State of California

M e m o r a n d u m

To: Bruce Wolfe, Executive Officer
Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Date: February 16, 2007

Original Signed by Eric Larson for

From: Charles Armor, Acting Regional Manager
Department of Fish and Game – Bay Delta Region, Post Office Box 47, Yountville, California 94599

Subject: 2006 Annual Self-Monitoring Report, Final Order Number: R2-2004-0018, WDID Number: 2019438001 Eden Landing Ecological Reserve (Baumberg Complex), Alameda County

The California Department of Fish and Game is submitting the 2006 Self-Monitoring Report (SMR) in compliance with the Waste Discharge Requirements described in the Final Order adopted March 17, 2004. The 2006 SMR includes revised Operations Plans for 2007 (enclosure).

We appreciate your staff's continued support in addressing water quality issues associated with the Department's operation and management of the ponds as part of the Initial Stewardship Plan. If you have any questions, please contact Mr. John Krause, Associate Wildlife Biologist, at (415) 454-8050; or Ms. Laurie Briden, Senior Wildlife Biologist, at (209) 948-7347.

Attachment: 2006 Self-Monitoring Report, 2007 Operations Plans (enclosure)

e✉: Krause, Briden, Palmisano, Wilcox, Shelton

JK/ma

2006 Self-Monitoring Report
Baumberg Complex - Hayward, California
Eden Landing Ecological Reserve

Order Number: R2-2004-0018
WDID Number: 2 019438001

February, 2007

Prepared for:

California Regional Water Quality Control Board
San Francisco Bay Region
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Introduction

This annual self-monitoring report summarizes the results of the water quality monitoring and sediment sampling conducted at the Baumberg Complex, also known as the Eden Landing Ecological Reserve (ELER), in Hayward, California, April through November 2006. Data was collected by the U.S. Geological Survey (USGS) on behalf of the Department of Fish and Game (Department) in accordance with the waste discharge requirements. Water quality monitoring was performed using continuous data recorders at the locations described in the Self-Monitoring Program outlined in the Final Order, except Pond B10. Since August 2004, B10 functioned as a muted tidal mudflat and residence time of intake water was limited to high tide cycles. In 2005, grab samples were collected in B10, but this data had limited usefulness and receiving water monitoring was discontinued, as requested by the Department and approved by the Regional Water Quality Control Board (RWQCB) in 2005. B10 operations were decommissioned in 2006 to accommodate construction activities, and the new water control structure will be completed such that ISP operations will resume in 2007. Water column sampling for metals was discontinued in 2006 since all levels were below Water Quality Objectives (WQOs), as approved by RWQCB staff in its letter to the Department, dated June 12, 2006. Analysis of the 2005/2006 sediment samples for metals were forwarded to the RWQCB staff under separate cover, since paired sampling seasons included data collected in the 2005/2006 winter season.

The Final Order for the South San Francisco Bay Low Salinity Salt Ponds covered 15,100 acres of ponds in Alameda, Santa Clara and San Mateo counties. This report covers ELER (Baumberg Complex) pond systems operated by the Department in 2006 and described in the ISP, including Systems B11 (Pond B10), B2 (B1), B2C, B6A and B8A. System B6A was operated only during part of the 2006 monitoring period due management activities necessary to provide suitable nesting habitat for the western snowy plover. The U.S. Fish and Wildlife Service (USFWS) will be submitting a report for the Alviso Ponds under separate cover.

The ponds are generally being operated as muted tidal systems, as described in the 2006 operations plans, augmenting flow-through systems described in the Initial Stewardship Plan (ISP). Bay water entered ponds via the bay and sloughs at high tides, flowed to one or more ponds, and discharged to sloughs and the bay at low tides. The ponds generally discharge at lower tides, for about 8 hours per day. In 2006, intake and discharge in Ponds B10, B2 (B1), B2c, B6A and B8A occurred at the same water control structure (WCS). Pond systems B8A and B2 also have additional intake WCS as described in the ISP.

The Final Order recognized two periods of discharges from the ponds: the Initial Release Period (IRP) when salinity levels in ponds were above 44 parts per thousand (ppt) and would decrease from the initial levels in the ponds, to a Continuous Circulation Period (CCP) thereafter, with salinities at or below the 44 ppt, which is the continuous discharge limit described in the Final Order. Different monitoring plans were identified in the Final Order for each specific period. In 2006 operation of all systems was with parameters for Continuous Circulation Period water quality monitoring, as more fully described later.

In 2005, the RWQCB required that triggering of reporting and best management practice (BMP) implementation should occur when the dissolved oxygen (DO) levels at the point of discharge fall below a 10^{th} percentile of 3.3 mg/L (calculated on a calendar weekly basis). Low DO conditions are expected during extended periods of high air and water temperature. The 3.3 mg/L DO "trigger" was determined based on levels found in Artesian Slough in July 1997, during an extended period of high air temperatures, and appeared to be the most relevant representation of natural dissolved oxygen variations in sloughs or lagoon systems currently available. This data and associated analysis were used in the issuance of Order No. R2-2005-0003, adopted by the Board on February 16, 2005, which permits Cargill Incorporated to discharge saline waters from Pond A18 to Artesian Slough. When a trigger event occurs, a timely report shall be made to the Board, and BMPs described in its Operations Plan shall be implemented. It has been documented that dissolved oxygen concentrations are observed in sloughs not affected by any discharge to contain dissolved oxygen levels below the Basin Plan standard of 5.0 mg/L, as well as periods below the 3.3 mg/L reporting trigger. Evaluation of benthic dissolved oxygen levels in a number of locations was completed during the monitoring season in 2006 in Newark Slough using receiving water monitoring protocol. In 2005, USFWS monitored ambient slough conditions at intake locations and noted that slough waters entering ponds during intake were below the 3.3 mg/L trigger. Therefore, observed receiving water dissolved oxygen levels may be within the natural range of variation in functional slough and lagoon environments of the South San Francisco Bay and not necessarily indicating a water quality signature of pond waters and discharges.

The RWQCB requested that additional information be provided in all ASMR, as described in a letter dated March 25, 2005. This SMR also incorporates those and subsequent suggested changes and requests for additional information, except as noted (i.e. discharge volumes, invertebrate analysis, as discussed below). The Department has prepared this report as the Draft 2006 Self-Monitoring Report for the Eden Landing Ecological Reserve (Baumberg Complex). Additional analysis and interpretation of monitoring data shall be completed to complement information presented in this report, and shall be submitted for review in April, 2007.

2006 Annual Summary

This section discusses the activities performed during the 2006 monitoring season at the ELER ponds (Baumberg Complex) to comply with RWQCB Final Order and subsequent requirements and/or modifications. The site location is shown on Figure 1; sampling locations are shown on Figures 2a and 2b. See Figure 3 for Newark Slough sampling.

The water quality monitoring performed according to the Final Order for operation of the pond systems revealed periods of low Dissolved Oxygen (DO). In 2004 and 2005, low DO levels were observed in a number of the South Bay Salt Ponds (SBSP), including ELER ponds, in the late-summer/early-fall when seasonal temperatures, winds and evaporation were expected to be highest. However, in 2005 and 2006, low DO levels were observed throughout the monitoring period, not just during the latter part of the season as was anticipated based on 2004 monitoring data. The low DO levels were more pronounced in some pond systems than others, and a definitive explanation for such differences is not yet apparent. There appears to be some correlation with abiotic factors, such as spring and neap tide periods, weather conditions and seasonal variations, and there may also be biotic factors that affect DO levels, such as algal growth and growth and/or usage by pond invertebrates or larger animals, including fish. The Department is currently analyzing the data sets to attempt to determine correlations between tidal cycles and DO levels, and will provide a summary in subsequent reports.

In 2005, RWQCB required that the time-period each day that ponds discharge, and an estimate of the quantity discharged, be included in the ASMR. It was understood that this information would be provided for particular periods of interest, rather than be provided in the form of a summary table for each actual discharge day. Estimates of discharge volume could provide useful information, which would be used for activities such as modifications to operations, and for evaluation and analysis, particularly for determining what effects, if any, discharges had on receiving waters, and determination of effectiveness of BMPs. RWQCB modified ASMR requirements similarly for the ponds operated by USFWS, which is working collaboratively with the Department on the ISP and long-term restoration project for the SBSP. In response to this requirement, USFWS requested assistance from USGS in developing a methodology to estimate discharge volumes. USGS developed a 'calculator' to estimate discharge from five Alviso Complex ponds for USFWS. Inputs currently include the pond water surface elevation, the number of discharge culverts (48"), and the range of dates for discharge. Output would be the estimated volume of discharge over the data range. Tidal height is predicted in the calculator. Generalized use of this calculator for other ponds, including those managed by the Department, could be expected once site specific calibration was performed. USGS performs a rigorous review process before they can publicly release the calculator report (for use outside the federal agencies). USGS is currently finishing their report on the calculator and the formal review process was completed at the end of January 2007. Once the calculator is available for use by the Department, we intend to provide this information in future reports to the RWQCB to assist in evaluation and analysis of particular periods of interest. The 2005 and 2006 SMRs would be revised accordingly.

Additional analysis and interpretation of monitoring data shall be completed to complement information presented in this report, particularly for DO, and shall be submitted for review in April, 2007.

System B11:

Pond B10 continued operation as a continuous discharge muted tidal pond and functioned as a muted tidal mudflat since residence time of intake water was limited to high tide cycles (due to a defunct culvert flap gate) only for the first two months of the 2006 season. Operation of the pond ceased after June 30, 2006 to allow construction activities to construct the new water control structure (WCS). Pond 11 was operated as a seasonal pond in 2006 with rainwater input only. B10 water quality samples were not collected in 2006; based on review of 2005 grab samples collected in B10, the data had limited usefulness and receiving water monitoring was discontinued for bay discharges as well, as approved by RWQCB in 2005.

The new intake/discharge WCS for Pond B10 is expected to be functional by February 2007. Construction of the WCS is being completed as part of the current phase of construction on the existing 835-acre Eden Landing restoration project, formerly known as the Baumberg Tract, and now as part of the larger ELER.

Abandonment of water control structure B11-6x was completed in-place. Removal of the remaining portions of the trash-rack, installation of rock riprap on the bay side and removal of the failed bulkhead wall and backfill of soil on the pond side to match existing grades were completed by June 30, 2006. The four 48" culvert pipes were plugged, filled with lean concrete mix by means of excavation of trenches within the levee top. Perforating the pipes and pumping in lean concrete was completed September 28, 2006.

System B8A:

Pond System B8A generally operated as muted tidal intake/discharge at the WCS in the northeast corner of B8A. North Creek provides the tidal circulation connection to Old Alameda Creek and the bay.

This system generally performed with continued low DO levels similar to observed conditions in 2005. System B8A continued to provide good habitat conditions for waterbirds despite the periods of low DO conditions. In 2006, this muted tidal system had greater difficulty in attaining the DO standard described in the Basin Plan and frequently resulted in 10^{th} percentile values below the reporting trigger set by the RWQCB at 3.3 mg/L, although median values generally ranged near the Basin Plan value of 5 mg/L.

As part of the current phase of construction on the existing 835-acre Eden Landing restoration project, which restored tidal action in Mount Eden Creek, intake at B9 was initiated upon completion of the Mount Eden Creek channel construction in November. System B8A thereafter received primary intake from B9, although muted tidal intake continues to occur at B8A. Residence time of pond waters is expected to decrease with the improved intake at B9, and DO levels in 2007 are expected to improve.

System B2C:

Pond B2C was operated under Continuous Circulation Period in 2006. This system generally performed with continued low DO levels, as observed in 2005. System B2C continued to provide good habitat conditions for waterbirds despite the periods of low DO conditions. This muted tidal system had the greatest difficulty in attaining the DO standard described in the Basin Plan and frequently resulted in 10^{th} percentile values below the reporting trigger set by the RWQCB at 3.3 mg/L, although median values generally ranged near the Basin Plan value of 5 mg/L.

System B2:

In 2006, Pond System B2 was operated for the majority of the season with discharge occurring from B2. For a limited time period, discharge occurred at B1, in an attempt to correct low DO discharge values, and this management activity was successful. For the first time during the ISP, pumped intake to B1 occurred because repairs to the #1 Intake Pump were completed, and, in order to ensure proper operations and maintenance, as well as attempting to improve DO levels, the pump was operated for approximately one week. Water levels rose significantly more than occurred via passive tidal intake, and DO levels showed improvement with the deeper water conditions. However, due to high energy costs and a negligible operations budget, operation of the #1 Intake pump is not a practicable means of routinely attempting to improve DO levels.

As described in the ISP, discharge was initiated alternatively from Pond B1, the main intake pond on October 13, 2006 in an attempt to improve DO values. The system was operated as muted tidal, intaking from and discharging to Old Alameda Creek from October 13 through October 31, 2006. DO values improved and monitoring for the season was discontinued. Thereafter, System B2 resumed typical discharge operations via B2 for the winter season.

System B6A:

Pond System B6A generally operated as muted tidal intake/discharge at the WCS in the eastern levee of B6A. Old Alameda Creek provides the tidal circulation connection to the bay.

This system generally performed with low DO levels similar to observed conditions in other shallow water pond systems 2005. This muted tidal system had difficulty in attaining the DO standard described in the Basin Plan and frequently resulted in 10th percentile values below the reporting trigger set by the RWQCB at 3.3 mg/L, although median values generally ranged near the Basin Plan value of 5 mg/L. System B6A provided good habitat conditions for waterbirds despite the periods of low DO conditions, and provided breeding habitat conditions for western snowy plover (WSP), a federally threatened species, which resulted in contradictory management needs. Therefore, to ensure breeding success for WSP, this system was not operated under continuous circulation beginning in mid-June and was allowed to draw down and operate as a seasonal pond.

For all pond systems:

To address low DO levels and to maintain summer operation water levels in the ponds, in Systems B2, B2C, B6A and B8A, the outlets were adjusted throughout the season. Management activity for the systems was relatively high, as adjustments were made frequently based on pond discharge and receiving water data, current or anticipated weather and predicted tidal conditions, to minimize discharge of pond waters below 10th percentile trigger values. A summary of discharge events is shown on Table 1.

Table 1. Summary of Discharge Events.

Complete notes of pond (system) conditions and management activities are available for review upon request. Continuous meter data (Datasondes) was provided to RWQCB staff during the season and are not included in the report due to large file size; Final Datasonde files are available upon request.

NOTE: Table 1 salinity values displayed are generally from field measurements using hand-held refractometer, except in rare cases where not collected and Datasonde values are substituted; Datasonde values differ slightly and are generally 4-8 ppt lower than refractometer values. Datasonde values should be considered more accurate and are used for all graphs listed as Figures in this SMR, and in table in *italics*.

Pond	Location	Date	Time	Salinity	Activity and notes
2c	B2c-14	April		6	1x48" Discharge continues at 25% (from winter ops)
2C	B2c-14	5/1/2006	10:30	8	Opened 2nd 48" Discharge to 5%
2C	B2c-14	5/8/2006	11:00	2C	Closed 25% 1x48" Discharge, 5% 1x48" Discharge continues
2c	B2c-14	5/15/2006	12:00	6	Increased 1x48" Discharge to 10%
2c	B2c-14	5/22/2006	10:30	5	Increased 1x48" Discharge to 20%
2c	B2c-14	5/25/2006	12:00	*9*	Increased 1x48" Discharge to 25%
2c	B2c-14	5/30/2006	13:00	16	Reduced 1x48" Discharge to 10%
2C	B2c-14	6/2/2006	11:45	15	Reduced 1x48" Discharge to 5%
2C	B2c-14	6/9/2006	11:45	19	Increased 1x48" Discharge to 20%. Intaking
2C	B2c-14	6/30/2006	12:00	*21*	CLOSED DISCHARGE
2C	B2c-14	7/3/2006	14:30	31	Opened 1x48" Discharge to 5%
2C	B2c-14	7/10/2006	13:15	*23*	Increased 1x48" Discharge to 20%
2C	B2c-14	7/13/2006	16:15	31	Reduced 1x48" Discharge to 15% Intaking
2C	B2c-14	8/4/2006	11:30	38	Increased 1x48" Discharge to 25%
2C	B2c-14	8/8/2006	11:15		Increased 1x48" Discharge to 50%
2C	B2c-14	8/11/2006	15:30	36	Increased 1x48" Discharge to 75% Intaking
2C	B2c-14	8/17/2006	9:30	*30*	Reduced 1x48" Discharge to 25%
2C	B2c-14	8/21/2006	9:45	41	Reduced 1x48" Discharge to 5%
2C	B2c-14	9/6/2007	10:00	*29*	Increased 1x48" Discharge to 25%
2C	B2c-14	9/8/2006	11:45	42	Increased 1x48" Discharge to 50%
2C	B2c-14	9/12/2006	12:30	*36*	Reduced 1x48" Discharge to 25%
2C	B2c-14	9/14/2006	13:00	*33*	Reduced 1x48" Discharge to 10%
2C	B2c-14	9/19/2006	11:15	*30*	Reduced 1x48" Discharge to 5%
2C	B2c-14	10/26/2006	11:20	*33*	Increased 1x48" Discharge to 10%
2C	B2c-14	11/11/2006	12:15	*33*	Reduced 1x48" Discharge to 5%
2	B2-10	4/28/2006	13:00	*27*	1x48" Discharge at 15% (from winter ops) Increased 1x48" Discharge to 25%. Opened 1x48" Intake 50%
2	B2-10	5/15/2006	12:30	26	Reduced 1x48" Discharge to 20%
2	B2-10	5/30/2006	13:15	28	Reduced 1x48" Discharge to 15%
2	B2-10	6/9/2006	12:00	31	Increased 1x48" Discharge.to 25%
2	B2-10	6/30/2006	12:15	*26*	CLOSED DISCHARGE
2	B2-10	7/3/2006	15:00	*37*	Opened 1x48" Discharge to 5%
2	B2-10	7/10/2006	14:00	*30*	Increased 1x48" Discharge to 10%
2	B2-10	8/4/2006	12:15	38	Increased 1x48" Discharge to 25%
2	B2-10	9/14/2006	11:15	*35*	Increased 1x48" Discharge to 50%
2	B2-10	9/19/2006	10:45	*37*	Reduced 1x48" Discharge to 5%
2	B2-10	9/28/2006	15:00	*30*	CLOSED DISCHARGE. INTAKING

					Pond Mgmt. change, began discharge at Pond B1 (B2-1) to improve DO
1	B2-1	10/13/2006	15:00	*28*	Opened 1x48" Discharge to 5%
1	#1 Intake Pump	10/20/06	14:00	*30*	Started Pump
1	#1 Intake Pump	10/26/2006	12:00	*29*	Pump turned OFF
1	B2-1	10/31/2006	12:00	*29*	CLOSED DISCHARGE, DO improved
					Pond Mgmt. change, resumed discharge at Pond B2 (B2-10) for winter operations
2	B2-10	10/31/2006	11:30	40	Opened 1x48" Discharge to 5%
8A	B8A-NC	4/27/2006	14:30	20	1x48" Discharge continues at 15% (from winter ops)
8A	B8A-NC	5/8/2006	12:45	*27*	Reduced 1x48" Discharge to 10%
8A	B8A-NC	5/27/2006	9:15	*14*	Increased 1x48" Discharge to 35%
8A	B8A-NC	6/2/2006	13:00	*45*	Reduced 1x48" Discharge to 5%
8A	B8A-NC	6/30/2006	12:45	*23*	CLOSED DISCHARGE
8A	B8A-NC	7/3/2006	16:00	*25*	Opened 1x48" Discharge to 5%
8A	B8A-NC	8/4/2006	13:00	39	Increased 1x48" Discharge to 25%
8A	B8A-NC	8/11/2006	14:30	*27*	Reduced 1x48" Discharge 15%. Intaking
8A	B8A-NC	8/14/2006	14:45	*32*	Reduced 1x48" Discharge to 5%
6A	B6A-10	4/28/2006	12:30	*29*	Opened 1x48" intake 25%. 1x48" Discharge closed
6A	B6A-10	5/8/2006	12:00	13	Opened 1x48" Discharge to 5%. Intaking
6A	B6A-10	5/16/2006	14:00	13	Reduced 1x48" Intake to 20%.Increased 1x48" Discharge to 10%
6A	B6A-10	5/22/2006	12:00	8	Reduced 1x48" Intake to 10%. Increased 1x48" Discharge to 50%
6A	B6A-10	6/2/2006	12:15	20	Reduced 1x48" Discharge to 5%
6A	B6A-10	6/8/2006	13:00	*4*	Increased 1x48" Discharge to 20%
6A	B6A-10	6/13/2006	8:30	*12*	Reduced 1x48" Discharge to 15%
6A	B6A-10	6/19/2006	15:00	*0*	CLOSED DISCHARGE for seasonal pond operation (snowy plover breeding)
6A	B6A-10	6/26/2006	12:15	*13*	CLOSED INTAKE 6A Pond System = seasonal (draw-down) operation

Water Quality Monitoring Requirements

Water quality monitoring was performed at the sampling stations shown in Figures 2a and 2b. The water quality parameters are provided in the Final Order and are summarized below for reference:

Table 2. Continuous Circulation Period Discharge Limits.

All pond waters discharging to the Bay or Sloughs shall meet the following limits:

Constituent	Instantaneous Maximum	Instantaneous Minimum	Units
Salinity (Continuous Circulation Period)	44	n/a	ppt
Dissolved Oxygen[1]	n/a	5.0	mg/L

Constituent	Instantaneous Maximum	Instantaneous Minimum	Units
pH[2]	8.5	6.5	

[1] = Limitation applies when receiving waters contain ≥ 5.0 mg/L of dissolved oxygen (DO). When receiving waters don't meet the Basin Plan objective, pond discharges must be ≥ DO receiving water level.

Dissolved Oxygen (DO) Trigger. At each pond discharge location, if the DO concentration is < 3.3 mg/L,calculated on a calendar weekly basis, values below the trigger shall be reported promptly to RWQCB, corrective measures shall be implemented in an attempt to increase DO concentrations, receiving waters shall be monitored and Operation Plans shall be revised, as appropriate, to minimize reoccurrence.

[2] = The Discharger may determine pH compliance at the discharge or in the receiving water.

Water Quality Monitoring Methodology

Continuous Pond Discharge Sampling:

USGS installed continuous monitoring devices (Hydrolab-Hach Company, Loveland, CO) called Datasondes in ponds B8A, B6A, B2C and B2 prior to the 2006 season discharge monitoring. Datasondes were installed in all ponds (B2, B2C, B6A and B8A) on April 27, 2006. On September 21, 2006, they installed a Datasonde in pond B1 in preparation for discharge of pond B1. The Datasondes measured water quality at the outflow of the discharge into San Francisco Bay or the connecting tidal slough. Discrete water samples were collected concurrent with some meter calibrations throughout the monitoring season to perform Winkler titration samples. Samples were fixed in the field and analyzed at the USGS Menlo Park facility. Results were compared to direct meter readouts of DO to check for meter accuracy.

Datasondes were installed on the pond side of the WCS that discharged waters to the San Francisco Bay receiving waters using a PVC holder attached to a pole or plastic pipes mounted to the structure to allow for free water circulation around the sensors. The devices were installed at a depth of at least 25cm to ensure that all sensors were submerged, and these depths were monitored and adjusted to maintain constant submersion as the pond water levels fluctuated. The Datasondes were serviced biweekly to recalibrate and de-foul the units (unless otherwise noted in service records). Spare data recorders were deployed to replace devices during servicing periods.

Datasondes collected values for the following parameters: salinity, pH, temperature, and dissolved oxygen, which were collected at 15-minute intervals with a sensor and circulator warm-up period of 2 minutes. Data were downloaded weekly from Datasondes and the devices were serviced to check battery voltage and data consistency. A recently calibrated Hydrolab Minisonde was placed next to the Datasonde in the pond at the same depth, and readings of the two instruments were compared. Datasondes were calibrated pre-deployment and maintained on a biweekly cleaning and calibration schedule unless they required additional maintenance. Any problems detected with the Datasonde were corrected through calibration or replacement of parts or instruments.

All pond systems were monitored under Continuous Circulation Period protocol in 2006 at the discharge point (B2 [B1], B2C, B6A and B8A). The B2 meter was moved from B2-10 to B2-1 in an attempt to alter management and improve discharge DO levels in

System B2. Discharge was initiated from Pond B1 on October 13, 2006, operating as muted tidal, intaking from and discharging to Old Alameda Creek, through October 31, 2006. DO values improved and monitoring for the season was discontinued, and winter operations discharge resumed in B2.

System B11, (Pond B10) continued to operate as a muted tidal mudflat due to the defunct WCS, similar to 2005 operations, but was operated a seasonal beginning in early summer. The defunct water control structure (B11-6x) in Pond 10 consisted four, 48" culverts with flap gates on the pond side and was originally used for intake of bay waters for salt making operations. This structure was intended to be replaced by B11-1 consisting of three, 48" culverts (2 with flap gates, one with slide-flap combination gates) as part of the ISP in 2005 but construction was delayed until 2006 due to site conditions and funding constraints and will be completed for 2007 operations.

Abandonment of B11-6x was completed in-place. Removal of the remaining portions of the structure and installation of rock riprap on the bay side and backfill of soil on the pond side to match existing grades were completed by June 30. The four 48" culvert pipes were plugged, filled with lean concrete mix by means of trench excavation within the levee top. Perforating the pipes and pumping in lean concrete was completed September 28, 2006. In 2005, Pond B10 was sampled weekly using discrete "grab" samples at two locations in the pond; however, this data had limited utility and was not conducted in 2006, as approved by RWQCB staff in 2005.

During the 2006 monitoring season, short data gaps (on the order of days) were observed due to Datasonde malfunctions, and Datasondes were replaced as needed to address malfunctions. Datasonde malfunctions occurred less frequently in 2006 than in 2005. Communication protocols have been improved and the devices were installed in more appropriate locations and water depths as compared to 2005.

During periods of neap tides coinciding with discharge periods, the Datasondes were occasionally exposed for short periods (hours). These episodes were corrected as soon as possible after being observed in the field or during review of data and occurred less frequently that in 2005. Device malfunctions that occurred resulted in questionable data accuracy and were mostly attributed to corrosion, exposure, bio-fouling. It is likely that malfunctions cannot be completely avoided, as the Datasondes are deployed in harsh saline environments. The devices suffer significant bio-fouling and the data from the week between cleanings may be affected by the bio-fouling.

Discharge Time-Period and Volume Estimates:

In a letter dated March 25, 2005, RWQCB required that the Department document in each ASMR the time-period each day that ponds discharge, and an estimate of the quantity discharged, starting in the 2005 monitoring period. Based on subsequent conversations with RWQCB staff, it is understood that this information would be provided for particular periods of interest, rather than be provided in the form of a summary table for each actual discharge day. Estimates of discharge volume could provide useful information, which would be used for activities such as modifications to operations, and for evaluation and analysis, particularly for determining what effects, if any, discharges had on receiving waters, and determination of effectiveness of BMPs. RWQCB modified ASMR requirements similarly for the ponds operated by USFWS, which is working collaboratively with the Department on the ISP and long-term restoration project for the SBSP. In response to this requirement, USFWS requested assistance from USGS in developing a methodology to estimate discharge volumes. USGS is developing a calculator model (PONDCALC) to estimate discharge from five Alviso Complex ponds for USFWS. Inputs include the pond water surface elevation, the number of discharge culverts (48"), and the range of dates for discharge. Output would be the estimated volume of discharge over the data range. Tidal height is predicted in the calculator. Generalized use of this calculator for other ponds, including those managed by the Department, likely would be appropriate.

USGS must go through a lengthy internal review process before public release of data products (for use outside the federal agencies). USGS completed the PONDCALC report at the end of January 2006. Once the calculator has been modified for use by the Department at the Eden Landing ponds, we intend to provide discharge volume estimates in future reports to the RWQCB to assist in evaluation and analysis of particular periods of interest. This 2006 SMR, and previous year's ASMRs would be revised accordingly.

Discharge time period information is summarized in Table 1: Summary of Discharge Events. The time-period each day that pond discharge was made is not specifically provided in this report. It should be noted that the daily discharge time-period information would be based on predicted tidal elevations, not actual time periods because there is currently no instrumentation to record actual discharge time-periods. Discharge periods in the ISP were assumed to be approximately 8 hours a day. Discharge event information is useful to contextualize management actions and BMP's implemented during ponds operations and provide details to complement the gereral information in the Operations Plans; discharge quantity estimates, which are not yet available as noted above, will also complement this information.

Receiving Water Sampling (Continuous Circulation Period):

Receiving quality measurements were collected in sloughs that drain into San Francisco Bay including locations immediately outside the WCS in ponds B1, B6A, B2C and B8A from May 11, 2006 until November 16, 2006. Sampling was conducted on an approximately weekly basis (when water quality objectives in discharge samples were not met). Receiving waters were measured by USGS at 6 sites along Alameda Flood Control Channel adjacent to Pond B2C, and at 6 sites along Old Alameda Creek, adjacent to Pond 8A near the confluence of North Creek and adjacent to Pond 6A (Figure 2a). Receiving water was not monitored for bay discharges, as approved by RWQCB in the revised Final Order in 2005. Bay discharge locations include Ponds B2 and B10.

Receiving water samples were collected weekly when water quality objectives in discharge locations were not met. Sampling locations were marked using a GPS waypoint. USGS accessed slough sampling sites via boat from San Francisco Bay and used a GPS to navigate to sampling locations. When the boat was approximately 50-25 meters from the site, the engine would be cut or reduced to allow for drifting caused by current and wind to the site location. Every effort was made to ensure that the sample reading was collected from the center of the slough. A recently calibrated Hydrolab Minisonde (Hydrolab-Hach Company, Loveland, Colorado) was used to measure salinity, pH, turbidity, temperature, and dissolved oxygen at each location. Samples were collected from the near-bottom of the water column in addition to the near-surface at each sampling location. Depth readings of sample locations were collected at the completion of each Minisonde measurement to account for drift during the reading equilibration period. The specific gravity of each site was additionally measured with a hydrometer (Ertco, West Paterson, New Jersey) scaled for the appropriate range. This sample was collected concurrently with the near-surface Minisonde measurement. The majority of the samples were collected on the rising or high tide in order to gain access to the sampling sites, which were not accessible at tides less than 3.5 ft MLLW. Standard observations were collected at each site. These were:

A) Observance of floating and suspended materials of waste origin.
B) Description of water condition including discoloration and turbidity.
C) Odor – presence or absence, characterization, source and wind direction.
D) Evidence of beneficial use, presence of wildlife, anglers and other recreational activities
E) Hydrographic conditions – time and height of tides, and depth of water column and sampling depths.
F) Weather conditions – air temp, wind direction and velocity, and precipitation.

Sections A, B, C, D and E were recorded at each sampling location. Section F was recorded at the beginning and ending of each slough, unless it had changed significantly.

Calibration and Maintenance:

All the instruments used for sampling as part SMP were calibrated and maintained according to the USGS standard procedures. Datasondes were calibrated pre-deployment and maintained on a biweekly cleaning and calibration schedule unless they required additional maintenance. During the cleaning and calibration procedure, simultaneous readings were collected with a recently calibrated Hydrolab Minisonde to confirm data consistency throughout the procedure (initial, de-fouled [post cleaning], and post calibration). The initial and de-fouled readings were also used to detect shifts in the data due to accumulation of biomaterials and sediment on the sensors. The problem of algae and other substances interfering with the moving parts such as on the self-cleaning brush and circulator was improved with the use of nylon stockings. This allowed for maximum water flow past the sensor but stopped algae from wrapping around and binding the moving parts. Copper mesh and wire was used to inhibit growth in ponds with high concentrations of barnacles and hard algae, which could interfere with sensor function. USGS performed a biweekly fouling check to detect shifts in data due to the accumulation of biomaterial and sediment on the sensors. A calibration and maintenance log was maintained for each pond.

Additionally, Winkler titration samples were collected in April, May, September and November 2006 to check accuracy of DO readings. Results were compared to direct meter readouts of DO to check for meter accuracy. Despite some variability in readings, the data suggest that Datasondes and Minisonde DO readings are generally consistent.

