United States Department of the Interior

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January 31, 2008

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

Subject: 2007 Annual Self-Monitoring Report For South San Francisco Bay Low Salinity Salt Ponds Order No. R2-2004-0018, WDID No. 2 019438001.

Dear Mr. Wolfe:

This letter transmits the 2007 Annual Self-Monitoring Report and Revised Operations Plans for the subject project at the U.S. Fish and Wildlife Service's (FWS) Alviso Salt Ponds in Santa Clara County. The California Department of Fish and Game will be submitting a separate report covering the Eden Landing Salt Ponds in Alameda County.

The report provides information on the main parameters of concern including salinity, metals, dissolved oxygen (DO), pH, and temperature. Note that we provided the raw monitoring data to your staff as it became available in order that both our agencies might learn about the operating conditions in these ponds. This report summarizes that data and provides some additional information.

Please contact me or Eric Mruz at (510) 792-0222 if you have questions regarding this report.

"I certify under penalty of law that this document and all attachments have been prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. The information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Sincerely yours,

G. Mendel Stewart
San Francisco Bay NWR Complex
Project Leader

Enclosures
1. Self Monitoring Report

2007 SELF-MONITORING PROGRAM FOR ALVISO PONDS WITHIN SOUTH SAN FRANCISCO BAY LOW SALINITY SALT PONDS ALAMEDA, SANTA CLARA, & SAN MATEO COUNTIES, CALIFORNIA

ORDER NO. R2-2004-0018
WDID NO. 2 019438001

January 2008

Prepared for:
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LIST OF ACRONYMS

Acronym or Abbreviation	Full Phrase
ACOE	Army Corp of Engineers
Bay	South San Francisco Bay
cm	Centimeters
CCM	Continuous Circulation Monitoring
DANR	University of California, Davis Department of Agriculture and Natural Resources laboratory
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
FWS	United States Fish and Wildlife Service
Hg	Mercury
IRM	Initial Release Monitoring
ISP	Initial Stewardship Plan
LDO	Luminescent Dissolved Oxygen
meHg	Methymercury
mg/L	Milligrams per Liter
MLLW	Mean Low Lower Water
NAVD	North American Vertical Datum
NGVD	National Geodetic Vertical Datum
ppt	Parts per Thousand
RW	Receiving Water
RWQCB	California Regional Water Quality Control Board
THg	Total Mercury
TSS	Total Suspended Solids
USGS	United States Geological Survey
WCS	Water Control Structure
WQO	Water Quality Objective

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A special thanks to Nicole Athearn and Kathleen Henderson for all the data collection and support over the years.

SECTION 1
PROJECT OVERVIEW

This annual report summarizes the results of the 2007 water quality sampling conducted at the Alviso Salt Ponds in Santa Clara County, California, which are part of the South San Francisco Bay Low Salinity Salt Ponds. Operations occurred from May through October 2007. Sampling was performed on a continuous, weekly, monthly, or bi-monthly schedule as required by the California Regional Water Quality Control Board (RWQCB) Final Order (No. R2-2004-0018). Sampling was performed by the United States Geological Survey (USGS) on behalf of the United States Fish and Wildlife Service (FWS) in accordance with the waste discharge requirements.

The Final Order for the South San Francisco Bay Low Salinity Salt Ponds concerned 15,100 acres of ponds in Alameda, Santa Clara, and San Mateo Counties. The area encompasses the Alviso Pond Complex (Figure 1-1). This report covers the following pond systems within the complex: A2W, A3W, A7, A14, and A16. The systems are operated by the Don Edwards San Francisco Bay National Wildlife Refuge in Santa Clara County. The California Department of Fish and Game will submit a report for the Eden Landing (Baumberg) Ponds under a separate cover.

The ponds are generally being operated as flow-through systems with Bay or slough waters entering an intake pond within each pond system at high tides through a tide gate, passing through one or more ponds, and exiting the particular system's discharge pond to either a tidal slough or the Bay at low tides. The ponds only discharge at low tides for about 6 or 8 hours per day. Two ponds in the A3W and A7 systems, Ponds A3N and A8, respectively, were operated as seasonal ponds during 2007 and were not connected to this flow-through system. Also, Ponds A12, A13, and A15, part of the A14 pond system, are designed as batch ponds. Discharge occurs from Pond A15 to Pond A16 when salinity reaches 100-120 ppt, it was not discharged on a batch basis in 2007.

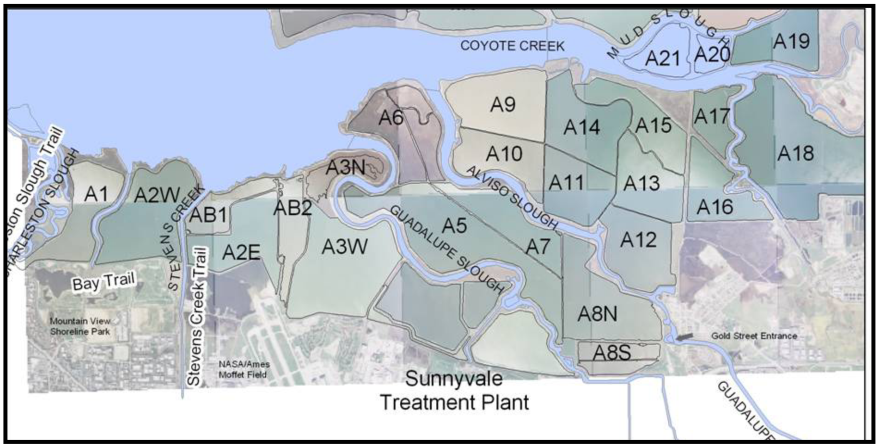


Figure 1-1: Alviso Pond Complex

1.1 FINAL ORDER NUMBER R2-2004-0018

The Final Order recognized two periods of discharges from the ponds. The first covered the Initial Release Period (IRP) when salinity levels would decrease from the initial levels in the ponds. The second period is the Continuous Circulation Monitoring (CCM) period after salinities went below the 44 parts per thousand (ppt) salinity discharge limit. Different monitoring plans were identified in the Final Order by RWQCB and revised in 2005 (March 25, 2005 letter) for each specific period and are reiterated below.

1.1.1 RWQCB Initial Release Period Monitoring Plan

Receiving water samples from the slough and Bay were collected at discrete locations near the water surface and bottom from downstream and upstream of the discharge point. This occurred one week before initiating discharge, one day after the initial discharge, three days later, and then seven days later. Sampling continued on a weekly basis until the FWS was able to document that the discharge salinity levels were below 44 ppt. Once discharge began, discharge pond samples were collected prior to pond water mixing with receiving water using a continuous monitoring device. Dissolved oxygen (DO) levels in the pond water during discharge, calculated on a weekly basis, were required to remain above a 10^{th} percentile of 3.3 mg/L. If the dissolved oxygen levels fell below this requirement, the FWS was required to accelerate receiving water monitoring in the slough and/or Bay to weekly, notify RWQCB Staff, and implement best management practices to increase dissolved oxygen levels in discharged water, including within pond monitoring. For days it collects receiving water samples, the FWS also reported standard observations and documented what tidal phase samples were collected in. Additionally, the FWS made daily estimates of the quantity and time-period of discharge from the ponds and the strength of tides. All notes were recorded on standard monitoring sheets.

Samples for benthos were collected from discrete locations at the convenient stage of the tide at the following frequency: One week before initiating discharge; fourteen days after the initial discharge; 28 days following the second sampling; once in the late summer (August); and finally once in the late summer of the following year. Salinity samples were collected within ponds at least twice per month for at least the previous two months before discharges commenced. Dissolved oxygen samples were collected between 8:00 am and 10:00 am, with the times being recorded on the standard monitoring sheets.

1.1.2 RWQCB Continuous Circulation Period Monitoring Plan

Receiving water samples from the slough and Bay were collected at discrete locations near the water surface and bottom from downstream and upstream of the discharge point. Samples were collected on a monthly basis between May and October 2007 as close to low tide as practicable. Discharge pond samples were collected before pond water mixed with receiving water using a continuous monitoring device. Dissolved oxygen levels in the pond water, calculated on a weekly basis, were required to remain above a 10^{th} percentile of 3.3 mg/L. If the dissolved oxygen levels fell below this requirement, the FWS was required to accelerate receiving water monitoring in the slough and/or Bay to weekly, notify RWQCB Staff, and implement best management practices to increase dissolved oxygen levels in discharged water, including within pond monitoring. For days it collects receiving water samples, the FWS also reported standard observations and documented what tidal phase samples were collected in. Additionally, the FWS made daily estimates of the quantity and time-period of discharge from the ponds and the strength of tides. All notes were recorded on standard monitoring sheets.

SECTION 2
ANNUAL SUMMARY

This section summarizes the monitoring activities conducted by FWS during the 2007calendar year at the Alviso Pond Complex to comply with the Final Order.

2.1 WATER QUALITY MONITORING METHODOLOGY

Continuous Pond Discharge Sampling (Initial Release and Continuous Circulation Phases):

USGS installed continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, Colorado) in Alviso Ponds A2W, A3W, A14, and A16 which were initially released during 2004 and 2005 and were to be monitored under CCM monitoring beginning 1 May 2007; the meters were installed and began logging on 23 April 2007 with the exception of Pond A16, installed 1 May 2007. The continuous monitoring Datasonde for Pond A7 was installed on 11 May 2007 when the pond began discharging, after repair of the gate had been completed. Additional continuous monitoring Datasondes were installed in Alviso Ponds A9 and A1 on 9 July 2007 and 9 September 2007. These two Ponds are normally operated as intakes for their respective systems, but were temporarily operated as partially muted tidal (see Section 3 Corrective Actions Taken). Datasondes were installed inside the ponds at the discharge point, where they could measure water quality at the outflow of the discharge into the slough and/or San Francisco Bay. They were

Figure 2-1: Datasonde holder within Weir Structure

secured within submerged perforated ABS tubes attached to water control structures 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 level fluctuated (Figure 2-1).

Salinity, pH, temperature, and dissolved oxygen were collected at 15-minute intervals with a sensor and circulator warm-up period of 2 minutes. Data were downloaded weekly and sondes 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. Any problems detected with the Datasonde were corrected through calibration or replacement of parts or instruments. The sensors on the Datasonde were calibrated prior to deployment into the salt pond and were calibrated and cleaned on a biweekly schedule unless otherwise noted in service records. 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 cleaned, 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.

2.1.1 Alviso Receiving Water (IRP/CCM):

Beginning 16 May 2007, samples were collected at least monthly from A3W receiving water (Guadalupe Slough, 8 sites), A7 receiving water (Alviso Slough, 7 sites), A16 receiving water (Artesian Slough, 5-6 sites) and A14 (3 sites) through November 2007. Samples were collected weekly when water quality objectives in discharge samples were not met. Sampling locations were marked using a GPS waypoint. We 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 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 (25 cm) 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 3.0 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, fisherpeople 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 only at the beginning and ending of each slough sampling trip, unless noteworthy changes in conditions occurred during the trip.

