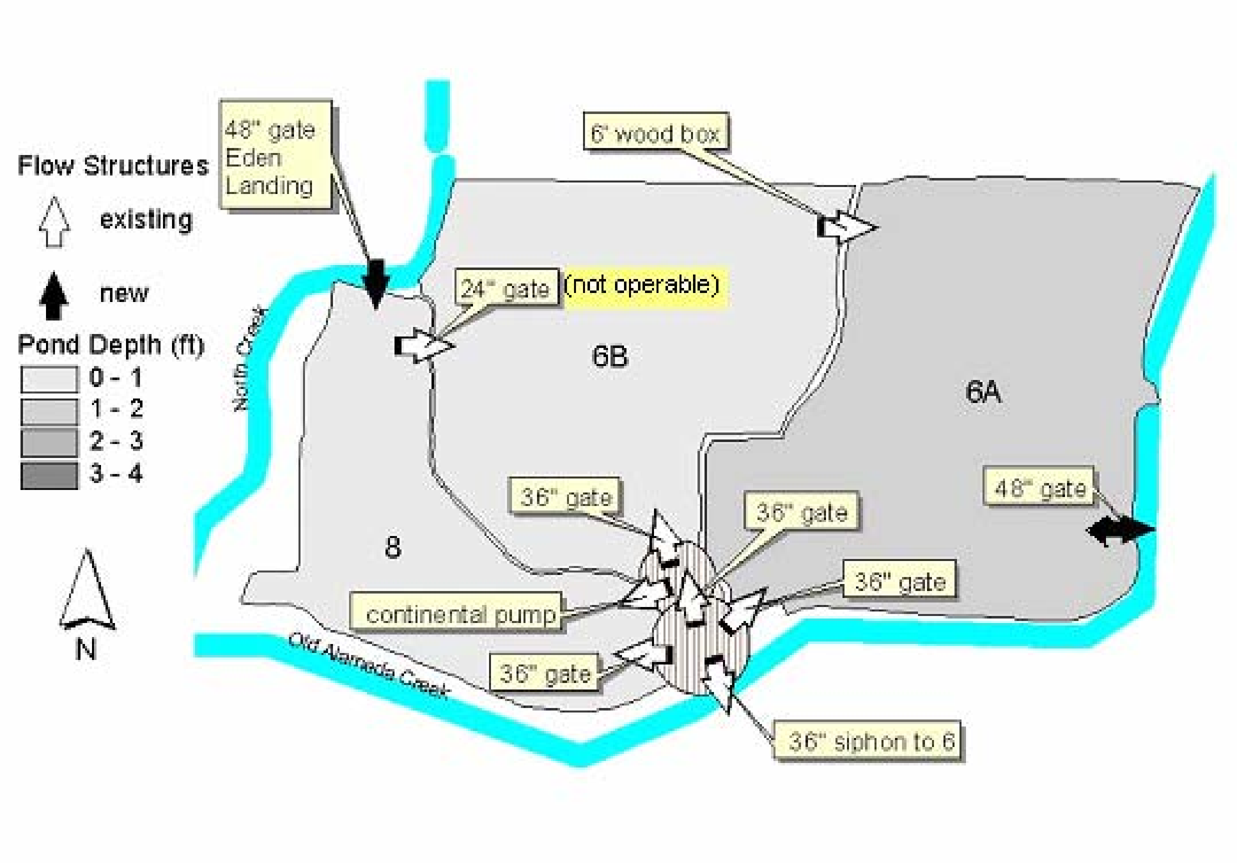

Figure 1. Map of Ponds and Water Control Structures
Note: Pond depths based on winter conditions.

Management Operations

As a seasonal or muted tidal pond system, the system would not be subject to continuous circulation through ponds during the summer high evaporation season. Only Pond 6A would be operated in the summer, as a muted tidal pond. The seasonal ponds would be filled during the fall to provide open water during the winter and early spring, and would be drained in the spring. Due to the hydraulic limitations of the intake to pond 8 and the limited capacity of Old Alameda Creek, it was not considered practical to maintain continuous circulation in the 6A system during the summer.

The intake and outlet structures and internal connections were designed to provide circulation for filling the pond system in the fall and to empty the ponds in the spring. The proposed intake structure into pond 8 at North Creek would include one 48” gravity culvert. All gravity intake flows would occur at high tide. The pond 8 intake structure was constructed as part of the North Creek levee improvements, part of the Eden Landing restoration project.

In addition, the existing control structures include two control ponds located between the three ponds near Old Alameda Creek. The control ponds are each less than 1 acre. As shown in the ISP, the south control pond (also called a donut) is connected by gated culverts to ponds 8 and 6A, to the north control pond and the siphon to pond 6 across Old Alameda Creek. The north control pond is connected to pond 6B. The north control pond was the source for water for the Continental pump, which pumped up into pond 8. For the salt making operations, the control ponds and pump were used to transfer water to and from pond 6. For the initial stewardship conditions, the pump and siphon will not be required. The system would be separate from the Pond 2/2C pond system south of Old Alameda Creek.

The system outlet structure is located on the eastern side of pond 6A, and would discharge to Old Alameda Creek south of the creek crossing composed of 20 tide gates. All outflows would occur at low tide.

The initial stewardship conditions would include different operation plans for the ponds during the winter and summer seasons. The ponds would be seasonal and would have open water through the system during the winter. During the summer, the ponds would be dry or include a limited area of muted tidal area in pond 6A.

Operation of Pond 6A as a muted tidal pond during the summer would be managed to provide suitable foraging habitat for shorebirds, specifically the snowy plover. With muted tidal operation, the outlet culvert would be opened to allow both inflow and outflow on each tidal cycle. Gate settings may be varied to provide limited ponding or to primarily provide mudflat habitat. The pond would then have a twice daily cycle of intake and discharge, generally maintaining wet conditions in the pond. Because of the limitation of the culvert and the creek channel, the daily tidal cycle within the pond would be relatively small, generally less than one foot. The tidal cycle in the bay is generally over six feet.

Table 1
Baumberg System 6A Inflow and Outflow

Period	**Gravity Intake Flow**		**Discharge Flow**	
	Average	**Peak**	**Average**	**Peak**
Summer	-	-	-	-
Winter November - May	2 cfs 700 gpm	82 cfs 37,000 gpm	2 cfs 1,000 gpm	13 cfs 5,900 gpm

The predicted water surface elevations during the initial stewardship period are shown in Table 2, below.

Table.2
Baumberg System 6A Water Surface Elevations

Pond	Area (acres)	Bottom Elevation (ft NGVD)	Water Elevation (ft NGVD)		
			Existing	Interim Management	
				Summer	Winter
8	180	3.7	6.5	-	4.3
6B	284	2.1	3.0	-	3.0
6A	340	0.9	3.1	-	3.0
Total/ Average	804	2.	4.2	-	3.3

Seasonal Operations

Winter

Baumberg System 6A will require limited active management, primarily during the transitions to and from the winter operation conditions. Pond water surface elevations would be controlled primarily by adjusting the control gates at the intake and outlet, between ponds. Intake salinities would be the similar to the bay salinity and pond salinities would be similar to existing bay salinities.

For the winter operation, the wooden box from pond 6B to pond 6A would remain open to equalize the water surface elevations within the ponds. Water from the bay would circulate from pond 8 to 6B and 6A, supplemented by intake at the Pond 6A structure. Pond 8 would operate at a higher elevation because the pond bottom is higher. The water level in pond 8 may be controlled by a weir at the discharge, or by adjustment of the pond 8 control gates. The winter gate settings are shown on Table 3.