Two types of DO sensors were used, Clark Cell and Luminescent DO. There was no particular reason why one type was used over another, rather the devices were pooled and used as needed. When malfunctions occurred and meters required replacements, the loaner units were often Clark Cell sensors. Clark Cell DO sensors were used throughout the season on the Datasondes in ponds B6A and B2 [+B1] and for the latter part of the season for ponds B2C and B8A. The Clark Cell sensors can be problematic due to the self-cleaning brush attachments on the equipment which tend to damage the surface of the membrane more frequently. Luminescent DO (LDO) sensors are improved in that they did not have the same brush mechanism and were less problematic, though were not problem free. LDO sensors were used from the beginning of the monitoring season until the first week in August in pond B2C, and until mid-September in pond B8A.

Regardless of type, the salt pond environment results in corrosion and fouling and will continue to pose challenges to successful deployment of continuous monitoring devices.

Pond Management Sampling:

As approved by RWQCB in 2005, the Department discontinued pond management sampling due to limited analysis and applicability.

Chlorophyll-a Sampling:

As approved by RWQCB in 2005, the Department discontinued collecting in-pond chlorophyll samples due to limited analysis and applicability and did not collect in-pond chlorophyll samples in 2006.

Metals- Annual Water Column Sampling:

As approved by RWQCB in 2005, the Department discontinued annual water column metals sampling because analysis of previous year's data showed metals concentrations were within WQO's.

Sediment Monitoring

As approved by RWQCB in 2005, the Department discontinued sediment sampling because analysis of previous year's data showed metals concentrations were within WQO's. In 2006, RWQCB supported redirection of monitoring efforts to address specific issues rather than generalized pond monitoring; accordingly, the study of mercury shall be centered on the USFWS Alviso Pond Complex, in Pond A8 and Alviso Slough. The Alviso sediment monitoring effort is not yet complete and data collection is still underway. USFWS will provide a report to the RWQCB when it becomes available and any relevant findings may be applicable to the Department's ponds at ELER.

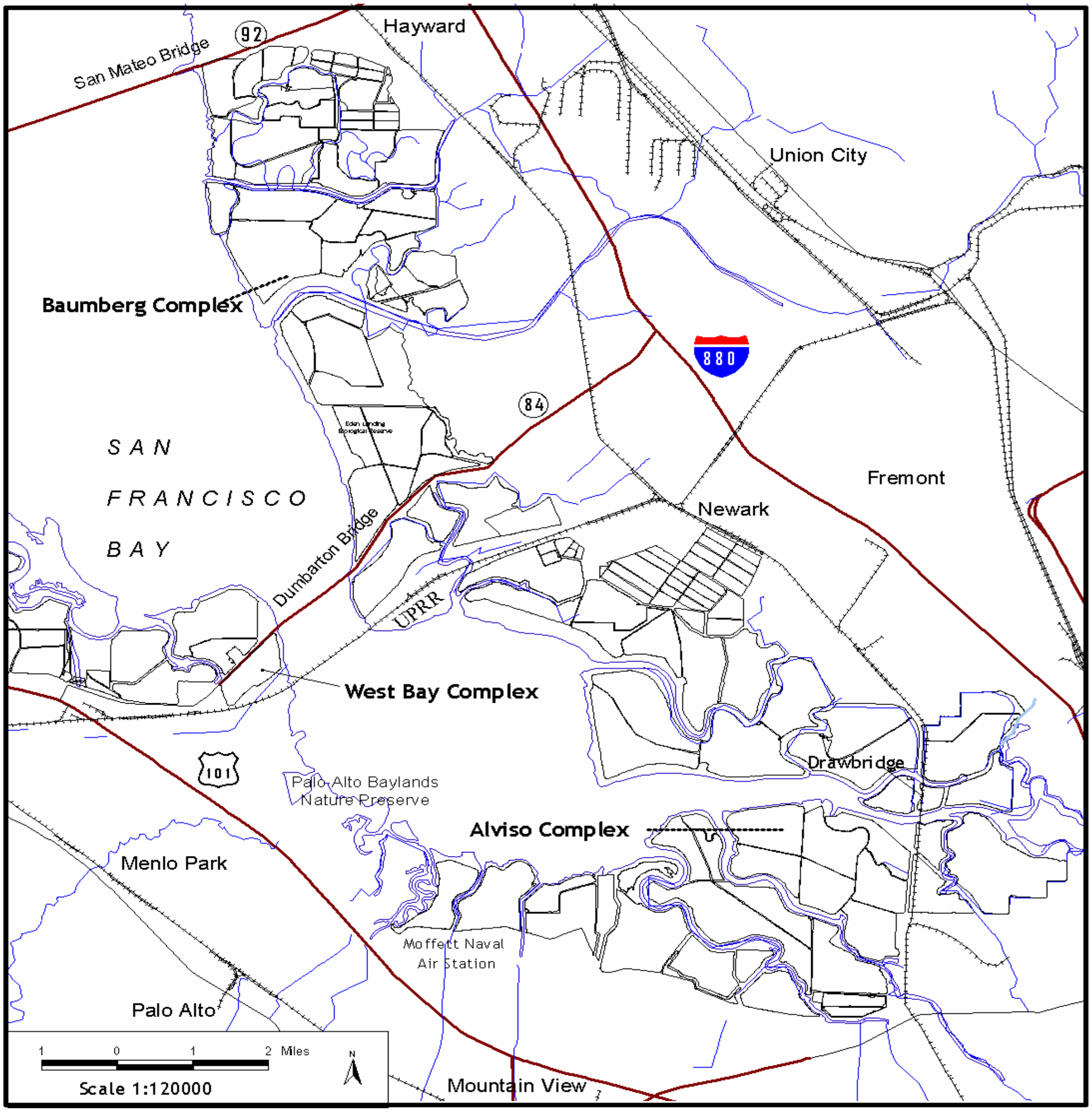


Figure 1. Vicinity Map of the Eden Landing Ecological Reserve (Baumberg Complex) Ponds

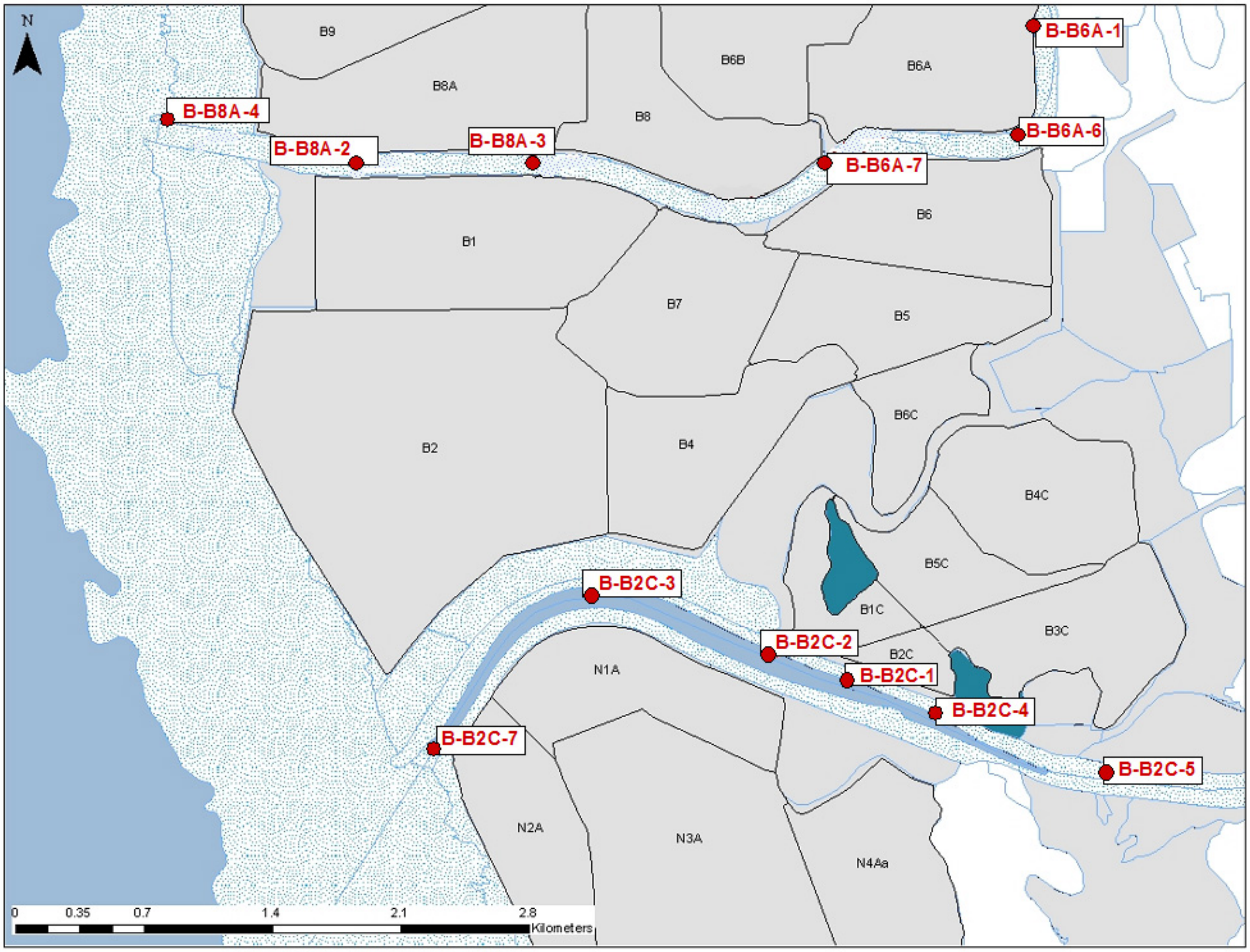


Figure 2a. Eden Landing Ecological Reserve (Baumberg Complex) Water Quality Sampling Locations- Receiving Waters

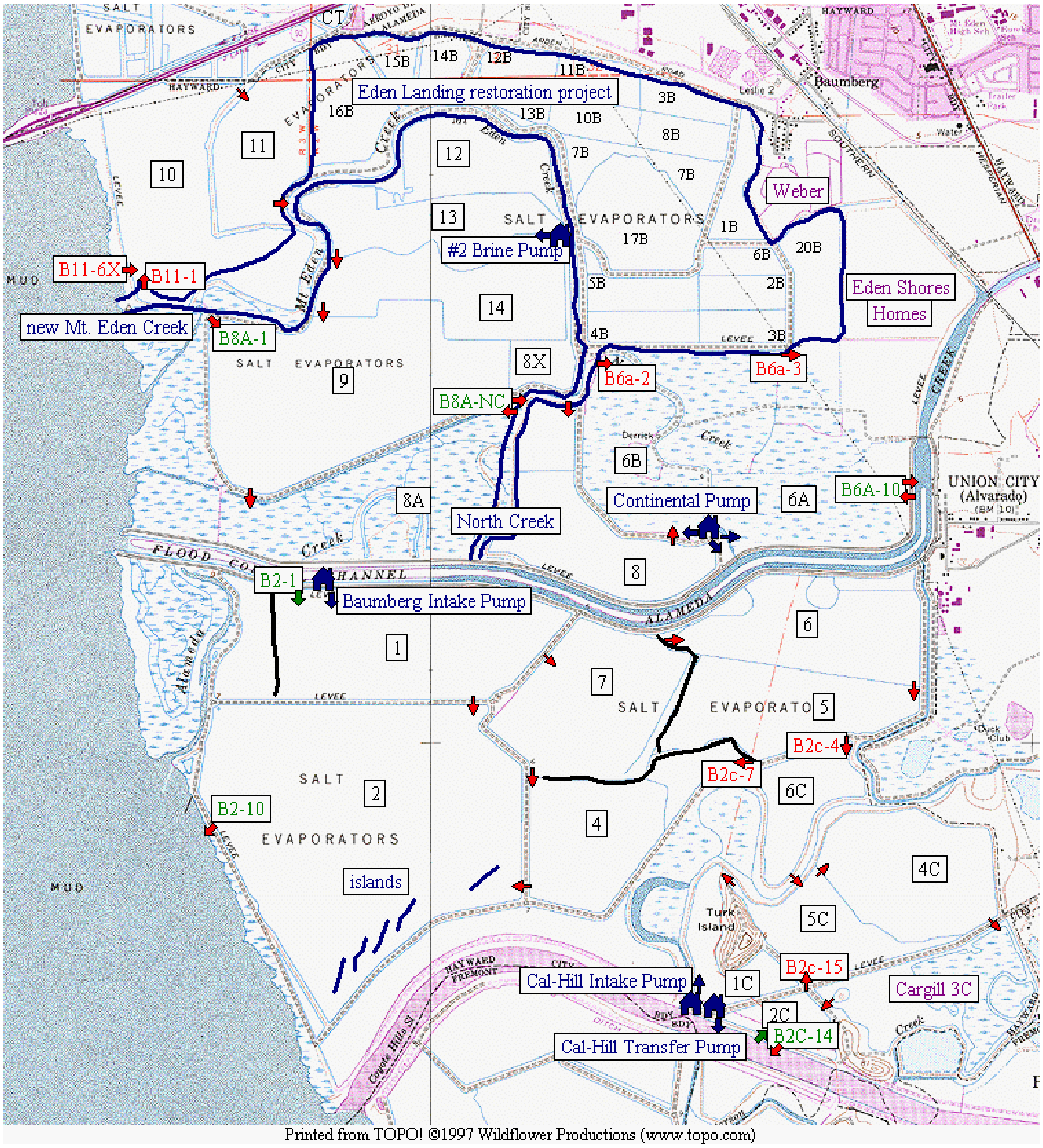


Figure 2b. Eden Landing Ecological Reserve (Baumberg Complex) - Discharge and Intake Locations (Green text boxes).

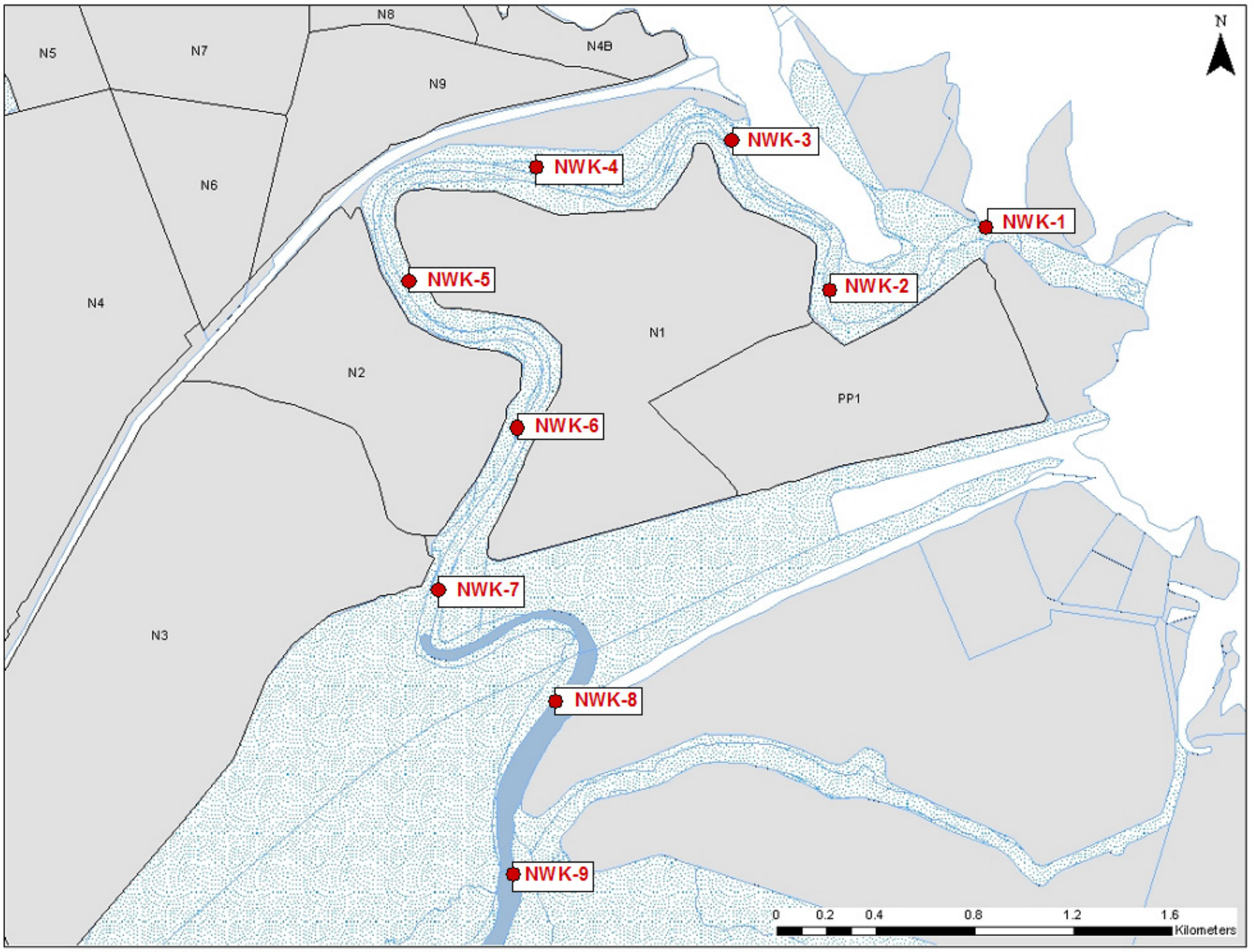


Figure 3. Newark Slough Water Quality Sampling Locations (Receiving Waters Reference)

Water Quality Monitoring Results

Discharge and Receiving Waters

Results from the monitoring of pond discharge locations and receiving waters are summarized below by parameter. It should be noted that, where the continuous data collection meter files show values below Basin Plan objectives and Final Order requirements, it does not necessarily indicate or reflect actual violations. Pond discharges did not occur continuously. Pond discharge data should be reviewed considering tidal variation and operational activities which resulted in ceasing or modifying discharges.

Figures 3-6 show the daily means for salinity, pH, temperature and DO for the discharge monitoring and receiving water samplings at B2C, Figures 7-10 for B8A, Figures 11a/b-14a/b for B2/B1, and Figures 15-18 for B6A. Due to an administrative oversight, receiving waters were only monitored in the north channel of Old Alameda Creek, so the two week period when System B2 was operating with discharge via Pond B1 (B2-1 location) did not have receiving water samples collected in the south channel of Old Alameda Creek nearest the B2-1 discharge. Data collected in Newark Slough to show variability in ambient conditions for slough water quality are presented in Figure 19-22.

The 2006 surface water analytical results and field observations are large files and are not included in this SMR. Please contact the Department to request this information.

Salinity

Pond salinities generally behaved as expected. Salinities were generally not above the 44 ppt required for Continuous Circulation Period operations, except for rare, very brief periods during neap tide intervals (see Instantaneous salinity readings for B8A data from 6/1/06, 6/2/06, 6/4/06, 11/2/06, 11/11/06). These periods were the result of water moving from adjacent, slightly higher salinity ponds during atypical water circulation patterns resulting from decreased intake and lower water levels. Only a portion of those daily mean periods were during actual discharge events, and values were only a few points above 44 ppt. Refer to Figures 3, 7, 11a/b, and 15 for daily means in B2C, B8A, B2/1 and B6A, respectively. The operating salinities for all system ponds are expected to remain under Continuous Circulation Period conditions in future years, and will continue to chiefly function as low-salinity systems, reflecting only relatively higher salinities than the intake waters from the Bay and sloughs. Differences in mean salinity between pond and bay waters are more apparent during neap tide periods. It is anticipated that seasonal or batch pond operations, where a limited number of ponds are allowed to reach moderate salinities, will not prevent continued management of primarily low salinity ponds.

<u>B2C:</u>
System B2C is operated as a muted tidal system, with intake and discharge at the same location, and salinity therefore varied depending on intake periods affected by spring and neap tide cycles. System B2C daily mean and instantaneous salinities were not above 44ppt (Continuous Circulation Period limit). Pond B2C discharge monitoring showed pond salinities of approximately 5 ppt in late-April 2006, and operated at values ranging

from approximately 5-37 between late-April through November. Daily mean salinity in B2C was consistently below 44 ppt throughout the season and the system operated under Continuous Circulation Period conditions.

The highest recorded daily mean value was 37 ppt (10/31/06). This coincided with a period during which time pond water temperatures were approximately 30 degrees Celsius due to lower water levels associated with increased discharge (maximum gate setting was 50% open) and higher salinity brines from other ponds in the B2C system had accumulated in B2C during a spring tide cycle. This period was during the latter part of the season when evaporation was probably at its highest. Instantaneous salinity values ranged from a low of 0 ppt to a high of 37 ppt.

<u>B8A:</u>
System B8A is operated as a muted tidal system, with intake and discharge at the same location. Salinity correspondingly varied depending on spring and neap tide periods. At the start of the monitoring season, discharge salinity from B8A was at approximately15 ppt starting in late-April, 2006. Daily mean salinities were not above 44 ppt and the system operated under Continuous Circulation Period conditions.

The highest recorded daily mean value was 41 ppt (06/02/06). Instantaneous salinity values ranged from a low of 12 ppt to a high of 46 ppt, while daily mean salinity typically ranged from 11 to 41 ppt from late-April through November. Refer to instantaneous salinity readings for B8A data from 6/1/06, 6/2/06, 6/4/06, 11/2/06 and 11/11/06 for values exceeding 44 ppt. Discharge salinity was actively managed and was generally limited by operations to avoid instantaneous discharge values above 44ppt. During only one brief period (6/30 to 7/3/2006) during warmer weather and a period of neap tides, discharge operations were temporarily suspended to increase water levels, although salinities were within the typical operation range. Higher salinity waters originating in Pond B9 appear to have been well mixed by intake in B8A at the discharge location, since it was operated in a muted tidal condition.

<u>B2 (B1):</u>
System B2 is operated as a circulating system, with augmented muted tidal intake at the B2-10 discharge location on the bay. Discharge operations were alternatively initiated in Pond B1 at the B2-1 location on 10/13/06. Therefore intake and discharge occurred at the same location in both operation alternatives. Daily mean salinities were not above 44 ppt and the system operated under Continuous Circulation Period conditions. Discharge salinity from B2 was at approximately 27 ppt starting in late-April, 2006 and ranged up to 35 ppt.

Pond B2 salinity in mid-September was approximately 34 ppt when discharge at the B2-10 location was ceased and operations were altered such that discharge for the B2 system was initiated at the B2-1 location into Old Alameda Creek via pond B1 (10/13/06). Discharge salinity from B1 was at approximately 28 ppt starting in mid-October, 2006. B1 daily mean salinities ranged from 27-31 ppt. Instantaneous salinity values ranged from 26 ppt to 31 ppt. Discharge occurred from October 13 through 31, 2006 during which time daily mean salinity ranged from 28-30.

B6A:

System B6A is operated as a muted tidal system, with intake and discharge at the same location. Salinity correspondingly varied depending on spring and neap tide periods. At the start of the monitoring season in late-April, 2006 daily mean discharge salinity from B6A was at approximately 8 ppt. Daily mean salinities were not above 44 ppt and the system operated under Continuous Circulation Period conditions.

The highest recorded daily mean value in B6A was 14 ppt (06/02/06). Instantaneous salinity values ranged from a low of 0 ppt to a high of 32 ppt, while daily mean salinity typically ranged from 6 to 14 ppt from late-April through June. There were no recorded salinity values exceeding 44 ppt. Discharge was actively managed by operations to avoid fluctuating water levels which could result in flooding breeding bird nests.

To ensure operations would avoid flooding nest sites and ensure breeding success for western snowy plover and other avian species and to prevent excursions from water quality objectives (specifically, low dissolved oxygen values, as discussed herein) , this system ceased operation under continuous circulation and in mid-June was allowed to draw down and operate as a seasonal pond until transition to winter operations began. System B6A provided good habitat conditions for WSP and other waterbirds despite the periods of low DO conditions, and successfully provided breeding habitat conditions for WSP and other shorebirds once operations were changed to seasonal pond conditions.

pH

Levels of pH varied in each Pond System and were different comparing between systems, but were generally less than 8.5 during discharge periods. Refer to Figures 4, 8, 12a/b and 16 for daily means in B2C, B8A, B2/1 and B6A, respectively. Compliance for pH levels was allowed in the Final Order to be measured in either the pond or receiving waters, as determined by the discharger. While pH levels were above 8.5 for some periods within the ponds, the receiving waters pH did not appear to be elevated and during monitoring there did not appear to be any adverse effect. There was no readily identifiable pattern in pH values as related to discharge operations, and may be more correlated to DO values.

In B2C, daily mean pH varied extensively, ranging from approximately 8.9 to 7.8. B2C receiving waters did not reflect elevated pH levels, and receiving waters pH values were generally similar to pond pH values, ranging from approximately 8.3 to 7.7 during the season.

In B8A, daily mean pH ranged from, and was generally between, 8.5 and 7.5 during the monitoring season and was similar to ambient slough conditions. The lowest values (7.5-7.6) were during a period when discharge was briefly ceased.

In B2 and B1, daily mean pH ranged between 8.6 and 7.7 during the monitoring season. Ambient slough conditions were likely similar to those for B8A, as the sample point at the mouth of Old Alameda Creek would reflect similar values.

Daily mean pH in the System B6A remained ranged from 8.5 to 7.8, and was generally between 8.3 and 7.8 during the monitoring season. Receiving waters pH values were generally lower than pond pH values, ranging from approximately 7.8 to 7.6 during the season.

Temperature

Temperature levels in the ponds were generally similar to the temperature levels in the intake and receiving waters and therefore easily met the discharge limits of not exceeding natural temperatures of the receiving waters by 20^{o}F. Refer to Figures 5, 9, 13a/b and 17 for daily means in B2C, B8A, B2/1 and B6A, respectively.

Dissolved Oxygen (DO)

Monitoring efforts showed that DO levels in Ponds B1, B2C, B8A and B10 (during continuous monitoring period) exhibited a strong diurnal pattern where lower DO is observed near dawn and higher DO is observed at mid-day. Continuous monitoring DO values are discussed below by pond system, and evaluations are based on daily mean values recorded at the discharge locations and on calendar-weekly 10th percentiles. Values are referenced with the Basin Plan water quality objectives (compliance limit of 5.0 mg/L) and reporting "trigger" values established by RWQCB (below 3.3 mg/L), as discussed herein. Where calendar-weekly tenth percentile "trigger" values were below 3.3 mg/L, notification of these conditions was made to RWQCB staff. It should be noted that the summary data does not necessarily indicate or reflect actual violations. Pond discharges did not occur continuously nor in all of these periods, as Best Management Practices (BMPs) were implemented, such as temporarily ceasing discharge, or reducing gate settings to limit discharge. Refer to Figures 6, 10, 14a/b and 18 for daily means in B2C, B8A, B2/1 and B6A, respectively.

Additional analysis and interpretation of monitoring data shall be completed to complement information presented in this report, particularly for DO and tidal cycle affects, and shall be submitted for review in April, 2007.

<u>Pond System B2C:</u> Monitoring data for B2C was collected April 27 through November 15, 2006, representing 203 total recorded days, not including approximately 7 days when meters did not record data and 14 days of data that was inaccurate due to malfunctions or other reasons. For valid data B2C, daily mean DO was below 5.0 mg/L on 65 of 182 days, and of those days, daily mean DO was below 3.3 mg/L on 12 days; there were 23 weeks, of 30 weeks, where calendar-weekly tenth percentile "trigger" values were below 3.3 mg/L. It should be noted that this summary does not necessarily indicate or reflect actual violations. Pond discharges did not occur continuously, and discharge only occurred during one corresponding trigger value. Best Management Practices (BMPs) were implemented and appeared to effectively avoid discharge during trigger periods. Monitoring indicated that Receiving Waters were below 5.0 mg/L only on one date

(09/05/06, 4.9 mg/L at bottom). This date corresponded to the discharge period. It is unclear whether the lower DO values in the receiving waters can be attributed solely to pond discharge affects, or whether the lower DO values can be attributed to natural variation in slough and bay conditions or other factors, or a combination thereof.

Pond System B8A: Monitoring data for B8A was collected from April 27 to November 12, 2006, representing 199 total recorded days; there were no days when meters did not record data due to unknown malfunctions. For B8A, daily mean DO was below 5.0 mg/L on 84 days, and of those days, daily mean DO was below 3.3 mg/L on only three days (07/30/06, 11/01/06 and 11/02/06, and 3.2, 2.8 and 3.2 mg/L, respectively); there were 21 weeks, of 29 weeks, where calendar-weekly tenth percentile “trigger” values were below 3.3 mg/L, which required notification of RWQCB. It should be noted that this summary does not necessarily indicate or reflect actual violations. Pond discharges did not occur continuously, and discharge only occurred during one corresponding trigger value. Best Management Practices (BMPs) were implemented and appeared to effectively avoid discharge during trigger periods. Monitoring indicated that B8A Receiving Waters were not observed below 5.0 mg/L during the discharge period, except on two dates (07/20/06, 10/03/06) but was not below 4.7 mg/L. Both of the lower DO receiving water dates coincided with tenth-percentile trigger discharge periods, although receiving waters did not reflect values outside of ambient slough conditions noted in other sloughs nor was an adverse effect observed during monitoring Bottom and surface values were 4.7 and 4.9 mg/L and 4.8 and 4.9 mg/L, respectively. It appears that DO values in Old Alameda Creek (receiving waters) were not affected by the low DO discharges, except possibly on those two dates, as minor variation in DO values can be attributed to natural variation in slough and bay conditions and other factors.

Pond System B2 (B1): Monitoring data for B8A was collected from April 27 to September 21 and monitoring data for B1 was collected from September 21 through October 8, 2006, representing 184 total recorded days, not including approximately 4 days when the Datasonde did not record data due to unknown malfunctions. For B2, daily mean DO was below 5.0 mg/L on 29 days, and of those days, daily mean DO was below 3.3 mg/L on only one day; there were 12 weeks, of 22 weeks, where calendar-weekly tenth percentile “trigger” values were below 3.3 mg/L and RWQCB was notified. For B1, daily mean DO was below 5.0 mg/L on 27 days, and of those days, daily mean DO was below 3.3 mg/L on 16 days; there were 4 weeks, of 5 weeks, where calendar-weekly tenth percentile “trigger” values were below 3.3 mg/L. It should be noted that this summary does not necessarily indicate or reflect actual violations. Pond discharges did not occur continuously, and discharge did not occurred during each week which the trigger value was observed; the data represents all data collected at the pond discharge location. Best Management Practices (BMPs) were implemented and appeared to effectively minimize discharge during trigger periods. For System B2, receiving waters were not monitored; for B2, this is because it is a bay discharge, and such the Final Order does not require receiving water monitoring, as revised and approved by RWQCB in 2005. Due to an administrative oversight, receiving waters were not monitored by USGS for System B2 discharge via B1, so for an approximately two-week period, discharge from Pond B1 (B2-1 location) did not have receiving water samples collected in the south channel of Old Alameda Creek nearest the B2-1 discharge. Receiving waters were collected in the north channel of Old Alameda Creek, for B8A discharge monitoring, and the station at the mouth of Old Alameda Creek is only a few hundred yards south of the B2-1 discharge location and could reasonably be expected to reflect conditions in both the north and south channel. Discharge from Pond B1 was limited to 5% of the single 48" culvert, therefore the volume was minimal, but by operating B-1 as a muted tidal intake and discharge system, DO values improved such that the system was operating above the trigger value.