2.1.2 Calibration and Maintenance:

All the instruments used for sampling as part of the South Bay Salt Pond Initial Stewardship Plan's Self-Monitoring Program 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. 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 were used to inhibit growth in ponds with high concentrations of barnacles and hard algae, which could interfere with sensor function. We 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.

We estimated times of actual discharge as the period when the water surface elevation in the receiving waters was lower than the water surface elevation of the ponds. We converted NGVD29 pond staff gage readings to NAVD88 using Corpscon program (ACOE), and then converted NAVD88 to MLLW using estimated conversion values for the specific discharge location (G. Hovis, pers. comm.). Slough water surface elevation was estimated using Coyote Creek Station tide estimates, provided as MLLW feet (Tides and Currents Pro software). The pond was assumed to be discharging when the water surface elevation of the slough was less than that of the pond.

2.2 WATER QUALITY MONITORING SUMMARY

Pond systems A2W, A3W, and A7 have been opened to the Bay and slough since 2004 and are being monitored during their Continuous Circulation Phases. Pond Systems A14 and A16 were opened to the sloughs on March 31, 2005 and are also being monitored under Continuous Circulation. During the 2007 monitoring season, Pond A1 (11 September to 2 October.), Pond A9 (12 July to 5 September), and Pond A5 (21 May to 31 August) were opened for discharge in an attempt to improve water quality with in those Pond Systems and also remove sediment deposition away from the intake structures. The results of the 2007 sampling events in the pond systems are documented below.

2.2.1 Salinity

The salinity levels for Pond Systems A2W, A3W, and A7 in 2007 remained well below 44 ppt and the discharge ponds generally reflected slightly higher salinities than the intake waters from the bay and sloughs (Refer to Figures A-1 through 4 in Appendix A).

The salinity in Pond A14 was below 44 ppt during the initial discharge of the system on 31 March 2005. However, since there is a long residence time associated with this system, elevated salinity levels were identified above 44 ppt for most of 2006. At the start of the 2007 monitoring season, the salinity fluctuated above 44 ppt for the first five days, and then remained below the limit for the remainder of the season due to construction activities performed (Refer to Figure A-5 in Appendix A).

In Pond System A16, the salinity was 70 ppt at the time of opening (March 31, 2005). By April 25, 2005, the salinity had fallen below 44 ppt and has remained below the limit until recently when the Pond was intentionally drained to reveal the Pond bottom. From 11 October 2007 to 30 November 2007, the intakes for Pond A17 and Pond A16 were closed which allowed the water levels to drop and expose mud flats and internal channels. During this time, the salinity rose to levels above 44 ppt. until the intakes were re-opened (Refer to Figure A-6).

Table 2-1
Salinity Ranges

Pond	2007 Salinity Range (ppt)	2007 Salinity Avg. (ppt)	2006 Salinity Avg. (ppt)	2005 Salinity Avg. (ppt)	2004 Salinity Avg. (ppt)
A1	21.52 – 39.81	27.5	NA	NA	NA
A2W	17.33 – 38.59	28.6	17.2	28.9	32.0
A3W	14.61– 32.70	23.8	11.9	17.3	29.2
A5	16.60 – 30.16	25.3	NA	NA	NA
A7	13.20 – 31.01	25.19	16.4	22.2	33.3
A9	21.3 – 33.19	28.06	NA	NA	NA
A14	16.03 – 51.97	28.93	49.3	40.8	NA
A16	3.26 – 70.74	22.76	14.2	24.5	NA

2.2.2 Salinity Compliance

Salinity levels in all the Pond Systems were in compliance with the Final Order except for Pond System A14 and Pond A16. Pond System A14 salinity was in compliance 90 percent of the 2005 season, 29 percent in 2006, and 95 percent for 2007 . The rise in salinity was caused from a long residence time and poor discharge rate which was influenced by a low flow discharge channel in the system. In May 2007, this discharge channel was excavated to allow proper water flow through the system in which the salinity did not rise above the 44 ppt limit for the remainder of the monitoring season (Refer to Table 2-1).

With prior approval from the RWQCB, Pond A16 was 90 percent drained to show the pond bottom and then perform aerial photography imagery of the exposed pond. The aerial photos are being used in a collaboration data set to support a proposed reconfiguration of Pond A16 operation. When salinity levels began to increase due to the lowering of water levels, there was a minimal amount of water being discharged into the Artesian slough.

2.2.3 Temperature

Temperature levels in the ponds generally matched the temperature levels in the intake and receiving waters and therefore met the discharge requirement of not exceeding natural temperatures of the receiving waters by 20°F. Table 2-2 shows the Pond temperature range and average for each year since the initial release.

Table 2-2
Temperature Ranges

Pond	2007 Temp. Range (°C)	2007 Temp. Avg. (°C)	2006 Temp. Avg. (°C)	2005 Temp. Avg. (°C)	2004 Temp. Avg. (°C)
A1	12.3 – 27.1	17.7	NA	NA	NA
A2W	13.5 – 33.7	20.8	21.0	20.0	20.3
A3W	13.4 – 28.2	20.7	21.5	20.9	20.0
A5	14.0 – 26.9	21.6	NA	NA	NA
A7	13.2 – 26.1	20.2	21.3	20.1	19.6
A9	17.2 – 30.4	22.4	NA	NA	NA
A14	13.7 – 27.9	20.6	20.4	19.4	NA
A16	14.3 – 29.5	22.3	22.9	22.3	NA

2.2.4 Temperature Compliance

The Alviso Complex was in compliance with the Final Order for temperature 100 percent during the 2007 season (Refer to Figures A-7 through 12 in Appendix A).

2.2.5 pH Compliance

Levels of pH varied differently in each Pond System, but were generally greater than 8.5. (Table 2-3). As stated in the Final Order: "The Discharger may determine compliance with the pH limitation at the point of discharge or in the receiving water."

- Pond A1 has no receiving water samples that were taken since Pond A1 discharges across a mud flat with similar effects to Pond A2W. The pH in the pond averaged 8.2 with a high of 9.16.

- In A2W, pH in the pond increased to a high of 9.33 on June 9 and June 10, and then oscillated throughout the year with an average of 8.3. There were no receiving water samples taken for Pond A2W because of a letter dated May 16, 2006 from the RWQCB to the FWS, which eliminates receiving water sampling for Pond A2W. (Refer to Figure A-13 in Appendix A).

- Pond System A3W followed a similar pattern as Pond System A2W with an average of 8.5 and a high of 9.35. In 2007, there were two receiving

- water samples that were above 8.5. On 24 July 2007 two bottom samples had a pH reading of 8.58 (Refer to Figure A-14 in Appendix A).

- Pond System A7 stayed generally between 8.5 and 9.0 throughout the 2007 season, and increased to a high of 9.11 on 24 May 2007 with a season average of 8.21. There were no receiving water samples that were above 8.5. (Refer to Figure A-15 and A-16 in Appendix A).

- Pond System A14 averaged 8.36 with an initial pH release of 8.79 in 2005. There were no receiving water samples that were above 8.5 (Refer to Figure A-17 in Appendix A).

- Pond System A16 had an initial pH of 8.69 upon release in 2005. Throughout the 2007 season, the pH fluctuated from 7.70 and 10.1. The season's average was 9.02. In 2007, there were no receiving water samples above 8.5 during the monitoring season (Refer to Figure A-18 in Appendix A).

Table 2-3
In Pond pH Ranges

Pond	2007 pH Range	2007 pH Avg.	2006 pH Avg.	2005 pH Avg.	2004 pH Avg.
A1	7.65 – 9.16	8.22	NA	NA	NA
A2W	7.50 – 9.33	8.3	8.2	8.4	8.5
A3W	7.55 – 9.35	8.5	8.2	8.6	8.7
A5	7.68 – 9.22	8.3	NA	NA	NA
A7	7.60 – 9.26	8.21	8.3	8.67	8.8
A9	7.54 – 8.56	7.95	NA	NA	NA
A14	7.23 – 10.1	8.36	8.5	8.42	NA
A16	7.70 – 10.1	9.02	8.9	8.73	NA

For 2007, levels of pH in receiving waters went above the 8.5 discharge limit on two occasions during the monitoring season. On 24 July 2007 two bottom samples recorded the pH of 8.58. There was one upstream and one downstream sample taken form the discharge point at Pond system A3W. Table 2-4 shows the only samples taken in 2007 that had readings above 8.5 in the receiving waters.

Table 2-4
pH in Receiving Waters

Sample	Date	Time	Sample Level	Temp. (°C)	pH	DO (mg/L)	Salinity (ppt)
A3W-1	7/24/07	9:43	Bottom	24.50	8.58	1.14	24.66
A3W-3	7/24/07	10:05	Bottom	25.00	8.58	0.83	23.97

2.2.6 Dissolved Oxygen

For the 2007 season, the dissolved oxygen was once again problematic for achieving compliance with the Final Order. Dissolved oxygen levels in the pond water, calculated on a weekly basis during discharge, were required to remain above a 10th percentile of 3.3 mg/L. Significant algae growth and decomposition in these ponds appeared to cause fluctuating diurnal oxygen levels throughout the Alviso Ponds Complex during the summer months. The FWS continued to make adjustments and modifications to the Alviso Ponds Complex (see Section 3, Corrective Actions Taken) in order to improve the dissolved oxygen levels.

Ponds A1, A5, and A9 were operated as muted tidal for a portion of the 2007 monitoring season. By discharging and intaking slough/ Bay water in those Pond Systems, this process removes sediment deposition away from the intake structures and usually provides better water quality within the Ponds (Table 2-5, 2-6 and 2-7 respectively).

Pond System A2W in 2007 had a total of 26 recordable sampling weeks, which had a weekly 10th percentile higher then 3.3 mg/l for 13 of the 26 weeks (Table 2-8). Pond A2W was operated as partially muted tidal for much of the summer, which did alleviate some of the dissolved oxygen concerns near the water control structure, but the interior portions of the Pond showed signs of depressed DO (see Section 3, Corrective Actions Taken).

For the 2007 season, the FWS again used the existing flow diversion baffles (see Section 3, Corrective Actions Taken) in Pond A3W to move the flow of water away from algae buildup and with hopes to further increase oxygen uptake. Pond System A3W was monitored for 27 weeks in 2007. It had a weekly 10th percentile higher then 3.3 mg/l for 2 weeks, compared to 2005 data which had 22 weeks with a higher 10th percentile of 3.3 mg/L (Table 2-9). Since the discharge point for Pond A3W was located near the edge of a large algal mat, water currents caused discharge waters to flow through the area of algae buildup which resulted in consistently depressed dissolved oxygen levels as seen in the data since the ponds were opened in 2004.