Table 3. Winter Gate Settings

Gate	Setting (% open)
B8 inlet	100, with adjustable weir on pond side*
B 6A outlet	Varied gate setting**

*Weir board setting controls amount of water in the pond which controls how much water can enter based on tide elevations.
** Depending on target water level

Summer

In the spring the system would be drained for the summer condition. This was assumed to occur in early May, but could vary depending on habitat conditions in the ponds. For example, the transition could be delayed or advanced based on use of the pond by migratory birds, snowy plover nesting activities, or salinity levels in the ponds.

Because ponds would be operated as seasonal ponds, the ponds would slowly drain and dry during the late spring, and no further management would be required until winter. The ponds would then become part of the continuous flow operation in winter.

If pond 6A is to be operated as a muted tidal pond during the summer, the outlet culvert would be opened to allow inflow and outflow and the water level would be controlled by the outlet weir. Without the outlet weir the pond would only contain minimal water at extreme high tides.

Operations, Constraints, and Corrective Measures

Constraints

The primary constraint in operating this system is the ability to bring adequate Bay water into the ponds particularly in the summer to keep salinities below 40 ppt. The operational plan addresses this by allowing seasonal draw down in summer where the ponds will be allowed to dry. Snowy plovers may use this system for nesting. Pond 6A may be operated as muted tidal in summer to provide suitable foraging habitat for shorebirds, specifically the snowy plover.

Corrective Measures

Water Level Control

The water level in B8 is the primary control for Pond System 6A management, and secondary control of water level via B6A. Low water levels in Pond B8 may expose mudflats portions of all of the ponds. High water levels can increase wind wave generation and increase levee erosion.

The inlet gate settings control the overall flow through the pond system, while the outlet gate settings control the water level in the pond system. Because the normal water level in the pond is above mean water level in the slough, the outlet gate will discharge for more hours of the day than the duration of inflow through the inlet gates. The water level in the pond should not have a noticeable variation during the day, but may vary by 1.0 feet during a month due to the influence of weak and strong tides.

Salinity Control

The maximum salinity for the discharge at B6B is 44 ppt, according to the water quality objectives for the ISP. For routine operations, intake occurs on high tides. The outlet flow should be increased when the salinity in B8 is close to 35 ppt. Increased outflow will tend to decrease the water level in B6A and increase the inflow at high tide. The increased circulation flow and reduced volume in the pond (lower water surface elevation) will reduce salinity. Lower water levels in B6A will make the water level more sensitive to monthly cycles of weak and strong tides. Therefore, the outlet gate setting may need to be adjusted to reduce flow during periods of weak high tides to maintain water in the pond. There is no minimum salinity proposed for pond B6.

Dissolved Oxygen Control

Since this pond system will be mainly discharged in the winter we do not foresee problems with low DO. The following discussion covers the event when DO levels drop during the summer months, when B6A is operated as muted tidal and water levels must be lowered to ensure successful nesting by snowy plovers. Maintaining suitable habitat for snowy plovers may be accomplished by only allowing intake, thereby potentially raising salinity levels above continuous circulation (discharge) range. If salinity is raised above discharge limits in the summer, it is expected that by allowing water levels to raise in the winter, salinity will be returned to allowable discharge levels. To ensure that dissolved oxygen levels at the B6A discharge are not degrading receiving waters below Basin Plan objectives, a “trigger” for the continuous release is included in the operation plan. If dissolved oxygen levels at the pond discharge fall below the trigger value, Best Management Practices (BMPs) listed in this Operations Plan must be implemented.

The DO trigger is if dissolved oxygen at the discharge falls below the 10^{th} percentile of 3.3 mg/L (calculated on a weekly basis). This 10^{th} percentile trigger is based on dissolved oxygen levels found in Artesian Slough in July 1997. These values are the most relevant representation of natural dissolved oxygen variations in sloughs or lagoon systems currently available. The numerical DO trigger may be revised as additional monitoring data becomes available. Any revision must be approved by the Water Board.

If a trigger event occurs, the discharger shall make a timely report to the Water Board, and implement BMPs described in this Operations Plan, as appropriate. These adaptive management techniques may include additional monitoring, controlling the flow rate of the intake or discharge, controlling the timing of the discharge, aeration, or temporarily suspending the discharge. Timely notification is intended to be 24 hours after the monitoring/sample results are available.

BMPs include the closing of the discharge during periods of time when the diurnal pattern suggests that DO would be below the trigger (3.3 mg/L). For analysis of the 2004 data, as reported in the 2004 Self-Monitoring Report, ceasing discharge from 10pm to 10 am would avoid most of the excursions from the limit. If overnight DO levels in the pond are low, the outlet gates could be adjusted daily to allow discharge only during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m.

In the October 5, 2005 letter from regarding File No. 2199.9438 (RS), which requested the revisions/corrections incorporated herein, RWQCB stated that the Department should implement a DO corrective measure (BMP) that ceases nighttime discharges if the weekly 10^{th} percentile value of pond discharge shows the trigger value of 3.3 mg/L, unless a more effective alternative can be implemented.

Daily discharge timing is not practicable due to staff and budget constraints. However, a similarly effective alternative can be implemented during periods when the weekly 10^{th} percentile is at or below the trigger value. The alternative to daily discharge timing is weekly discharge timing. Closing the discharge for a period of days when overnight DO levels in the pond are known to be or are expected to be low, particularly when this corresponds with periods when overnight tides are low and would result in the majority of discharge volume, and/or with weak (neap) tide periods when intake is more limited, would provide equivalent protection of receiving waters as would daily closure of the outlet gates. By adjusting discharge gates on an approximately weekly basis (with the number of days being depending on duration of the neap tide cycle), this would allow for periods when no discharge would occur, or discharge would occur only during periods when discharge is mostly during the day, when pond DO levels are higher.

A possible consequence of ceasing discharge, while not resulting in discharge of low DO pond waters to receiving waters, is prolonged periods of depressed DO levels due to more limited intake, since without discharge pond water levels are higher and thereby duration and volume of intake is reduced. It appears that reducing residence time of water in the ponds improves overall DO levels. Therefore, allowing discharge, even at reduced volumes, would provide for some increased volume of intake. A discharge gate can be set to allow reduced discharge volumes versus discharge volumes that would be expected for normal operations. For example, a gate could be set at approximately 10 percent open (vs. normally 20% open) during strong (spring) tide periods, when the weekly 10^{th} percentile is at or below the trigger value. Reduced discharge settings would reduce the volume of discharge water entering the receiving waters, and correspondingly minimize the extent to which low DO discharges could potentially affect receiving water quality. These reduced discharge volumes would allow for greater exchange of intake waters, since pond water levels would be lower than if no discharge occurred, which may also help to raise DO values.

Dissolved Oxygen BMPs

As noted above, there are a range of BMPs available to reduce potential impacts to the dissolved oxygen levels in Old Alameda Creek. These BMPs are discussed below (Evalution of the effectiveness of the BMPs is shown in the Self Monitoring Report- 2004):

1. Slough Monitoring

Additional monitoring data may be collected from Old Alameda Creek. The slough monitoring is not a BMP to improve the slough DO conditions, but is intended to collect data on the slough conditions and to identify the potential effects of the B 6A discharge. The slough data may be used to evaluate whether the slough conditions meet water quality objectives.

2. Adjust Discharge Flow

When B6A DO levels are near to the established discharge trigger, the discharge flow may be decreased to reduce the potential effects of the discharge in Old Alameda Creek. Decreasing discharge flows is a reasonable corrective action for DO since the action (response) can be made proportional to the observed problem and since it is likely to have an immediate effect. The degree of flow reduction should be related to the observed DO levels in the slough, diurnal fluctuations, and tidal cycles. Records should be kept of continuous monitoring data for B 6A, and any slough monitoring data, as well as, the tide levels, pond water level, and gate settings. The records will be used to evaluate the effects of the B6A discharge and to refine future operation plans.