Pond System B6A: Monitoring data for B6A was collected April 27 through June 27, 2006, representing 62 total recorded days; there were no days when meters did not record data due to unknown malfunctions. For B6A, during the discharge period, daily mean DO was below 5.0 mg/L on 7 days, and daily mean DO was not below 3.3 mg/L at all; there were six weeks, of nine weeks, where calendar-weekly tenth percentile "trigger" values were below 3.3 mg/L and RWQCB was notified. It should be noted that this summary does not necessarily indicate or reflect actual violations. Pond discharges did not occur continuously, and discharge only occurred during one corresponding trigger value. Best Management Practices (BMPs) were implemented and appeared to effectively avoid discharge during trigger periods. Monitoring indicated that B6A Receiving Waters were not observed below 5.0 mg/L during the discharge period, except on two dates (05/31/06, 06/12/06) but was not below 4.5 mg/L. The May 31, 2006 receiving water samples coincided with a tenth-percentile trigger discharge period, although receiving waters did not reflect values outside of ambient slough conditions noted in other sloughs nor was an adverse effect observed during monitoring. Bottom and surface values were 4.7 and 4.9 mg/L. It appears that DO values in Old Alameda Creek (receiving waters) were not affected by the low DO discharges, except possibly on this date, as minor variation in DO values can be attributed to natural variation in slough and bay conditions and other factors.

In this shallow-water muted tidal system, we had difficulty maintaining the DO standard described in the Basin Plan because of competing management needs; western snowy plover (WSP), a federally threatened species, required more static water levels with shallow water and dry, exposed pond bottom conditions for suitable nesting and foraging habitat, therefore managing the pond to maximize intake to attain WQO's was inherently difficult. As a result, 10^{th} percentile values sagged below the 3.3 mg/L reporting trigger, although median values generally ranged near the Basin Plan value of 5 mg/L. To avoid flooding nest sites and to ensure breeding success for WSP, this system ceased operation under continuous circulation and in mid-June was allowed to draw down and operate as a seasonal pond until transition to winter operations began. System B6A provided good habitat conditions for WSP and other waterbirds despite the periods of low DO conditions, and successfully provided breeding habitat conditions for WSP and other shorebirds once operations were changed to seasonal pond conditions.

Newark Slough monitoring discussion: Newark Slough is located south of ELER. The slough is south of the Dumbarton Bridge, but north of the USFWS-managed Alviso Pond Complex (Figure 3). In 2006, USGS began monitoring water quality in approximately two-week intervals in Newark Slough, which is not affected by pond or other substantial discharges. Newark Slough may be a suitable reference site for ambient conditions and provide a context for natural variation and comparisons to sloughs that receive pond discharges.

In 2005, samples were also collected on one date from nine different sites in Newark slough, and seven recorded samples had instantaneous DO values less than 5.0 mg/L. In 2006, monitoring data for Newark Slough was collected approximately bi-monthly from June 8 through October 23, 2006, representing 11 total recorded days (Figure 19). For Newark Slough, daily mean DO was below 5.0 mg/L on 5 days for bottom samples, and of those days, 3 days were below 5.0 mg/L for surface samples also. There were 36, of the total 99, bottom samples that had an instantaneous value of less than 5.0 mg/L, and 28 of the 99 surface samples that had an instantaneous value of less than 5.0 mg/L. While daily mean DO was not below 3.3 mg/L on any of the monitoring dates, there were 4 sample dates which recorded minimum values below 3.3 mg/L (Refer to the table below).

Table 3: Selected Newark Slough Dissolved Oxygen Values

Date	Bottom (AVG)	Surface (AVG)	MIN. DO
8/2/2005	5.46	5.79	3.57
6/21/2006	5.25	5.50	3.03
7/19/2006	4.21	4.46	2.06
8/3/2006	4.91	5.22	2.96
8/16/2006	4.59	4.75	2.95

The sampling in Newark Slough shows that DO in sloughs unaffected by pond discharges can have dissolved oxygen values of less than 5.0 mg/L. It appears that low DO values and variation in DO values can be attributed to natural variation in slough and bay conditions and other factors such as biotic interactions. Furthermore, it can be assumed that waters entering the ponds from sloughs during higher tide intake cycles are not necessarily above the 5.0 mg/L and 3.3mg/L standards, therefore pond waters may not be expected to meet those standards upon discharge.