Table 2-5
Pond A1 10th percentiles for Dissolved Oxygen during All times

Start Date	End Date	2007 data mg/L	2006 data mg/L	2005 data mg/L	2004 data mg/L
9/2	9/8	0.0	n/a	n/a	n/a
9/9	9/15	0.3	n/a	n/a	n/a
9/16	9/22	3.9	n/a	n/a	n/a
9/23	9/29	3.6	n/a	n/a	n/a
9/30	10/6	3.9	n/a	n/a	n/a
10/7	10/13	4.4	n/a	n/a	n/a
10/14	10/20	4.4	n/a	n/a	n/a
10/21	10/27	3.8	n/a	n/a	n/a
10/28	11/3	2.9	n/a	n/a	n/a
11/4	11/5	2.9	n/a	n/a	n/a

* Data is based on a 10th percentile with 3.3 mg/L being the trigger for reporting non-compliance

Table 2-6
Pond A5 10th percentiles for Dissolved Oxygen during discharge

Start Date	End Date	2007 data mg/L	2006 data mg/L	2005 data mg/L	2004 data mg/L
7/8	7/14	2.01	n/a	n/a	n/a
7/15	7/21	1.90	n/a	n/a	n/a
7/22	7/28	2.33	n/a	n/a	n/a
7/29	8/4	1.15	n/a	n/a	n/a
8/5	8/11	2.21	n/a	n/a	n/a
8/12	8/18	1.80	n/a	n/a	n/a
8/19	8/25	1.43	n/a	n/a	n/a
8/26	9/1	0.06	n/a	n/a	n/a
9/2	9/8	0.01	n/a	n/a	n/a
9/9	9/15	0.04	n/a	n/a	n/a
9/16	9/22	2.26	n/a	n/a	n/a

* Data is based on a 10th percentile with 3.3 mg/L being the trigger for reporting non-compliance

Table 2-7
Pond A9 10th percentiles for Dissolved Oxygen during discharge

Start Date	End Date	2007 data mg/L	2006 data mg/L	2005 data mg/L	2004 data mg/L
7/8	7/14	1.2	n/a	n/a	n/a
7/15	7/21	2.6	n/a	n/a	n/a
7/22	7/28	1.3	n/a	n/a	n/a
7/29	8/4	2.3	n/a	n/a	n/a
8/5	8/11	2.1	n/a	n/a	n/a
8/12	8/18	2.8	n/a	n/a	n/a
8/19	8/25	1.3	n/a	n/a	n/a
8/26	9/1	1.6	n/a	n/a	n/a
9/2	9/8	0.8	n/a	n/a	n/a

* Data is based on a 10th percentile with 3.3 mg/L being the trigger for reporting non-compliance

Table 2-8
Pond A2W 10th percentiles for Dissolved Oxygen during discharge

Start Date	End Date	2007 data mg/L	2006 data mg/L	2005 data mg/L	2004 data mg/L
5/1	5/5	5.0	4.6	3.5	n/a
5/6	5/12	5.0	3.5	3.4	n/a
5/13	5/19	4.6	3.9	2.8	n/a
5/20	5/26	3.2	6.0	2.4	n/a
5/27	6/2	3.4	3.4	1.6	n/a
6/3	6/9	5.0	4.3	3.7	n/a
6/10	6/16	4.2	4.5	2.4	n/a
6/17	6/23	3.3	2.8	3.1	n/a
6/24	6/30	3.9	3.8	4.0	n/a
7/1	7/7	3.7	4.1	3.0	n/a
7/8	7/14	4.2	3.8	2.3	n/a
7/15	7/21	3.6	2.4	2.2	2.2
7/22	7/28	2.5	2.1	0.4	3.6
7/29	8/4	2.2	4.1	0.4	4.5
8/5	8/11	1.8	3.5	1.1	3.6
8/12	8/18	1.8	4.1	1.6	3.9
8/19	8/25	0.9	5.4	0.9	3.4
8/26	9/1	1.4	4.8	2.1	2.5
9/2	9/8	1.7	4.4	2.9	2.4
9/9	9/15	1.1	4.2	3.2	4.4
9/16	9/22	3.1	5.1	2.8	3.7
9/23	9/29	4.7	4.1	3.0	4.6
9/30	10/6	2.3	4.5	4.5	4.9
10/7	10/13	1.1	4.1	3.4	5.2
10/14	10/20	1.3	4.0	4.3	5.5
10/21	10/27	n/a	6.0	7.2	5.1
10/28	11/3	3.8	6.9	7.9	n/a

* Data is based on a 10th percentile with 3.3 mg/L being the trigger for reporting non-compliance

Table 2-9
Pond A3W 10th percentiles for Dissolved Oxygen during discharge

Start Date	End Date	2007 data mg/L	2006 data mg/L	2005 data mg/L	2004 data mg/L
4/23	4/30	1.7	4.7	5.1	n/a
5/1	5/5	2.7	4.2	3.5	n/a
5/6	5/12	3.1	4.3	3.8	n/a
5/13	5/19	2.6	3.2	4.4	n/a
5/20	5/26	1.7	5.2	3.8	n/a
5/27	6/2	0.0	5.4	3.6	n/a
6/3	6/9	0.0	5.0	3.8	n/a
6/10	6/16	0.2	3.5	3.5	n/a
6/17	6/23	1.0	2.7	3.9	n/a
6/24	6/30	1.6	2.3	3.6	n/a
7/1	7/7	1.6	2.7	3.7	n/a
7/8	7/14	0.6	2.7	4.5	n/a
7/15	7/21	0.4	2.3	1.7	0.1
7/22	7/28	0.7	0.5	1.9	0.7
7/29	8/4	0.8	2.6	2.6	0.1
8/5	8/11	1.3	2.9	3.6	0.4
8/12	8/18	0.8	2.9	3.5	0.1
8/19	8/25	0.2	3.4	3.6	0.1
8/26	9/1	0.4	2.5	1.9	0.1
9/2	9/8	0.3	1.9	0.6	0.1
9/9	9/15	0.7	2.5	3.6	0.1
9/16	9/22	1.1	4.7	2.2	0.1
9/23	9/29	1.3	3.2	3.8	0.1
9/30	10/6	2.1	2.8	1.4	0.1
10/7	10/13	2.0	4.0	4.0	0.1
10/14	10/20	3.4	4.6	4.0	1.1
10/21	10/27	2.7	2.8	3.5	2.0
10/28	11/3	3.4	5.7	5.6	2.5
11/4	11/10	4.9	n/a	5.2	4.2
11/11	11/13	7.0	n/a	n/a	n/a

* Data is based on a 10th percentile with 3.3 mg/L being the trigger for reporting non-compliance

Table 2-10
Pond A7 10th percentiles for Dissolved Oxygen during discharge

Start Date	End Date	2007 data mg/L	2006 data mg/L	2005 data mg/L	2004 data mg/L
4/24	4/30	n/a	5.9	3.2	n/a
5/1	5/6	n/a	4.8	1.3	n/a
5/7	5/12	3.5	5.5	2.2	n/a
5/13	5/19	4.8	4.9	1.9	n/a
5/20	5/26	3.9	5.3	2.5	n/a
5/27	6/2	3.6	5.9	2.7	n/a
6/3	6/9	4.0	2.7	3.5	n/a
6/10	6/16	3.6	3.4	3.1	n/a
6/17	6/23	4.0	3.5	4.0	n/a
6/24	6/30	3.9	4.0	2.8	n/a
7/1	7/7	3.6	5.4	3.8	n/a
7/8	7/14	3.2	4.5	4.7	n/a
7/15	7/21	3.8	4.4	4.7	n/a
7/22	7/28	3.5	3.9	4.7	0.7
7/29	8/4	3.6	5.3	4.7	0.2
8/5	8/11	4.7	6.0	4.7	2.5
8/12	8/18	4.6	5.9	4.6	2.7
8/19	8/25	2.8	5.8	5.1	2.7
8/26	9/1	1.5	4.1	4.1	1.5
9/2	9/8	0.1	3.5	2.8	0.6
9/9	9/15	0.1	4.1	3.2	0.5
9/16	9/22	2.2	4.4	2.1	1.2
9/23	9/29	0.3	2.9	1.2	0.4
9/30	10/6	0.6	2.4	1.4	2.3
10/7	10/13	0.2	3.5	2.8	3.3
10/14	10/20	1.5	4.0	2.7	3.0
10/21	10/27	3.3	4.1	2.4	2.2
10/28	11/3	1.3	5.7	4.5	0.9
11/4	11/10	3.4	n/a	4.2	2.5
11/11	11/17	5.8	n/a	n/a	3.8
11/18	11/19	5.0	n/a	n/a	4.5

* Data is based on a 10th percentile with 3.3 mg/L being the trigger for reporting non-compliance

Table 2-11
Pond A14 10th percentiles for Dissolved Oxygen during discharge

Start Date	End Date	2007 data mg/L	2006 data mg/L	2005 data mg/L	2004 data mg/L
3/27	4/2	n/a	n/a	5.0	n/a
4/3	4/9	n/a	n/a	5.2	n/a
4/10	4/16	n/a	n/a	5.5	n/a
4/17	4/23	n/a	n/a	4.3	n/a
4/24	4/30	2.8	1.0	4.1	n/a
5/1	5/5	3.3	0.1	2.0	n/a
5/6	5/12	5.3	0.0	0.2	n/a
5/13	5/19	6.3	0.0	0.0	n/a
5/20	5/26	4.8	0.4	0.0	n/a
5/27	6/2	4.7	0.2	0.5	n/a
6/3	6/9	5.2	0.2	2.6	n/a
6/10	6/16	4.7	0.2	0.1	n/a
6/17	6/23	4.1	0.3	0.4	n/a
6/24	6/30	4.4	0.3	1.2	n/a
7/1	7/7	4.4	1.8	1.5	n/a
7/8	7/14	3.6	0.9	1.1	n/a
7/15	7/21	3.5	1.0	1.4	n/a
7/22	7/28	3.7	1.6	0.6	n/a
7/29	8/4	4.8	1.9	1.2	n/a
8/5	8/11	4.7	0.1	1.6	n/a
8/12	8/18	5.2	0.2	1.8	n/a
8/19	8/25	3.5	0.1	0.1	n/a
8/26	9/1	2.0	0.1	1.1	n/a
9/2	9/8	1.4	0.6	0.4	n/a
9/9	9/15	2.6	1.3	0.4	n/a
9/16	9/22	2.8	0.2	0.4	n/a
9/23	9/29	2.6	0.0	1.0	n/a
9/30	10/6	3.8	0.0	0.5	n/a
10/7	10/13	4.6	0.1	0.1	n/a
10/14	10/20	4.2	1.7	0.2	n/a
10/21	10/27	4.4	0.6	1.1	n/a
10/28	11/3	5.3	1.0	2.1	n/a
11/13	11/19	n/a	n/a	0.5	n/a
11/20	11/26	n/a	n/a	0.5	n/a
11/27	11/30	n/a	n/a	3.6	n/a