3. Monthly Discharge Timing

The intake/outlet structure at B 6A has significant reserve capacity for discharge. The outlet gate will generally only be 10 to 20 percent open to maintain the water level in B6A. If overnight DO levels in the pond are low, the outlet gates could be adjusted based on the monthly tidal cycles to cease discharge during periods with higher high tides during the day and allow discharge during periods with higher high tides at night. Selecting periods for discharge with high tides at night would reduce the volume of discharge during the night when pond DO levels may be lower than ambient slough conditions.

4. Daily Discharge Timing

During summer, the best discharge time is from approximately 10 a.m. to 10 p.m. Depending on the daily tide cycle, the daily discharge volume may be released in less than an entire day. As daily discharge timing is not practicable due to limited staff availability, if overnight DO levels in the pond are expected to be low and this corresponds with weak tide periods, the outlet gates could be adjusted weekly to allow discharge only during periods when discharge is mostly during the day, when pond DO levels are higher and this corresponds with stronger tides. A higher high tide during the discharge period would reduce the outlet volume. Increased discharge flows at low tide to allow for this discharge timing may increase salinity locally in the receiving waters during the discharge periods. If the discharge timing reduces the overall daily outflow volume, the reduced flow would decrease circulation flows and may increase salinity in the discharge pond. Therefore, the BMP for DO control may adversely affect the salinity control and must allow for conservative management.

5. Temporarily Cease Discharge

Temporarily stopping the pond discharge would prevent any effects on DO conditions in the receiving waters. However, long periods without circulation through the ponds would increase salinity conditions in the ponds. Without inflows to replace evaporation losses, the salinity in the B6A system may double in four to six weeks, depending on weather conditions. This would likely have substantial adverse affects on the biological resources associated with the ponds and may also create substantial odor problems for the neighboring communities as the pond bottom dries, and may also have a negative effect on gypsum formation in the pond, as well as future salinity conditions in the pond when the pond is refilled. If a system pond may be closed off for extended periods without inflow, the pond should be allowed to be drained to avoid hypersaline conditions.

6. Installation of Baffles

A series of flow diversion baffles could be installed at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake. This measure may be appropriate in circumstances where deeper borrow ditches are conveying pond waters to the discharge, and when there is significant algae build up in the pond and particularly at the discharge.

7. Mechanically harvest dead algae

Dead algae could be harvested where it is accumulating near the discharge location. If extensive mats are noted in the pond, mechanically harvesting dead algae on a pond wide basis would not be practicable. However, harvesting dead algae where it is accumulating near the discharge location could be performed in conjunction with installation of baffles to prevent build up.

8. Aeration.

Aeration could occur within the discharge ponds near the outlet structures following installation of bubbler/diffuser systems or floating mechanical aerators. The effectiveness of such aerators is currently being evaluated by U.S. Fish and Wildlife Service in the Alviso ponds. Limitations with such a measure include the following: Cost of acquiring, maintaining and operating aerators, floating aerators typically require water depths of 6 feet or more and diffuser systems are more effective with deeper water than the two feet or lower depths in ponds 2 and 2C. Aeration systems would require design studies to evaluate the size and configuration of the aeration equipment and preferred operation. Construction for aeration at the discharge structures would also require an evaluation of electrical supplies, pond dredging, and segmentation of a portion of the pond to control aeration 'contact time'. Implementation of an aeration program would require six months to a year to implement, and would only be implemented if the aerators being installed at the Alviso ponds are shown to be effective.

pH Control

The pH of the discharge is related to the DO of the discharge. If the pH of the discharge falls outside the range of 6.5-8.5 an analysis of the impact of discharge pH on the receiving water waters will be performed. If it is determined that discharge is impacting receiving water pH, the above mitigations measures will be implemented.

Avian Botulism Control

If summer monitoring shows that average daily DO levels in pond B 6A drop to one mg/L, circulation will be increased by fully opening the flap gates to operate the pond as muted tidal. Additionally, to reduce the likelihood of a severe outbreak of this disease, any dead bird carcasses in the ponds or nearby receiving waters will be promptly collected and buried or burnt.

Mobilization of Inorganics and/or the Methylation of Mercury Control

Ponds 8, B 6B, and B 6A are seasonal; Pond B 6A may be operated as seasonal, or muted tidal. Inorganics and methyl mercury levels will be monitored as required in the WDRs. If levels are found to rise, further analysis of the cause and mitigation measures will be developed if the need arises. If seasonal pond operations are found to increase methyl mercury levels, DFG will notify the Regional Water Quality Control Board (RWQCB) and consult to determine the best approach to addressing the issue.

In late summer and early fall of 2003 and 2004, USGS completed baseline sampling of sediments for total mercury and methyl mercury in the Eden Landing (Baumberg Complex) ponds. USGS analyzed 20 composite sediment samples from Eden Landing salt ponds collected in January 2005. Overall, total mercury concentrations were low. Pond B1 had one of the highest total mercury concentration in the study. Concentrations of methyl mercury were lowest in this system in B7. Further sampling and analysis of the situation is being conducted at this time. Summarizing comparison among all seasons and ponds during 2003 – 2005, for total mercury, no Eden Landing pond contained concentrations exceeding 1.0μg/g. On average, methyl mercury concentrations did not differ significantly between seasons among ponds sampled in both seasons. Pre- and post discharge data are not yet sufficient to determine the potential impacts of management operations. Additional samples will be collected in winter 2005-2006 and again in late summer 2006, and focus on locations where depth gradients result in exposed mudflats in portions of these ponds, as well as locations which contained the highest levels of methyl mercury prior to discharge and are now being managed as seasonal.

Monitoring and Adaptive Management Action Plan

Monitoring

Pond Management

The routine pond management will require weekly site visits to record pond conditions and intake readings. The management monitoring parameters are listed below.

Weekly Monitoring Program for Pond Management

Location	Parameter
B 8 intake	Slough Salinity, Gate Settings
B 6A outlet	Pond Water Level, Salinity, Gate Settings

The weekly observation program will include visual pond observations to note levee erosion, vandalism, potential algae buildup and signs of avian botulism.

Water Quality

The Water Board discharge permit requires additional water quality monitoring. The specifics of the water quality monitoring program are detailed in the Self Monitoring Program document. A summary is presented below:

Continuous Pond Discharge Sampling: Continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, CO) installed in ponds prior to their initial release dates and through November. Salinity, pH, temperature, and dissolved oxygen collected at 15-minute intervals with a sensor and circulator warm-up period of 2 minutes. Data downloaded weekly and Sondes were serviced to check battery voltage and data consistency.

Pond Management Sampling (for Initial Release and Continuous Circulation): In-pond water quality measurements twice monthly in discharge ponds from ???? 2005 (i.e., two months prior to the initial release of ponds. One sampling location to be established for each salt pond; parameters to be measured are salinity, pH, turbidity, temperature, and dissolved oxygen. Readings collected from the near-surface at a depth of approximately 25cm.

Chlorophyll-a sampling (for Continuous Circulation Monitoring): USGS collected chlorophyll samples monthly in Baumberg salt ponds in September and October 2005. Chlorophyll-a sampling was discontinued for 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples to be collected annually, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels).

Communication of Monitoring Results and Violations

During the 2004 monitoring season down-time for the continuous data recorders led to data gaps and poor communication regarding potential water quality violations. Spare data recorders have been purchased to replace devices during servicing.