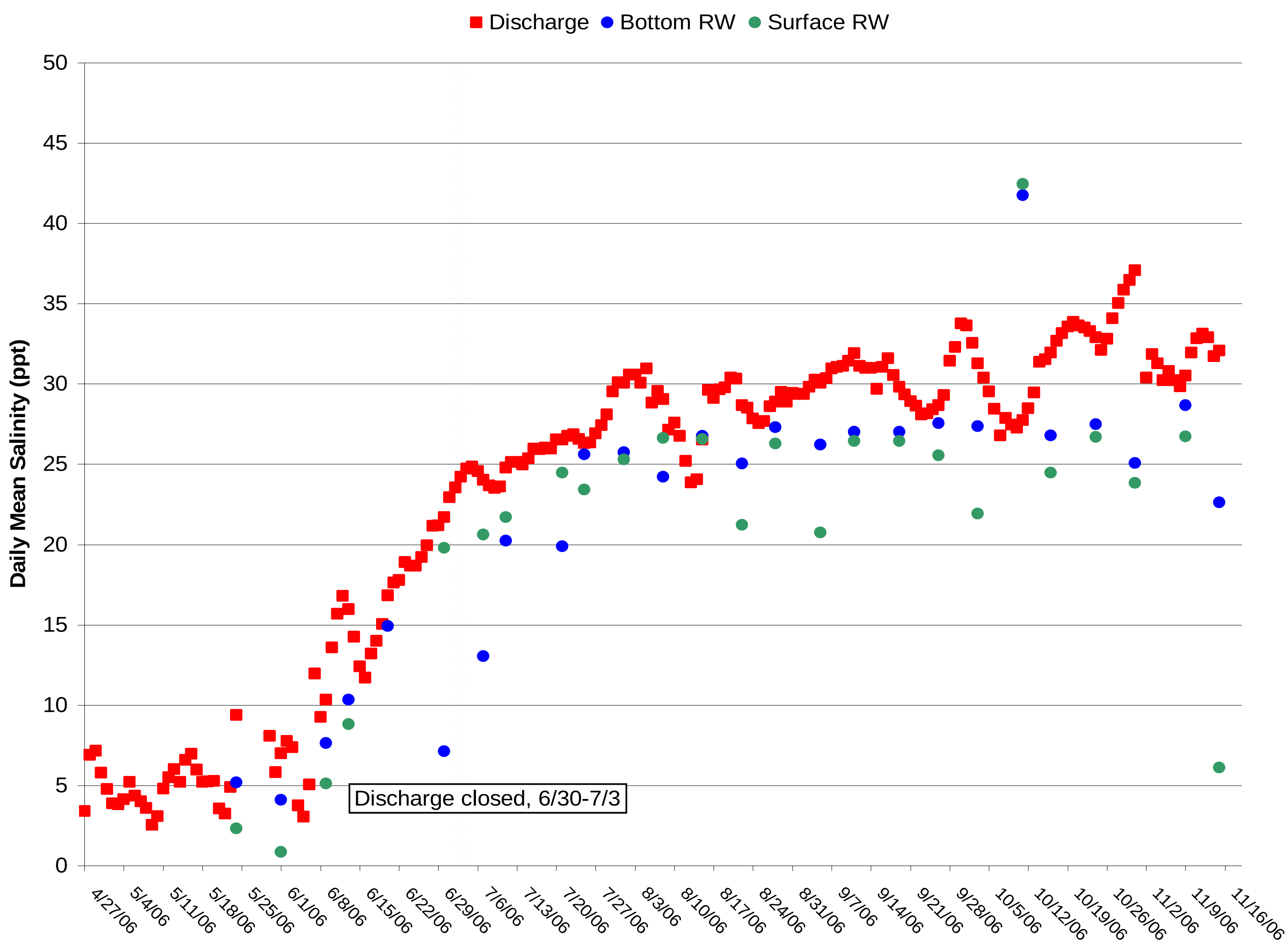


Figure 3. Pond B2C- Daily Mean Salinity for Discharge and Receiving Water

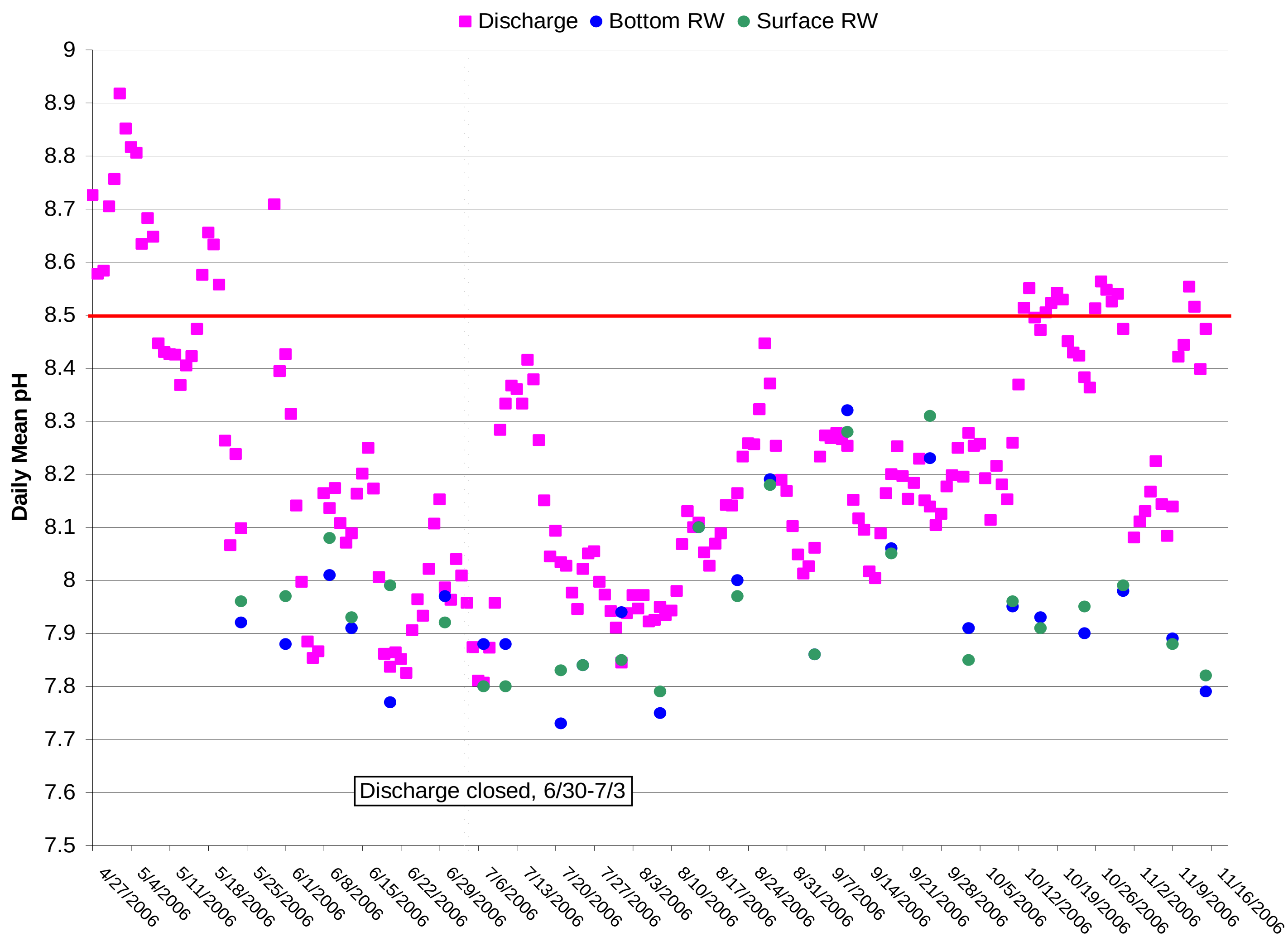


Figure 4. Pond B2C- Daily Mean pH for Discharge and Receiving Water

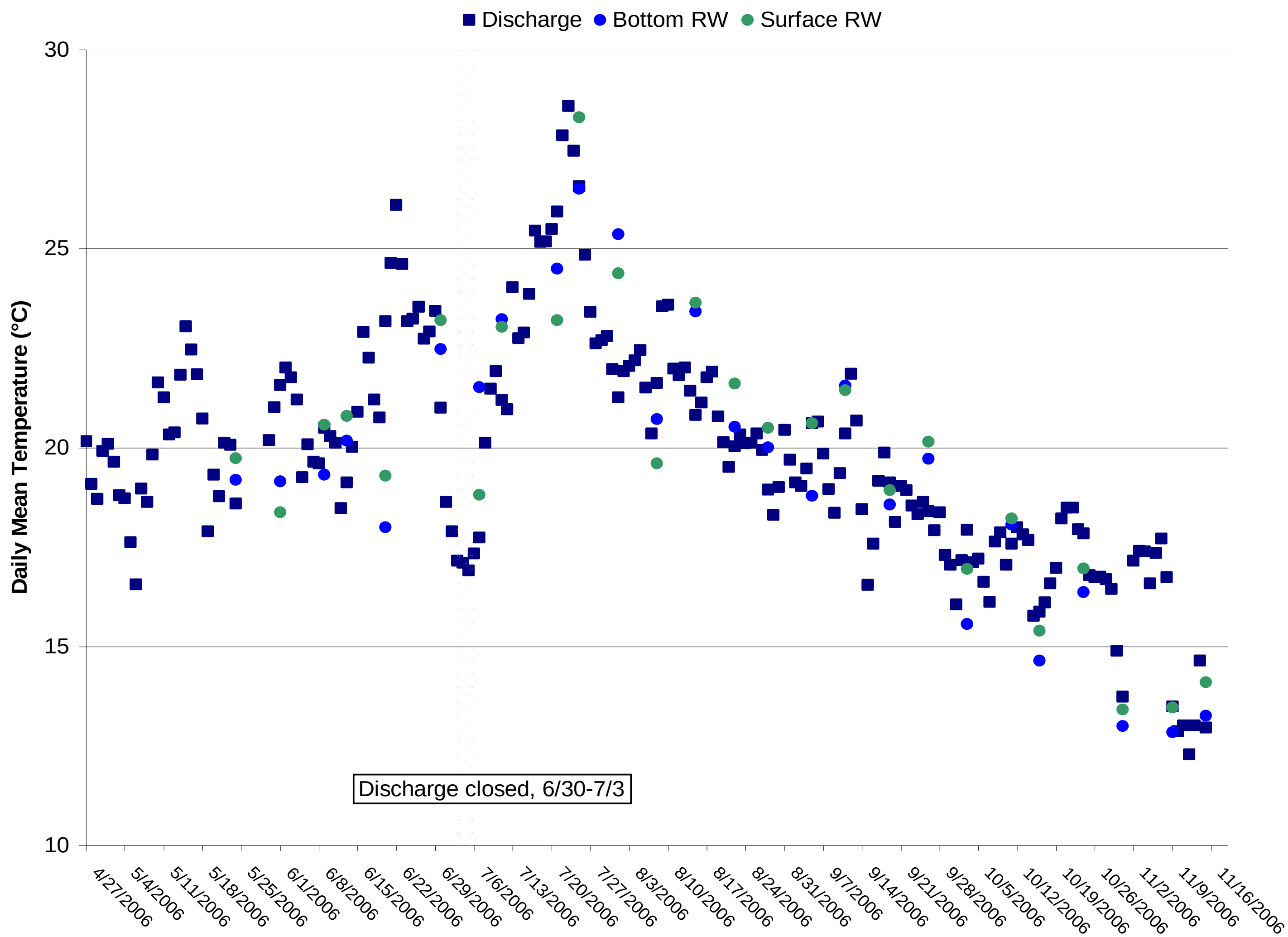


Figure 5. Pond B2C- Daily Mean Temperature for Discharge and Receiving Water

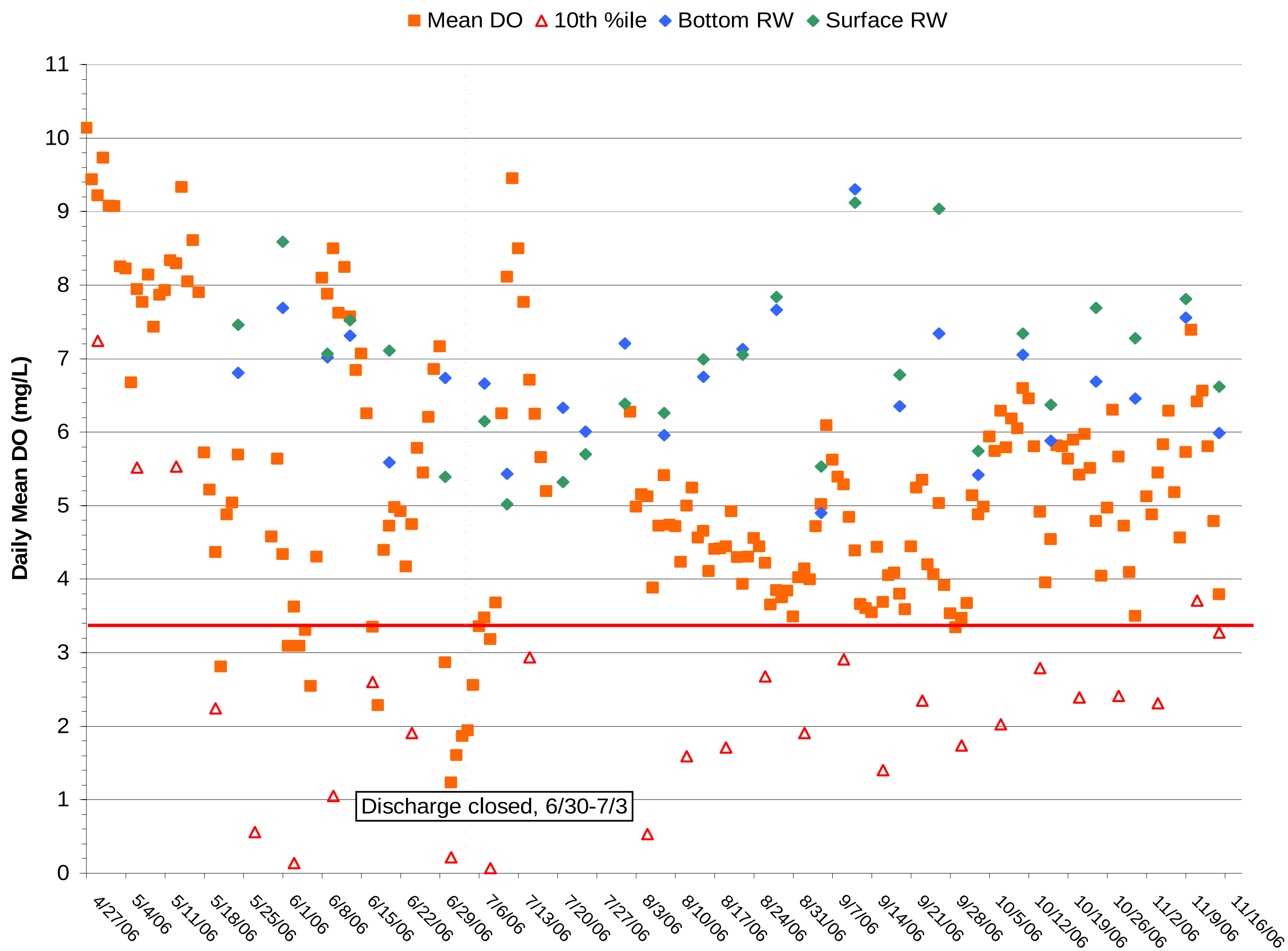


Figure 6. Pond B2C- Daily Mean DO for Discharge and Receiving Water

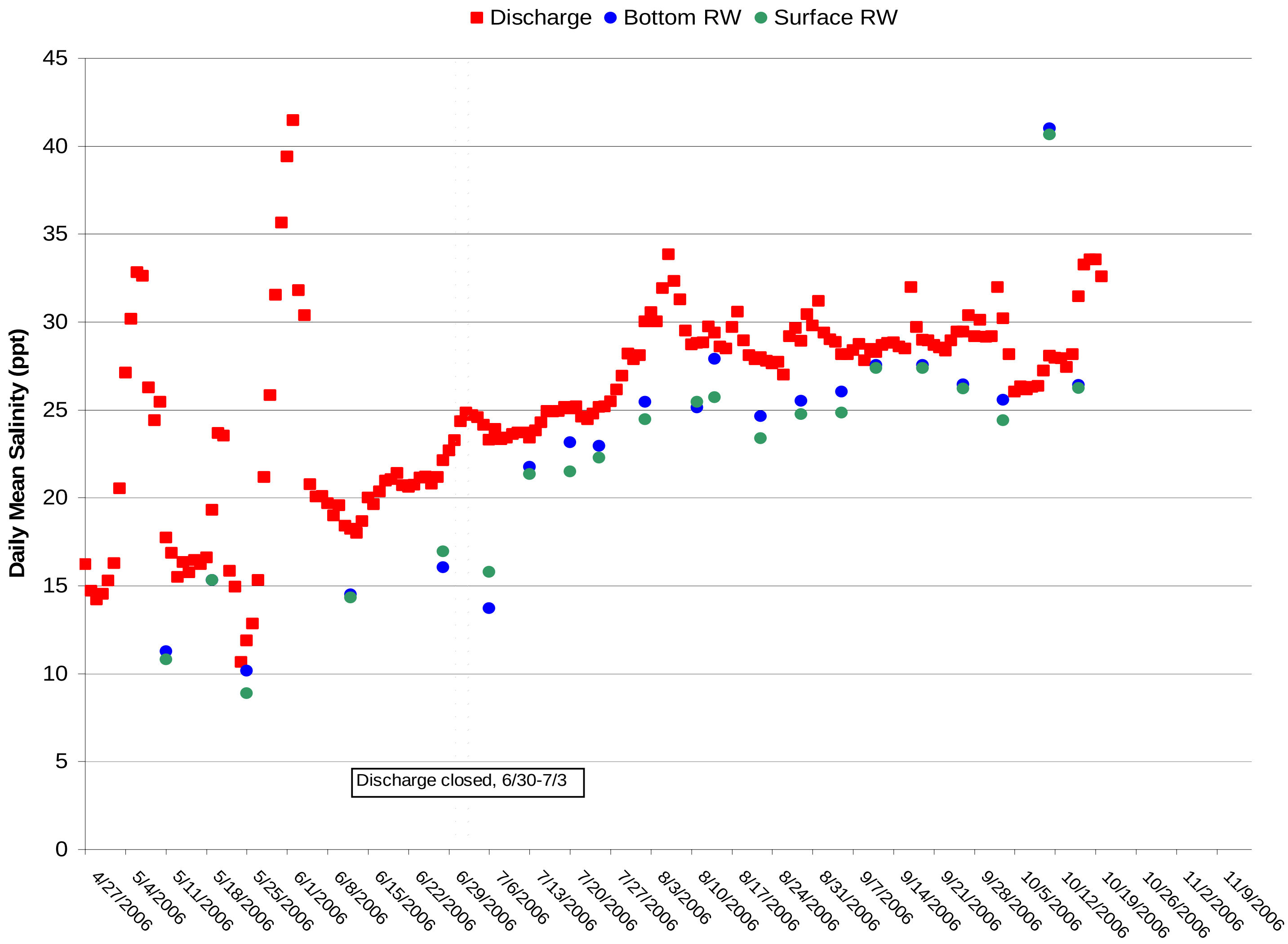


Figure 7. Pond B8A- Daily Mean Salinity for Discharge and Receiving Water

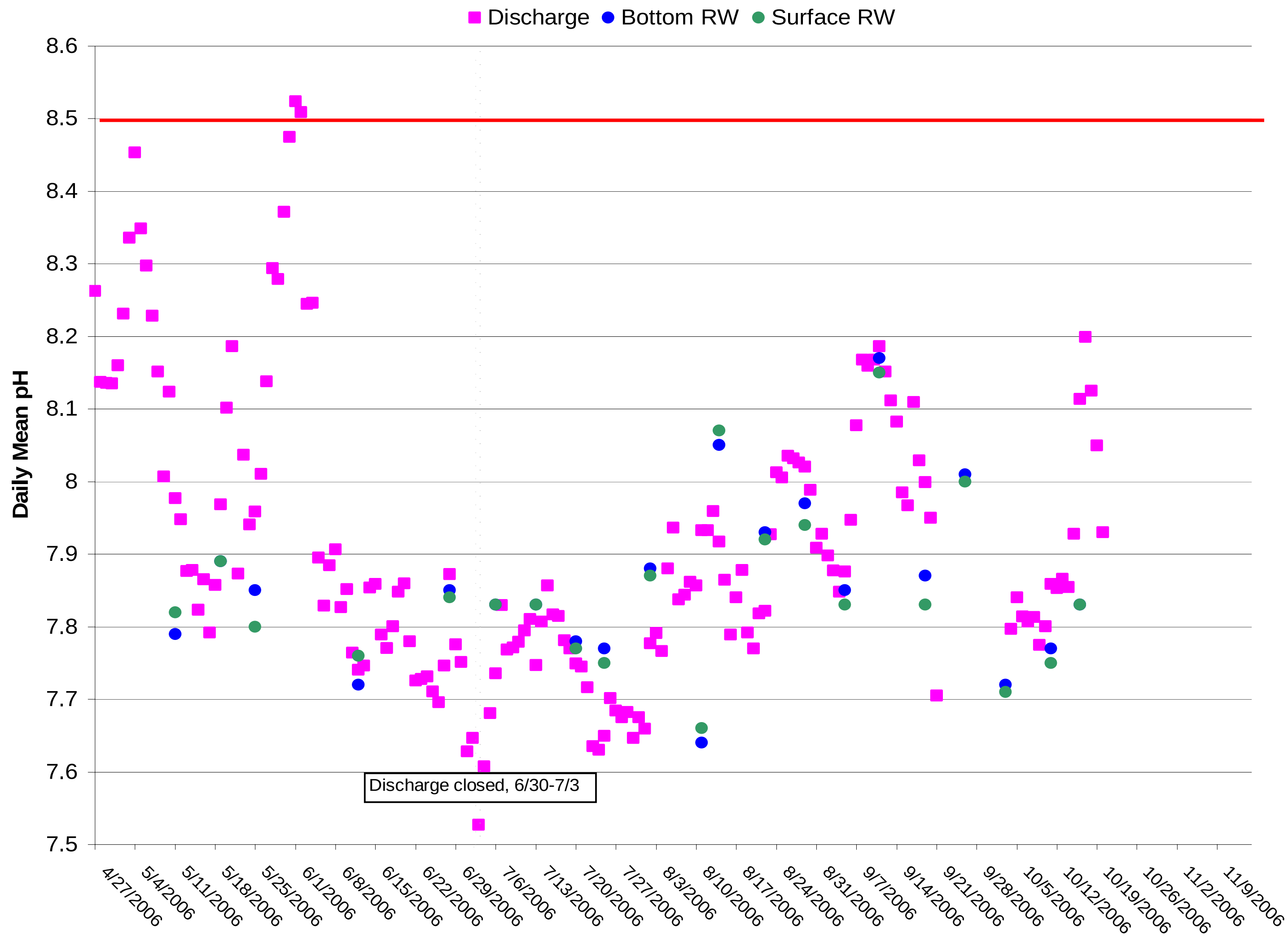


Figure 8. Pond B8A- Daily Mean pH for Discharge and Receiving Water

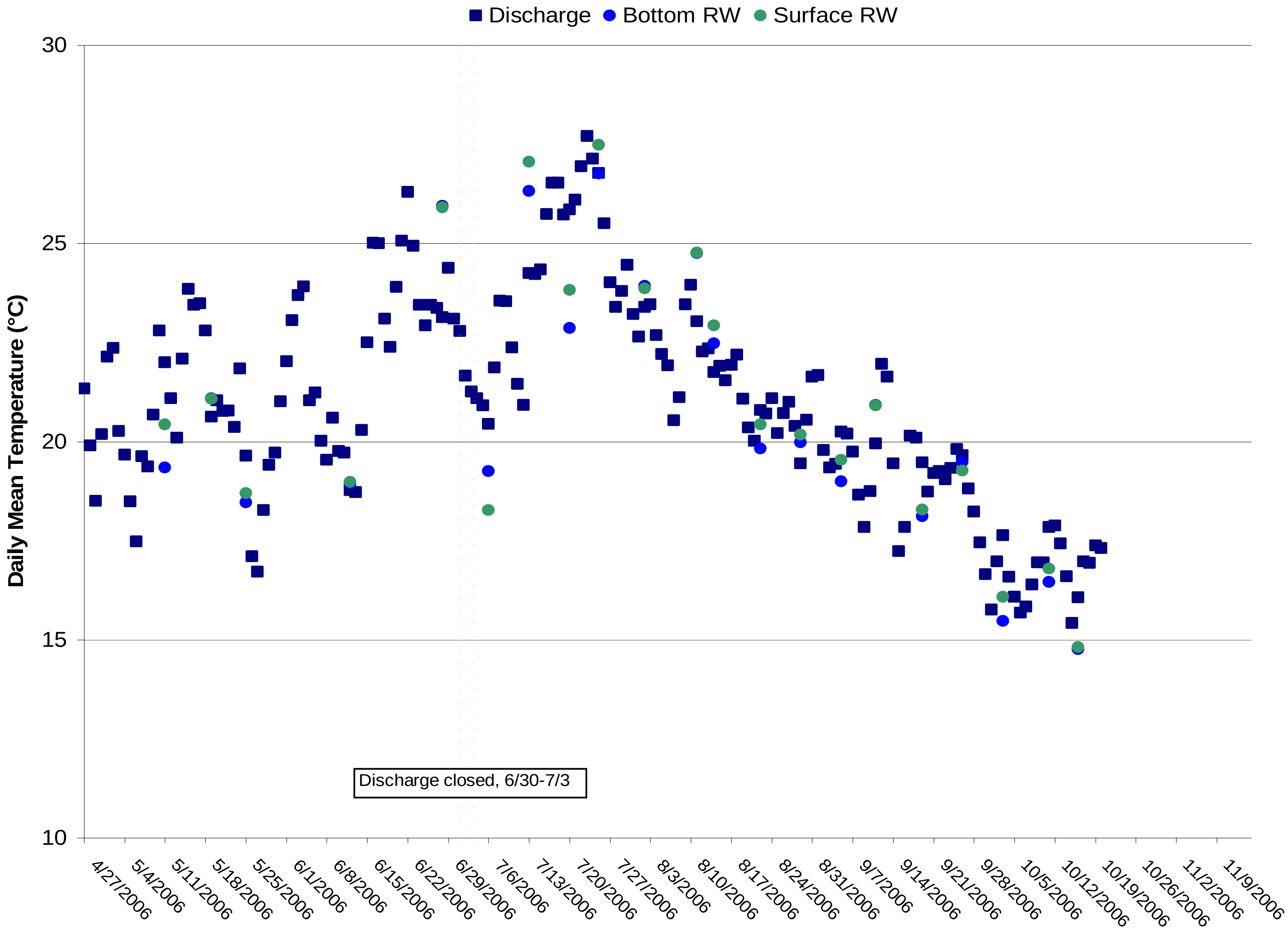


Figure 9. Pond B8A- Daily Mean Temperature for Discharge and Receiving Water

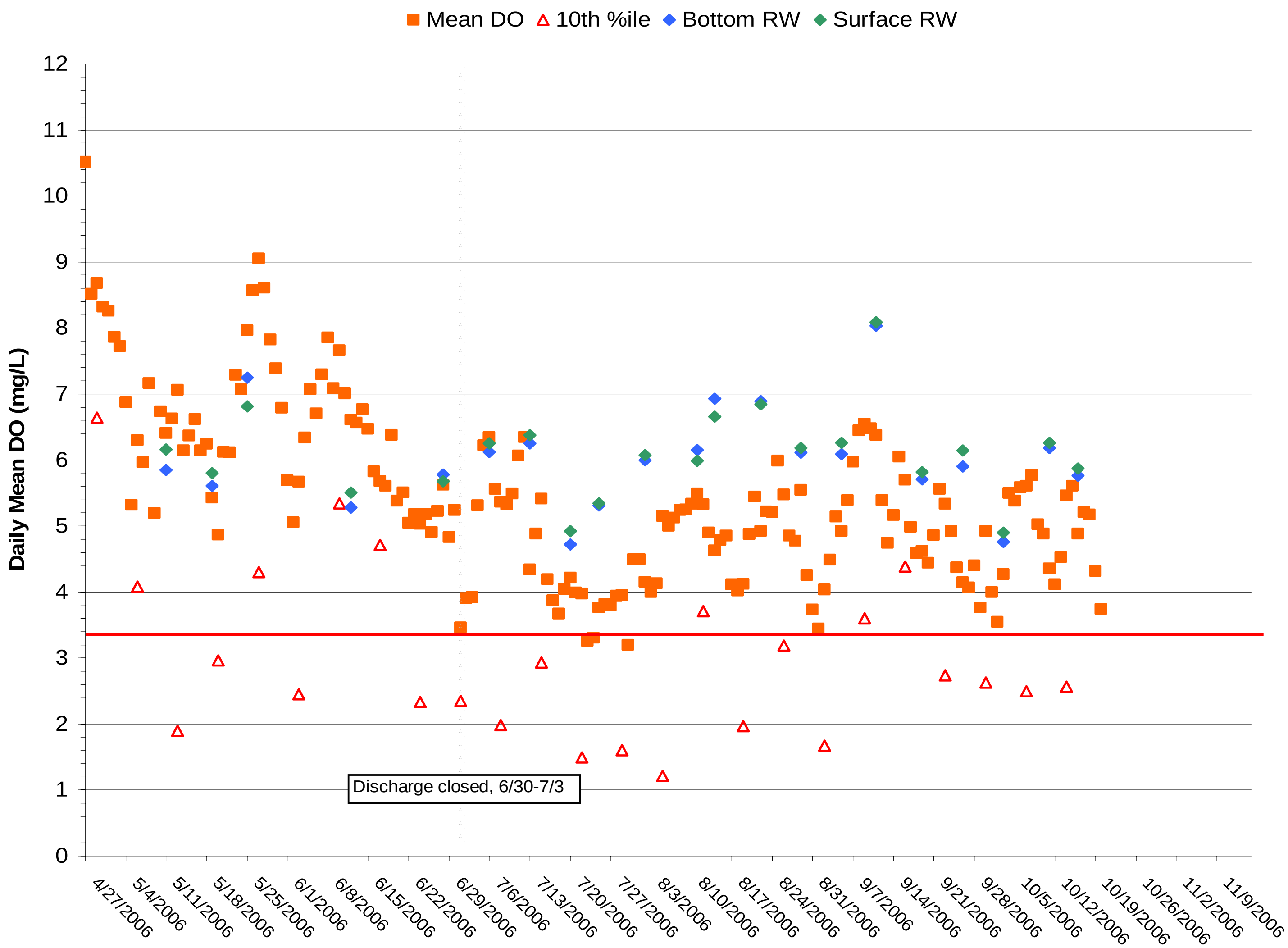


Figure 10. Pond B8A- Daily Mean DO for Discharge and Receiving Water

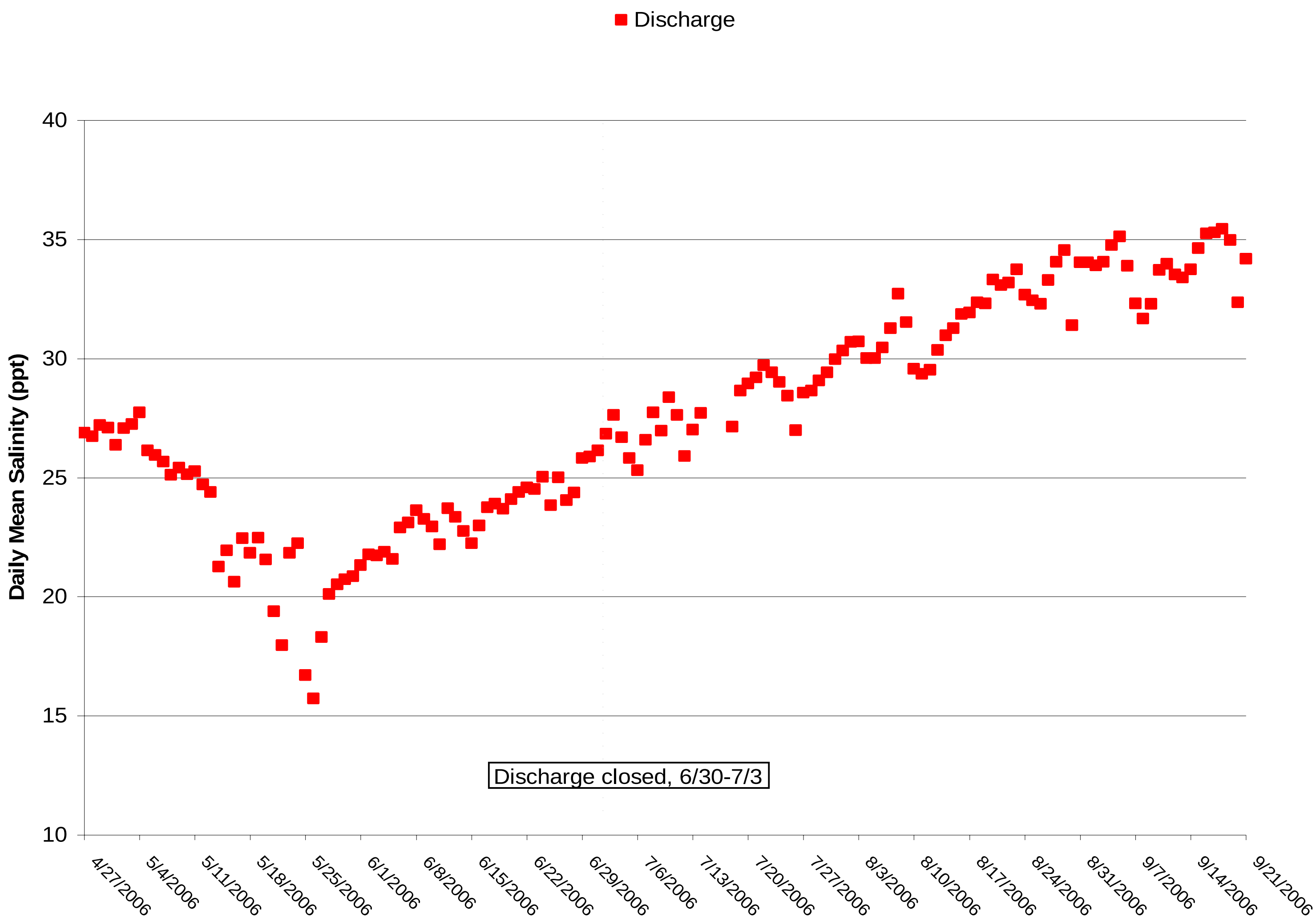


Figure 11a. Pond B2- Daily Mean Salinity for Discharge and Receiving Water

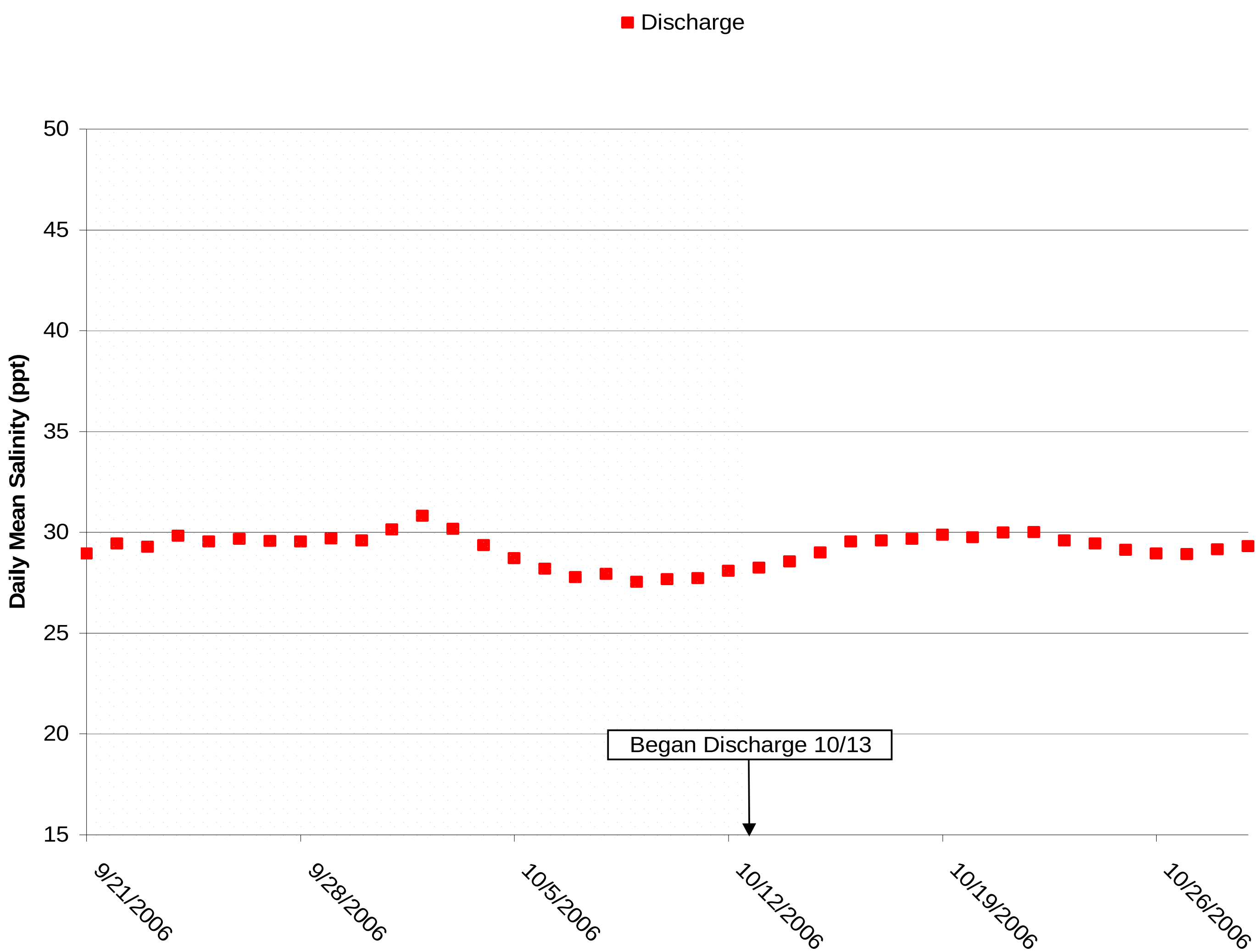


Figure 11b. Pond B1- Daily Mean Salinity for Discharge and Receiving Water

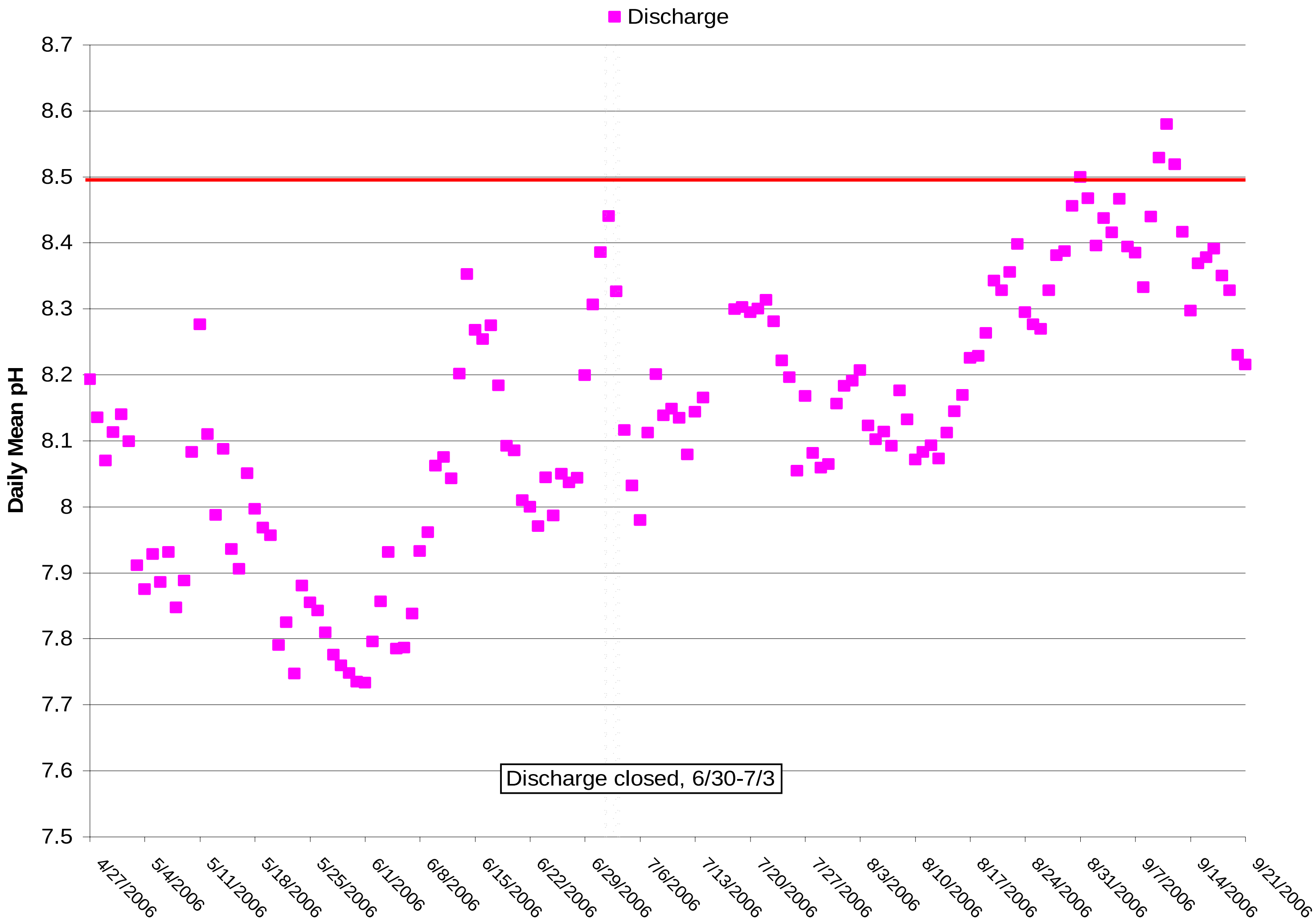


Figure 12a. Pond B2- Daily Mean pH for Discharge and Receiving Water

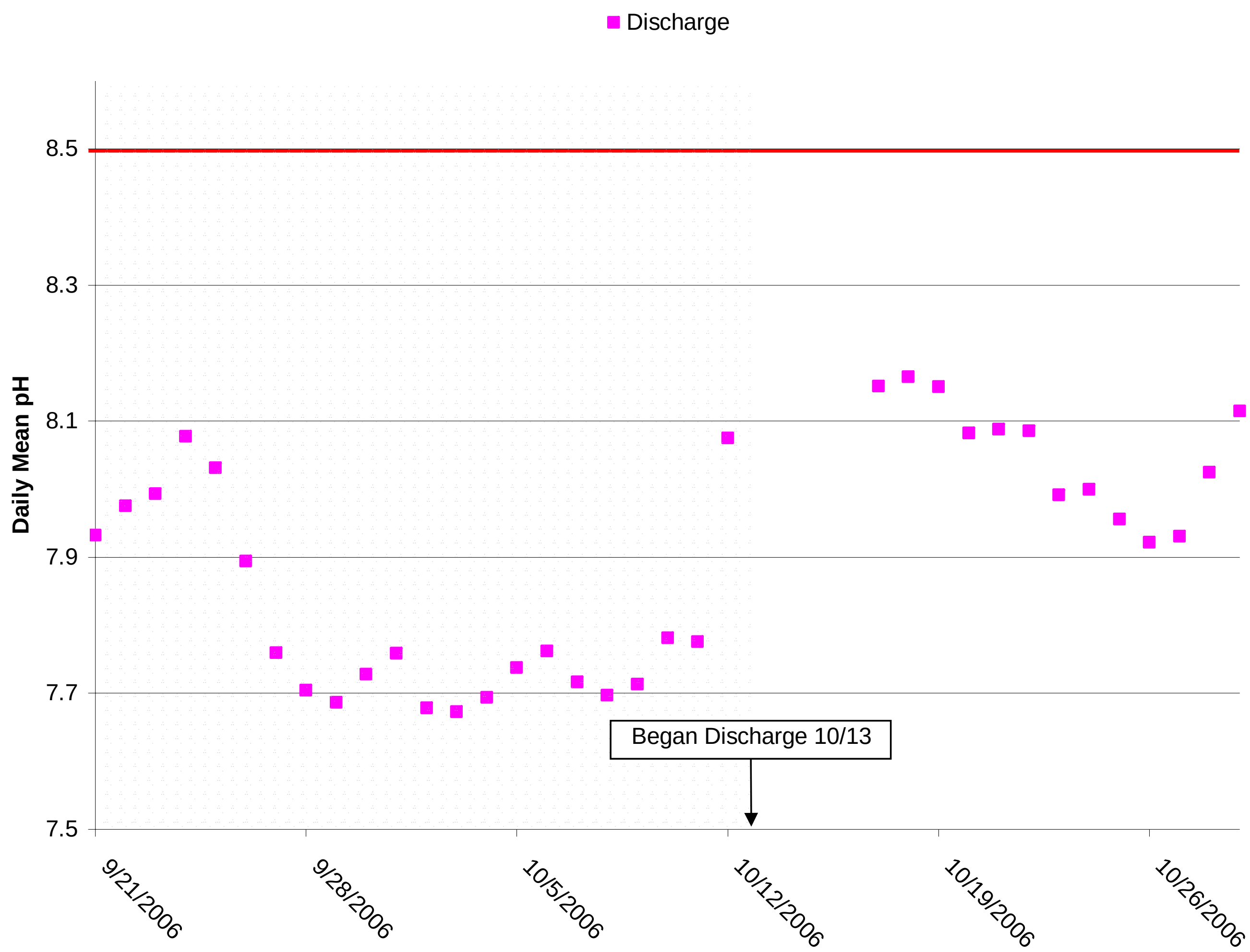


Figure 12b. Pond B1- Daily Mean pH for Discharge and Receiving Water

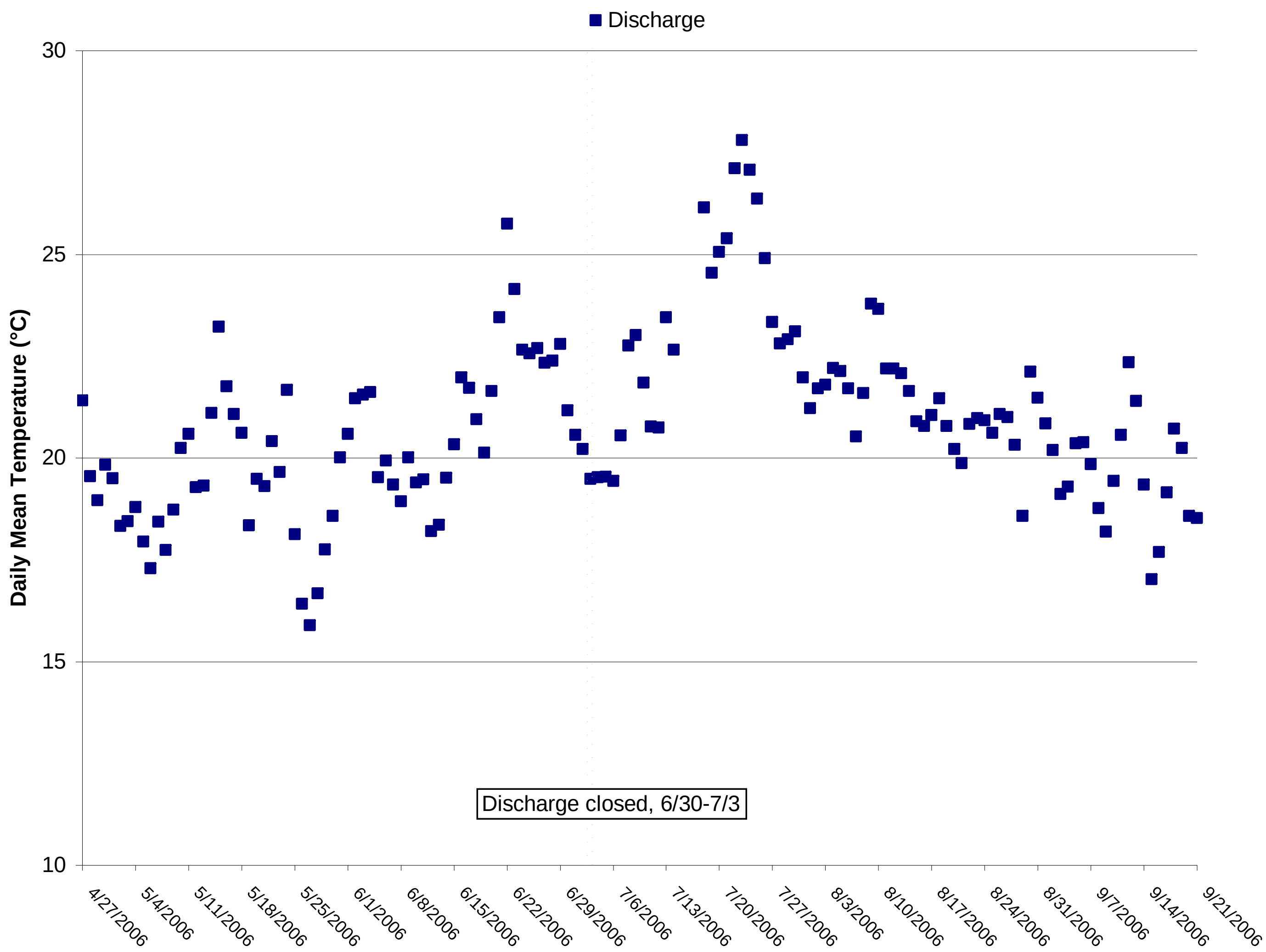


Figure 13a. Pond B2- Daily Mean Temperature for Discharge and Receiving Water

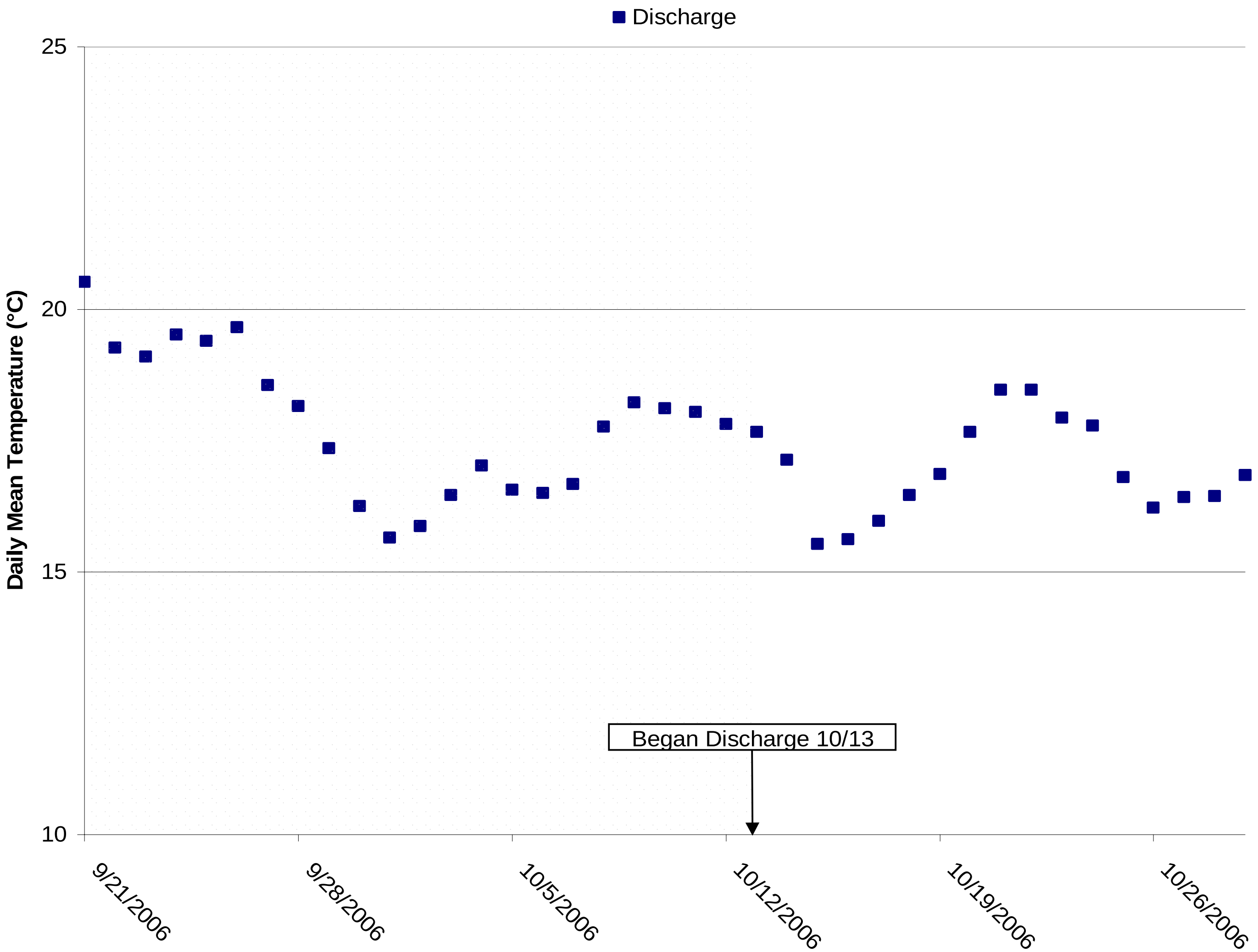


Figure 13b. Pond B1- Daily Mean Temperature for Discharge and Receiving Water

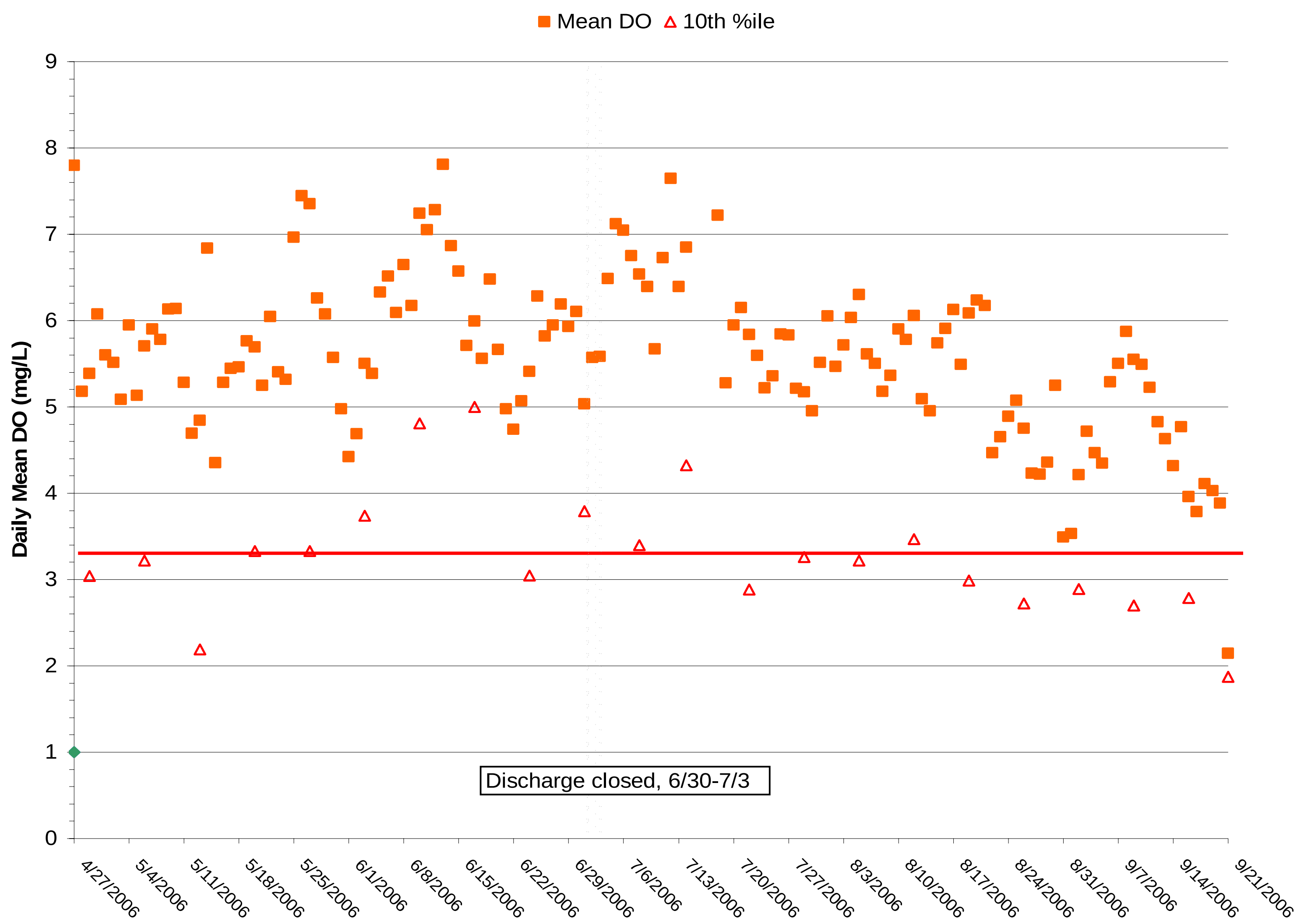


Figure 14a. Pond B2- Daily Mean DO for Discharge and Receiving Water

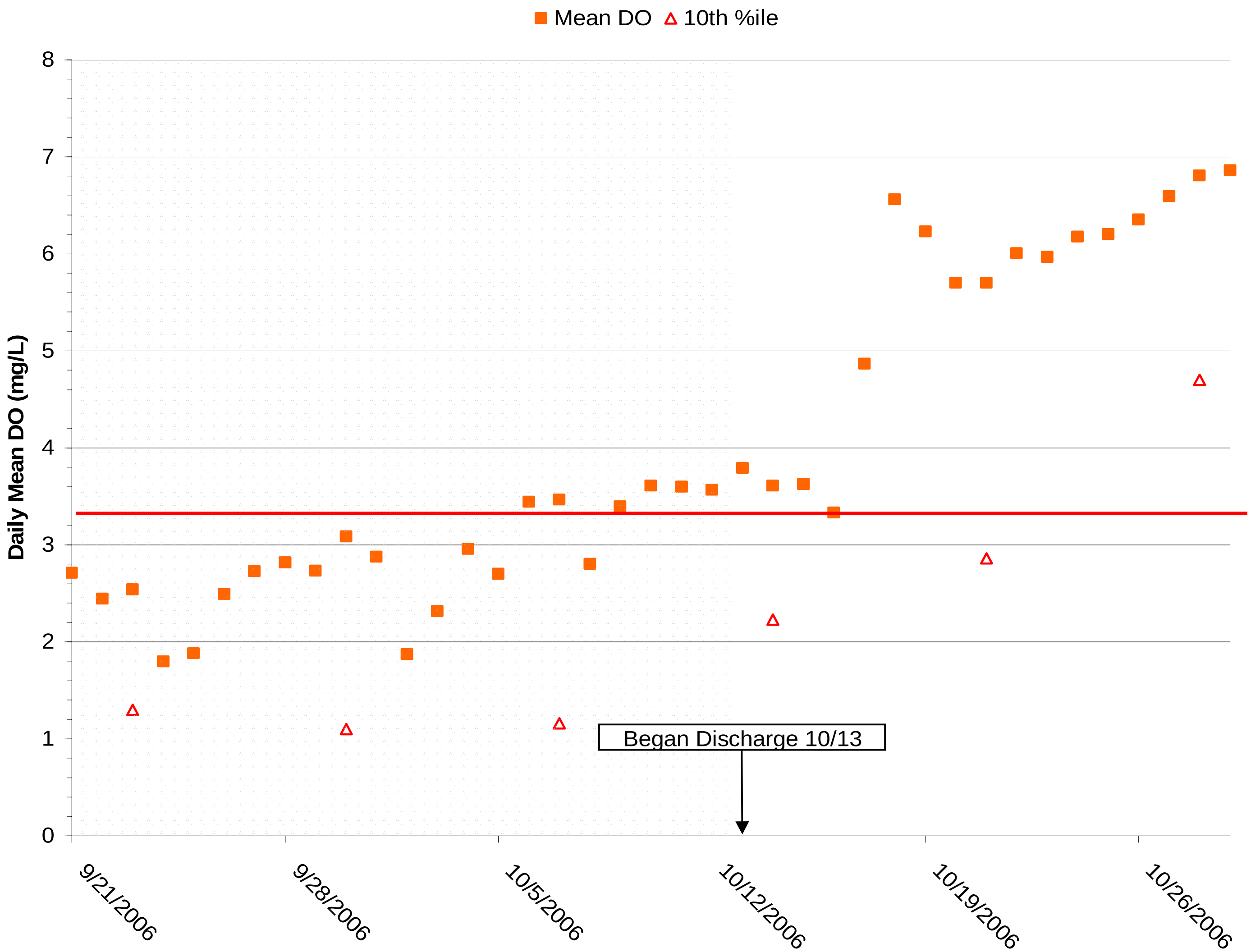


Figure 14b. Pond B1 Daily Mean DO for Discharge and Receiving Water

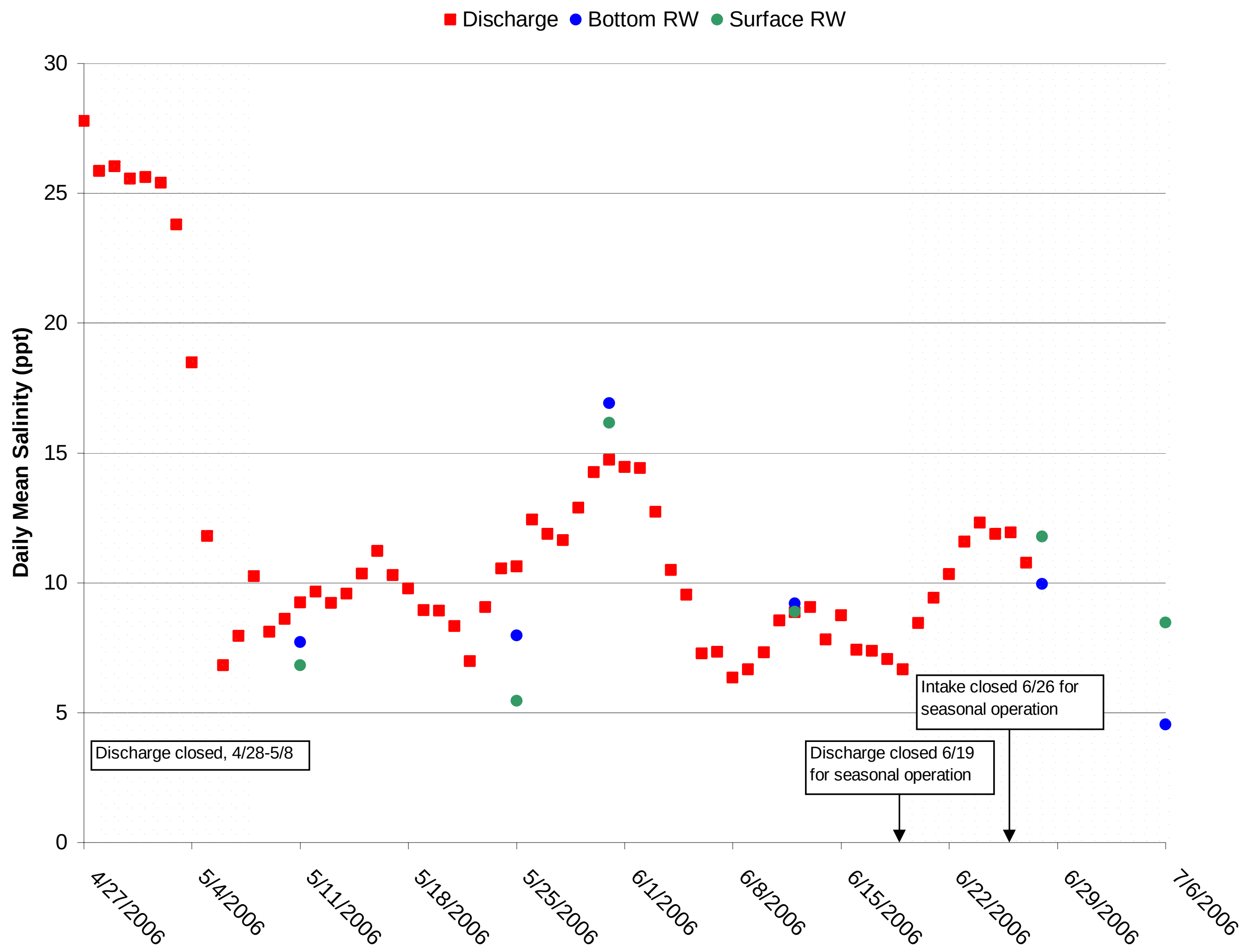


Figure 15. Pond B6A- Daily Mean Salinity for Discharge and Receiving Water

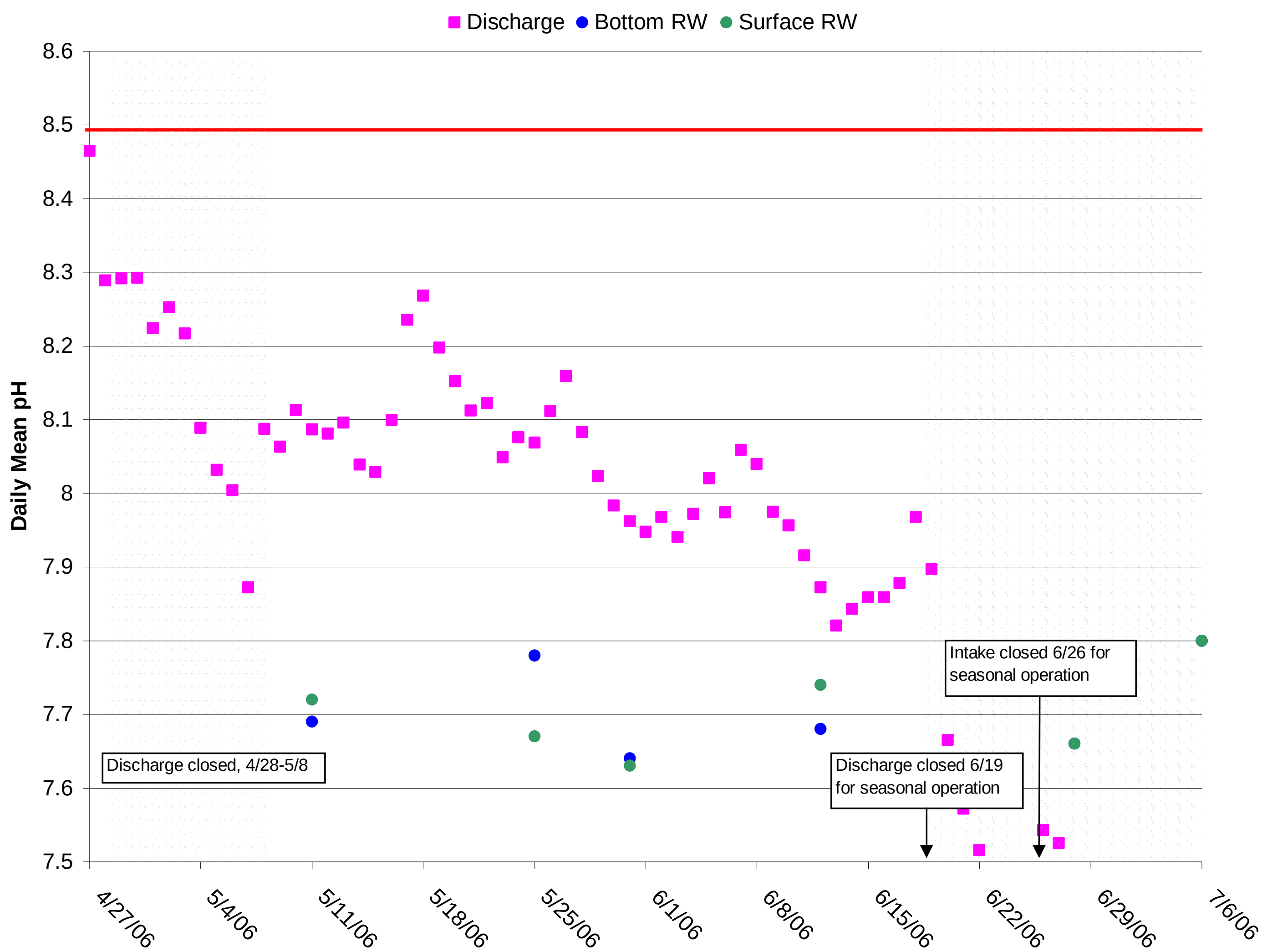