* Data is based on a 10th percentile with 3.3 mg/L being the trigger for reporting non-compliance

Table 2-12
Pond A16 10th percentiles for Dissolved Oxygen during discharge

Start Date	End Date	2007 data mg/L	2006 data mg/L	2005 data mg/L	2004 data mg/L
3/27	4/2	n/a	n/a	4.8	n/a
4/3	4/9	n/a	n/a	4.8	n/a
4/10	4/16	n/a	n/a	6.6	n/a
4/17	4/23	n/a	n/a	5.6	n/a
4/24	4/30	n/a	3.7	7.4	n/a
5/1	5/5	8.2	5.1	5.8	n/a
5/6	5/12	7.7	7.0	5.3	n/a
5/13	5/19	6.7	2.9	5.2	n/a
5/20	5/26	4.8	2.9	5.7	n/a
5/27	6/2	3.9	4.3	2.9	n/a
6/3	6/9	6.4	4.2	6.5	n/a
6/10	6/16	7.1	3.7	4.8	n/a
6/17	6/23	6.4	1.5	5.0	n/a
6/24	6/30	7.5	2.0	3.6	n/a
7/1	7/7	6.9	1.5	2.9	n/a
7/8	7/14	5.8	5.8	2.1	n/a
7/15	7/21	5.1	3.0	2.7	n/a
7/22	7/28	4.9	4.6	2.8	n/a
7/29	8/4	3.7	6.2	1.8	n/a
8/5	8/11	3.4	6.6	0.1	n/a
8/12	8/18	2.3	1.1	4.8	n/a
8/19	8/25	2.2	2.6	1.4	n/a
8/26	9/1	1.3	4.3	4.0	n/a
9/2	9/8	0.3	5.2	2.4	n/a
9/9	9/15	2.8	2.0	4.9	n/a
9/16	9/22	2.0	4.2	4.7	n/a
9/23	9/29	4.5	4.4	4.8	n/a
9/30	10/6	3.8	4.2	4.2	n/a
10/7	10/13	3.8	7.6	5.7	n/a
10/14	10/20	2.8	5.5	4.3	n/a
10/21	10/27	0.1	2.8	5.2	n/a
10/28	11/3	0.9	4.0	2.3	n/a
11/3	11/5	0.9	n/a	n/a	n/a

* Data is based on a 10th percentile with 3.3 mg/L being the trigger for reporting non-compliance

Pond System A7 was operating as a continuous flow with the intake at Pond A5, and the discharge point in Pond A7 until 9th May 2007, when Pond A7 was operated as muted tidal. On 21 May 2007, Pond A5 was also operated as muted tidal, until 31 August 2007, when Pond A7 system was restored back to a continuous flow through system. In 2007, Pond A7 was monitored for 27 weeks where the weekly 10th percentile was above 3.3 mg/L for 15 weeks (see Table 2-10). Pond A5 was monitored for 11 weeks with a 10th percentile was above 3.3 mg/L for 0 weeks (see Table 2-6).

Pond System A14 had 27 weeks of monitoring (Table 2-11). There were 22 weeks which had a 10th percentile value of greater than 3.3 mg/L, compared to 2006 which had 0 weeks of a higher 10th percentile of 3.3 mg/L (this was a 2005 Initial Release Pond, with no 2004 data available). Prior to the 2007 monitoring season, Pond A14 system discharge channel was dredged to increase water flow (see Section 3, Corrective Actions Taken).

Pond System A16 had a continuous monitor installed at the discharge point for 27 weeks (Table 2-12). The dissolved oxygen levels were above the 3.3 mg/L trigger for 18 weeks. This Pond System for the 2007 season was operated as a continuous flow system due to previous years lessons learned, when Pond A16 was operated as muted tidal in which affluent from the San Jose Sewage Treatment Plant was the primary intake source to Pond A16, the pH and salinity levels fluctuated greatly (see Section 3 Corrective Actions Taken).

2.2.7 Dissolved Oxygen Compliance

The FWS has again struggled with DO compliance in the 2007 season. The Pond Systems produced high algal growth (Figure 2-2) that could have caused dissolved oxygen levels to vary significantly over the course of the day. This is because during daylight hours, photosynthesis will produce oxygen and consume dissolved carbon dioxide (which behaves similar to carbonic acid). During nighttime hours, respiration will produce dissolved carbon dioxide and consume oxygen. Therefore, any significant algal growth will cause dissolved oxygen to peak during the late afternoon and to be at their lowest levels in pre-dawn (Final Order). Compliance with the Final Order limits is also dependent on factors beyond the FWS control, such as strength of tides, rainfall, and temperature. Table 2-13 below indicates the percentage of weeks that the dissolved oxygen met or exceeded a 10^{th} percentile of 3.3 mg/ L.

Figure 2-2: Algae Growth in Pond A17

Table 2-13
Alviso Complex DO Compliance with a weekly 10^{th} Percentile above 3.3 mg/L

Pond System	2007 Total No. of Sampling Weeks	2007 data	2006 data	2005 data	2004 data
A1	9	67 %	n/a	n/a	n/a
A2W	26	50 %	89 %	36 %	77 %
A3W	27	8 %	43 %	76 %	6 %
A5	11	0 %	n/a	n/a	n/a
A7	27	58 %	89 %	45 %	17 %
A9	9	0 %	n/a	n/a	n/a
A14	27	81 %	0 %	17 %	n/a
A16	27	67 %	64 %	69 %	n/a
DO levels in the pond water, calculated on a weekly basis, were required to remain above a 10^{th} percentile of 3.3 mg/L. Calculations were based on discharge times during the monitoring season. (1 May – 31 October)					

2.2.8 Water Column Sampling for Metals.

Water column sample collection for metals were eliminated for monitoring by the RWQCB in a letter dated May 16, 2006. The results of the 2005 metal collections showed that all metal concentrations were well below their respective water quality objectives. The salinity limit contained in the Final Order should act as an adequate surrogate for metals since the mechanism for both salinity and metals to increase is by evaporation.

2.2.9 Invertebrates

Ecological monitoring of benthic invertebrates can be a useful tool for detecting the impacts of water quality changes over time, as they can provide consistent responses to environmental stressors. According to the Final order, benthic samples are no longer required for the Alviso Complex and were not taken in 2007.

2.2.10 Receiving Water Sampling

Receiving water analyses

The receiving water data was collected for the Alviso Complex from May – October 2007 (Figure 2-3). The surface and bottom samples that were taken show close approximations of water quality parameters to Newark slough (Figure 2-4), which provides a reference of ambient conditions in sloughs.

Samples that were taken just outside the discharge point of the Ponds which show some salinity stratification between the surface and bottom samples that are most likely caused from the Ponds discharge. Figures A1 – A25 in Appendix A, plots the receiving water samples collected and the Pond discharge for water quality parameters of salinity, temperature, pH, and DO for each system in the Alviso Complex. Therefore, it may be assumed that water entering into a Pond system may already have depreciated DO values which may result in further depressed oxygen levels due to high nutrient levels and other biotic factors functioning in the Pond systems. USGS further evaluated the water quality in and around the Pond systems which state that the discharge from Pond A3W sometimes increased the DO concentrations in the receiving waters (see Additional Water Quality Sampling).