The Department is required by the Final Order to contact the RWQCB when violations occur. The Department did not contact the RWQCB to alert them about the potential DO violations. Standard Provisions and Reporting Requirements, state that the Department must notify RWQCB staff by phone within 24 hours, and follow-up with a written report within 5 business days.

The USGS will forward raw data to the Department the day it is collected. The Department will call the RWQCB within 24 hrs of receiving the information to alert them of a potential violation. Once the USGS has had time to analyze the data and delete false readings from the data set, the Department will contact the RWQCB staff via email with information regarding the status of the potential violation.

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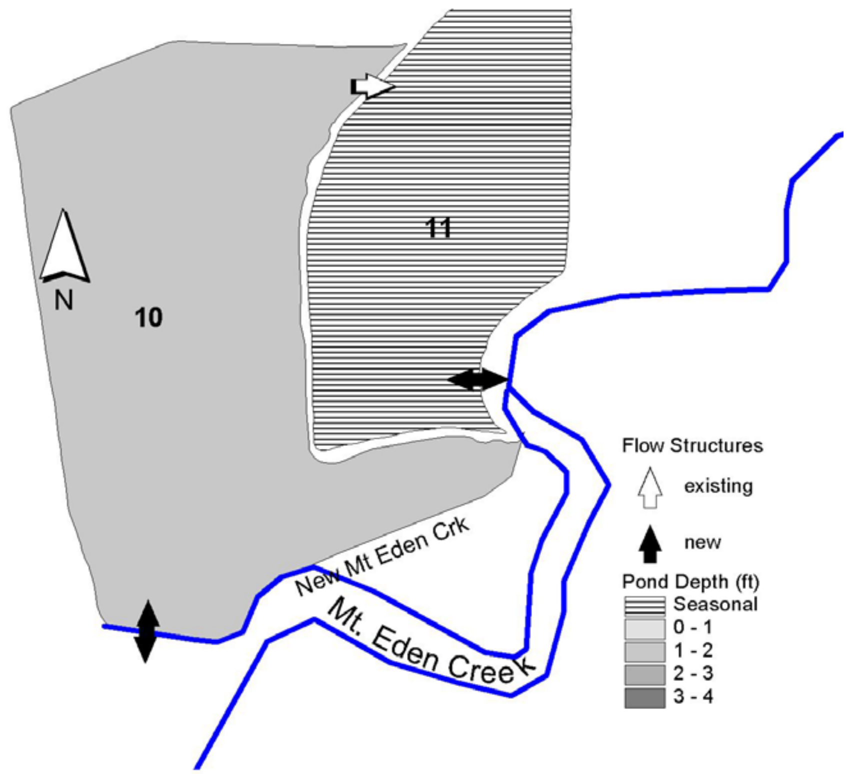
Operations Plan -- Baumberg Complex Pond System 11 (Eden Landing Ecological Reserve)

Hayward, Alameda County (Revised, December 2005)

Regional Water Quality Control Board
San Francisco Bay Region
Order Number: R2-2004-0018
WDID Number: 2 019438001



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Summary of Changes to the Operations Plan

There have been several changes to the Operation of the Pond 11 system from the plan that was proposed in the Initial Stewardship Plan (ISP) and the July 2004 Operations plan. Due to high construction costs, 2 proposed culverts will not be constructed (second culvert into pond 10 and the new culvert connecting ponds 10 and 11). These facilities located near the mouth of Mt. Eden Creek at the bay-front levee, as described/depicted in the ISP, will be replaced with one new multi-culvert structure in Pond 10 as part of the final phase of construction for the 835-ac Eden Landing restoration project, anticipated to be completed by the fall of 2006, and will thereafter perform according to the ISP. The existing Pond 10 intake will be decommissioned. The ISP described closing the Pond 10 intake if it became necessary to shut the outlet for any length of time. This would require slide gates on each water control structure. Due to high construction costs and limited usefulness these gates will not be installed.

Since planned operation ISP operation of the Pond System could not be initiated in 2004, ISP water management in the summer of 2004 was accomplished by using the existing Pond 10 intake. Discharge from the pond was allowed by manually opening one of the four flap gates on the existing intake to allow the pond to drain. In August 2004 the flap gate failed and the pond became muted tidal, providing shallower water levels due to the high pond bottom elevation, a condition which will continue until the new intake/discharge structure is constructed. Pond 11 was closed off and allowed to dry during the summer of 2004. In the winter of 2004-05, pond 11 filled with rainwater and provided open water conditions similar to ISP winter operations until draw down began to occur with the onset of the evaporation season. As described in the ISP, Pond 11 will be allowed to dry out in the summer season. Pond 10 will continue to operate as a muted tidal pond with continuous intake and subsequent discharge.

As a muted tidal system with a fairly high bottom, the pond doesn't have the ability to bring water in for more than a few hours at the highest tides and is therefore draining most of the day. The continuous data collection device (Datasonde) used for water quality monitoring, was located at the end of the bulkhead wall near the intake/discharge culvert and collected data continuously in 2004, except when the meter was exposed for short periods. As pond water levels fell, the Sonde was exposed for longer periods and therefore no data was collected. With the low water conditions established due to the muted tidal operation conditions it is not possible to collect continuous data, as the Sonde cannot be immersed in water at all times and cannot be safely relocated nearer to the intake/discharge culvert. Relocating the device poses significant safety risks due to the on-going deterioration of the water control structure and difficult physical access. We must discontinue continuous data collection until the new water control structure is constructed and the system is operated as year-round open water. Since the volume of intake is exceeded by discharge volume, and therefore results in very little residence time, after discussion with Regional Water Quality Control Board (RWQCB) staff we proposed a revision to the Self-Monitoring Program, to conduct weekly point sampling rather than continuous data collection via the continuous collection device (Sonde). It is believed that this periodic sampling will provide adequate information on water quality conditions, as the current muted-tidal operation is not expected to function similarly to managed, open-water ponds since muted tidal operation does not result in a large volume of water entering and remaining the pond and therefore results in little, if any, residence time. RWQCB approved the weekly "grab" sample monitoring in Pond B10, as noted in their October 5, 2005 letter to the Department, provided the pond is operating as a muted tidal system.

Introduction

This Operations Plan describes the muted tidal operation of the Pond 11 system and the limited management activities required to meet the overall goals and objectives described in the Initial Stewardship Plan and the requirement of the Regional Water Quality Control Board's (RWQCB) Final Order. A detailed description of the System 11 ponds as they are presently functioning are provided in the System Description section, Summer and Winter operations and management activities are shown in the Management section, and limitations on the ability to provide the specific corrective measures required to adaptively manage the system are described in the Operations, Constraints, and Corrective Measures section.

Eden Landing Ecological Reserve (Baumberg Complex) Location

The Baumberg ponds consist of a 5,500-acre complex of evaporator ponds in the East Bay west of Hayward and Union City in Alameda County. Since the complex contains only evaporators, brine historically has been pumped to the Coyote Hills ponds and routed from there to the Newark plant or to the Redwood City plant, through a pipeline paralleling the Dumbarton Bridge, for final processing. The approach to the San Mateo Bridge (Hwy 92) and the Eden Landing Ecological Reserve, formerly known as the "Baumberg Tract," forms the northern boundary of the complex. The reserve was established in May 1996 to restore former salt ponds and crystallizers to tidal salt marsh and seasonal wetlands. The site is bordered on the east by residential and commercial areas of the Cities of Hayward, Union City and Fremont. Alameda Creek Flood Control Channel (also known as Coyote Hills Slough) and the Coyote Hills form the southern boundary. San Francisco Bay borders the site to the west.