Figure 16. Pond B6A- Daily Mean pH for Discharge and Receiving Water

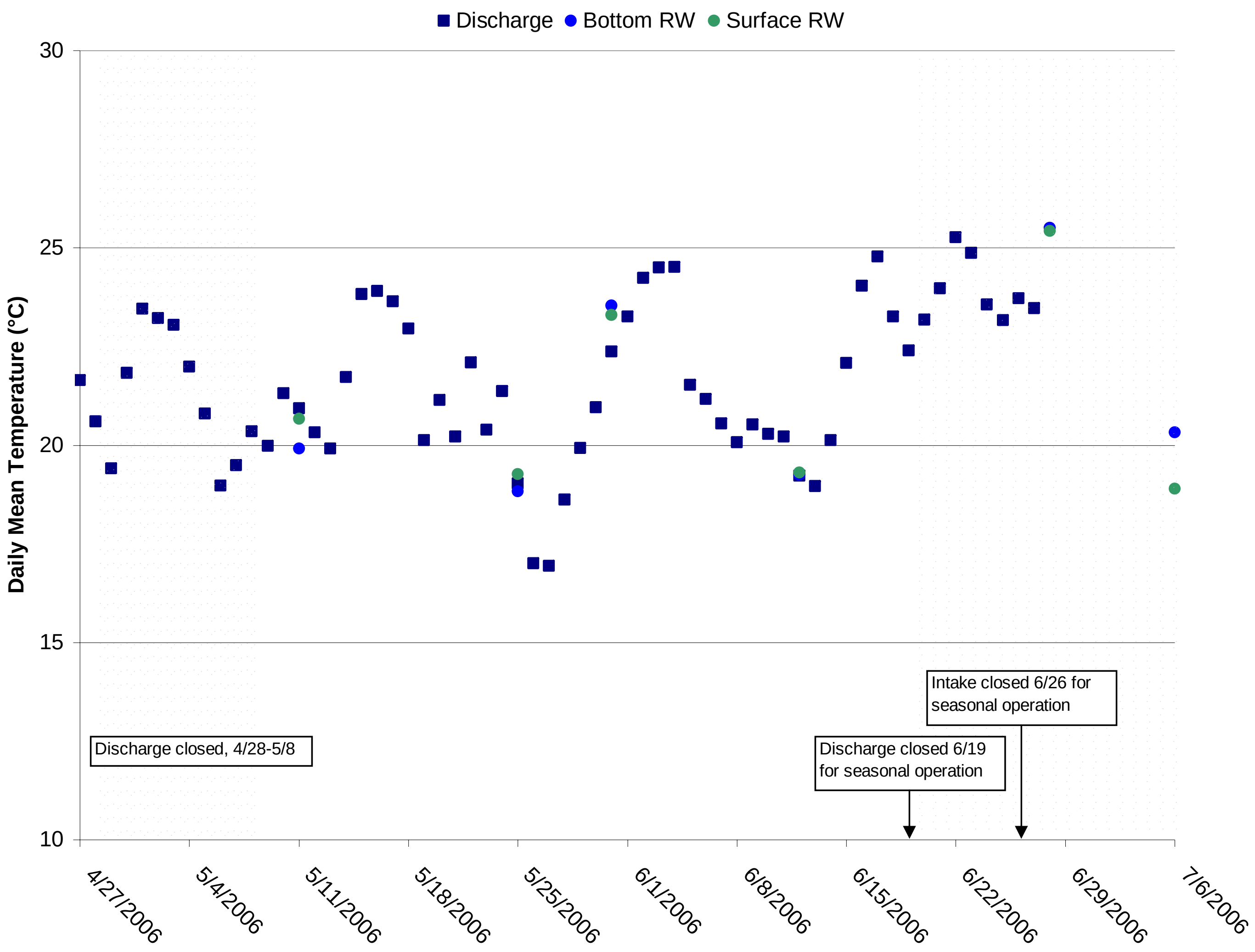


Figure 17. Pond B6A- Daily Mean Temperature for Discharge and Receiving Water

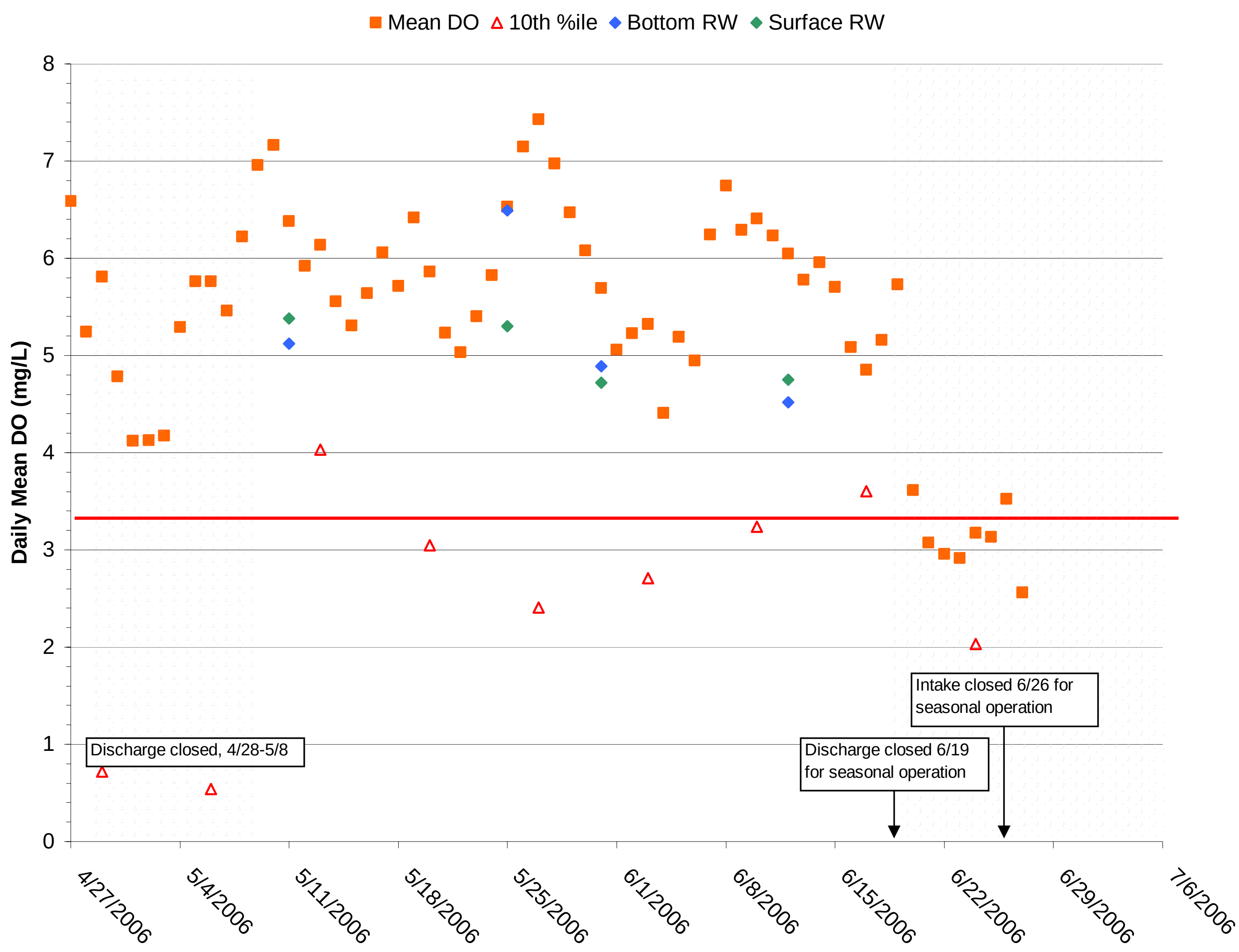


Figure 18. Pond B6A- Daily Mean DO for Discharge and Receiving Water

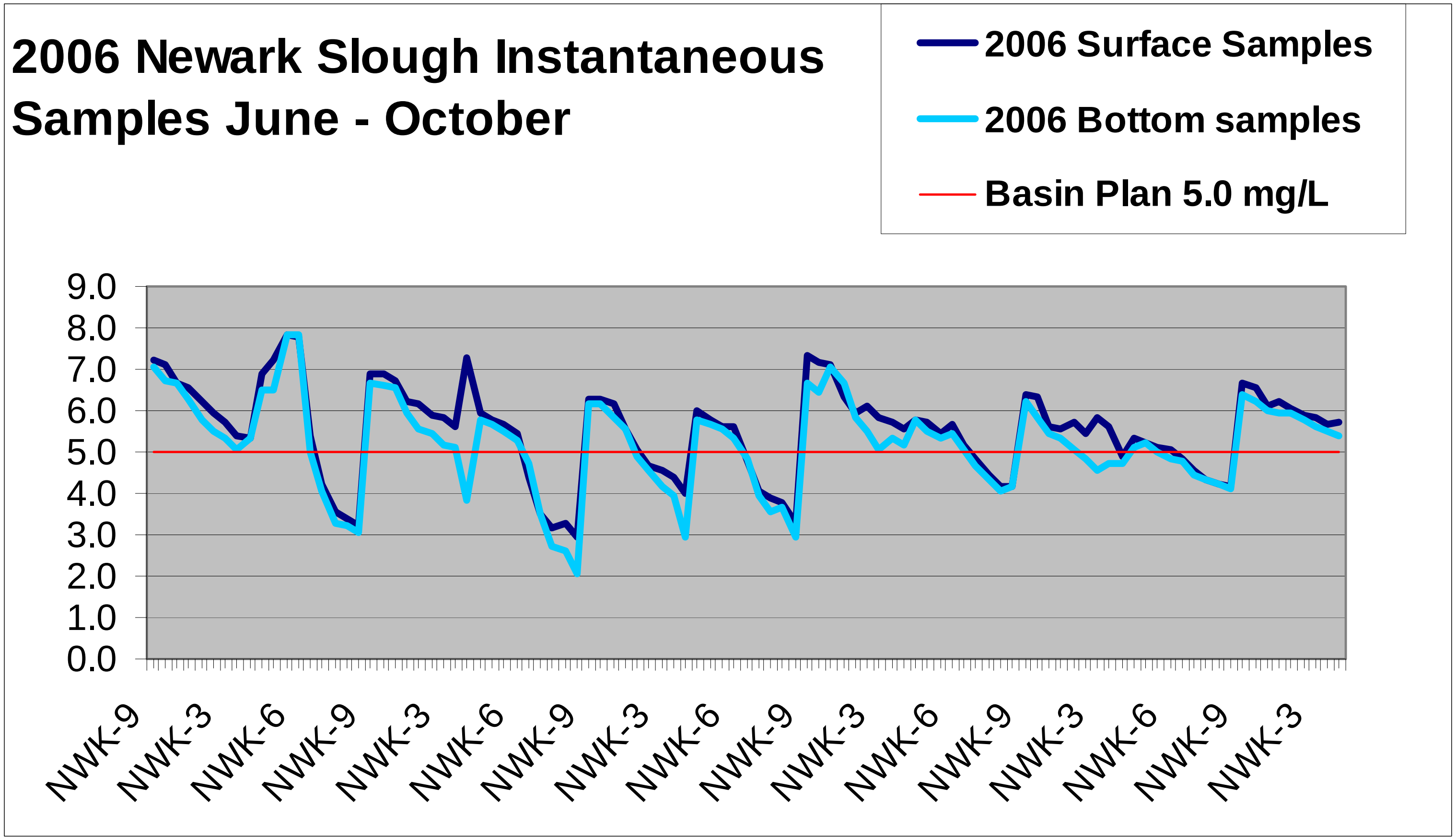


Figure 19. Newark Slough Dissolved Oxygen values, 06/06-10/06

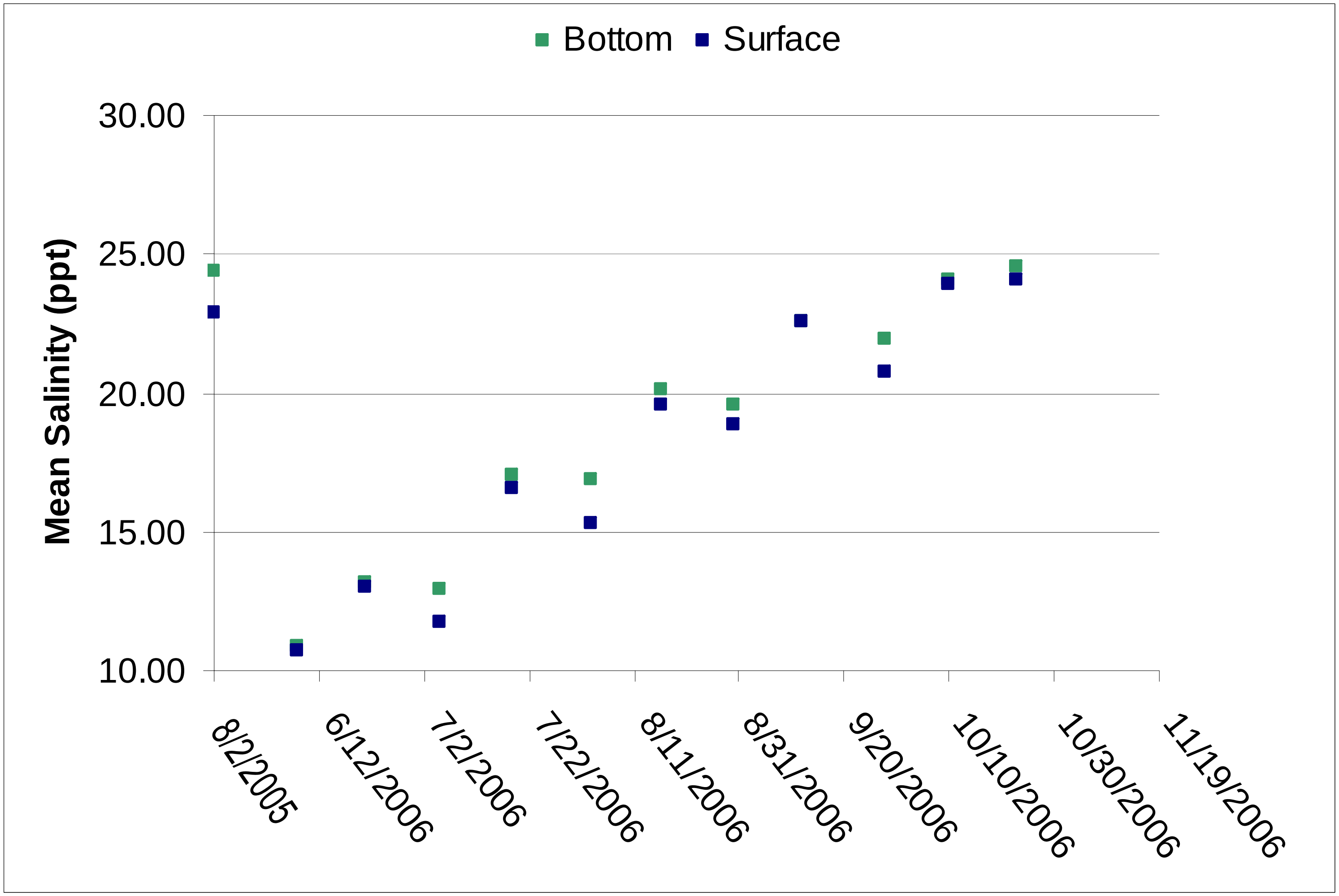


Figure 20. Newark Slough Salinity values, 08/05, 06/06-10/06

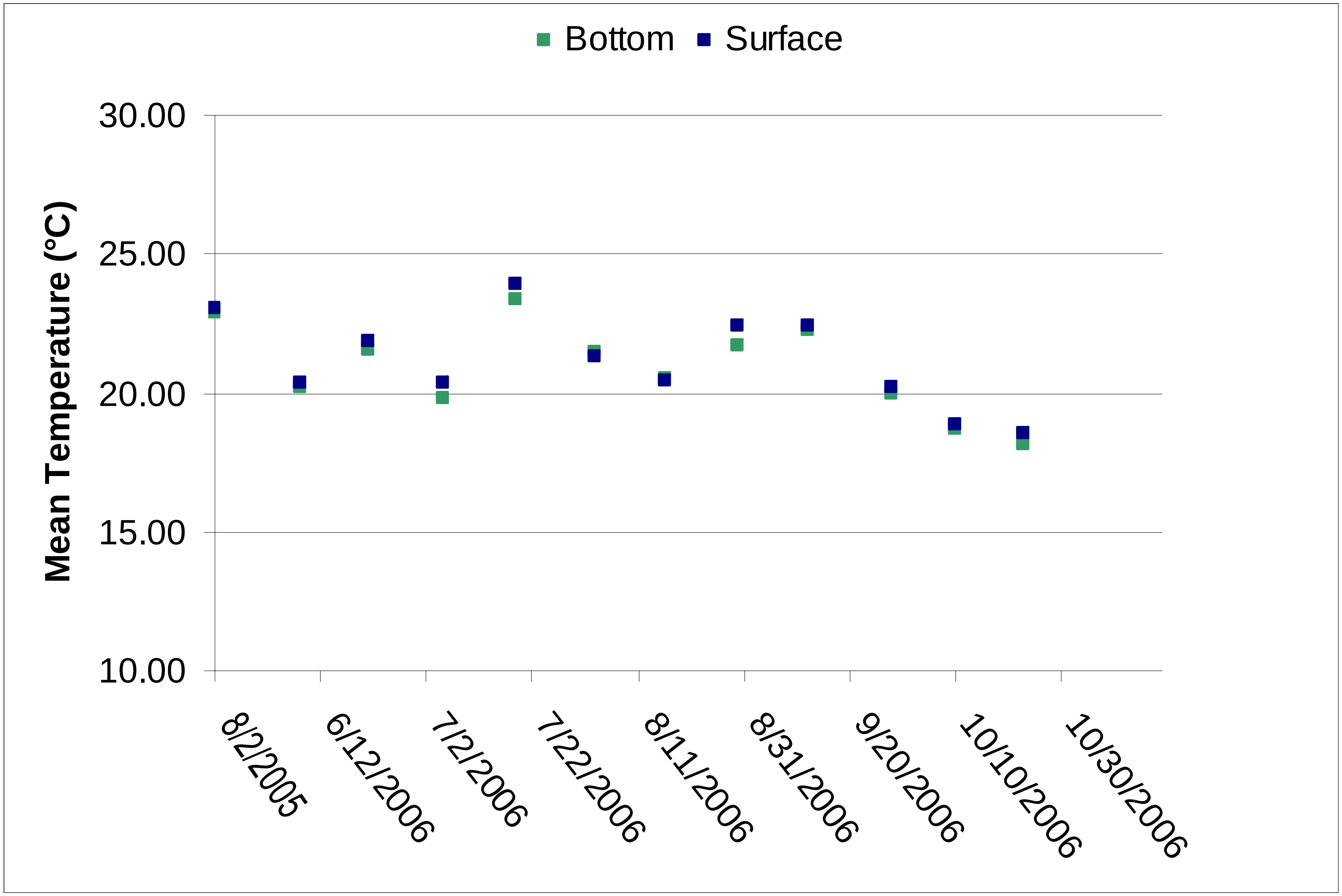


Figure 21. Newark Slough Temperature values, 08/05, 06/06-10/06

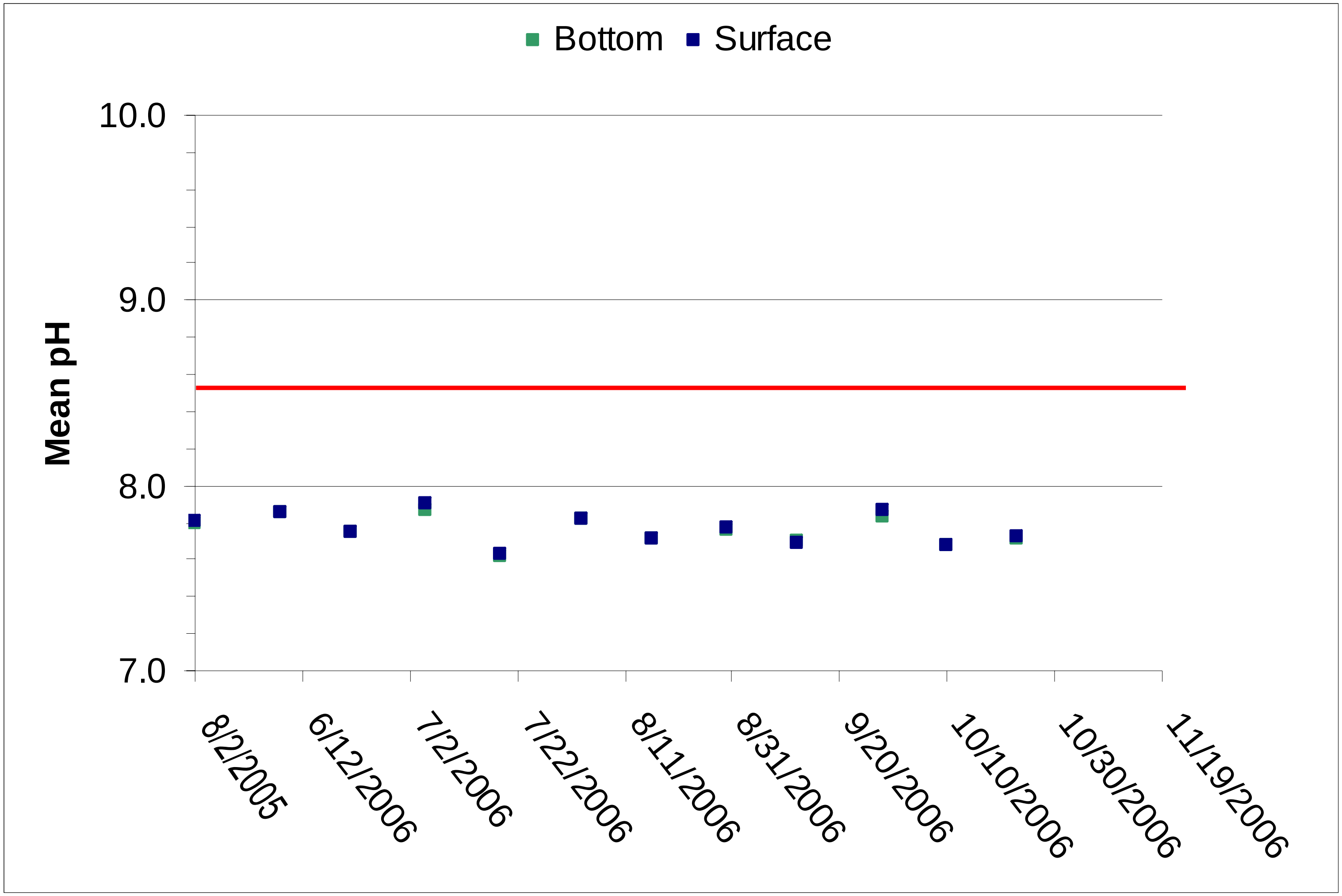


Figure 22. Newark Slough pH values, 08/05, 06/06-10/06

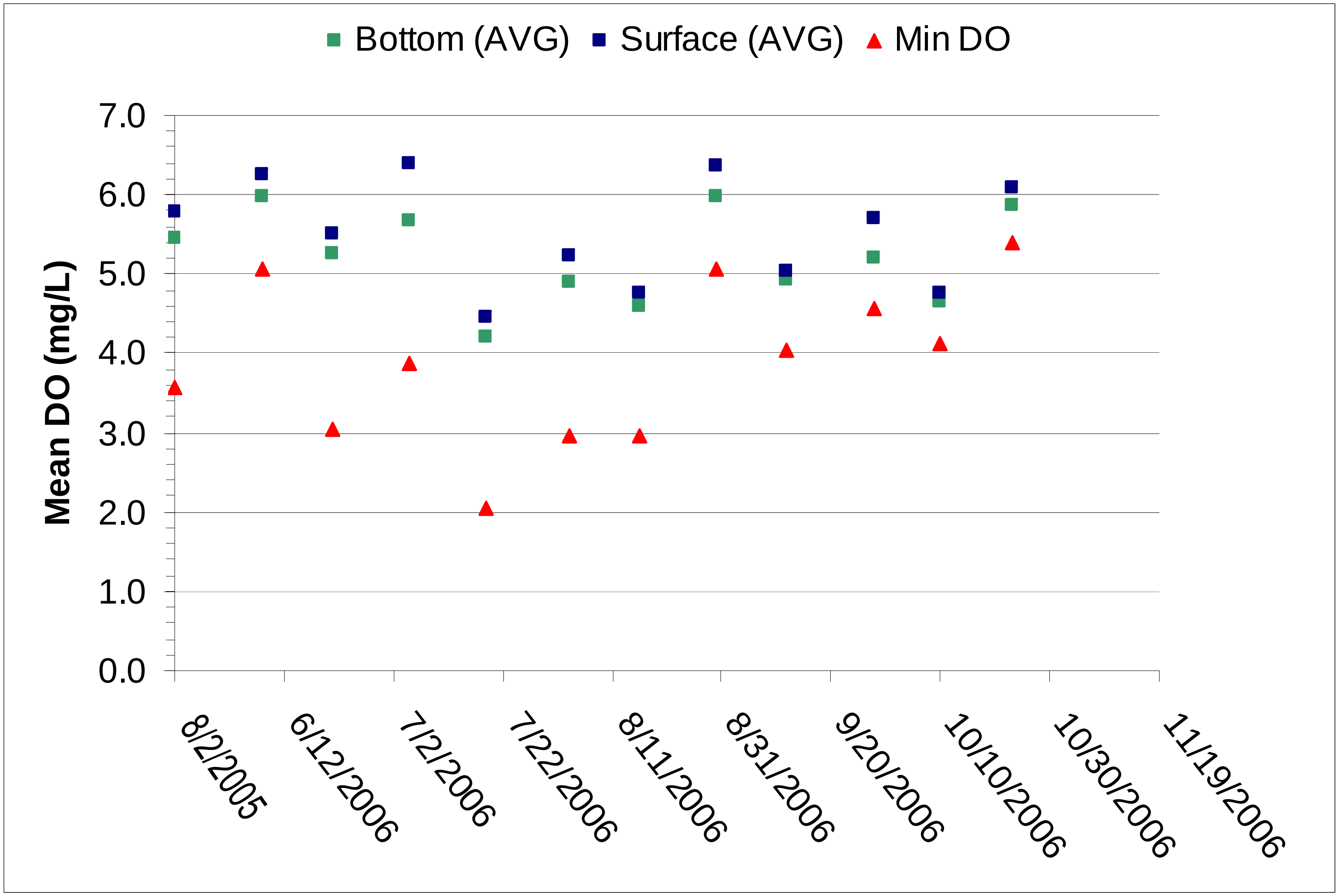


Figure 22. Newark Slough Dissolved Oxygen values, 08/05, 06/06-10/06

Effectiveness of Dissolved Oxygen BMPs

It is recognized that it will not be feasible for a well-operated lagoon system to continuously meet an instantaneous dissolved oxygen limitation of 5.0 mg/L as specified in the Basin Plan, which is based on the national criteria published by the U.S. Environmental Protection Agency (USEPA). It is understood that that a stringent interpretation of this limit is not necessary to protect water quality, based on review of probe monitoring data in the Bay, site-specific standards work in recent years in the Everglades and Virginian Province (Cape Cod, MA to Cape Hatteras, NC), and the data collected by USGS in Newark Slough in 2005 and 2006. The Department therefore concludes that DO levels lower than 5.0 mg/l naturally occur in estuaries. In 2005, the Final Order was modified such that RWQCB required a "trigger" for reporting and action if, at the point of discharge, the calendar weekly 10th percentile falls below 3.3 mg/L. RWQCB required that DO corrective measures (BMPs) be implemented, such as ceasing nighttime discharges if the 3.3 mg/L trigger values are observed, unless a more effective alternative can be implemented.