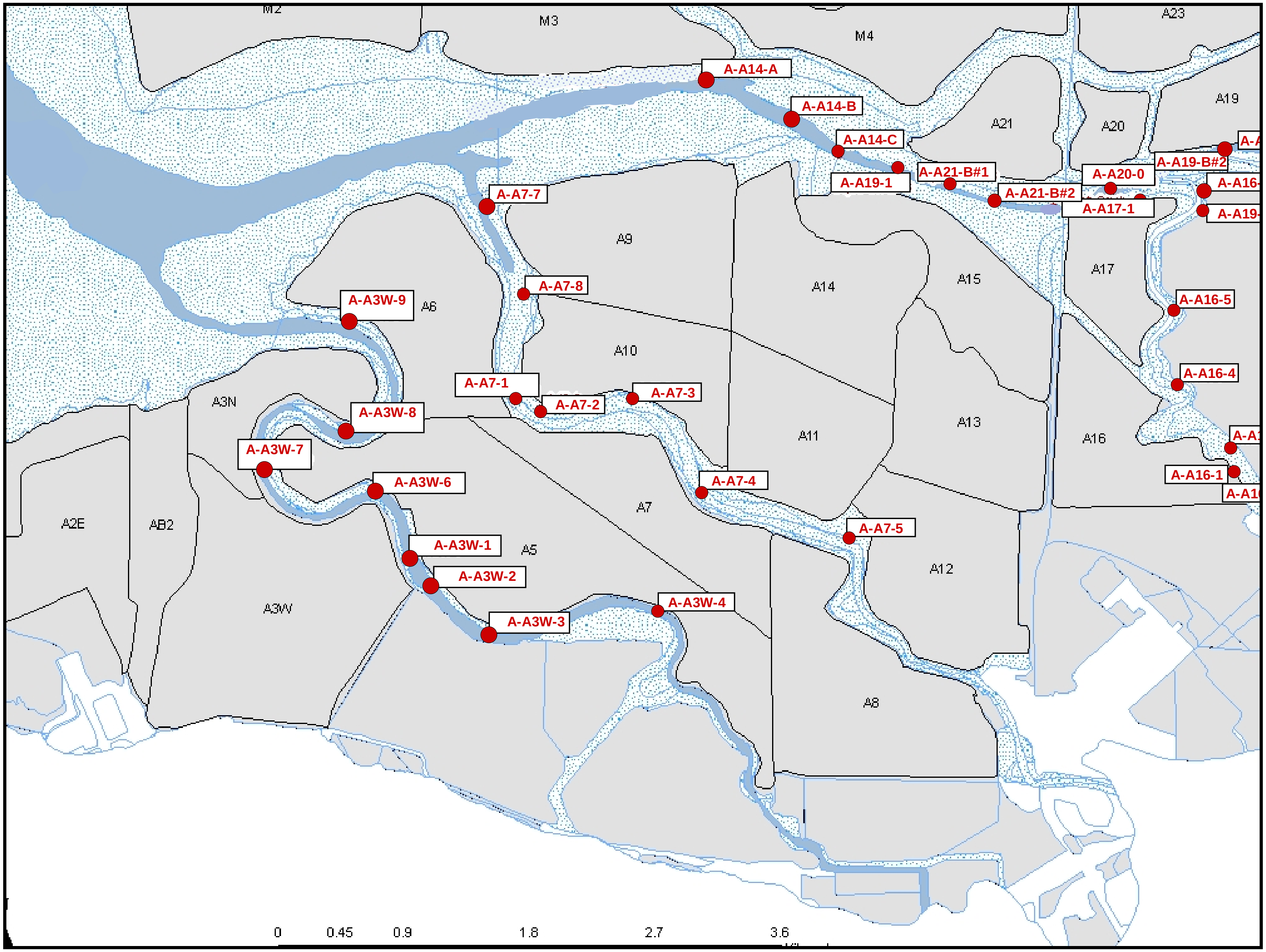


Figure 2-3: Receiving Water Sampling Locations

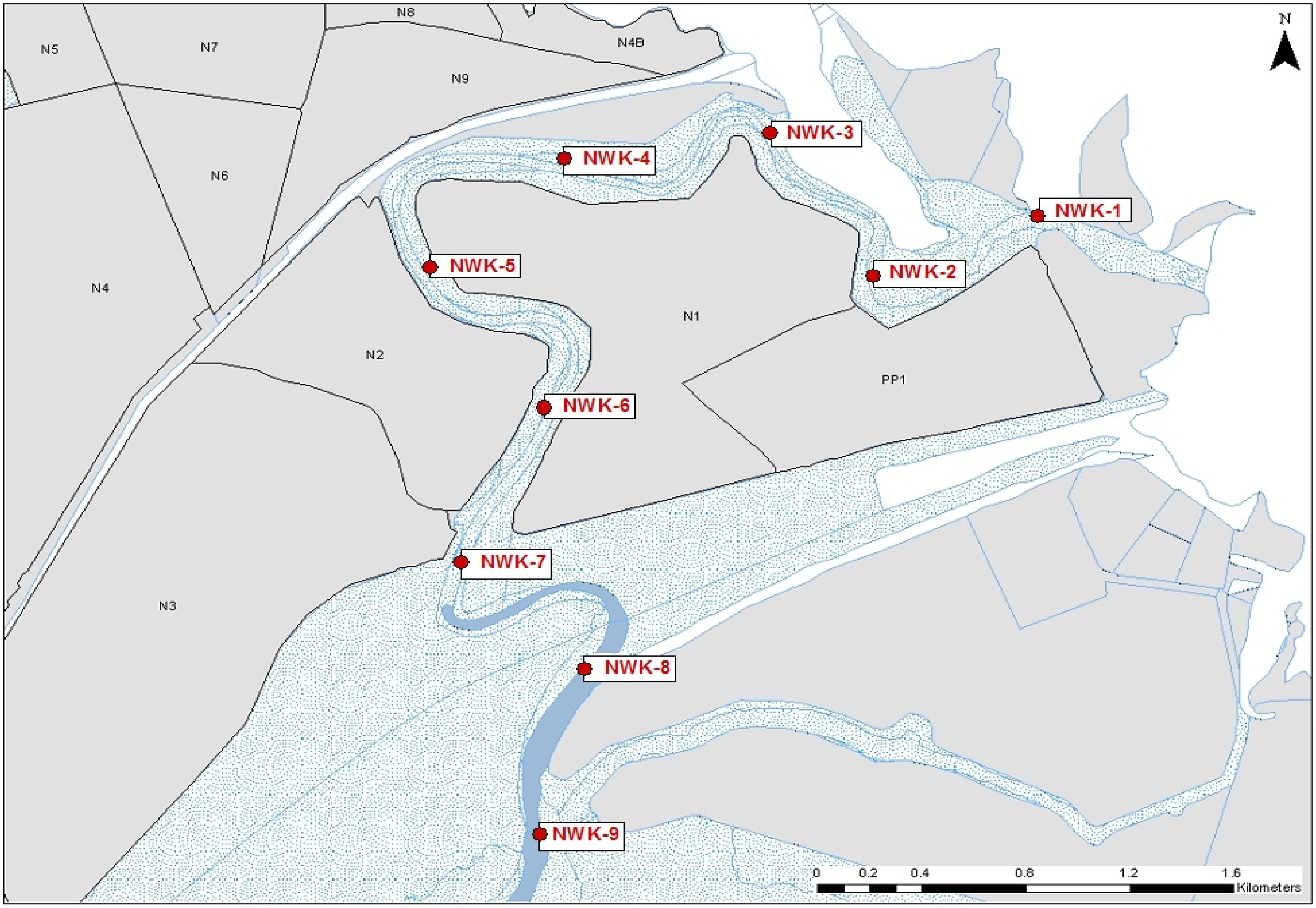


Figure 2-4: Newark Sampling Locations

2.2.11 Additional Water Quality Sampling

To better help understand the water quality in and around the South Bay Salt Ponds, additional sampling was done by the FWS. Newark slough located south of the Dumbarton Bridge, and North of the Alviso Pond system, is independent of any discharge coming from the Salt Ponds. In 2005, 2006, and 2007, samples were collected from nine different sites in Newark slough (Figure 2-4). On August 2, 2005, 18 samples were collected from the surface, with seven recorded samples having an instantaneous value of less than 5.0 mg/L. Samples were collected from June – October in 2006 with a total of 99 surface and bottom recordings. There were 36 bottom samples of the total 99 samples that had an instantaneous value of less than 5.0 mg/L, and 28 surface samples of the total 99 samples that had an instantaneous value of less than 5.0 mg/L (Table 2-14). In 2007, there were 108 samples collected with 48% of the bottom samples recorded with DO levels below 5.0 mg/L. The sampling in Newark slough shows that DO in areas completely unaffected by Salt Ponds discharge can have dissolved oxygen values of less than 5.0 mg/L.

Table 2-14
Newark Slough

Sample Year	Total No. of Samples Taken	Total No. of Surface Samples below 5.0 mg/L	Percent of Surface Samples below 5.0 mg/L	Total No. of Bottom Samples below 5.0 mg/L	Percent of Bottom Samples below 5.0 mg/L
2005	18	7	39 %	n/a	n/a
2006	99	28	28 %	36	36 %
2007	108	39	36 %	52	48 %

USGS also conducted additional water quality sampling at "understanding the natural variability of slough DO and the effect of pond discharge on the DO concentrations in the sloughs".[1] The Newark and Mowry sloughs water quality was also tested to "document DO variability in nearby sloughs that were unaffected by pond discharge. The results showed that natural tidal variability in the slough appeared to dominate control on the slough DO concentrations. Pond discharge was identified in the slough with the deployed instruments, but the discharge at times increased DO concentrations in the slough. The effects of altering the volume of pond discharge were overwhelmed by natural spring-neap tidally variability in the slough."[1] The report from USGS "Dissolved oxygen in Guadalupe Slough and Pond A3W, South San Francisco Bay, California, August and September 2007" will be provided to the RWQCB when it becomes available to the FWS.

[1] Shellenbarger, G.G., Schoellhamer, D.H., Morgan, T.L., Takekawa, J.Y., Athearn, N.D., and Henderson, K.D., 2008, Dissolved oxygen in Guadalupe Slough and Pond A3W, South San Francisco Bay, California, August and September 2007: U.S. Geological Survey Open-File Report 2008-XXXX

2.3 SEDIMENT MONITORING SUMMARY

Sediment cores were collected for analysis of total mercury (THg) and methyl mercury (meHg) during winter 2005 from the Alviso salt ponds as part of continuing monitoring to establish baseline concentrations in the sediments of the ponds comprising the South Bay Salt Pond Restoration Project. Results reported were summarized as Appendix B in the 2005 Annual Self Monitoring Report.

As per the RWQCB letter dated May 16, 2006 it states "Furthermore, while not a revision to the self-monitoring program, this letter supports USFWS efforts to direct mercury monitoring funds towards the study centered on Pond A8 and Alviso Slough". The Pond A8 and Alviso Slough sediment monitoring is still in the data collection phase. The FWS will report all information to the RWQCB when it becomes available.

SECTION 3
CORRECTIVE ACTIONS TAKEN

This section summarizes and analyzes the effectiveness of corrective methods that were taken by the FWS in an attempt to improve water quality within each pond system, as well as when the receiving waters approached limits stated by the Final Order were appearing to be reached. The Final Order states that if summer monitoring shows that DO levels at the discharges fall below a 10th percentile of 3.3 mg/L (calculated on a calendar weekly basis), the FWS will accelerate receiving water monitoring to weekly, conduct within pond monitoring, and consult with the RWQCB as to which Best Management Practices described below for increasing dissolved oxygen levels will be implemented (see Operations Plans Appendix B through F). While most of these methods have been tried since the implementation of the ISP, very few of them actually have shown to improve DO levels:

- Increase the flows in the system by opening the inlet further. If increased flows are not possible, fully open the discharge gate to allow the pond to become fully muted tidal or partial muted tidal system until pond DO levels revert to levels at or above conditions in the Bay or slough.

- Set in a series of flow diversion baffles at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake.

- Install Solar aerators used to circulate waters.

- Close discharge gates completely until DO levels meet standards.

- Close discharge gates completely for a period of time each month when low tides occur primarily at night when DO levels are typically at their lowest

- Cease nighttime discharges due to diurnal pattern. This is a daily operation of discharge gates, closing the discharge gates at night (when the DO is typically at the lowest) and then opening them in the morning when the DO levels have reverted to higher levels. However, this is not a long term solution for resolving DO issues and the FWS will continue to consult with the RWQCB on best management practices.

- Mechanically harvest dead algae. Mechanically harvesting algae would be very difficult and expensive considering how large the ponds are. This might work on a very limited basis such as removing the dead algae from around the discharge structure, but it is difficult to find a place to dry and dispose of the harvested algae in our highly urban environment. The algae would smell and the local landfills do not want us to bring our salt laden dead algae into their green waste disposal systems.

On 4th September 2007, FWS staff was taking weekly inspections of Salt Ponds when dead fish were noticed in several ponds. USGS personnel also noted dead fish in the Salt Ponds and our observations are noted below. The Ponds have historically shown diurnal changes of DO values throughout the year. The actual cause of the dead fish observed is still unclear; however, there are many factors such as algae decay, warm temperatures, and windless days that could all be contributors to the depressed DO values

Pond A1: 5 striped bass approximately 10”- 25” in length were seen near the intake structure. Water near the intake appeared “normal”; however, the water at the southern end of Pond was milky in color with an odor of decay. The milky color was noticed along the southern edge of the pond and extended approximately 20 ft. to 300 ft. into the Pond.

Pond A2W: The water in the pond appeared very milky in spots especially along the Western edge and it was very smelly in the Southwest corner (Figure 3-1). We did not observe any dead fish.

Figure 3-1: Milky color in Pond A2W

Pond AB1, A2E, AB2: The water in the pond appeared normal. We did not observe any dead fish.

Pond A3W: The water in the pond appeared very milky in spots especially along the Western and Southern edge. There was a very smelly odor along the Southern paved levee adjacent to the gate. We did not observe any dead fish.

Pond A5 / A7: The water in the pond appeared milky in spots and the odor was very smelly through out the pond. We observed approximately 20 dead rays, 10" – 30" in length that were partially eaten in the Northeast corner of the pond.