Major drainages that discharge into the San Francisco Bay within the complex include Old Alameda Creek and Alameda Creek Flood Control Channel. Alameda Creek Flood Control Channel diverges from Old Alameda Creek in Union City to provide bypass capacity during large floods. Several hundred acres of extant tidal marsh front the San Francisco Bay, known as the Whale's Tail Marsh at the center of the complex. The marsh is located outboard of ponds 9, 8A, 2, and 1, where Mount Eden Creek and Old Alameda Creek discharge into the Bay. Prior to the acquisition, all ponds within this complex were under Cargill ownership and have now been transferred to DFG.

Pond System 11

Pond System 11 is 332 acres in size; it includes ponds 10 (214 acres) and 11 (118 acres) and is located on the northwest corner of the Eden Landing Ecological Reserve (Baumberg Complex). The average bottom elevation of these ponds is 2.6 NGVD. The northwestern corner of Pond 10 is adjacent to the Highway 92 toll plaza. These ponds are most easily accessed from the Eden Landing Road Gate.

Biological Resources

Many species are known to use the Pond 11 System; management and operations plans have been specifically designed to avoid impacts to these species. For a more complete discussion of these species and potential impacts, see the Final EIR/EIS for the South Bay Salt Ponds Initial Stewardship Plan (April 2004). Pond 10 functioned as an intake pond during salt making operations. The ponds of this system historically have been characterized by lower salinities and constant ponding of a foot or more. Consequently this pond system typically supports waterfowl and picivorous birds including scaup, ruddy ducks, double crested cormorant, gull, white pelican, and least, Forster's, and Caspian terns. Islands in Pond 10 have historically provided nest sites for terns, American avocets, and black-necked stilts. Given historic pond depths, the ponds have not historically been heavily used by shorebirds as have other shallower ponds in the system. Shorebirds primarily use these ponds for roosting, which occurs on the unvegetated levees within the system. Since pond 10 was an intake pond and the other pond was characterized by lower salinities, this system historically supported abundant fish populations.

Under the management regime proposed in the ISP, the ponds will have more variable water depths particularly in the spring, which will provide enhanced shorebird foraging habitat. Water levels will be maintained at adequate depths to assure islands within Pond 10 provide suitable nesting habitat.

Pond 10 will operate as a muted tidal pond under a continuous intake and subsequent discharge condition due to the deterioration of the existing water control structure, until the existing structure can be abandoned and a new water control structure can be constructed.. As a muted tidal system with a fairly high bottom, the pond doesn't have the ability to bring water in for more than a few hours at the highest tides and is therefore draining most of the day. Under muted tidal conditions, shorebird foraging habitat will be increased and habitat for waterfowl and other waterbirds that prefer deeper water will be decreased. Most of the small islands in Pond 10 will not likely be used for nesting by terns and other species since adjacent foraging conditions may be inadequate and lack of breeding use may also be partly attributed to easier access by predators from land-bridges due to reduced water levels.

System Description

Objectives

The objective of the Pond B11 system operation described in the ISP is to maintain year-round open water habitat in B10 and seasonal winter open water habitat in pond B11 by introducing tidal circulation through pond B10 while maintaining discharge salinities to lower Mount Eden Creek at less than 40 ppt.

For 2005 and until the replacement of the main water control structure at the mouth of Mount Eden Creek provides an operational structure following introduction of full tidal action, Pond 10 will operate as a muted tidal pond under a continuous intake and subsequent discharge condition. As a muted tidal system with a fairly high bottom, the pond doesn't have the ability to bring water in for more than a few hours at the highest tides and is therefore draining most of the day. Pond 11 will be filled during the winter by rainfall only and be allowed to draw down and dry during the summer evaporation season.

Water Control Structures

The Baumberg System 11 intake and outlet is presently located at the southwest end on pond 10 and includes four 48-inch gates from the Bay. These gates are in disrepair and allow unimpeded intake. This structure was planned to be utilized to manage water circulation in the system prior to the construction of the new ISP structures, which are expected to be completed and operational by the fall of 2006. As an interim management operation, in the summer of 2004 a winch was constructed to allow one of the flap gates to be opened, allowing pond 10 to be drawn down during the early portion of each spring tide series. This structure's pond side flap-gate was opened allowing the system to be operated as a muted tidal system during the drawdown (discharge period). In August of 2004 the flap gate hinges failed and Pond 10 became continuously muted tidal. Water circulation between Pond 10 and 11 via two 43-inch wood gates is not feasible under the current muted tidal operation because pond 10 doesn't have the ability to bring water in for more than a few hours at the highest tides and is therefore draining most of the day.

When the ISP is fully implemented, the following will be completed (system map below):

- New 3 x 48-inch gravity inlet/outlet structure will be constructed in the southeast corner of Pond 10 connecting to lower Mount Eden Creek to replace the existing intake structure from the San Francisco Bay.

- New 48-inch gravity inlet/outlet structure with control weir at Mount Eden Creek from Pond 11 (this facility is in place).

- Remove the existing 48-inch gate located in the south-east corner of Pond 10 to the former brine ditch within Mount Eden Creek (to be completed as part of the Eden Landing restoration project).

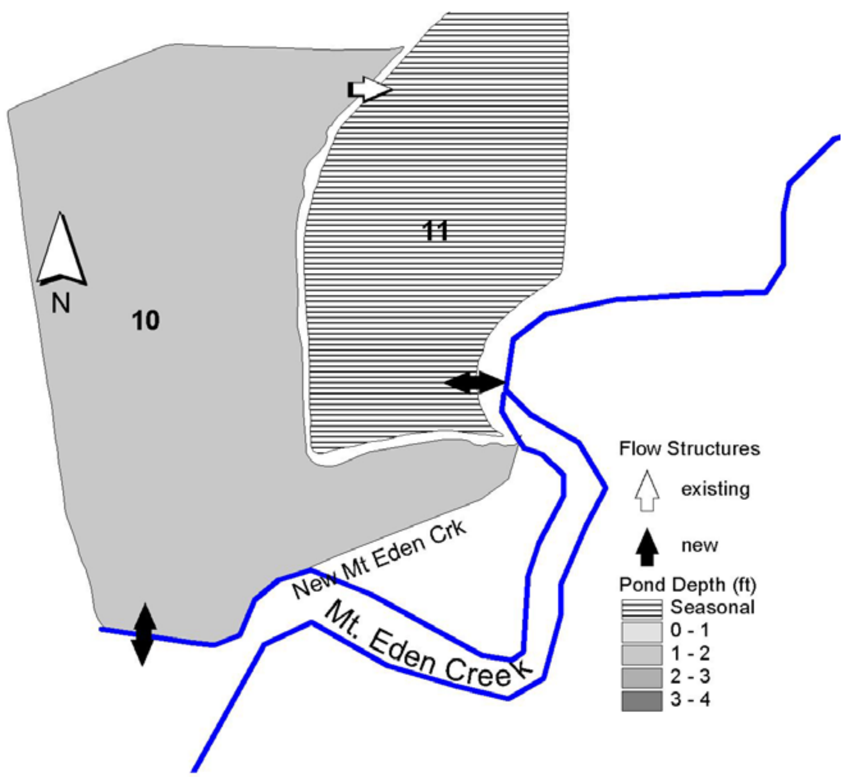

Figure 1. Map of Ponds and Water Control Structures

Management Operations

Due to delays in completion of the Eden Landing restoration project which will restore tidal flows to Mount Eden Slough, water management during the summer of 2004 through the fall of 2005 was planned to use the existing intake structure at pond 10 to fill and drain the ponds during the summer. As discussed above this facility has failed and the Pond 10 has become muted tidal. The connection between Pond 10 and 11 has been closed and Pond 11 is now being managed as a seasonal pond.