To address the excursions from the DO limit, several operational strategies or Best Management Practices (BMPs) were proposed in the individual system operations plans. Closure of the discharges during periods of time when the data indicates that DO would be below the 3.3 mg/L trigger was evaluated. Since there is a strong diurnal pattern to DO levels, ceasing discharge from 10 pm to 10 am, as was discussed in the 2004 SMR, would have avoided most of the excursions from the limit that year. In the 2005 SMR, we stated that daily discharge timing is not practicable due to staff and budget constraints and that a similarly effective alternative, weekly discharge timing, could be implemented during periods when the ponds are at or below the trigger value. The weekly discharge timing BMP may be particularly useful when trigger values are expected or observed to correspond 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. Closing or reducing the discharge or substantially reducing the volume for a period of days when overnight DO levels in the pond are known to be, or are expected to be, low could adequately protect receiving waters. Rather than 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), such management activities allow for periods when little or no discharge would occur during the night, or discharge would occur only during periods when lower tides are expected during the day when pond DO levels are higher.

In reviewing the 2005 data, ceasing discharge appear to prolong periods of depressed DO levels due to more limited intake, less circulation and less mixing of in-pond waters. Reducing residence time of water in the ponds appears to improve overall DO levels; therefore, allowing discharge, even at reduced volumes, would provide for some increased volume of intake and improve circulation and mixing. For much of 2006, we set discharge gates to allow reduced discharge volumes versus discharge volumes that would be expected for normal operations when the ponds are at or below the trigger value (e.g Gates set at approximately 5 percent open versus 25% open for typical operations).

While not preventing pond discharges from reaching receiving waters, reduced discharge settings 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 allow for greater circulation, exchange and mixing of intake waters, since pond water levels would be lower than if no discharge occurred and muted tidal intake/discharge provides for greater circulation and mixing, which also appears to help raise DO values. Based on review of 2005 data and data for alternative management for System B2 (refer to B1 data) where pond waters were below the trigger, initiation/continuation of discharge at 5% appears to improve DO values. Based on review of previous years' data, closure of pond intakes is not suggested. Refer to Table 1 for a full summary of discharge events and gate settings.

Additional analysis and interpretation of monitoring data shall be completed to complement information presented in this report, particularly for DO and tidal cycle affects, and shall be submitted for review in April, 2007.

Invertebrate Monitoring

Waste discharge requirements did not require invertebrate monitoring for bay discharges, but did for slough discharges. Benthic macroinvertebrate collection was completed during slough water quality monitoring conducted for 2005; however, the analysis and discussion was not completed for the 2005 SRM. One sample was collected in 2006. Preliminary data are presented here pending QA/QC procedures to confirm identification.

<u>Methods:</u>
Benthic macroinvertebrate samples were collected at Alameda Creek Flood Control Channel and Old Alameda Creek receiving water sampling locations concurrently with receiving water quality samples on five occasions (before pond release, 14 and 28 days after, in August 2005, and in August 2006). Benthic macroinvertebrates were sampled from the boat using a standard Eckman grab sampler (15.2 cm x 15.2 cm x 15.2 cm). Samples were collected by lowering the dredge into the water slowly, holding it level on the substrate, and releasing the "jaws." Soft substrates consistently produced samples that filled the dredge, whereas on harder substrates only a portion of the dredge was filled (the dredge cannot as deeply penetrate a hard surface). Sampling locations with vegetative debris on the substrate produced samples with high concentrations of vegetation. Grab samples were washed in the field using a 0.5mm mesh sieve and preserved in 70% ethanol and rose bengal dye. Samples were sorted and invertebrates enumerated using dissecting microscopes and appropriate taxonomic keys (Usinger 1971, Merritt and Cummins 1978, Pennak 1989, Smith and Johnson 1996).

Table 4: Benthic macroinvertebrates

			B8A Receiving Water					B2C Receiving Water				
			4/20/2005	5/11/2005	5/25/2005	8/17/2005	8/11/2006	4/5/2005	4/26/2005	5/10/2005	8/16/2005	8/14/2006
Group	**Order/Family**	**Species**										
Bivalvia	Corbidae	*Potamocorbula amurensis*	0	15	0	2	0	4	1	0	2	0
	Myidae	*Mya arenaria*	0	5	61.5	17.5	264	0	0	0	0	1
	Tellinidae	*Macoma balthica*	0	40.5	0	23.5	42	0	0	2	14	17
	Veneridae	*Gemma* sp.	0	22	6	14	12	2	0	1	0	0
Bryozoa			0	1	0	0	0	0	0	0	0	0
Coelomate	unknown coelomate	unknown coelomate	0	6	0	0	0	0	0	0	2	0
Crustacea	Ampeliscidae	*Ampelisca* sp.	0	0	0	16	0	0	0	0	3	12
	Ampithoidae	*Ampithoe* sp.	0	0	0	6	0	0	0	0	0	0
	Cirripedia	unknown cirripeds	0	1	11	0	0	0	0	0	0	0
	Copepoda	unknown copepods	0	0	1	0	0	0	1	0	0	0
	Corophiidae	*Corophium* sp.	4	5.5	0	39	3	0	0	0	0	12
		unknown corophiid	0	0	0	0	0	0	0	0	0	1
	Cumacea		0	12.7	27	10	47	0	1	4	33	13
	Gammaridae	*Melita californica*	0	0	0	18	0	0	0	0	0	0
		unknown gammarids	2	7	0	75.5	5	0	0	0	8	11
	Ischyroceridae	*Ericthonius brasiliensis*	0	2	0	145	1	0	0	0	0	3
	Isopoda	*Paranthura* sp.	0	0	0	7	0	0	0	0	0	0
		unknown isopods	0	0	1	28	3	0	0	0	0	0
	Ostracoda	Type II	0	7	0	10	4	0	0	0	1	0
	Stenothoidae	unknown stenothoid	0	0	0	12	0	0	0	0	0	0

	Tanaidae	*Pancolus californiensis*	1	0	0	8	0	0	0	0	0	4
	Amphipoda	unknown amphipods	0	8	0	0	2	0	0	0	0	0
Gastropoda	Assimineidae	*Assiminea californica*	0	0	0	0	1	0	1	0	0	0
	Pulmonata	unknown terrestrial snail	0	0	0	0	0	1	0	0	0	0
Hydrozoa	Campanulariidae	*Obelia* sp.	0	3	0	1	0	0	0	0	0	0
Insecta	Collembola	unknown collembolans	0	0	0	0	0	2	0	0	0	0
	Ephydridae	*Ephydra* sp.	0	0	1	0	0	0	0	0	0	0
Nematoda	unknown nematodes	unknown nematodes	0	2	0	3	0	0	0	0	0	0
Oligochaeta	Tubificidae	*Tubificoides* sp.	0	22	3	2	48	0	0	1	1	12
	unknown oligochaete	unknown oligochaete	0	0	6	0	9	0	0	0	0	0
Polychaeta	Capitellidae	*Capitella capitata*	0	14.3	1	6.5	4.5	0	0	0	0	2
		unknown capitellid	0	9	1	0	0	0	0	0	0	0
	Cirratulidae	*Cirratulus* sp.	0	2	0	4	27	0	0	1	0	1
	Glyceridae	*Glycera* sp.	0	18	0	5.5	0	0	0	1	4	0
	Goniadidae	*Glycinde* sp	0	0	0	0	8	0	0	0	0	1
	Nereidae	*Neanthes* sp.	0	2	2	1.5	0	0	0	0	0	0
	Polynoidae		0	1	0	0	0	0	0	0	0	2
	Sabellidae	unknown sabellids	0	0	1	5	0	0	0	0	0	0
	Spionidae	*Polydora* sp.	1	0	0	5.5	3	0	0	0	0	0
		Streblospio sp.	3	8	0	0	0	0	0	0	4	0
		unknown spionids	0	0	0	13	10	0	0	0	0	0
		unknown polychaete	2	29	0	30	10.5	0	0	2	1	1

Compliance Evaluation Summary

As there is a strong diurnal pattern to DO levels, ceasing discharge from 10 pm to 10 am would avoid most of the excursions from the DO limit. Daily discharge timing, however, is not practicable due to staff and budget constraints and cannot be implemented. We instead implemented a similarly effective alternative; during periods when the weekly 10th percentile is at or below the trigger value, Department staff performed weekly discharge timing. This BMP may be particularly useful when trigger values are expected or observed to correspond 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. Closing or reducing the discharge when overnight DO levels in the pond are known to be or are expected to be low should adequately protect receiving waters. By adjusting discharge gates on an approximately weekly basis (with the number of days being depending on duration of the neap tide cycle), such management activities allow for periods when little or no discharge would occur during the night when pond DO levels are lower.

In 2006, discharge gates were generally set to allow reduced discharge volumes versus discharge volumes that would be expected for normal operations described in the operations plans. For example, a gate would be set at approximately 5 percent open (versus normally 25% open) during strong (spring) tide periods, when the weekly 10th percentile was at or below the trigger value. Reduced discharge settings 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 still allow for exchange and mixing of intake waters and provide improved circulation, since pond water levels would be lower than if no discharge occurred. More continuous operational periods, rather than intermittent operations, are expected to help raise DO values by reducing overall residence time.

RWQCB suggested in 2005 that the BMP providing installation of baffles should be implemented to help improve DO values at the discharge, as was conducted at the Alviso Pond Complex operated by USFWS. For most Eden Landing pond systems, the installation of baffles may not be expected to improve DO levels. In pond B2C, this is because there is no deep borrow ditch at the discharge, which is presumably where especially low DO water would be located. Pond B2C is generally more uniformly shallow because levee maintenance using the floating dredge, as is typically conducted by Cargill for salt pond operations, had not been necessary and had not occurred in this system for a number of decades. In Pond B6A, baffles would not be necessary for seasonal operations, and may also not be effective because the pond has a relatively high and variable-contour pond bottom, much of which is exposed, it does not have a deep borrow ditch at the discharge were it to be operated as a shallow water system in summer. In future years we don’t anticipate summer operations in System B6A because of its value as a season pond system to support breeding for western snowy plover. In Pond B8A, because of the high pond bottom, the only water in the pond is in the borrow ditch. Therefore, installation of baffles across the borrow ditch would not result in diversion of waters from other portions of the pond since no other areas would have sufficient water.

Baffles may be useful in Pond B2 because it is a deeper open-water system, but because the floating dredge was in the system recently (2005), the baffle system used by USFWS in the Alviso ponds may not be appropriate for installation. We will consider the use of baffles in Pond B2 in future years if necessary and installation is practicable. Weekly discharge timing and reduced discharge gate setting operational BMPs were implemented to address low DO values and appear to be sufficiently protective of receiving waters, since signatures of pond water were not readily apparent in receiving water data.

Data, Collection, Evaluation, and Communication

A few gaps in the data sets were caused by malfunctioning meters. While malfunctioning meters resulted in a few days of data gaps, there were no days when low water conditions resulted in full day data gaps. It should be noted that pond operations were monitored as often as possible, given staff limitations, and the down-time of the continuous data recorders was significantly reduced compared to 2005. Since meters have been adjusted more appropriately and pond operations are now better understood, in the future we expect that there will be few, if any, data gaps that result from management operations. Spare data recorders have been provided to address replacement during device servicing. These efforts are expected to ensure data is adequately recorded.

In 2006, USGS collected data and provided raw data to the Department generally on the same day it was downloaded from the meters. The Department was therefore able to review data as soon after it is collected to make effective operational and management decisions. Raw data was evaluated by USGS for accuracy and erroneous readings, and then typically provided the reviewed, calendar-weekly data set to the Department within one week of collection. This procedure provides adequate availability and use of collected information.

Regarding communication of compliance with Final Order requirements to the RWQCB, for 2006, the Department followed Standard Provisions and Reporting Requirements, which required that we report potential noncompliance events to RWQCB staff by phone within 24 hours, and follow-up with a written report within 5 business days. The Department reviewed the raw data and the calendar-weekly data, and promptly contacted RWQCB when DO trigger conditions were observed. Communications were typically made via telephone and/or email. Additionally, we provided the data to RWQCB by posting files to its ftp site. This effort was very helpful in addressing concerns and conversations and other written communications between the Department and RWQCB staff were very helpful.

Requests for Revisions to SMP:

<u>ASMR Submittal Date:</u>
Because data collection typically continues until the end of November and the holiday season typically reduces staff availability during the end of the year, there are only a few weeks to prepare the ASMR for submittal. As there are typically substantial document

revisions, data analysis, interpretation and synthesis activities required, the Department requests that the ASMR submittal date be revised to March 1.

<u>Benthic macroinvertebrates:</u>
For most of the ISP actions, initial release period salinity limits were set at 100ppt, and invertebrate monitoring may have been useful to show effects of elevated salinity and residence time. Actual ISP operations were commenced with salinity at the initial discharge generally less than 50ppt. Thus, salinity values were only slightly elevated above Continuous Circulation levels and those values were observed for only a very brief period. Considering these conditions, it appears that the invertebrate monitoring, intended to help determine effects, is unlikely to provide significant insight.

ISP modeling predicted elevated salinity and longer residence times in sloughs than were observed. As the ELER ponds generally had no daily mean salinities greater than CCP levels, effects of elevated salinity and longer residence times would not be expected to be apparent. Furthermore, receiving water monitoring prior to, immediately following and weeks after initiation of discharge did not indicate discernable affects of salinity or residence time. There appeared to be little indication that salinity values, residence time or stratification had any more effect than exposure to higher salinity waters during drought years.

Considering that there is a seasonal difference in invertebrates, being short-lived organisms, the lack of conclusive data about water quality effects is additionally complicated. Furthermore, affects in the receiving waters were not readily observed in other water quality parameters except in few instances (generally only for DO, and only at or in the immediate vicinity of the discharge location), and in some of those limited instances, ELER pond systems weren't actually discharging. Therefore, fluctuations in the receiving waters, independent of discharge could result in inconclusive analysis.

The Department proposes that invertebrate sampling be deleted from SMR requirements, as the time and cost associated with doing tedious invertebrate sorting, identification and evaluation is not likely to provide much, if any, information relative to discharge effects on receiving water invertebrates. The invertebrates that have been collected will be stored, and, if at a later date there is a need to continue invertebrate studies, the collections may be useful as reference. Limited monitoring funding may be better spent on other analysis efforts, such as synthesizing and further analyzing the collected pond and receiving water data to identify trends, patterns or relationships between pond and receiving water conditions, particularly for DO.

<u>Pond Discharge Montoring:</u>
It has been documented that DO concentrations in a number of South S.F. Bay sloughs (including Newark Slough, which is not affected by pond discharges), are often below the Basin Plan standard of 5.0 mg/L, and frequently experience periods below the 3.3mg/L trigger value as well. Based on these observations the Department proposes to modify the Final Order requirements for continuous monitoring. We propose to discontinue continuous monitoring during periods when pond discharges will be at 10% or less of

capacity, since monitoring data for the past 3 years has not shown any adverse affects of pond discharges on receiving waters. At reduced discharge settings, the volume of waters entering the receiving waters at minimal discharge settings is presumably negligible relative to the volume of receiving waters. Previous monitoring of receiving waters rarely shows a water quality "signal" from the discharge, and no adverse affects have been observed (i.e. fish kills or other adverse affects on biological resources, observance of floating and suspended materials of waste origin, unusual water condition including discoloration and turbidity, unusual odor, affects on beneficial uses, such as wildlife, anglers and other recreational activities). For periods when pond discharges will be greater than 10% of capacity, the existing Final Order requirements would be followed such that continuous monitoring of discharges and periodic receiving water monitoring would be conducted.

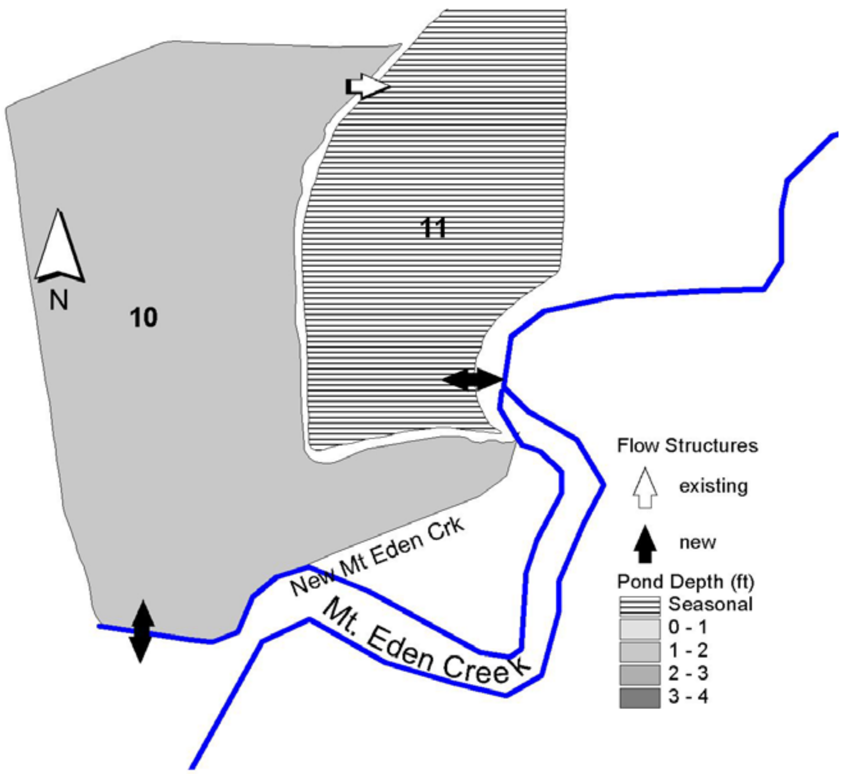
The basis for modifying the requirements shall be based on evaluation of benthic dissolved oxygen levels in a number of locations that was completed during the previous monitoring seasons, application of the USGS PONDCALC discharge volume estimator and additional analysis of data collected in previous monitoring seasons. Furthermore, ambient slough conditions were monitored at intake locations in 2005 by USGS and USFWS observed that slough waters entering ponds during intake were below the 3.3 mg/L trigger at various periods. Therefore, observed pond discharge and receiving water dissolved oxygen levels are likely within the natural range of variation in functional slough and lagoon environments of the South San Francisco Bay and not necessarily indicating any adverse affect on overall water and habitat quality or wildlife resources.

Additional analysis and interpretation of monitoring data shall be completed to complement information presented in this report, particularly relevant to DO, and shall be submitted for review to support this request for modification of the Final Order.

Operations Plan -- Pond System 11
Eden Landing Ecological Reserve
(Baumberg Complex)
Hayward, Alameda County

February, 2007

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



Revised, February, 2007 by:

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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 June 2005 Operations plan. Due to high construction costs, some proposed culverts will not be constructed (a new water control structure connecting Ponds 10 and 11). The new water control structure (WCS) located near the mouth of Mt. Eden Creek inside the bay-front levee will have three 48" culverts allowing intake into, and discharge from, Pond 10 will be operational in Spring 2007. The WCS is being constructed as part of the current phase of construction for the 835-ac Eden Landing restoration project, and is anticipated to be completed in February, 2007. Upon commencement of operations, System 11 will thereafter perform according to the ISP. The historic Pond 10 intake water control structure has been 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, which were not included in the design due to high construction costs and limited usefulness. Furthermore, review of previously collected data for pond operations and management at Eden Landing Ecological Reserve (ELER) indicate that closure of intakes is not recommended due to affects on water quality.

Since planned operation ISP operation of System B11 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 at high tide and mudflat conditions at low tide due to the high pond bottom elevation, a condition which continued through summer 2006. Pond 10 construction activities in 2006 included abandonment in-place of the existing WCS. Thereafter, Pond 10 operated as a seasonal pond. Mt. Eden Creek has been restored to tidal action. Pond 11 was operated as a seasonal pond since summer, 2004.

In 2005, we proposed revisions, approved by the Regional Water Quality Control Board, to the Self-Monitoring Program to discontinue receiving water monitoring for bay discharges.

Introduction

This Operations Plan describes the muted tidal operation of System B11 and 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. A detailed description of the System 11 pond operations anticipated for 2007 are provided in the System Description section, Summer and Winter operations and management activities are shown in the Management section, and 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 (ELER), formerly called the Baumberg Complex, consist of a 5,500-acre complex of evaporator ponds along the eastern shores of San Francisco 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 for final processing. The approach to the San Mateo

Bridge (Hwy 92) and the previously existing 835-ac Eden Landing Ecological Reserve restoration project, 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 Salt Company ownership and all operations have been transferred to the Department of Fish and Game (DFG).

System B11

Pond System 11 is 332 acres in size; it includes Pond 10 (214 acres) and Pond 11 (118 acres) and is located on the northwest corner of the Eden Landing Ecological Reserve (Baumberg Complex). 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. The average bottom elevation of these ponds is 2.6 NGVD.

Biological Resources

Many species are known to use System B11; management and operations plans have been specifically designed to provide suitable habitat for 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 and the ponds in this system historically had been characterized by lower salinities and constant ponding of a foot or more. Consequently, this pond system typically supported 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 and may use them seasonally for foraging.

Under the management regime proposed in the ISP, the ponds will have 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 with intake and discharge when the new water control structure (WCS) is operational in 2007. Under muted tidal conditions, shorebird usage will consist of mainly of breeding and foraging in summer and habitat for waterfowl and other waterbirds that prefer deeper water will be provided in winter. Small islands in Pond 10 are likely to be used for nesting by terns and may be used by other species as well, and adjacent foraging conditions are good because of the outboard mudflats and Mt. Eden Creek channel.

System Description

Objectives

The objective of the Pond B11 system operation described in the ISP is to maintain year-round open water habitat in Pond 10 and seasonal winter open water habitat in Pond 11 by providing muted tidal circulation through Ponds 10 and 11. Discharge to the bay at the mouth of Mount Eden Creek is expected to meet water quality objectives (WQOs).

For 2007, once the main water control structure at the mouth of Mount Eden Creek is operational, Pond 10 will operate as a muted tidal open water pond. Pond 11 will be filled during the fall and winter by intake from Pond 10 and rainfall and will be managed to provide shallow water conditions in the spring and fall season shorebird migration periods.

The System 11 primary intake and outlet is located at the southwest end of the Pond 10 levee at the mouth of Mt. Eden Creek where it meets the bay and includes three 48” culverts with tide gates. There is one combination slide/flap and two flap-only gates on the pond side of the WCS. Water circulation between Pond 10 and 11 occurs by a wooden 2 x 43” WCS in the northern side of the ponds.

For 2007 ISP operations (refer to system map, below):

- A gravity flow inlet/outlet WCS consisting of three 48” culverts and tide gates is located in the southeast corner of Pond 10 at the mouth of Mount Eden Creek along the bayshore levee replaced the historic intake structure.
- A new 48” WCS with a water level control weir at Mount Eden Creek at Pond 11.

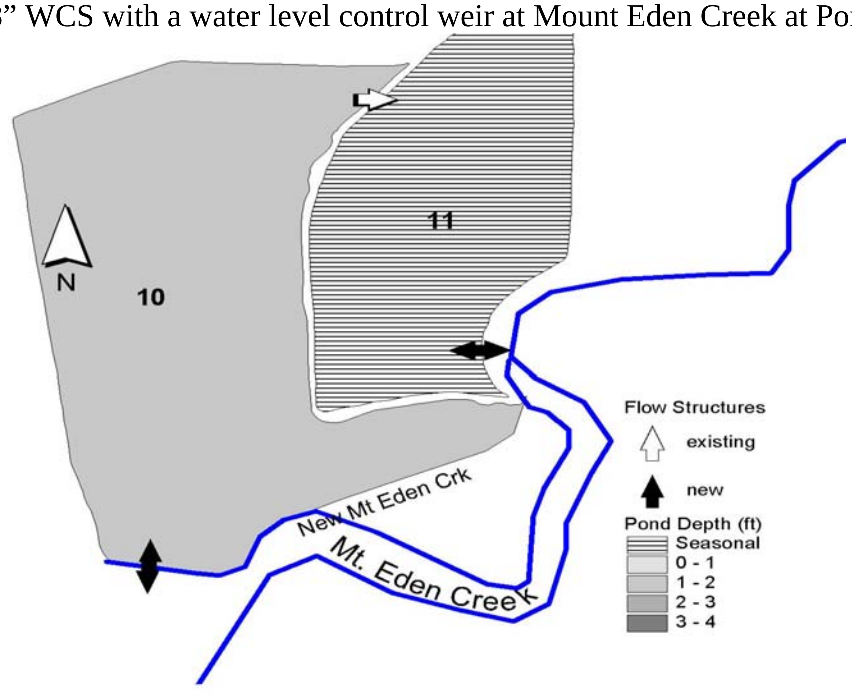

Figure 1. Map of Ponds and Water Control Structures

Management Operations

System B11 ponds will be managed differently during the winter and summer seasons. Pond 10 will operate as a muted tidal open water pond year-round, with deeper water levels in the winter. Water circulation between Ponds 10 and 11 will occur via two 43-inch wood gates. Pond 11 will be open water during the winter and will be a seasonal pond during the summer evaporation season.

ISP operational 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 and operated as a seasonal pond during the summer. Active management will be required year-round and particularly during the transitions to and from the summer operations. Water surface elevations would be primarily controlled by adjusting the outlet control gates. Pond salinities would be similar to existing Bay salinities except in Pond 11 when allowed to draw down for the summer.

The summer operation is intended to provide adequate intake and circulation flow to make-up for evaporation during the summer season and meet water quality objectives (WQOs). Summer operations would normally extend from May through October and coincides with the water quality monitoring season required to comply with the Final Order.

During the winter, the circulation pattern would be from Pond 10 to Pond 11 and discharge returning to Mt. Eden Creek. The Pond 10 WCS would be adjusted to allow bay water in to supplement rainfall and maintain higher water levels, providing open water habitat in both ponds. Pond 11 could discharge into Mt. Eden Creek during the winter. The weir on the Pond 11 discharge could help control the water surface elevations. See Table 1 for in- and out-flow conditions for each operational period.

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 Descriptions

Winter

For the winter operation, the gates from Pond 10 to Pond 11 would be open. Water from the bay at the mouth of Mt. Eden Creek would circulate from Pond 10 to Pond 11 and discharge would generally occur at Pond 10. 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 Pond 10 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)
10	214	2.2	3.5	0.7
11	118	2.9	4.0	0.3

Table 3. Winter Gate Settings

Gate	Setting (% open)
Pond 10 outlet	10 (1 gate)*
Pond 11 inlet	0
Pond 11 outlet	Variable number (setting) of weir boards *

* May be adjusted when water surface elevation is too high.
Weir boards may be used to control water surface elevations.

Summer

In the spring, the system would be transitioned 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 March to enhance foraging opportunities of migrating shorebirds.

The summer operation is intended to provide circulation flow into Pond 10 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 11 would be seasonal and generally dry during the summer. The weir outlet gate would be open to allow muted tidal flow into the pond at high tide as necessary to accommodate habitat management needs. Because the typical pond bottom elevations are near 3 feet NGVD, the tidal inflows would only occur during higher tides.

Table 4. Summer Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
10	214	2.2	3.5	0.7
11	118	2.9	-	-

Table 5. Summer Gate Settings

Gate	Setting (% open)
Pond 10 outlet	20 (1 gate)
Pond 11 inlet	Variable number (setting) of weir boards *
Pond 11 outlet	Variable # weir boards prevent discharge

* May be adjusted when water surface elevation is too low.
Weir boards may be used to control water surface elevations.