We had also observed 25-30 dead Leopard Sharks (12" – 40" in length) and several thousand small dead fish (assumed to be Top Smelt) in the Northwest corner of the pond. In the Southeast corner of the pond we also observed 15 dead striped bass and several thousand small dead fish (assumed to be Top Smelt).

Pond A14 system: The water in the pond appeared normal. We did not observe any dead fish.

Pond A16 system: The water in the pond appeared normal. We did not observe any dead fish.

Corrective Actions Taken: On September 11, 2007 Pond A1 operations were switched from continuous flow to fully muted tidal. This process allowed inflow and discharge through the structure. USGS also conducted additional monitoring in Pond A3W and in the Guadalupe slough near the discharge point for Pond A3W. The sampling involved installing several continuous monitoring devices in the slough for one week, and then a second sampling set for ten days. Biological Oxygen Demand samples were also taken within Pond A3W and in Guadalupe slough near the discharge point. These results are still under review and will be made available to the Regional Water Quality Control Board when they are released..

In the future, corrective actions that could be taken to prevent fish kills would be to harvest algae in targeted locations such as near the discharge points, operate Pond Systems to a continuous flow through rather than muted tidal, configure the pond geometry using baffles or constructing levees in areas to prevent algae buildup near discharge points, and increase water levels in the ponds. Other corrective actions that were taken during the 2007 monitoring season are listed below

3.1 Pond System A2W

This pond system discharges directly into the Bay over an exposed mud-flat at low tide that is approximately 1 1/2 kilometers before it reaches the receiving waters. Most of the discharge water is dissipated into the mud-flat before it reaches the receiving waters. For this reason, the FWS used Pond System A2W as a control pond with few corrective actions taken. The discharge from Pond A2W would have minimal if any effect on its water quality. One action that was taken to improve the dissolved oxygen at the discharge point was to make Pond A2W partially muted tidal during the monitoring season. The compliance of Pond system A2W increased from 36% in 2005, 89% in 2006, and 50% in 2007. The FWS believes that leaving this system to as close to full muted tidal as possible during the monitoring season will help alleviate DO issues at the discharge point for the system. However, areas farthest away from the discharge point show signs of poor water quality with low DO values, signs of distressed fish or dead fish during summer months, and abnormal water color observations. There are two islands within this Pond system that have nesting birds during the breeding season. The FWS did not make Pond A2W full muted tidal for fear of disturbing nesting birds with the fluctuating water levels that occur with a muted tidal system.

In an attempt to increase water quality with in the A2W system, the Pond A1 intake water control structure was fabricated to allow a muted tidal operation. At the Pond A1 structure there is only a flap gate attached on the Pond side culvert which will only allow water to intake from the slough. On 11th September 2007 this flap gate at Pond A1 was modified to open 100% and allow for a fully muted tidal system. By having a muted tidal system at Pond A1, it would increase the chances of water quality success, and also allows the intake channel to be naturally scoured from the sediment build up that occurs. Without the ability to discharge from this structure, heavy equipment would be needed to remove the excess sedimentation. The pond side flap gate was closed to discharge on 2nd November 2007, but remained partially open for intake.

3.2 POND SYSTEM A3W

In the 2004 season, Pond A3W discharged dissolved oxygen that was in compliance with the Final Order for only one week (Table 2-13). To evaluate why dissolved oxygen levels in Pond A3W were severely depressed on a consistent basis (i.e., below 1 mg/L), the FWS performed two surveys and determined the low dissolved oxygen levels in the Pond A3W discharge were the result of a large mat of decaying algae in one area of the pond, and were not representative of the general state of the pond. Since the discharge point for Pond A3W was located near the edge of this algal mat, water currents caused discharge waters to flow through the area of algae buildup which resulted in consistently depressed dissolved oxygen levels in the Pond. On April 14, 2005 the FWS installed a set of baffles to move the flow of water away from algae buildup to increase oxygen uptake. The FWS extended these baffles for 2006 with hopes of increasing oxygen uptake to the discharge. The compliance for Pond system A3W fell from 76% in 2005 to 43% in 2006, and in 2007 the DO compliance was only 8%. During the 2007 monitoring season, the baffles located at the discharge point of Pond A3W did not seem to be effective with desired DO levels. On 26th July 2007, a portion of one of the sections of baffles was tied up in an attempt to circulate the water differently and thus positive DO results. This action did not seem to affect Ponds discharge DO levels positively or negatively, and only re-enforced our assumptions that DO levels are more controlled by weather effects than management actions.

3.3 POND SYSTEM A7

In 2005, a corrective measure taken at Pond system A7 to improve DO was to install 4 SolarBee Circulators. The SolarBee's are designed to circulate water by bringing water from deeper (low oxygenated areas) and sending it passively across the surface causing a mixing action with generally higher dissolved oxygen values. At the end of the 2005 season, the SolarBees were seen to be ineffective in producing higher dissolved oxygen values, and thus removed for the 2006 season. As a result of the circulators futility in 2006, the FWS installed baffles at the discharge point for Pond system A7 with hopes of improving DO. However, on June 1, 2006, Pond A7 water control structure failed due to moving piles which hold the headwall in place. This resulted in uncontrollable discharge and intake of water flow. The culverts were then immediately plugged so that no water flow could occur through this water control structure. The continuous monitor was then moved to Pond A5 discharge point. Without the ability to have a flow through operation in this system, Pond A5 was made partially muted tidal. Using partially muted tidal as opposed to fully muted tidal which has both pond and slough side tide gates open 100 percent allows for more control of water levels within the Pond to assure enough freeboard on the levees. The results of this corrective action raised the DO compliance to 89% in 2006, compared to only 45% in 2005.

Before the 2007 monitoring season, the Pond A7 water control structure was repaired and again open to water flow. For Pond A7, the discharge was open 100% with the intakes open as partially muted tidal. From the positive results seen in the 2006 season having Pond A5 partially muted tidal, on 21st May 2007 the discharges at Pond A5 were open 100% to allow for a partially muted tidal system. The operation of having both Pond A5 and Pond A7 as partially muted tidal resulted in having the back portions of the Ponds show signs of poor water quality, such as milky water color and increased algae odor. With anticipated water quality problems occurring in the back portions of the Ponds, on 31st August 2007, the system was then switch from a partially muted tidal system at both Ponds A5 and A7 to a continuous flow through system with Pond A5 as the intake and Pond A7 as the discharge point. This continuous flow through correction was thought to alleviate the portions of Pond with poor water quality, however, on 4th September 2007, dead fish were observed in Pond A5 and Pond A7.

3.4 POND SYSTEM A14

This is a four pond system that was initially released on April 31, 2005. The salinity was below the 44 ppt. limit at the time of initial discharge. Pond A14's continuous monitor at the discharge had weekly dissolved oxygen readings with a 10th percentile of <2.0 mg/L for the majority of the 2005 and 2006 season (see Table 2-13). Many corrective actions were taken to try and improve the DO values; none of them seem to be effective. Corrective actions taken in 2005:

- June 27 – July 29: close the system down to a two pond system, an intake (Pond A9) and discharge pond (Pond A14). Both of the intake and discharge gates were open 100 percent to allow as much water flow as possible minimizing residence time.

- July 29 – August 30: make Pond A14 discharge 100% muted tidal.
- September 6: install a set of flow diversion baffles.
- October 4 – December 7: closed discharge gates completely to protect receiving water quality.

None of the above corrective actions taken improved the water quality for Pond System A14 in 2005. The FWS believes that a limiting factor to increasing the water quality for this system is the channel that discharges water from Pond A14 to Coyote Creek. This was an existing channel that is approximately 800 feet in length. It was intentionally not excavated to reduce impacts to native species with the hopes that it would scour out naturally. This scouring did not occur; the sides of this discharge channel have actively fallen into the channel reducing water flow to extremely minimal levels (Figure 3-2). The FWS believes that the water quality and effective corrective actions that can be taken for this Pond system relies on the ability to reduce residence time which will provide adequate water flow. This channel was originally designed to be excavated in 2005, but due to contractors increased work load, this project was not finished until 9th May 2007 (Figure 3-3). Pond A14 was then operated as partially muted tidal for the remainder of the monitoring season. This corrective action has increased water quality compliance tremendously for Pond A14. In 2006, the DO was in compliance for 0% of the season. After the excavation of the discharge channel occurred, the DO compliance was 81% during the 2007 monitoring season

Figure 3-2: Pond A14 pre-construction of channel

Figure 3-3: Pond A14 post construction of channel

Pond A9 which is the intake for the Pond A14 system was operated as partially muted tidal from 12th July – 5th September 2007. By having a partially muted tidal system at Pond A9, it would increase the chances of water quality success, and also allows the intake channel to be naturally scoured from the sediment build up that occurs. Without the ability to discharge from this structure, heavy equipment would be needed to remove the excess sedimentation.

3.5 POND SYSTEM A16

This pond system was initially released on April 31, 2005 with a salinity of 70 ppt. There are two ponds in this system with an intake at Pond A17 (coming from Coyote slough) and a discharge at Pond A16 (into Artesian slough). The systems flow is reversed during the winter to prevent entrapment of migrating salmonids coming from Coyote Creek. The intake and discharge gates were open 100 percent for most of the season because of the ability to control water levels with a weir box at both water control structures. Having the gates fully open causes a short residence time for moving water through this system and the dissolved oxygen was in compliance for 64% of the 2006 season, and 67% in 2007.

As part of our Corrective Actions explained in the Operations Plan, when dissolved oxygen levels fall below a 10^{th} percentile of 3.3 mg/L (based on a calendar week), one option is to close discharge gates completely for a period of time each month when low tides occur primarily at night when DO levels are typically at their lowest. This corrective action was tried in August of 2005 due to reaching non-compliance concentrations for DO. However, by closing the gates and not allowing depleted oxygenated levels from reaching the receiving waters, this action tremendously impaired the water quality with in the pond. As a result of this corrective action, the DO levels within the pond dropped below 1.0 mg/L for a period of 11 hours. These actions are believed to have caused the pelagic fish to be stressed and were easily preyed upon by gulls and other piscivorous species. In August of 2005, Pond system A16 was then operated as muted tidal which improved DO dramatically at that time.

With lessons learned from corrective actions taken in 2005, the FWS operated Pond system A16 as muted tidal on May 1, 2006. While muted tidal systems appear to increase oxygen levels when compared to ponds operating in a continuous circulation mode, for Pond A16, the intake is mainly dominated with the effluent from the San Jose Water Pollution Control Plant which has very low levels of salinity (ppt). The salinity acts as a buffering agent for pH, so with low salinity levels, the pH in Pond A16 became fluctuated during muted tidal operation and caused similar fish stress as seen during low DO readings. On May 18, 2006 the system was reverted back to a continuous flow operation with the intake at Pond A17, and the discharge at Pond A16. While this stabilized the pH with in the pond, the DO was unable to remain above the 10^{th} percentile of 3.3 mg/L for 36 % of the 2006 monitoring season.