Each pond in the system will be managed differently during the winter and summer seasons. Pond 10 will operate as a muted tidal pond under a continuous intake and subsequent discharge condition. As a muted tidal system with a fairly high bottom, the pond doesn't have the ability to bring water in for more than a few hours at the highest tides and is therefore draining most of the day. Water circulation between Pond 10 and 11 via two 43-inch wood gates is not feasible under the current muted tidal operation. Pond 11 will be a seasonal pond filled during the winter by rainfall only and be allowed to draw down and dry during the summer evaporation season. The following describes the future expected conditions:

When the ISP is fully implemented, the operating water levels in the ponds will be lower during the summer to increase the gravity inflow into the system during the higher evaporation season. The water level in Pond 10 will be maintained at approximately 3.1 feet NGVD during the summer, and 4.0 feet NGVD during the winter. Because of the high bottom elevations in pond 11 (2.9 NGVD), it would be only partially wet during the summer. Therefore, Pond 11 could be closed off from Pond 10, and Pond 11 would be operated as a muted tidal or seasonal pond during the summer. Active management will be required primarily during the transitions to and from the summer operations. Water surface elevations would be primarily controlled by adjusting the outlet control gates. Intake salinities would be the same as Bay salinities and pond salinities would be similar to existing Bay salinities.

The summer operation is intended to provide circulation flow to make-up for evaporation during the summer season. The summer operation would normally extend from May through October.

During the winter, the circulation pattern would be from pond 10 to pond 11, then to Mount Eden Creek. The Pond 10 control gates would be adjusted to only allow water in to maintain higher water levels and create open water habitat in both ponds. Pond 11 would discharge into Mt. Eden Creek during the winter. The weir on the Pond 11 discharge will control the water surface elevation in the ponds. See Table 1 for average and peak flows in the system.

Table 1
Baumberg System 11 Inflow and Outflow

Period	**Gravity Intake Flow**		**Discharge Flow**	
	Average	**Peak**	**Average**	**Peak**
Summer	28 cfs 13,000 gpm	348 cfs 156,000 gpm	26 cfs 12,000 gpm	70 cfs 31,000 gpm
Winter	11 cfs 4,900 gpm	318 cfs 144,000 gpm	12 cfs 5,200 gpm	65 cfs 29,000 gpm

Seasonal Operations (when ISP is fully implemented)

Winter

For the winter operation, the gates from pond 10 to pond 11 would be open. Water from the Bay would circulate from pond 10 to 11. The control gates at the outlet structures from ponds 10 and 11 would be set to provide open water throughout the system.

The winter operation is intended to provide a smaller circulation flow in B10 than the summer operation. Evaporation is normally minimal during the winter. The winter operation is intended to maintain a stable pond depth while allowing large inflows during spring tide periods and rainwater to drain from the system. Winter circulation flows may significantly reduce salinity in Ponds 10 and 11. In wet years, San Francisco Bay salinity levels may be below 15 ppt for extended periods. Low salinity in Pond 10 in the spring may contribute to algal conditions and contribute to lower DO levels in late summer. The estimated average total winter inflow to the system is approximately 11 cfs (daily average), or 22 acre-feet/day, with an outlet flow of about 12 cfs (24 acre-feet/day). The winter operation period would normally extend from November through April.

Table 2. Winter Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
B10	214	2.2	3.5	0.7
B11	118	2.9	4.0	0.3

Table 3. Winter Gate Settings

Gate	Setting (% open)
B10 inlet	100
B10 outlet	10 (1 gate)*
B11 inlet	0
B11 outlet	weir board setting**

* Closed unless pond surface too high
**Weir board setting controls amount of water in the pond which controls how much water can enter based on tide elevations.

Summer

In the spring the system would be changed to the summer operation condition. This was assumed to occur between mid April and early May, but could vary depending on habitat conditions in the ponds. For example, the transition could be delayed or advanced based on use of the pond by migratory birds or salinity levels in the ponds. Ideally, pond water levels would be lowered gradually beginning in April to enhance foraging opportunities of migrating shorebirds.

The summer operation is intended to provide circulation flow into B10 to replace water lost to evaporation (approximately 2 acre-feet/day) during the summer season. The average total circulation inflow is approximately 28 cfs (daily average), or 56 acre-feet/day, with an outlet flow of about 26 cfs (52 acre-feet/day). The summer operation would normally extend from May through October.

Pond B11 would be seasonal and generally dry during the summer. The intake/outlet gate would be open to allow muted tidal flow into and out of the pond at high tide. Because the typical pond bottom elevations are near 3 feet NGVD, the tidal inflows would only occur during higher high tides. Only tides above 6 feet MLLW would flow into B11.

Table 4. Summer Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
B10	214	2.2	3.5	0.7
B11	118	2.9	-	-

Table 5. Summer Gate Settings

Gate	Setting (% open)
B10 inlet	100
B10 outlet	20 (1 gate)
B11 inlet	100
B11 outlet	100

These B10 summer gate settings are based on pond modeling and assume average evaporation conditions. The gate settings are intended to provide sufficient circulation flow to limit the summer salinity increases to between 5 and 10 ppt. The actual modeled conditions began at 30 ppt in the spring, and increased to 38 ppt in the fall, using relatively high summer intake salinity conditions from the summer of 1994. The pond operations may need to be adjusted to account for salinity conditions in the pond. (See salinity control section below)

Operations, Constraints, and Corrective Measures (for ISP, when fully implemented)

Constraints

The primary constraint in operating this system is the high bottom elevation of Pond 11. This reduces the ability to bring adequate Bay water into the pond 11, particularly in the summer, to keep the bottom saturated. The operational plan for the ISP, when fully implemented, attempts to address this by raising water levels in B10 to push water into Pond 11.

Corrective Measures (for the ISP, when fully implemented)

Water Level Control

The water level in B10 is the primary control for Pond System 11 management. Low water levels in Pond 10 may expose mudflats portions of both ponds. High water levels can increase wind wave generation and increase levee erosion.

The inlet gate settings control the overall flow through the pond system, while the outlet gate settings control the water level in the pond system. Routine summer operation would have the Pond 10 outlet gate set at less than a quarter of the inlet opening. Because the normal water level in the pond is above mean water level in the slough, the outlet gate will discharge for more hours of the day than the duration of inflow through the inlet gates. The water level in the pond should not have a noticeable variation during the day, but may vary by 1.0 feet during a month due to the influence of weak and strong tides.

The proposed pond water level in pond B10 of 3.5 feet NGVD is intended to be near the historic average pond water level for the period 1997 to 2003 of 3.8 feet. During that period the pond water level ranged from approximately 2.7 to 5.1 feet NGVD.

Salinity Control

The design maximum salinity for the discharge at B10 is 40 ppt. For routine operations, intake occurs on high tides. The outlet flow should be increased when the salinity in B10 is close to 35 ppt. Increased outflow will tend to decrease the water level in B10 and increase the inflow at high tide. The increased circulation flow and reduced volume in the pond (lower water surface elevation) will reduce salinity. Lower water levels in B10 will make the water level more sensitive to monthly cycles of weak and strong tides. Therefore, the outlet gate setting may need to be adjusted to reduce flow during periods of weak high tides to maintain water in the pond.

There is no minimum salinity proposed for pond B10.

Dissolved Oxygen Control

To ensure that dissolved oxygen levels at the discharge are not degrading receiving waters below Basin Plan objectives, a “trigger” for the continuous release is included in the operation plan. If dissolved oxygen (DO) levels at the pond discharge fall below the trigger value, Best Management Practices (BMPs) listed in this Operations Plan must be implemented.