The summer gate settings are based on numerical calculations and 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)

Constraints, and Corrective Measures

Constraints

The primary constraint in operating this system is the ability to adequately circulate water in the ponds because of the higher bottom elevation of Pond 11. This reduces the ability to bring adequate Bay water into the Pond 11, particularly in the summer, and therefore adequately circulate water to meet WQOs. The operational plan addresses this by seasonal operational changes and using BMPs, as necessary.

Corrective Measures

Water Level Control

The water level in Pond 10 is the primary control for 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.

High tide elevations and weather conditions and to a lesser degree the weir board gate settings control the overall intake and 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 25% 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 0.1'-0.2' over the course of weeks due to the influence of weak and strong tides and management operations.

The proposed pond water level in pond 10 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 Pond 10 is 40 parts per thousand (ppt) and discharge limit for meeting WQOs is 44 ppt. For routine operations, intake occurs on higher tides. The outlet flow should be increased when the salinity in Pond 10 is close to 35 ppt. Increased outflow will tend to decrease the water level in Pond 10 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 Pond 10 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 10.

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. 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 10^{th} percentile falls below 3.3 mg/L (calculated on a calendar weekly basis). 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 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 Regional Water Quality Control Board (RWQCB).

If a trigger event occurs, the discharger shall make a timely report to RWQCB staff, 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 reducing or closing the discharge during periods of time when the diurnal pattern suggests that DO would be below the trigger (3.3 mg/L). If overnight DO levels in the pond are low, the outlet gates could be adjusted weekly when discharge would occur mostly during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m.

In 2005, RWQCB stated that the Department should implement a DO corrective measure (BMP) that ceases nighttime discharges if the trigger value of 3.3 mg/L is observed in ponds, unless a more effective alternative can be implemented. As daily discharge timing is not practicable due to staff and budget constraints, weekly discharge timing can be implemented. Reducing or 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 would provide adequate protection of receiving waters, 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. 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 5-10 % 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 receiving waters. These BMPs are discussed below:

1. Slough Monitoring

Additional monitoring data may be collected from the receiving waters. 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 low DO 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 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 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 Pond 10, 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 pond discharge and to refine future operation plans.

3. Monthly Discharge Timing

The intake/outlet structures have significant reserve capacity for discharge. The outlet gate will generally be less than 50% open to maintain the water levels in the pond. 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. Weekly Discharge Timing

If overnight DO levels in the pond are low for a given week, the outlet gates could be adjusted approximately weekly to reduce discharge during the night, or when higher tides occur at night and discharge occurs mostly during the day when pond DO levels are higher. During summer, this may be from approximately 10 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 this BMP may be most appropriate. Increased discharge flows to allow discharge timing may increase salinity locally in receiving waters during the discharge periods but would not be expected to exceed 44 ppt.

5. Temporarily Cease Discharge

Temporarily ceasing discharge would prevent any effects on DO conditions in receiving waters. However, periods without circulation through the pond could adversely affect water quality conditions in the pond which could result in poorer conditions, depending on weather and other factors. This could also have an adverse affects on the biological resources associated with the ponds and may also create substantial odor problems for the neighboring communities as the accumulated biomass dies and decays, and may also have a negative effect on future water quality conditions in the pond.

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 the deeper borrow ditches are conveying pond waters to the discharge, and when there is significant algae build up in the pond, 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 aerators was evaluated by U.S. Fish and Wildlife Service in the Alviso ponds in 2005. The aerators were not effective. This BMP is not expected to be implemented unless a different means was developed, evaluated and shown to be effective. Furthermore, significant capital costs would be likely, and are not feasible within the current operations budget.

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 could be performed. If pH in the receiving waters approaches 9.0, samples for ammonia could 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.

Control of Inorganic Mobilization and/or Methylation of Mercury

System 11 will provide constant flooding in Pond 10 (no change in Redox potential). Pond 11 will be seasonally dry and may result in conditions that result in a change in Redox potential. Inorganics and methyl mercury levels were monitored from 2003-2006 and levels were not found to exceed WQOs, therefore further analysis is not anticipated.

Monitoring and Adaptive Management Action Plan

Monitoring Activities

Pond Management

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

Weekly Monitoring Program for Pond Management

Location	Parameter
Pond 10	Pond Water Level, Salinity, Discharge Gate Setting
Pond 11	Slough Salinity, Pond Salinity, Pond Water Level, Gate/Weir 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 pond from May through October. 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 Datasondes are serviced to check battery voltage and data consistency.

Receiving Water Sampling (Continuous Circulation Period)**:** Bay receiving water quality measurements are not required, as approved by RWQCB in 2005.

Pond Management Sampling (for Initial Release and Continuous Circulation)**:** In-pond water quality measurements were discontinued beginning in 2006 due to limited applicability.

Chlorophyll-a sampling (for Continuous Circulation Monitoring): USGS collected Chlorophyll samples monthly in 2004 but was discontinued in 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples were collected from 2003-2005, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels) and levels were within WQOs and therefore discontinued.

Communication of Monitoring Results and Violations

In previous monitoring seasons, some data gaps resulted due to greater-than-expected water level fluctuations and due to Datasonde malfunctions. To address these issues, communications protocols have been improved and Datasondes have been installed in more appropriate locations and water depths. Spare Datasondes were made available to replace devices as needed.

The Department is required by the Final Order to contact the RWQCB staff by phone within 24 hours and follow-up with a written report within 5 business days when potential violations occur. The Department will review raw data the day it is collected and contact RWQCB staff as necessary.

Contact Information

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Operations Plan -- Pond System 8A
Eden Landing Ecological Reserve
(Baumberg Complex)
Hayward, Alameda County

February, 2007

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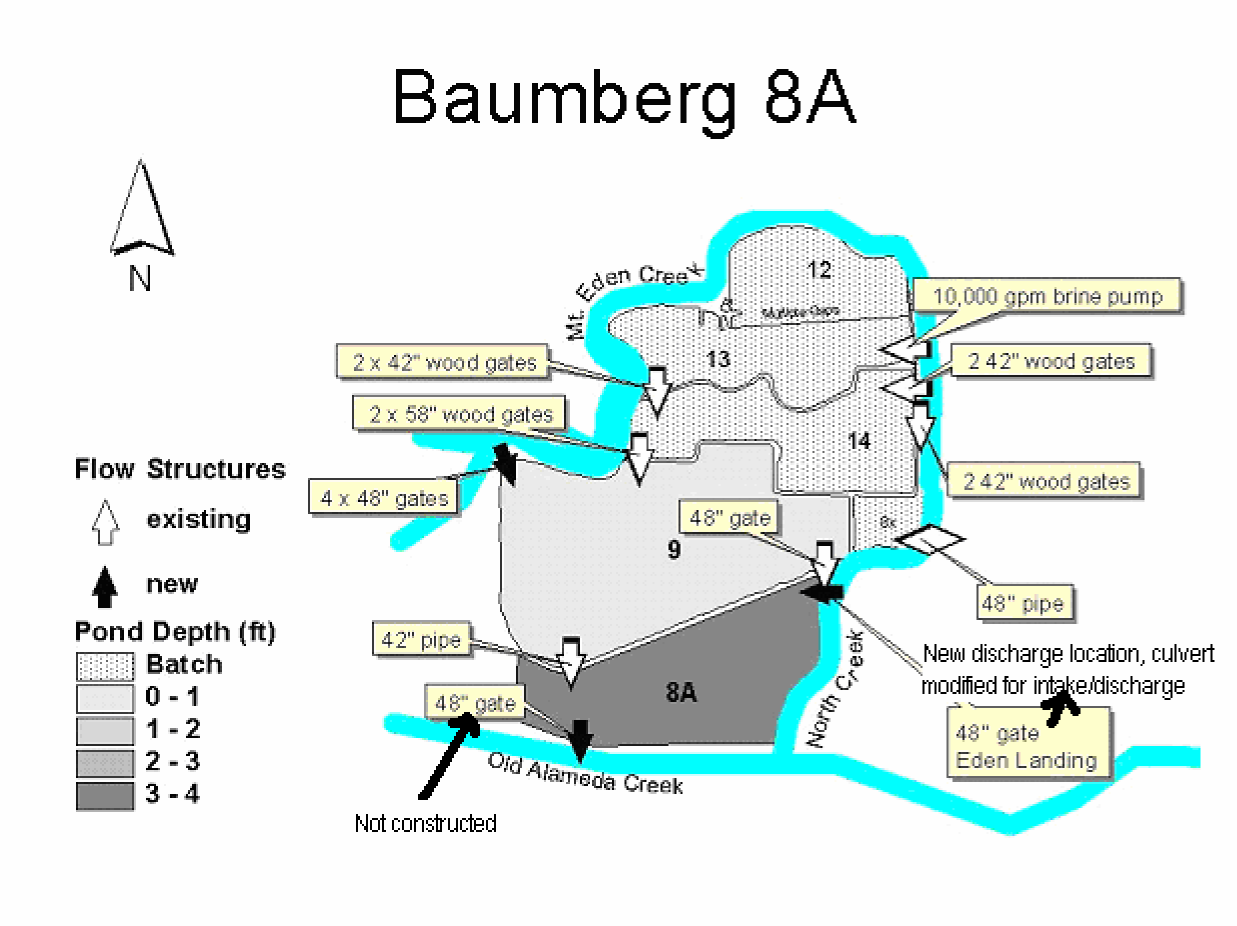

Revised, February, 2007 by:

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Table of Contents

Summary of Changes to the Operations Plan

Mt. Eden Creek was restored to tidal action in November 2006. Intake to Pond 9 has been dramatically improved. North Creek was breached into the Eden Landing restoration site in October 2006, but this action should not have much affect on operations and is described for context.

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 expected to function is discussed in the System Description section. Summer and winter management activities are described in the Management section, and the specific corrective measures required to adaptively manage the system are discussed in the Operations, Constraints, and Corrective Measures section.

Eden Landing Ecological Reserve (Baumberg Complex) Location

The Eden Landing Ecological Reserve (ELER), formerly called the Baumberg Complex, consist of a 5,500-acre complex of evaporator ponds along the eastern shores of San Francisco 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 the Department.

System 8A is relatively large in size, 1,008 acres. Table 1 describes the acreages and bottom elevations of the individual ponds in System 8A. 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

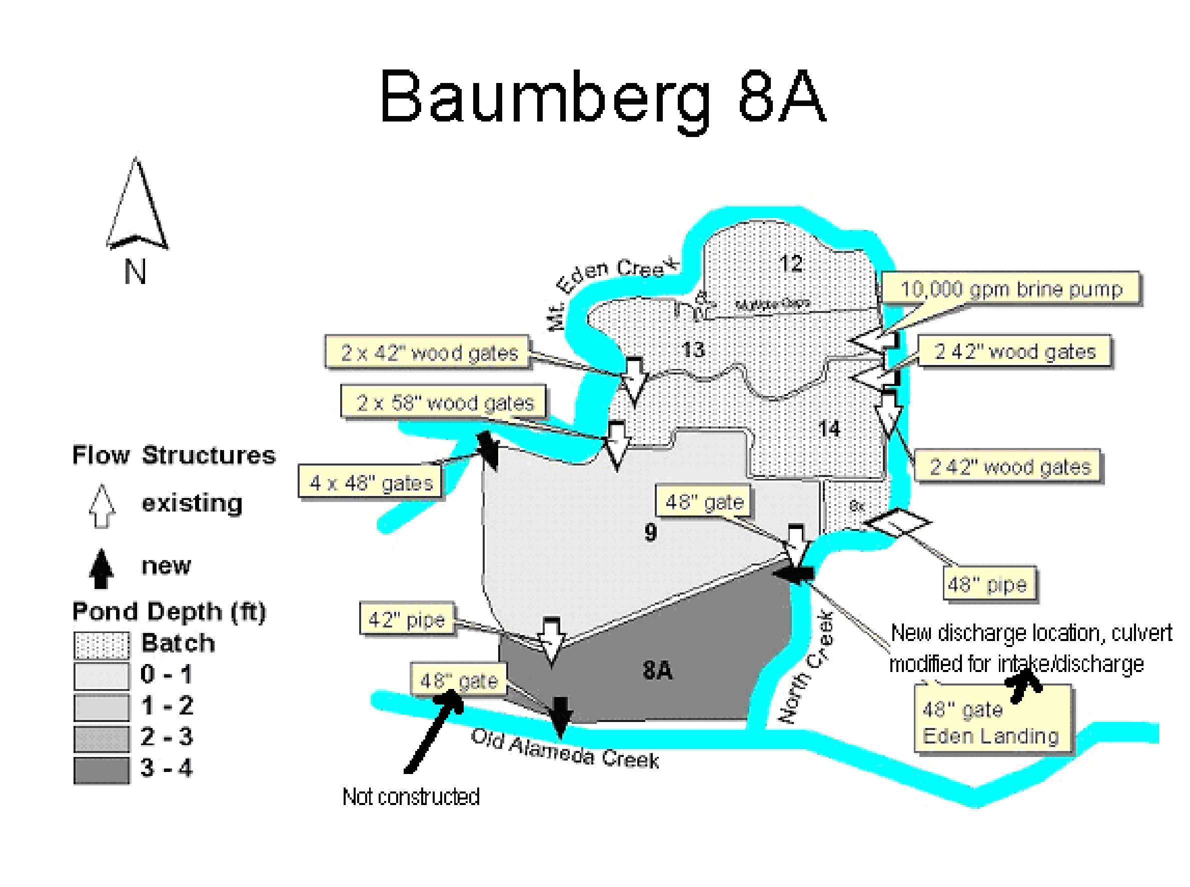
Various waterbird species are known to use System 8A; management and operations plans have been specifically designed to provide suitable habitat for numerous waterbird species and avoid adverse impacts. Since Pond 9 would be a managed pond with year-round open water, shorebirds would use shallower pond 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 operate independently to provide shallow water and mudflat habitat for waterbirds, especially during the fall migration season. 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 year-round 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 System 8A 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.

Varying pond depths in this system result from limited intake (high pond bottoms). During the spring and fall bird migration seasons, management operations would be transitioned according to seasonal use to provide optimum habitat conditions. These ponds may be heavily used by shorebirds for foraging, as is typical of shallower ponds. Shorebirds and other waterbirds may also use these ponds for roosting, particularly on the un-vegetated levees within the system and on remnant wooden structures. The 8A system may support fish populations in Ponds 8A and 9.

No restrictions on intake are expected since salmonid entrainment is not anticipated, as Old Alameda Creek is not suitable spawning habitat due to the barrier to fish passage at the 20 Tide Gate crossing structure approximately 3 miles upstream from the mouth. North Creek is also not suitable for salmonid spawning. North Creek was breached into the Eden Landing restoration site in October, 2006 and as vegetated tidal marsh develops, nursery habitat for fish may be provided. 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

- Tidal circulation through Ponds 9 and 8A
- Allow portions of Pond 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 salt making 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:

- 4 x 48” intake gates 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 pump (#2 Brine Pump) at Pond 12 from North Creek tidal area
- Existing internal connection from Pond 9 to 8A
- One 48” discharge gate from 8A to North Creek, allows supplemental intake
- Existing staff gages in all ponds

System Description

System Ponds

The System 8A primary intake is located at the northwest end of Pond 9 and includes four 48” gates from Mount Eden Creek near the bay. The system outlet is located at the northeastern end of Pond 8A with one 48” gate into North Creek and acts as a supplemental intake gate. The normal flow through the system in summer is from Pond 9 to Pond 8A. Flow from Pond 9 to 8A is controlled by one 42” culvert pipe near the western levee.

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 8A bottom 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 since the latter is not operable. The pond connections are culverts rather than fixed weirs, as described in the ISP. 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 pumped water via the #2 Brine Pump pulling water from the North Creek tidal area, if needed, but will generally receive water from Pond 9. Pond 8x includes a culvert to North Creek (combo gate on North Creek, weir box in 8x) to provide shallow water and mudflat. The typical bottom elevations in Pond 8x are above normal high tides and inflow is limited, but the deeper borrow ditch areas will contain water regularly.

Management Operations

Intake to Pond 9 has been improved with restoration of tidal action to Mt. Eden Creek in November, 2006 and System 8A is operating as intended. The discharge culvert located in the northeast corner of Pond 8A also acts as a supplemental intake, particularly valuable during the summer, when muted tidal intake/discharge operations are important for achieving WQOs.

Pond	Area (acres)	Bottom Elevation (ft NGVD)	Water Elevation (ft NGVD)		
			Cargill	Initial Stewardship	
				Summer	Winter
9	356	2.6	4.7	3.4	4.6
8A	256	4.0	4.6	2.0	4.5
12	99	2.9	4.8	-	4.0
13	132	3.1	4.6	-	4.0
14	156	3.5	4.7	-	4.0
Total/ Average	1,008	3.0	4.7	3.4	4.2

Summer Operation

Summer operations are 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 ac.ft./day. The summer operation season normally extends from May through October.

Summer Gate Settings (*varies, to be determined in field)

Gate	Setting (% open)
Pond 9 intakes	4 x 100*
Pond 9 – 8A	100
Pond 8A intake	100
Pond 8A outlet	25*
Pond 13 - 14	0
Pond 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 elevation for habitat values. The winter operation period would normally extend from November through April.

Winter Gate Settings (* varies, to be determined in field)

Gate	Setting (% open)
9 intakes	2* x 100
9 – 8A	100*
8A intake	100*
8A outlet	10*
13 - 14	100*
14 - 9	100*

Constraints, and Corrective Measures

Constraints

The primary constraint in operating this system is the ability to bring adequate Bay water into and circulate water in the ponds, particularly in summer, to keep salinities below 40 ppt and meet WQOs. The operational plan addresses this by managing water levels lower than previous conditions for salt making, by operating the system as muted tidal via the intake/discharge structure in Pond 8A and by using BMPs, as necessary. Muted tidal operations will help ensure pond salinities remain lower at the end of the rainy season and during summer operations 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.

Pond 8A system may support fish populations in system ponds but no restrictions on intake are anticipated since salmonid entrainment is not expected to be an issue. Old Alameda Creek is not suitable spawning habitat due to lack of upstream spawning habitat and because a barrier to fish passage 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 tidal slough entering the Eden Landing restoration site. It will take a number of years for vegetated marsh to develop in the restoration site due to low elevations in the former crystallizer ponds. The tidal restoration would only provide open water and marsh as 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 gates, since the culvert connections to Pond 8A mute flow but there are no weirs in the system, as originally 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 Pond 8A will help ensure less fluctuation in Pond 9 and keep salinities near 40 ppt.

During the summer, the high bottom elevation (4.0 ft NGVD average) of Pond 8A keeps the pond mostly dry, although waters will be maintained in the deep borrow ditches. The inflows from Pond 9, with the supplemental intake at the intake/discharge structure are expected to provide adequate 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 due to tides and weather conditions. Water levels in Ponds 12, 13, and 14 are affected by seasonal rainfall and intake and management and the ponds are expected to dry during the summer.

Winter Water Level Control

The water level in Pond 8A and the variable intake capacity of Pond 9 are the primary controls for flow in System 8A. Normal winter operation would have the intake gates fully open. Water levels would be controlled by the outlet gate setting. The normal water level in Pond 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 Pond 8A due to evaporation within the system. The design maximum salinity for the discharge at Pond 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 manage muted tidal discharge operations via Pond 8A. Because the Pond 8A discharge is operated as muted tidal in the borrow ditches, the discharge salinity will generally be slightly above the salinity in Old Alameda Creek during the summer in most years. Alternative management operations can be implemented, such that Pond 8A can be operated as a seasonal pond by closure of the Pond 8A supplemental intake and managing Pond 9 with muted tidal intake/discharge near the mouth of Mt. Eden Creek via two combination gates on the inboard side.

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. 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 10^{th} percentile falls below 3.3 mg/L (calculated on a calendar weekly basis). 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 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 Regional Water Quality Control Board (RWQCB).

If a trigger event occurs, the discharger shall make a timely report to RWQCB staff, 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 reducing or closing the discharge during periods of time when the diurnal pattern suggests that DO would be below the trigger (3.3 mg/L). If overnight DO levels in the pond are low, the outlet gates could be adjusted weekly when discharge would occur mostly during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m.

In 2005, RWQCB stated that the Department should implement a DO corrective measure (BMP) that ceases nighttime discharges if the trigger value of 3.3 mg/L is observed in ponds, unless a more effective alternative can be implemented. As daily discharge timing is not practicable due to staff and budget constraints, weekly discharge timing can be implemented. Reducing or 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 would provide adequate protection of receiving waters, 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. 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 5-10 % 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 receiving waters. These BMPs are discussed below:

1. Slough Monitoring

Additional monitoring data may be collected from the receiving waters. 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 low DO 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 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 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 Pond 10, 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 pond discharge and to refine future operation plans.

3. Monthly Discharge Timing

The intake/outlet structures have significant reserve capacity for discharge. The outlet gate will generally be less than 50% open to maintain the water levels in the pond. 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. Weekly Discharge Timing

If overnight DO levels in the pond are low for a given week, the outlet gates could be adjusted approximately weekly to reduce discharge during the night, or when higher tides occur at night and discharge occurs mostly during the day when pond DO levels are higher. During summer, this may be from approximately 10 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 this BMP may be most appropriate. Increased discharge flows to allow discharge timing may increase salinity locally in receiving waters during the discharge periods but would not be expected to exceed 44 ppt.

5. Temporarily Cease Discharge

Temporarily ceasing discharge would prevent any effects on DO conditions in receiving waters. However, periods without circulation through the pond could adversely affect water quality conditions in the pond which could result in poorer conditions, depending on weather and other factors. This could also have an adverse affects on the biological resources associated with the ponds and may also create substantial odor problems for the neighboring communities as the accumulated biomass dies and decays, and may also have a negative effect on future water quality conditions in the pond.

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 the deeper borrow ditches are conveying pond waters to the discharge, and when there is significant algae build up in the pond, 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 aerators was evaluated by U.S. Fish and Wildlife Service in the Alviso ponds in 2005. The aerators were not effective. This BMP is not expected to be implemented unless a different means was developed, evaluated and shown to be effective. Furthermore, significant capital costs would be likely, and are not feasible within the current operations budget.

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 could be performed. If pH in the receiving waters approaches 9.0, samples for ammonia could 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

Operations of 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 is expected, and the exposed portion of Pond 8A is not expected to contribute to methylation because the pond bottom has a significant gypsum layer. Inorganics and methyl mercury levels were monitored from 2003-2006 and levels were not found to exceed WQOs, therefore further analysis is not anticipated.

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

Location	Parameter
Pond 9 intake	Salinity
Pond 9	Depth, Salinity, Observations
Pond 8A	Depth, Salinity, Observations
Pond 12/13	Depth, Salinity, Observations
14	Depth, Salinity, Observations

Water Quality

The Final Order requires water quality monitoring for discharge. The specifics of the water quality monitoring program are detailed in the Self Monitoring Program document. A summary is presented below:

The Final Order requires water quality monitoring for summer discharge. The specifics of the water quality monitoring program are detailed in the Self Monitoring Program document. A summary is presented below, for summer discharge operations (not anticipated):

Continuous Pond Discharge Sampling: Continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, CO) installed in pond from May through October. 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 Datasondes are serviced to check battery voltage and data consistency.

Receiving Water Sampling (Continuous Circulation Period)**:** Slough receiving water quality monitoring, reporting and action would be required for summer discharge when, at the point of discharge, the calendar weekly 10^{th} percentile falls below 3.3 mg/L.

Pond Management Sampling (for Initial Release and Continuous Circulation)**:** In-pond water quality measurements were discontinued beginning in 2006 due to limited applicability.

Chlorophyll-a sampling (for Continuous Circulation Monitoring): USGS collected Chlorophyll samples monthly in 2004 but was discontinued in 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples were collected from 2003-2005, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels) and levels were within WQOs and therefore discontinued.

Communications of Monitoring Results and Violations

In previous monitoring seasons, some data gaps resulted due to greater-than-expected water level fluctuations and due to Datasonde malfunctions. To address these issues, communications protocols have been improved and Datasondes have been installed in more appropriate locations and water depths. Spare Datasondes were made available to replace devices as needed.

The Department is required by the Final Order to contact the RWQCB staff by phone within 24 hours and follow-up with a written report within 5 business days when potential violations occur. The Department will review raw data the day it is collected and contact RWQCB staff as necessary.

Contact Information

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Operations Plan -- Pond System 2 and 2C
Eden Landing Ecological Reserve
(Baumberg Complex)
Hayward, Alameda County

February 2007

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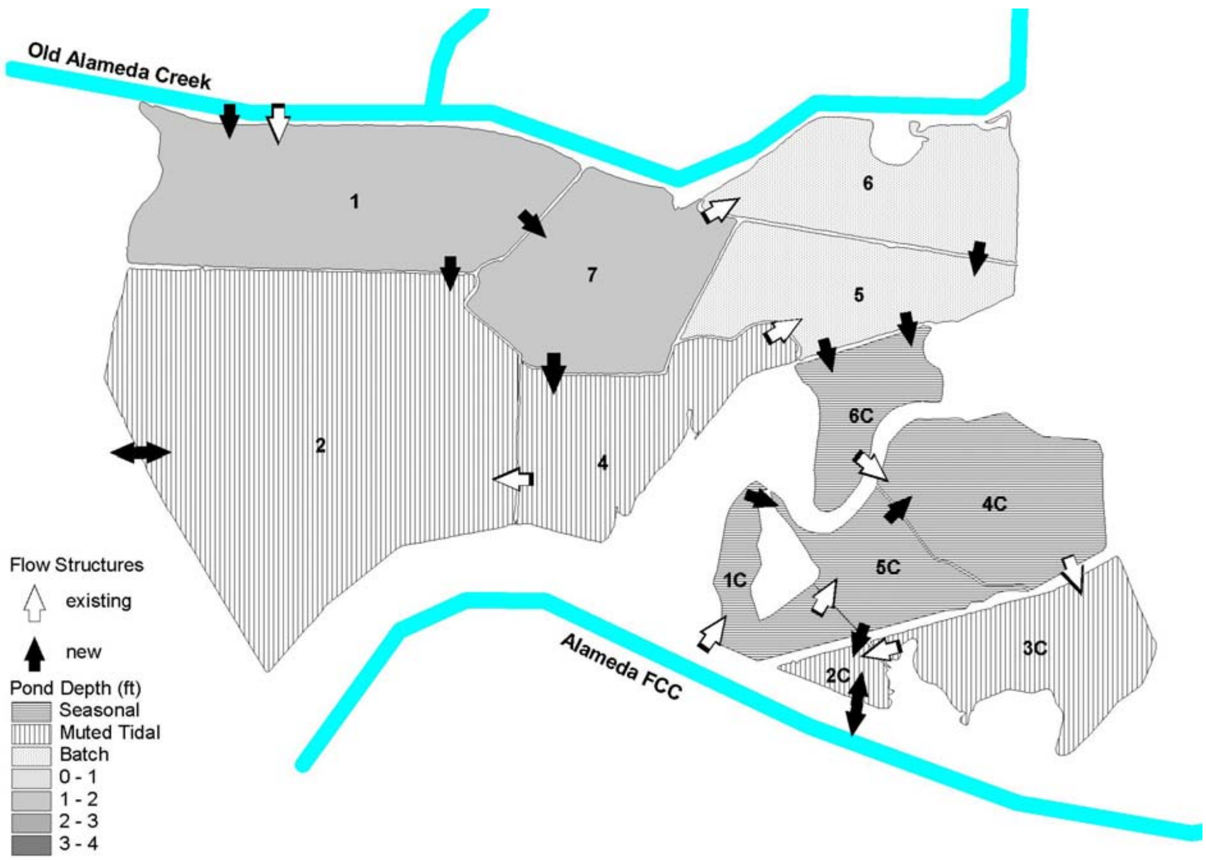

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Table of Contents

Summary of Changes to the Operation Plan

In 2005, Pond Systems 2 and 2C were linked. Ponds 6, 5 and 6C 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 Ponds 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, 4C, 5C and 1C would be seasonal ponds with winter open water and shallow water conditions in the fall and spring operational transitions and would be dry during the summer. Ponds 6C, 4C, 5C and 1C could also be shallow open water during the summer with pumped intake from Alameda Creek FCC, but pumped operations are not anticipated due to high energy costs. Ponds 1C, 5C, 4C, and 6C would generally be filled from the 2C subsystem in late-October with the onset of rainfall and increased gravity inflow.

Monitoring data from 2005 and 2006 in Systems 2 and 2C revealed difficulties with meeting the Final Order's Dissolved Oxygen (DO) requirements. A revised DO trigger, Best Management Practices and a 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 are described in the System Description section, summer and winter management activities are described 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 (ELER), formerly called the Baumberg Complex, consist of a 5,500-acre complex of evaporator ponds along the eastern shores of San Francisco 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 Cargill and may be severed from the ISP operations in the future.

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- System 2

Many species are known to use the System 2 ponds; 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. System 2 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).

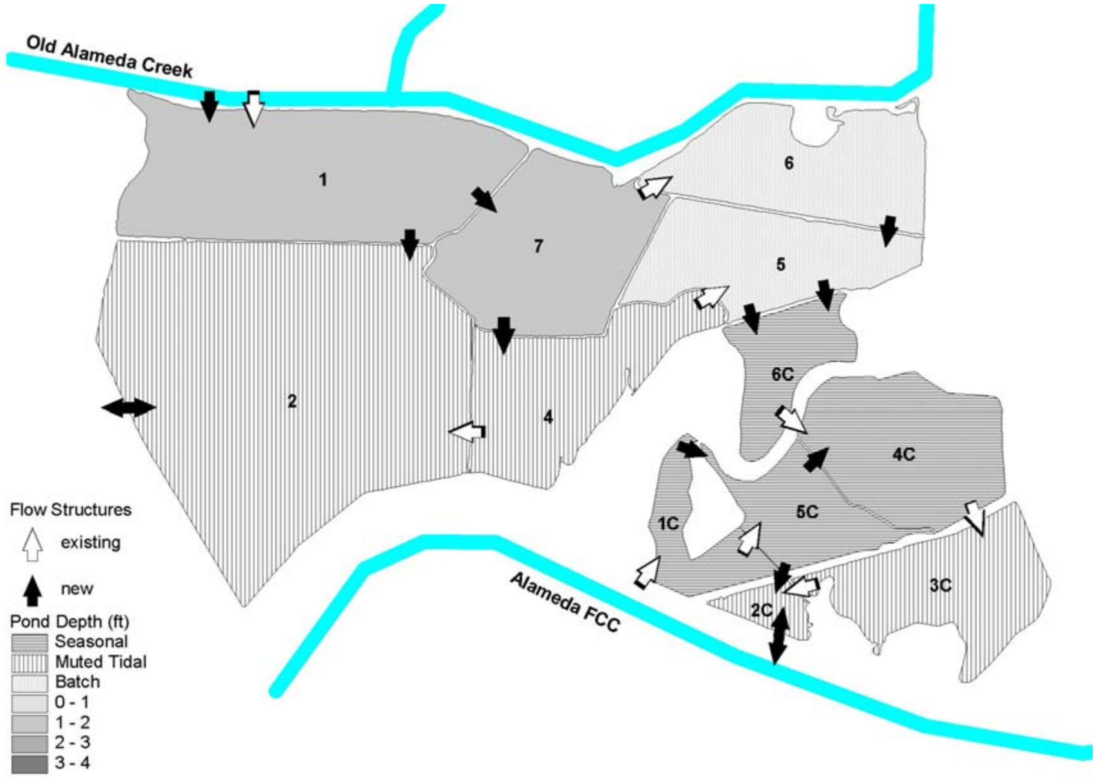
Biological Resources- System 2c

Various waterbird species are known to use System 2C; 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, 4C, 5C and 1C would be seasonal ponds with winter open water and shallow water conditions in the fall and spring operational transitions and would be dry during the summer. Ponds 6C, 4C, 5C and 1C could also be shallow open water during the summer with pumped intake from Alameda Creek FCC, but pumped operations are not anticipated due to high energy costs. Ponds 1C, 5C, 4C, and 6C would generally be filled from the 2C subsystem in late-October 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, pumped intake can occur, as described above. System 2C may support fish populations in the fall, winter and spring and in the summer in Pond 2C. Restricting intake during the winter 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 System 2/2C operation is to maintain year-round open water habitat in Ponds 1, 2, 6, 5 and 2C and winter open water habitat in all ponds (1, 2, 7, 4, 6, 5, 2C, 1C, 4C, 5C, and 6C. Pond 3C, owned by Cargill and still part of the 2C sub-system will be operated as year-round open water until decoupled from the circulation pattern. This operations plan provides tidal circulation through Ponds 1 and 2, and in Pond 2C (and 3C) while maintaining discharge salinities to San Francisco Bay (via Pond 2 discharge) and Alameda FCC (Pond 2C discharge) at less than 44 ppt.