For the 2007 monitoring season, Pond A16 system remained as a continuous flow through, with Pond A17 as the intake and Pond A16 as the discharge point. The DO levels for Pond System A16 was in compliance for 67% of the season. The DO compliance was anticipated to be higher, except starting 11th October 2007, Pond A16 and A17 water levels were lowered to obtain a detailed topographic survey of the Ponds. As part of Phase I in the South Bay Salt Pond Restoration Project, Pond A16 will be managed to enhance habitat for migratory shorebirds by creating nesting islands and shallow water foraging habitat. Creating the target shallow water habitat (depths of about 2 to 12 inches) is sensitive to the gentle slopes and microtopography within Pond A16. Pond topography is also important for determining the parameters of the construction contract, such as the volume of earthwork and construction access. Performing the topographic survey was a critical path item to meet the design and implementation schedule. Draining Alviso Ponds A16 and Pond A17 exposed the pond bed and allowed for aerial photographs to be flown and analyzed as part of a photogrammetric survey of the pond bottom (Figure 3-4). This high resolution is not cost effectively available using hydrographic survey methods while Ponds A16 and A17 are ponded with several feet of water. This temporary operation change lasted until 30th September 2007 when the Ponds were restored back to normal operating water levels.

Figure 3-4: mud flats of Pond A16 during draining period

SECTION 4
PLAN TO ACHIEVE COMPLIANCE

Maintaining dissolved oxygen levels in the ponds has been the major water quality challenge for the ISP. A number of corrective actions were implemented in 2005 through 2007 to raise dissolved oxygen in the ponds. Some of these actions improved DO levels, and some did not. Based on the lessons learned, for the 2008 season, the FWS once again plans on changing methods of operation as the need arises to improve water quality compliance. As noted in section 2.2.11 Additional water quality sampling, USGS has reported that DO levels being discharged into the Bay and sloughs actually improve DO concentrations during certain tide cycles.

4.1 POND SYSTEM A2W

Starting in May of 2008, the FWS plan to again open Pond A1 intake and Pond A2W discharge to a partially muted tidal system. Having the system partially muted will allow better control of the pond water levels. This will decrease the risk of flooding nesting birds located on several islands within the system during breeding season. With the Bay waters able to enter the discharge pond, it should improve the water quality within the system. Through trial and error, the gates will need to be adjusted to find equilibrium of water in-flow and discharge to account for evaporation during the summer. The back portions of the Ponds A1 and Pond A2W will need to be monitored closely when warmer weather patterns occur. Pond A2W system should then be switched to a continuous flow through system and increase water levels to prevent extremely low DO from occurring.

4.2 POND SYSTEM A3W

Flow diversion baffles will once again remain in place during the 2008 season. The baffles have proven to raise the DO concentrations at the discharge in 2005. At the discharge point in Pond A3W, one of the three gates has the ability to allow water in-flow as a partial muted tidal operation. Although Pond A3W was being operated minimally as partially muted tidal, the FWS will attempt to increase the muted tidal capabilities by further opening the intake at Pond A3W.

Water levels in Pond AB1 and Pond AB2 of Pond A3W system may be temporarily lowered during the summer to improve shorebird nesting and foraging habitat.

4.3 POND SYSTEM A7

For the 2008 season, Pond A7 water control structure will again be functional after having necessary repairs made to the pilings and headwall. The in-flow gates at Pond A5 and Pond A7 will remain partially open to allow for a muted tidal operation. The gates and weir boards will be adjusted through the season to find the optimum balance of water level and levee freeboard. A set of flow diversion baffles will remain in place at the discharge point in Pond A7. They extend approximately 150 feet into the pond on either side of the discharge gates, and should provide maximum oxygen discharge from shallow areas of the pond. A continuous monitor will be attached to Pond A5 and Pond A7 discharge points in order to record water quality parameters. If back portions of the Pond A7 System begin to show signs of stressed fish species, the system will be reverted back to a continuous flow through.

4.4 POND SYSTEM A14

In 2008, Pond A14 system will be operated similar to the 2007 water quality season. Pond A14 and Pond A9 will be operated as partially muted tidal to allow better inflow, and also help prevent sedimentation from occurring in the intake/ discharge channel.

4.5 POND SYSTEM A16

Due to observations and lessons learned in 2006, it will be recommended to open this system to continuous flow mode year round. The intake will be from Pond A17 and the discharge point at Pond A16. Pond A17 may be operated partially muted tidal during certain time periods to increase DO, and reduce sediment buildup around the trashrack. The water levels will be set by adjusting weir boards at the water control structures. Due to fish distress in August 2005 and May 2006 in Pond A16, it is recommended to not shut this system gates completely or operate as muted tidal at Pond A16 which could cause detrimental impact to the pelagic and benthic organisms.

SECTION 5
MONITORING PLAN MODIFICATIONS

In the Final Order it states that the DO instantaneous minimum for discharge is 5.0 mg/L. This "limitation applies when receiving waters contain at 5.0 mg/L of dissolved oxygen. In cases where receiving waters do not meet the Basin Plan objectives, pond discharges must be at or above the dissolved oxygen level in the receiving water:." Since the initial release of the Alviso Pond Complex, the discharges from these ponds have historically shown fluctuating diurnal DO values throughout the monitoring season. The receiving waters in the adjacent sloughs and Bay to the Pond discharges have also some recorded values less than 5.0 mg/L. Additional water quality sampling was done in Newark slough which is independent of any discharge coming from the Salt Ponds, has shown DO values being lower than the limit for one third of the observed recordings for the past three years (see Section 2.2.11 Additional Water Quality Sampling).

USGS has also conducted additional receiving water sampling in Newark, Mowry, and Guadalupe sloughs, which indicates that there seems to be a natural variability of slough DO that is virtually unaffected by pond discharge. This sampling (which was done in August and September 2007) also indicates that at times the pond discharge actually increases DO concentrations in the sloughs. This report will be provided to the RWQCB when it becomes available. Prior to that time, a presentation by Dave Schoellhamer of USGS can be arranged to review the preliminary results.

While the FWS will continue to collect and report the results of sampling that occurs in the Ponds as well as the Bay / sloughs, there seems to be evidence that Pond discharges may not be contributors to variable receiving water DO concentrations. It is the FWS suggestion that the RWQCB re-evaluate or revise the objectives for DO in the South Bay sloughs and consider a site specific objective based on recent data.