The DO trigger is if dissolved oxygen at the discharge falls below the 10^{th} percentile of 3.3 mg/L (calculated on a weekly basis). This 10^{th} percentile trigger is based on dissolved oxygen levels found in Artesian Slough in July 1997. These values are the most relevant representation of natural dissolved oxygen variations in sloughs or lagoon systems currently available. The numerical DO trigger may be revised as additional monitoring data becomes available. Any revision must be approved by the Water Board.

A letter from the RWQCB, dated March 25, 2005, described this DO trigger for reporting and action. Therefore, in evaluating compliance with the dissolved oxygen limit contained in Order

No. R2-2004-0018, the Department will consider it a trigger for reporting and action if, at the point of discharge, the 10th percentile falls below 3.3 mg/L (calculated on a calendar weekly basis).

If a trigger event occurs, the discharger shall make a timely report to the Water Board, and implement BMPs described in this Operations Plan, as appropriate. These adaptive management techniques may include additional monitoring, controlling the flow rate of the intake or discharge, controlling the timing of the discharge, installation of baffles, aeration, or temporarily suspending the discharge. Timely notification is intended to be 24 hours after the monitoring/sample results are available.

BMPs include the closing of the discharge during periods of time when the diurnal pattern suggests that DO would be below the trigger (3.3 mg/L). For analysis of the 2004 data, as reported in the 2004 Self-Monitoring Report, ceasing discharge from 10pm to 10 am would avoid most of the excursions from the limit. If overnight DO levels in the pond are low, the outlet gates could be adjusted daily to allow discharge only during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m.

In the October 5, 2005 letter from regarding File No. 2199.9438 (RS), which requested the revisions/corrections incorporated herein, RWQCB stated that the Department should implement a DO corrective measure (BMP) that ceases nighttime discharges if the weekly 10th percentile value of pond discharge shows the trigger value of 3.3 mg/L, unless a more effective alternative can be implemented.

Daily discharge timing is not practicable due to staff and budget constraints. However, a similarly effective alternative can be implemented during periods when the weekly 10th percentile is at or below the trigger value. The alternative to daily discharge timing is weekly discharge timing. Closing the discharge for a period of days when overnight DO levels in the pond are known to be or are expected to be low, particularly when this corresponds with periods when overnight tides are low and would result in the majority of discharge volume, and/or with weak (neap) tide periods when intake is more limited, would provide equivalent protection of receiving waters as would daily closure of the outlet gates. By adjusting discharge gates on an approximately weekly basis (with the number of days being depending on duration of the neap tide cycle), this would allow for periods when no discharge would occur, or discharge would occur only during periods when discharge is mostly during the day, when pond DO levels are higher.

A possible consequence of ceasing discharge, while not resulting in discharge of low DO pond waters to receiving waters, is prolonged periods of depressed DO levels due to more limited intake, since without discharge pond water levels are higher and thereby duration and volume of intake is reduced. It appears that reducing residence time of water in the ponds improves overall DO levels. Therefore, allowing discharge, even at reduced volumes, would provide for some increased volume of intake. A discharge gate can be set to allow reduced discharge volumes versus discharge volumes that would be expected for normal operations. For example, a gate could be set at approximately 10 percent open (vs. normally 20% open) during strong (spring) tide periods, when the weekly 10th percentile is at or below the trigger value. Reduced discharge settings would reduce the volume of discharge water entering the receiving waters, and correspondingly minimize the extent to which low DO discharges could potentially affect receiving water quality. These reduced discharge volumes would allow for greater exchange of intake waters, since pond water levels would be lower than if no discharge occurred, which may also help to raise DO values.

Dissolved Oxygen BMPs

As noted above, there are a range of BMPs available to reduce potential impacts to the dissolved oxygen levels in lower Mount Eden Creek. These BMPs are discussed below (Evalution of the effectiveness of the BMPs is described in the Annual Self Monitoring Report):

1. Slough Monitoring

Additional monitoring data may be collected from lower Mount Eden Creek. The slough monitoring is not a BMP to improve the slough DO conditions, but is intended to collect data on the slough conditions and to identify the potential effects of the B10 discharge. The slough data may be used to evaluate whether the slough conditions meet water quality objectives.

2. Adjust Discharge Flow

When DO levels are near to the established discharge trigger, the discharge flow may be decreased to reduce the potential effects of the discharge in Mount Eden Creek. Decreasing discharge flows is a reasonable corrective action for DO since the action (response) can be made proportional to the observed problem and since it is likely to have an immediate effect. The degree of flow reduction should be related to the observed DO levels in the slough, diurnal fluctuations, and tidal cycles. Records should be kept, including continuous monitoring data for B10, and any slough monitoring data, as well as the tide levels, pond water level, and gate settings. The records will be used to evaluate the effects of the B10 discharge and to refine future operation plans.

3. Monthly Discharge Timing

The intake/outlet structure at B10 has significant reserve capacity for discharge. The outlet gate will generally only be 10 to 20 percent open to maintain the water level in B10. If overnight DO levels in the pond are low, the outlet gates could be adjusted based on the monthly tidal cycles to cease discharge during periods with higher high tides during the day and allow discharge during periods with higher high tides at night. Selecting periods for discharge with high tides at night would reduce the volume of discharge during the night when pond DO levels may be lower than ambient slough conditions.

4. Daily Discharge Timing

If overnight DO levels in the pond are low, the outlet gates could be adjusted daily to allow discharge only during the day, when pond DO levels are higher. During summer, this may be from approximately 11 a.m. to 10 p.m. As daily discharge timing is not practicable due to limited staff availability, if overnight DO levels in the pond are expected to be low and this corresponds with weak tide periods, the outlet gates could be adjusted weekly to allow discharge only during periods when discharge is mostly during the day, when pond DO levels are higher and this corresponds with stronger tides. At approximately 50 percent gate openings, the daily discharge volume may be released in about 6 hours, depending on the tide. A higher high tide during the discharge period would reduce the outlet volume. Increased discharge flows to allow discharge timing may increase salinity locally in Mount Eden Creek during the discharge periods.

5. Temporarily Cease Discharge

Temporarily stopping the B10 discharge would prevent any effects on DO conditions in Mount Eden Creek. However, long periods without circulation through the pond would increase salinity conditions in the pond. Without inflows to replace evaporation losses, the salinity in B10 may double in four to six weeks, depending on weather conditions. This would likely have substantial adverse affects on the biological resources associated with the ponds and may also create substantial odor problems for the neighboring communities as the pond bottom dries, and may also have a negative effect on gypsum formation in the pond, as well as future salinity conditions in the pond when the pond is refilled.

6. Installation of Baffles

A series of flow diversion baffles could be installed at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake. This measure may be appropriate in circumstances where deeper borrow ditches are conveying pond waters to the discharge, and when there is significant algae build up in the pond and particularly at the discharge.

7. Mechanically harvest dead algae.

Dead algae could be harvested where it is accumulating near the discharge location. If extensive mats are noted in the pond, mechanically harvesting dead algae on a pond wide basis would not be practicable. However, harvesting dead algae where it is accumulating near the discharge location could be performed in conjunction with installation of baffles to prevent build up.

8. Aeration

Aeration would require installation of bubbler/diffuser systems or floating mechanical aerators near the discharge. The effectiveness of such aerators is currently being evaluated by U.S. Fish and Wildlife Service in the Alviso ponds. Limitations with such a measure include the following: Cost of acquiring, maintaining and operating aerators, floating aerators typically require water depths of 6 feet or more and diffuser systems are more effective with deeper water than the one to two feet or lower depths in pond 10. Aeration systems would require design studies to evaluate the size and configuration of the aeration equipment and preferred operation. Construction for aeration at the discharge structures would also require an evaluation of electrical supplies, pond dredging, and segmentation of a portion of the pond to control aeration 'contact time'. Implementation of an aeration program would require six months to a year to implement, and would only be implemented if the aerators being installed at the Alviso ponds are shown to be effective.

pH Control

The pH of the discharge is related to the DO of the discharge. If the pH of the discharge falls outside the range of 6.5-8.5 an analysis of the impact of discharge pH on the receiving water waters will be performed. If pH in the receiving waters exceeds 8.5, samples for ammonia will be collected from the receiving waters for analysis. If it is determined that discharge is impacting receiving water pH, the above corrective measures will be implemented.