Structures

System 2/2C includes the following structures for water circulation in the ponds:

- Four 48" intake/outlet gates near the northwest end of Pond 1 from Old Alameda Creek, near the San Francisco Bay, generally only operated as intakes
- 30,000 gpm intake pump (Baumberg #1 Intake Pump) from Old Alameda Creek
- One 48" gate from Pond 1 to 2
- One gap from Pond 2 to 4 and remaining levee being allowed to deteriorate

- Two 48” intake/outlet gates at the bayside (western) levee of Pond 2 at San Francisco Bay
- One 48” gate from Pond 1 to 7
- One 48” gate from Pond 7 to 4
- One 48” gate from Pond 7 to 6
- Three 42” wood gates from Pond 4 to 5 (One gate operable)
- One 36” wood gate, and one 36” gate culvert from Pond 5 to 6C (rust hinders use)
- Two 30” siphons from Pond 6C to 4C
- One gap from Pond 4C to 5C
- One new 36” culvert and gate from Pond 5C to 2C (replaced Pond 3C-4C wood gates)
- One gap from Pond 3C to 2C
- One gap from Pond 1C to 5C
- One 7660 gpm intake pump (Cal Hill Intake Pump) from Alameda FCC to Pond 1C
- Two 48” intake/outlet gates at the south side of Pond 2C to Alameda FCC
- Existing staff gages at all ponds except Pond 4c

System Description

System 2/2C 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 and 5 operate as batch or seasonal ponds which link the two subsystems.

Pond 2 Subsystem

Pond 1 has a water control structure (WCS) for gravity flow as the primary intake and an intake pump from lower Old Alameda Creek. The WCS includes gates to allow for inflow at all four culverts, and discharge at two culverts. The inflow from Pond 1 circulates through Ponds 7 and 4 to the discharge at Pond 2 during the winter, and in the summer, Pond 7 are closed off to allow limited flow from Pond 1 to 2 and Ponds 7 and 4 are 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 2C 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 and 5 link the Pond 2 and 2C subsystems. Water for these ponds may be supplied from either of 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 Ponds 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, 4C, 5C and 1C are operated as seasonal ponds with open water during the winter, but would be drawn down and mostly dry during the summer. These ponds could also be shallow open water during the summer with pumping from Alameda FCC. Pump operations are not generally anticipated. Ponds 1C, 5C, 4C, and 6C would generally be filled from the B2C subsystem in late October.

Management Operations

Summer Operation

Systems 2 and 2C operate at lower water levels during the summer to increase gravity inflows at high tide and avoid pumping. Summer operations would normally extend from May through October.

System 2

Summer operations are 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 are opened to allow supplemental muted tidal inflow. The total intake flow of approximately 110 acre-feet/day includes 65 acre-feet/day inflow at Pond 1 and 45 acre-feet/day inflow at Pond 2.

Ponds 6 and 5 would generally be maintained at the same water level as Pond 2, but would not include circulation flow during the summer. The connection from Pond 7 allows flows to Ponds 6 and 5 to make up for evaporation during the summer. Pond 6C would be seasonal and closed off from Pond 5 during the summer.

System 2C

Summer operations are 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 pond operates with muted tidal circulation at the intake/discharge WCS. Muted tidal inflow represents approximately 25 percent of the total volume in Ponds 2C and 3C.

Ponds 1C, 4C, 5C and 6C are seasonal ponds, dry during the summer. The Cal Hill Intake pump could provide circulation water for these ponds, but is not anticipated to be operated due to high energy costs. The muted tidal circulation flow at 2C is sufficient to maintain salinity conditions within the Continuous Circulation Period maximum (44 ppt), but the pump would be need to be run full time (8 to 12 hours per day at high tide) to maintain 1C, 4C, 5C and 6C below 40 ppt, which would increase operations and management costs and is not practicable. Ponds 1C, 4C, 5C and 6C may be partly flooded during the spring and fall to provide suitable foraging habitat for migrating shorebirds, which would tend to increase salinities in those ponds. Maintaining salinities below 40 ppt may not be necessary since higher salinity water would be diluted prior to discharge via mixing in Pond 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)
Pond 1 intake	100 (4 gates)
Pond 1 discharge	0* (1 gate)
Pond 1 to 7	75
Pond 1 to 2	100
Pond 7 to 6	50*
Pond 6 to 5	100
Pond 5 to 6C	0
Pond 6C to 4C	(not operable)
Pond 2 inlet	100 (2 gates)
Pond 2 outlet	35* (1 gate)
Pond 5C to 4C gap	n/a
Pond 2C to 5C	0
Pond 2C inlet	100 (2 gates)
Pond 2C outlet	35* (1 gate)

* To be determined in the field

The B2 subsystem summer gate settings are based on pond modeling and past operations and assume average evaporation conditions. The gate settings are intended to provide sufficient circulation flow to limit the summer salinity increases to prevent exceeding Continuous Circulation Period WQOs. The 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 field conditions.

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 System 2, 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.

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 lowered, the water levels in System 2 would be increased to a winter operation level of 4.5 feet NGVD. This would reduce the circulation flow through the system.

For System 2C, 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.

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 provide open water 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)
Pond 1 intake	100 (4 gates*)
Pond 1 discharge	0* (1 gate)
Pond 1 to 7	100
Pond 1 to 2	100
Pond 7 to 6	100*
Pond 6 to 5	100
Pond 5 to 6C	100
Pond 6C to 4C	(not operable)
Pond 2 inlet	100 (2 gates*)
Pond 2 outlet	50* (1 gate)
Pond 5C to 4C gap	n/a
Pond 2C to 5C	100*
Pond 2C inlet (restricted Dec-Mar)	100 (2 gates)
Pond 2C outlet	35* (1 gate)

* To be determined in the field

Constraints, and Corrective Measures

Constraints

The primary constraint in operating this system is the ability to adequately circulate water in the ponds, particularly in the summer, to meet WQOs. The operational plan addresses this by using BMPs, as necessary.

Corrective Measures

Summer Water Level Control

The water level in Ponds 1, 2 and 2C are the primary ponds for summer pond management. Low water levels in the ponds may expose portions of the pond bottoms and cause odor nuisances. 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 System 2. The outlet gate setting controls the water level in Pond 2. The internal pond gate settings from Ponds 1 to 7, Ponds 7 to 4, and Ponds 1 to 2 affect 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 50 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 and weather conditions.

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 and weather conditions.

Winter Water Level Control

The water level in the discharge ponds (Pond 2 and 2C) 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 supplemental intakes and the 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 settings at Pond 2 and 2C are adjusted to increase the outflow from the pond. Due to its remote location, the Pond 2 WCS 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 typically be filled in November from Pond 2C intake 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. An additional salinity control for System 2 is operation of the #1 Intake Pump in Pond 1, primarily in drier years. The intake pump may be turned on when the salinity in Pond 1 is above 37 ppt; however, pumped intake is not anticipated due to high energy costs. Increased inflows will tend to increase the water level in Pond 2 and 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 System 2C is to lower the water 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 bottoms.

If Ponds 1C, 4C, 5C and 6C were to be operated 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 2C to 5C. The salinity in 1C, 4C, 5C and 6C would increase due to the reduced circulation.

Ponds 6 and 5 are higher salinity “batch” ponds. 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 additional intake and no circulation out of, and minimal mixing between, 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 the system and weather/evaporation conditions. Salinity levels higher than 135 ppt in Ponds 6 and 5 are not desirable and may result in some gypsum precipitation in the ponds. If the late season salinity needs to be controlled, inflows could be supplemented with pumped flows from the Continental pump (System 6A), or allowing the ponds to draw down by allowing flow into other ponds in System 2 or 2C to allow greater inflows from Pond 1. High salinity outflows from Pond 5 may require further management actions to address increases in salinity in other ponds.

At the end of the evaporation season, typically November, the higher salinity water in Ponds 6 and 5 would be released into Ponds 4 or 6C and mixed/diluted in other ponds before reaching the discharge locations. Circulation from Ponds 6 and 5 should be controlled to maintain discharge salinity below 40 ppt. For example, the flow from Pond 5 to Pond 4 should be approximately half the flow from Pond 7 to Pond 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 Systems 2 and 2C.

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. 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 10^{th} percentile falls below 3.3 mg/L (calculated on a calendar weekly basis). 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 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 Regional Water Quality Control Board (RWQCB).

If a trigger event occurs, the discharger shall make a timely report to RWQCB staff, 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 reducing or closing the discharge during periods of time when the diurnal pattern suggests that DO would be below the trigger (3.3 mg/L). If overnight DO levels in the pond are low, the outlet gates could be adjusted weekly when discharge would occur mostly during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m.

In 2005, RWQCB stated that the Department should implement a DO corrective measure (BMP) that ceases nighttime discharges if the trigger value of 3.3 mg/L is observed in ponds, unless a more effective alternative can be implemented. As daily discharge timing is not practicable due to staff and budget constraints, weekly discharge timing can be implemented. Reducing or 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 would provide adequate protection of receiving waters, 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. 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 5-10 % 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 receiving waters. These BMPs are discussed below:

1. Slough Monitoring

Additional monitoring data may be collected from the receiving waters. 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 low DO 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 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 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 Pond 10, 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 pond discharge and to refine future operation plans.

3. Monthly Discharge Timing

The intake/outlet structures have significant reserve capacity for discharge. The outlet gate will generally be less than 50% open to maintain the water levels in the pond. 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. Weekly Discharge Timing

If overnight DO levels in the pond are low for a given week, the outlet gates could be adjusted approximately weekly to reduce discharge during the night, or when higher tides occur at night and discharge occurs mostly during the day when pond DO levels are higher. During summer, this may be from approximately 10 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 this BMP may be most appropriate. Increased discharge flows to allow discharge timing may increase salinity locally in receiving waters during the discharge periods but would not be expected to exceed 44 ppt.

5. Temporarily Cease Discharge

Temporarily ceasing discharge would prevent any effects on DO conditions in receiving waters. However, periods without circulation through the pond could adversely affect water quality conditions in the pond which could result in poorer conditions, depending on weather and other factors. This could also have an adverse affects on the biological resources associated with the ponds and may also create substantial odor problems for the neighboring communities as the accumulated biomass dies and decays, and may also have a negative effect on future water quality conditions in the pond.

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 the deeper borrow ditches are conveying pond waters to the discharge, and when there is significant algae build up in the pond, 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 aerators was evaluated by U.S. Fish and Wildlife Service in the Alviso ponds in 2005. The aerators were not effective. This BMP is not expected to be implemented unless a different means was developed, evaluated and shown to be effective. Furthermore, significant capital costs would be likely, and are not feasible within the current operations budget.

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 could be performed. If pH in the receiving waters approaches 9.0, samples for ammonia could 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 were monitored from 2003-2006 and levels were not found to exceed WQOs, therefore further analysis is not anticipated.

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	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
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 Final Order requires water quality monitoring for discharge. 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 pond from May through October. 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 Datasondes are serviced to check battery voltage and data consistency.

Receiving Water Sampling (Continuous Circulation Period)**:** Slough receiving water quality monitoring, reporting and action would be required for summer discharge when, at the point of discharge, the calendar weekly 10^{th} percentile falls below 3.3 mg/L.

Pond Management Sampling (for Initial Release and Continuous Circulation)**:** In-pond water quality measurements were discontinued beginning in 2006 due to limited applicability.

Chlorophyll-a sampling (for Continuous Circulation Monitoring): USGS collected Chlorophyll samples monthly in 2004 but was discontinued in 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples were collected from 2003-2005, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels) and levels were within WQOs and therefore discontinued.

Communication of Monitoring Results and Violations

In previous monitoring seasons, some data gaps resulted due to greater-than-expected water level fluctuations and due to Datasonde malfunctions. To address these issues, communications protocols have been improved and Datasondes have been installed in more appropriate locations and water depths. Spare Datasondes were made available to replace devices as needed.

The Department is required by the Final Order to contact the RWQCB staff by phone within 24 hours and follow-up with a written report within 5 business days when potential violations occur. The Department will review raw data the day it is collected and contact RWQCB staff as necessary.

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

February, 2007

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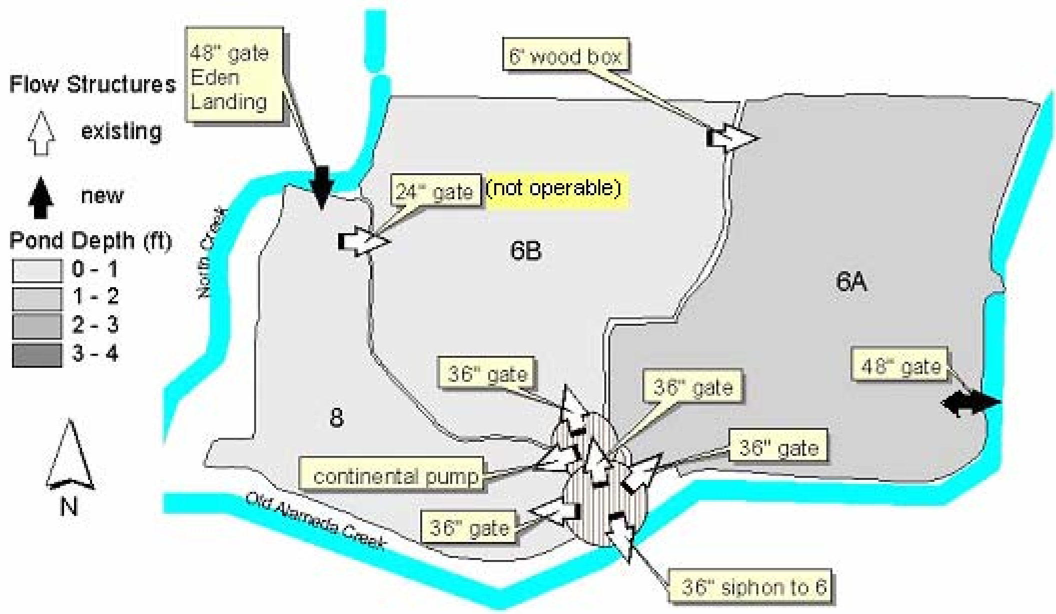

Revised, February, 2007 by:

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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. A detailed description of System 6A operation is discussed in the System Description section, Summer & Winter management activities are discussed in the Management section, and the specific corrective measures proposed 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 (ELER), formerly called the Baumberg Complex, consist of a 5,500-acre complex of evaporator ponds along the eastern shores of San Francisco 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 also provides tidal action 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 operations and maintenance responsibilities have been transferred to the Department.

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.

The ponds of this system are characterized by seasonal management, with varying salinities ranging from low to medium levels, with muted tidal intake operation in the summer in pond 6A to provide breeding habitat and shallow water foraging habitat for WSP (generally less than six inches in the Ponds 6A and 6B). Some water may be moved into the borrow ditches within Pond 8 and Pond 6B to produce brine flies and maintain suitable foraging habitat for WSP.

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 be limited to enhanced seasonal ponding, providing open water via limited intake to Pond 6A, resulting in generally shallow water in borrow ditches and shallow water or dry bottom areas in Ponds 6A and 6B. Pond 8 would be mostly dry in the summer due to the high pond bottom elevation, but water will also be added to enhance seasonal pond conditions. The ponds would be managed to have low salinity in the winter and spring to maintain salinity within Continuous Circulation Period salinity levels. The ponds would typically be filled in the fall with the onset of cooler weather via limited intake and with rainfall and increased gravity inflow during the winter. 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. Pond 6A could be operated as muted tidal year round, but will not be discharging during the summer to focus management on western snowy plover (WSP) breeding activities, requiring shallow water, mudflat and salt pan habitat. Water quality objectives (WQOs) were not adequately met in 2006 to provide for both WSP breeding and summer discharge operation conditions.

The ponds of this system are characterized by seasonal management, with varying salinities ranging from low to medium levels, with muted tidal intake operation in the summer in pond 6A

to provide breeding habitat and shallow water foraging habitat for WSP (generally less than six inches in the Ponds 6A and 6B). Some water may be moved into the borrow ditches within Pond 8 and Pond 6B to produce brine flies and maintain suitable foraging habitat for WSP. 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 WSP. Shallower ponded areas may also maintained in winter for foraging shorebirds, including WSP. The largest concentration of nesting and over-wintering snowy plovers are found in the ELER ponds north of Alameda Creek in System 6A and System 8A and may be managed to provide suitable habitat for WSP most of the year. Higher salinity seasonal "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, deeper portions of System 6A typically support abundant waterfowl including bufflehead, scaup, Northern shoveler, and ruddy duck.

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. System 6A 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 and lack of suitable spawning habitat upstream. North Creek is similarly not suitable for salmonids. North Creek was breached into the Eden Landing restoration site in 2006 and as 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:

- Operation of Ponds 8, 6B and 6A as seasonal (enhanced)
- Manage for different water surface elevations summer vs. winter:
    - Draw down of ponds in late spring for seasonal operation;
    - Maintain mostly open water during the winter
- Operate water levels lower than salt making operation elevations
- Maintain discharge salinity at levels below 44 ppt.

Water Control Structures

The proposed system includes:

- New 48” intake culvert with combination gate from North Creek and weir box at pond 8
- Existing internal connections between:
  - Pond 8 to 6B, via single 36” slide gates connecting the north “donut” to the ponds
  - Pond 6B and 6A, via a wooden 6’ box culvert
  - Pond 8 to 6A, via single 36” slide gates connecting the south “donut” to the ponds
- New 48” intake/discharge culvert with combination gates at Pond 6A and Old Alameda Creek
- Existing Continental Pump (not used)
- siphon under Old Alameda Creek from pond 6A to 6 (not used)
- Existing staff gages at all ponds

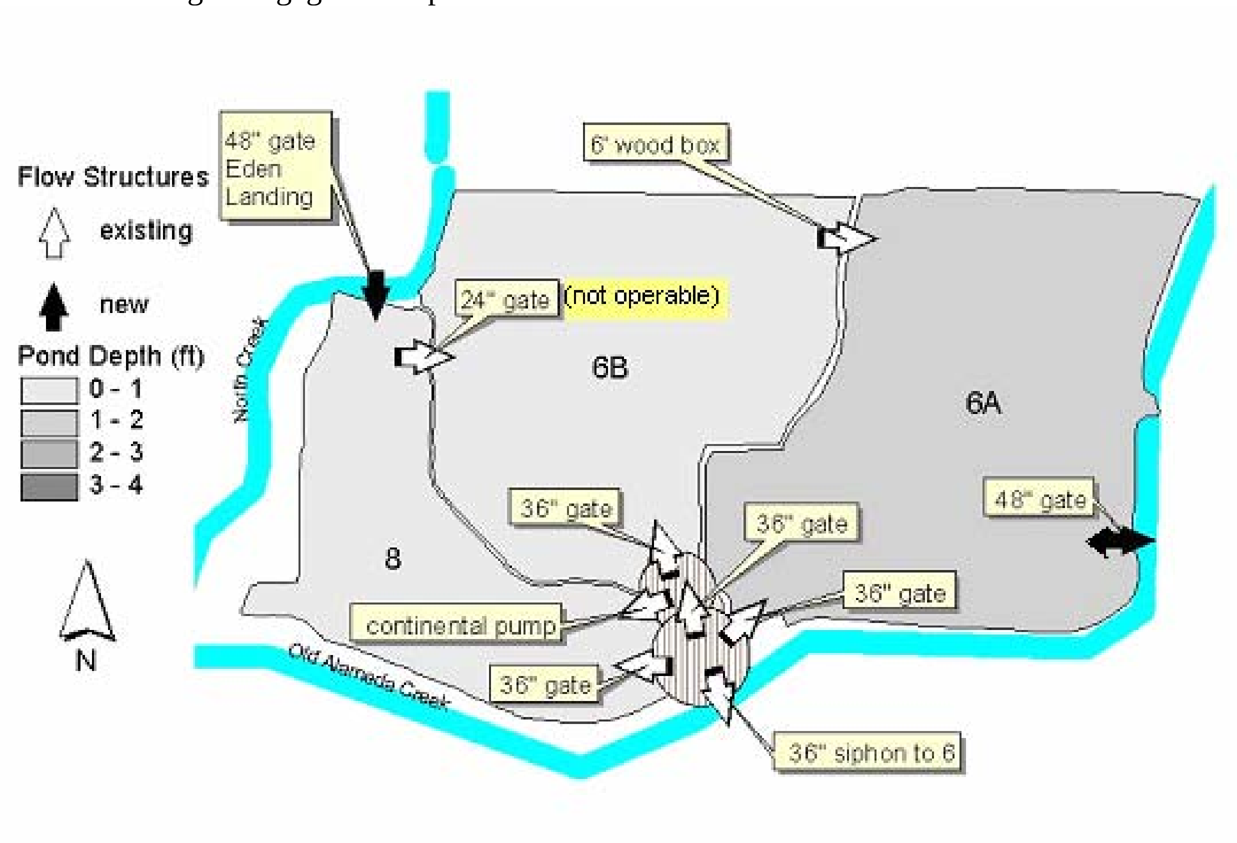

Figure 1. Map of Ponds and Water Control Structures
Note: Pond depths based on winter conditions.

Management Operations

As a seasonal, muted tidal pond system, the system would not be subject to continuous circulation through ponds during the summer high evaporation season. 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 hydraulic limitations of intake to pond 8 and the limited intake capacity at the new water control structure in Pond 6A via Old Alameda Creek, it was not considered practical to maintain continuous circulation in the 6A system during the summer. Furthermore, summer operations suitable for western snowy plover breeding habitat and maintaining water quality objectives may be contradictory, as described below.

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

In addition, the existing control structures include two control ponds (“donuts”) located between the three ponds near the Continental Pump and Old Alameda Creek. The donuts are each less than 1 acre. As described in the ISP, the south donut is connected by gated culverts to Ponds 8 and 6A, to the north donut is connected to the siphon to Pond 6 on the south side of Old Alameda Creek. The north donut is connected to Pond 6B. The north donut was the source for water for the Continental Pump, which pumped water into Pond 8 and into Pond 6 (part of System 2/2C) during the removal of brines during phase out of salt making operations prior to transfer to the Department. For the salt making operations, the control ponds and pump were used to transfer water to and from Pond 6. For the ISP, the pump and siphon will not typically be utilized. The system would be separate from System 2/2C south of Old Alameda Creek.

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

The ISP conditions includes different operation plans for the ponds during the winter and summer seasons. The ponds are managed with seasonal operations and have open water in the system during the winter to support over-wintering waterfowl. During the summer, the ponds would be mostly dry and enhanced with limited intake at Ponds 6A and 8 to support shorebird breeding and foraging, especially for WSP.

Summer operations will be limited to enhanced seasonal ponding, providing open water via limited intake to Ponds 6A and 8, generally resulting in shallow water in borrow ditches and shallow water or dry bottom areas in Ponds 6A and 6B. Pond 8 would be mostly dry in the summer due to the high pond bottom elevation, but water will also be added to the borrow ditches to enhance seasonal pond conditions. The ponds would be managed to have low salinity in the winter and spring to maintain salinity within Continuous Circulation Period salinity levels. The ponds would typically be filled in the fall with the onset of cooler weather via limited intake and with rainfall and increased gravity inflow during the winter. 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. Pond 6A could be operated as muted tidal year round, but will not be discharging during the summer to focus management on WSP breeding activities, requiring shallow water, mudflat and salt pan habitat. WQOs were not adequately met in 2006 to provide for both WSP breeding and summer discharge operation conditions.

The ponds of this system are characterized by seasonal management, with varying salinities ranging from low to medium levels to provide summer breeding habitat and shallow water foraging habitat for WSP (generally less than six inches in the Ponds 6A and 6B). Some water may be moved into the borrow ditches within Pond 8 and Pond 6B to produce brine flies and maintain suitable foraging habitat for WSP. 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 WSP. Shallower ponded areas may also maintained in winter for foraging shorebirds, including WSP. System 6A and System 8A and may be managed to provide suitable habitat for WSP most of the year. Higher salinity seasonal "batch" pond operations could provide high prey densities of prey items, although batch pond operations are not currently proposed, as higher salinity foraging areas within the ponds will result from existing seasonal operations. In the winter, deeper portions of System 6A typically support abundant waterfowl.

Operation of System 6A as seasonal during the summer would be managed by gate settings varied to provide limited ponding or to primarily provide panne habitat.

Table 1
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 ISP are shown in Table 2, below.

Table.2
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

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 gates at the intake and outlet WCS and between ponds. Intake salinities would be the similar to the bay and pond salinities would be similar to existing bay salinities.

For the winter operation, the wooden box culvert 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 the weir box and/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)
Pond 8 inlet	100, with adjustable weir on pond side*
Pond 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 and management needs

Summer

In the spring the system would be drained for the summer condition. This is assumed to occur in early April, 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, WSP nesting activities, or salinity levels in the ponds.

Because ponds would be operated as seasonal ponds, the ponds would slowly draw down during the late spring, and limited management would be required until winter. The ponds would become part of the continuous flow operation in winter.

Pond 6A could be operated as a muted tidal pond during the summer, and the outlet culvert would be opened to allow outflow and would contain minimal water at higher tides. Pond 6A is not anticipated to be operated as muted tidal in the summer, because discharging during the summer will focus management on western snowy plover (WSP) breeding activities, requiring shallow water, mudflat and salt pan habitat. Water quality objectives (WQOs) were not adequately met in 2006 to provide for both WSP breeding and summer discharge operation conditions.

Constraints, and Corrective Measures

Constraints

The primary constraint in operating this system is the ability to adequately circulate water in the ponds, particularly in the summer, to meet WQOs. 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 Pond 8 and discharge gate settings at Pond 6A are the primary control for System 6A management. 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 and weir 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 would 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 0.5’ during a month due to the influence of weak and strong tides and weather conditions.

Salinity Control

The maximum salinity for the discharge at Pond 6B is 44 ppt, according to the WQOs for the ISP. For routine operations, intake occurs on high tides. The outlet flow would be increased when the salinity in Pond 8 is close to 40 ppt. Increased outflow will tend to decrease the water level in Pond 6A and increase the inflow at high tide. The increased circulation flow and reduced volume in the pond (lower water surface elevation) will help reduce salinity. Lower water levels in Pond 6A 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 System 6A.

Dissolved Oxygen Control

Since this pond system will be mainly operated as open water in the winter, we do not foresee problems with low DO. The following discussion would be applicable in the event that DO levels drop during the summer discharge monitoring season, if Pond 6A would be operated as muted tidal and water levels must be lowered to ensure successful nesting by snowy plovers. To ensure that DO levels at the Pond 6A discharge are not adversely affecting receiving water WQOs, a “trigger” for the continuous circulation period 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.

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. 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 10^{th} percentile falls below 3.3 mg/L (calculated on a calendar weekly basis). 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 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 Regional Water Quality Control Board (RWQCB).

If a trigger event occurs, the discharger shall make a timely report to RWQCB staff, 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 reducing or closing the discharge during periods of time when the diurnal pattern suggests that DO would be below the trigger (3.3 mg/L). If overnight DO levels in the pond are low, the outlet gates could be adjusted weekly when discharge would occur mostly during the day, when pond DO levels are higher. During summer, this may be from approximately 10 a.m. to 10 p.m.

In 2005, RWQCB stated that the Department should implement a DO corrective measure (BMP) that ceases nighttime discharges if the trigger value of 3.3 mg/L is observed in ponds, unless a more effective alternative can be implemented. As daily discharge timing is not practicable due to staff and budget constraints, weekly discharge timing can be implemented. Reducing or 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 would provide adequate protection of receiving waters, 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. 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 5-10 % 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 Old Alameda Creek. These BMPs are discussed below:

1. Slough Monitoring

Additional monitoring data may be collected from the receiving waters. 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 low DO 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 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 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 Pond 10, 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 pond discharge and to refine future operation plans.

3. Monthly Discharge Timing

The intake/outlet structures have significant reserve capacity for discharge. The outlet gate will generally be less than 50% open to maintain the water levels in the pond. 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. Weekly Discharge Timing

If overnight DO levels in the pond are low for a given week, the outlet gates could be adjusted approximately weekly to reduce discharge during the night, or when higher tides occur at night and discharge occurs mostly during the day when pond DO levels are higher. During summer, this may be from approximately 10 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 this BMP may be most appropriate. Increased discharge flows to allow discharge timing may increase salinity locally in receiving waters during the discharge periods but would not be expected to exceed 44 ppt.

5. Temporarily Cease Discharge

Temporarily ceasing discharge would prevent any effects on DO conditions in receiving waters. However, periods without circulation through the pond could adversely affect water quality conditions in the pond which could result in poorer conditions, depending on weather and other factors. This could also have an adverse affects on the biological resources associated with the ponds and may also create substantial odor problems for the neighboring communities as the accumulated biomass dies and decays, and may also have a negative effect on future water quality conditions in the pond.

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 the deeper borrow ditches are conveying pond waters to the discharge, and when there is significant algae build up in the pond, 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 aerators was evaluated by U.S. Fish and Wildlife Service in the Alviso ponds in 2005. The aerators were not effective. This BMP is not expected to be implemented unless a different means was developed, evaluated and shown to be effective. Furthermore, significant capital costs would be likely, and are not feasible within the current operations budget.

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 could be performed. If pH in the receiving waters approaches 9.0, samples for ammonia could 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 average daily DO levels in pond Pond 6A drop to one mg/L, circulation would 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

Ponds 8, 6B, and 6A are seasonal; Pond 6A may be operated as seasonal, or muted tidal. System 6A will be seasonally dry and may result in conditions that result in a change in Redox potential. Inorganics and methyl mercury levels were monitored from 2003-2006 and levels were not found to exceed WQOs, therefore further analysis is not anticipated.

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
Pond 8	Slough Salinity, Gate/Weir Settings
Pond 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 Final Order requires specific water quality monitoring detailed in the Self Monitoring Program document. A summary is presented below, for summer discharge operations (not anticipated):

Continuous Pond Discharge Sampling: Continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, CO) installed in pond from May through October. 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 Datasondes are serviced to check battery voltage and data consistency.

Receiving Water Sampling (Continuous Circulation Period)**:** Slough receiving water quality monitoring, reporting and action would be required for summer discharge when, at the point of discharge, the calendar weekly 10^{th} percentile falls below 3.3 mg/L.

Pond Management Sampling (for Initial Release and Continuous Circulation)**:** In-pond water quality measurements were discontinued beginning in 2006 due to limited applicability.

Chlorophyll-a sampling (for Continuous Circulation Monitoring): USGS collected Chlorophyll samples monthly in 2004 but was discontinued in 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples were collected from 2003-2005, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels) and levels were within WQOs and therefore discontinued.

Communication of Monitoring Results and Violations

In previous monitoring seasons, some data gaps resulted due to greater-than-expected water level fluctuations and due to Datasonde malfunctions. To address these issues, communications protocols have been improved and Datasondes have been installed in more appropriate locations and water depths. Spare Datasondes were made available to replace devices as needed.

The Department is required by the Final Order to contact the RWQCB staff by phone within 24 hours and follow-up with a written report within 5 business days when potential violations occur. The Department will review raw data the day it is collected and contact RWQCB staff as necessary.

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