Avian Botulism Control

If summer monitoring shows that DO levels in the pond drop to one mg/L, circulation will be increased as described above, to attempt to improve water quality conditions and prevent conditions which may result in avian botulism. Additionally, to reduce the likelihood of a severe outbreak of this disease, when large numbers of dead bird carcasses are found in the ponds or discovered in nearby receiving waters, coordinated regional efforts will be made to promptly collect and bury or burn carcasses.

Mobilization of Inorganics and/or the Methylation of Mercury Control

The operations plan for System 11, when fully implemented, will provide constant flooding in Pond 10 (no change in Redox potential). Pond 11 will be seasonally dry. Under the current muted tidal operations, Pond 10 may result in conditions that result in a change in Redox potential. Inorganics and methyl mercury levels will be monitored. If levels are found to rise, further analysis of the cause and mitigation measures will be developed if the need arises.

In late summer and early fall of 2003 and 2004, USGS completed baseline sampling of sediments for total mercury and methyl mercury in the Eden Landing (Baumberg Complex) ponds. Methyl mercury levels in two sediment samples taken from Pond 11 in December 2003 were found to be high (10.7 ng/g). A single water sample in Pond 10 had 27 µg//L total Mercury. USGS analyzed 20 composite sediment samples from Eden Landing salt ponds collected in January 2005. Overall, total mercury concentrations were low. Concentrations of methyl mercury were highest in B11. Further sampling and analysis of the situation is being conducted at this time. Summarizing comparison among all seasons and ponds during 2003 – 2005, for total mercury, Pond B11 contained very elevated concentrations in late summer – fall 2003, but declined over 3–fold in winter 2005. On average, methyl mercury concentrations did not differ significantly between seasons among ponds sampled in both seasons. Pre- and post discharge data are not yet sufficient to determine the potential impacts of management operations. Additional samples will be collected in winter 2005-2006 and again in late summer 2006, and focus on locations where depth gradients result in exposed mudflats in portions of these ponds, as well as locations which contained the highest levels of methyl mercury prior to discharge and are now being managed as seasonal. If summer water levels in Ponds B10 and B11 are found to increase methyl mercury levels, according to the methyl mercury study done by USGS, the Department will notify RWQCB and consult to determine the best approach to addressing the issue.

If summer seasonal operation of Pond 11 increases methyl mercury levels, water levels in Pond 10 could be raised to flood pond 11. The pond would be maintained in a flooded condition with limited circulation. It is expected that salinities would rise above continuous discharge levels causing a cessation of the discharge, unless a waiver were provided by the RWQCB in the event that it could be shown that the discharge was not adversely affecting the receiving water. If not, the pond would be allowed to raise salinity during the summer, with salinities being lowered during the winter to reach discharge standards so that discharge could resume the following spring.

Monitoring and Adaptive Management Action Plan

As a muted tidal system with a fairly high bottom, the pond doesn't have the ability to bring water in for more than a few hours at the highest tides and is therefore draining most of the day. The continuous data collection device (Datasonde) used for water quality monitoring, was located at the end of the bulkhead wall near the intake/discharge culvert and collected data continuously in 2004, except when the meter was exposed for short periods. As pond water levels fell, the Sonde was exposed for longer periods and therefore no data was collected. With the low water conditions established due to the muted tidal operation conditions it is not possible to collect continuous data, as the Sonde cannot be immersed in water at all times and cannot be safely relocated nearer to the intake/discharge culvert. Relocating the device poses significant safety risks due to the on-going deterioration of the water control structure and difficult physical access. We must discontinue continuous data collection until the new water control structure is constructed and the system is operated as year-round open water. Since the volume of intake is exceeded by discharge volume, and therefore results in very little residence time, after discussion with Regional Water Quality Control Board (RWQCB) staff we proposed a revision to the Self-Monitoring Program, to conduct weekly point sampling rather than continuous data collection via the continuous collection device (Sonde). It is believed that this periodic sampling will provide adequate information on water quality conditions, as the current muted-tidal operation is not expected to function similarly to managed, open-water ponds since muted tidal operation does not result in a large volume of water entering and remaining the pond and therefore results in little, if any, residence time. RWQCB approved the weekly “grab” sample monitoring in Pond B10, as noted in their October 5, 2005 letter to the Department, provided the pond is operating as a muted tidal system.

Monitoring (for the ISP, when fully implemented)

Pond Management

The routine pond management will require weekly site visits to record pond conditions and intake readings. The management monitoring parameters are listed below.

Weekly Monitoring Program for Pond Management

Location	Parameter
B10 intake	Slough Salinity, Gate Settings
B10 outlet	Pond Water Level, Salinity, Gate Settings
B11	Slough Salinity, Pond Salinity, Pond Water Level, Gate Settings

The weekly observation program will include visual pond observations to note levee erosion, vandalism, potential algae buildup and signs of avian botulism.

Water Quality
The Final Order requires specific water quality monitoring detailed in the Self Monitoring Program document. A summary is presented below:

Continuous Pond Discharge Sampling: Continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, CO) installed in ponds prior to their initial release dates and through November. Salinity, pH, temperature, and dissolved oxygen collected at 15-minute intervals with a sensor and circulator warm-up period of 2 minutes. Data downloaded weekly and Sondes were serviced to check battery voltage and data consistency.

Receiving Water Sampling (Initial Release and Continuous Circulation):*Bay receiving water* quality measurements were collected after initial discharge and then monthly in San Francisco Bay outside the water control structure in ponds from July 2004 until October 2004.

Pond Management Sampling (for Initial Release and Continuous Circulation): In-pond water quality measurements twice monthly in discharge ponds from May through July 2004 (i.e., two months prior to the initial release of ponds. One sampling location to be established for each salt pond; parameters to be measured are salinity, pH, turbidity, temperature, and dissolved oxygen. Readings collected from the near-surface at a depth of approximately 25cm.

Chlorophyll-a sampling (for Continuous Circulation Monitoring): USGS collected chlorophyll samples monthly in Baumberg salt ponds in September and October 2004. Chlorophyll-a sampling was discontinued for 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples to be collected annually, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels).

Communication of Monitoring Results and Violations

During the 2004 monitoring season, some data gaps resulted due to greater-than-expected water level fluctuations and due to down-time for the continuous data recorders to allow for maintenance and poor communication regarding potential water quality violations were also noted. To address these issues, communications protocols have been improved and monitoring devices have been installed in more appropriate locations and water depths. Spare data recorders have also been purchased to replace devices during servicing periods.

The Department is required by the Final Order to contact the RWQCB when violations occur. The Department did not contact the RWQCB to alert them about the potential DO violations. Standard Provisions and Reporting Requirements, state that the Department must notify RWQCB staff by phone within 24 hours, and follow-up with a written report within 5 business days.

The USGS will forward raw data to the Reserve Manager the day it is collected. The Reserve Manager will call the RWQCB within 24 hrs of receiving the information to alert them of a potential violation. Once the USGS has had time to analyze the data and delete false readings from the data set, the reserve Manager will contact the RWQCB staff via email with information regarding the status of the potential violation.

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