APPENDIX A
ADDITIONAL FIGURES

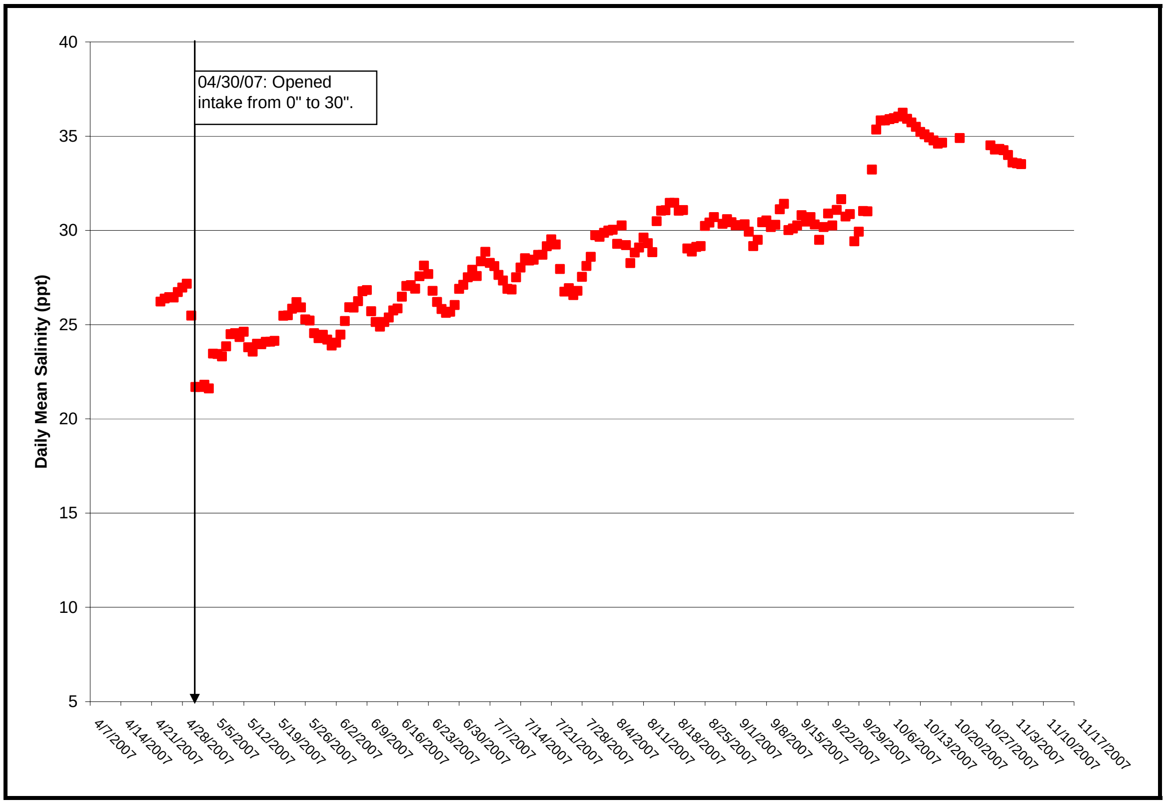


Figure A-1: Salinity of Pond A2W

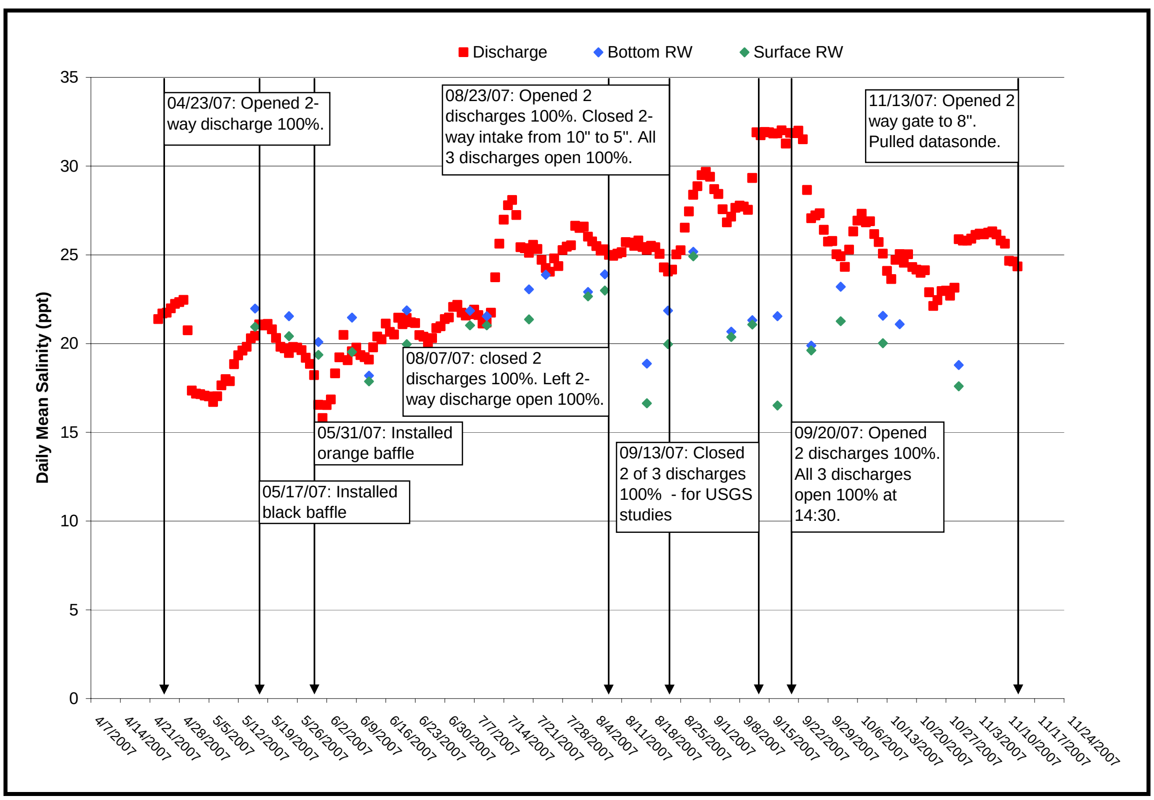


Figure A-2: Salinity of Pond A3W vs. Guadalupe Slough

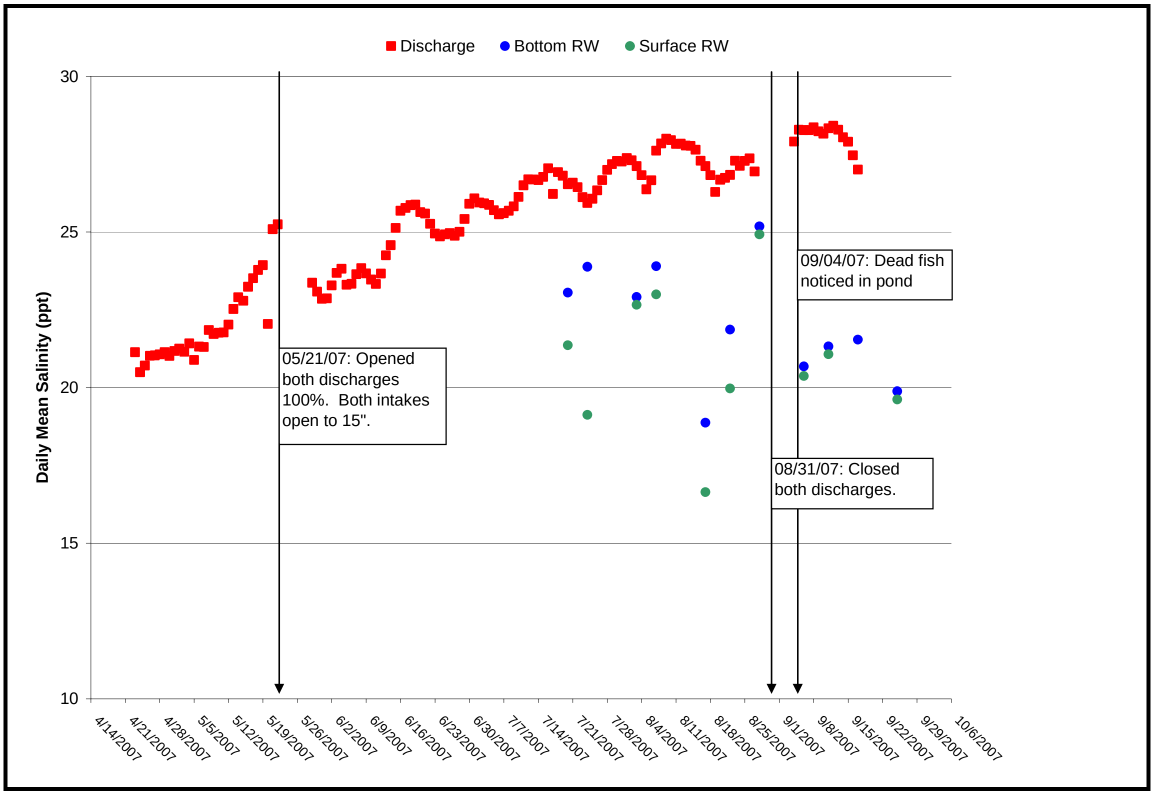


Figure A-3: Salinity of Pond A5 vs. Guadalupe Slough

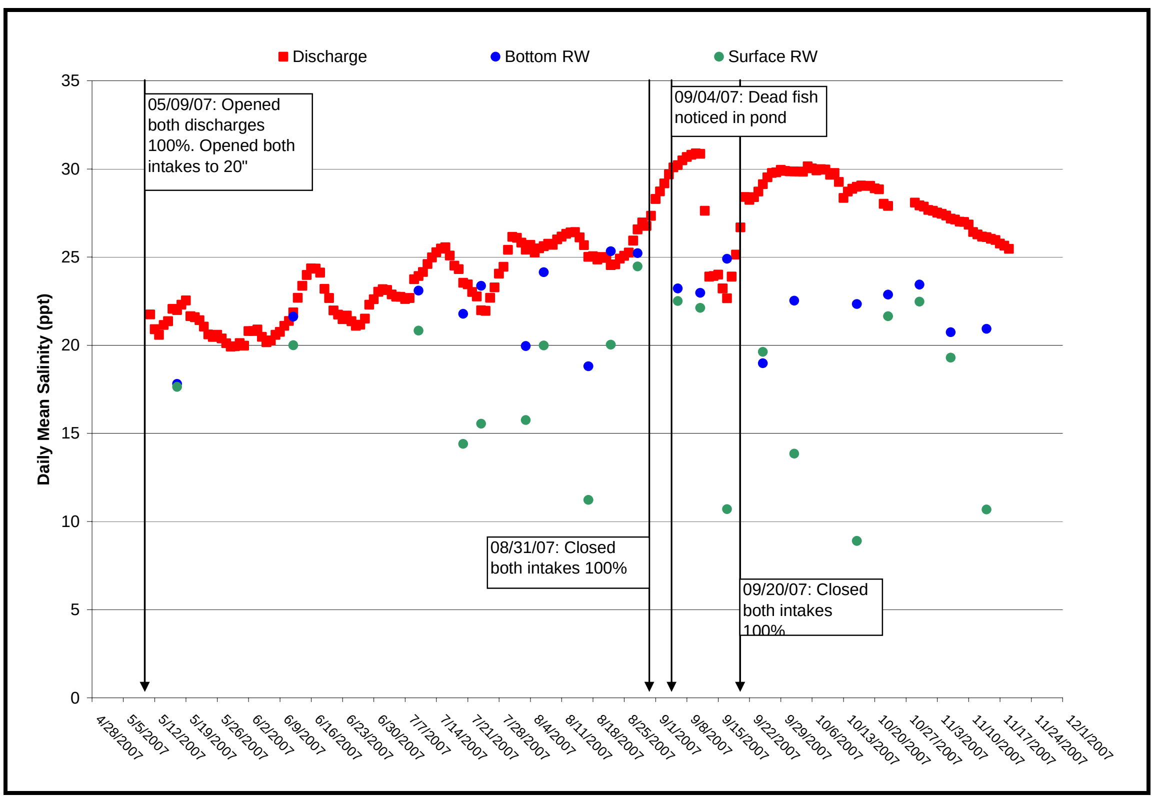


Figure A-4: Salinity of Pond A7 vs. Alviso Slough

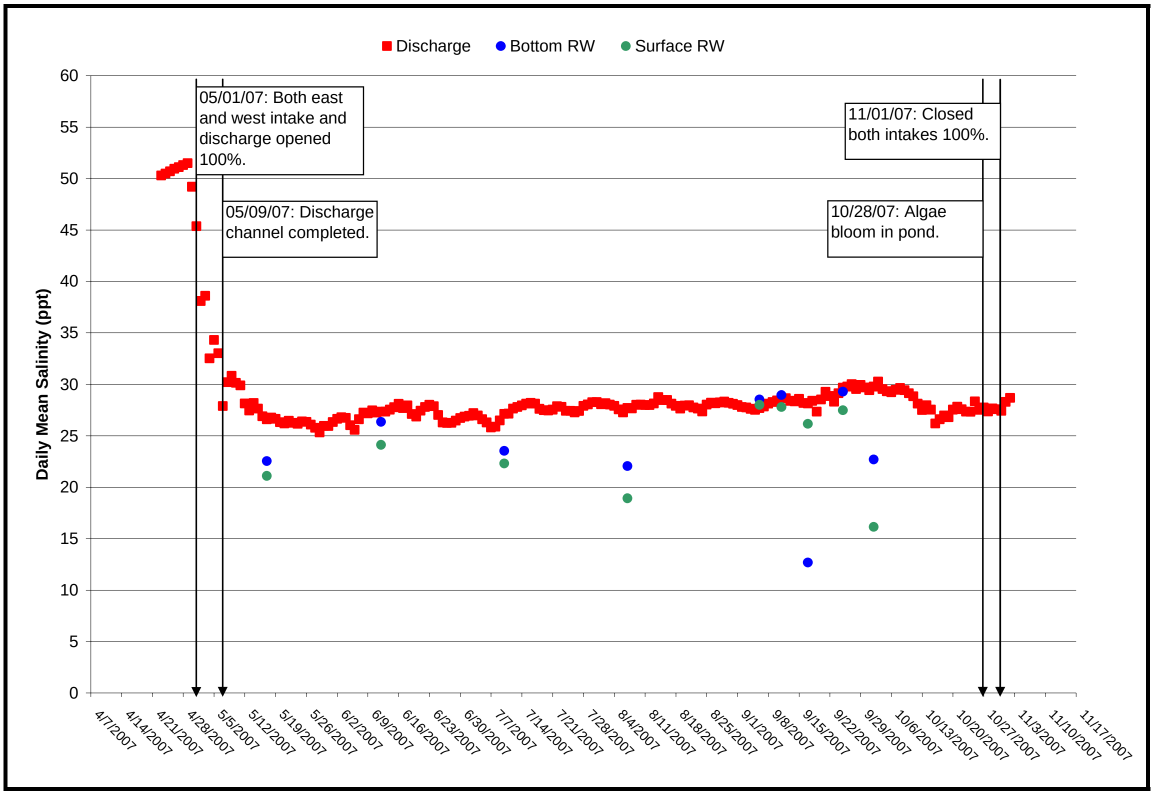


Figure A-5: Salinity of Pond A14 vs. Coyote Creek

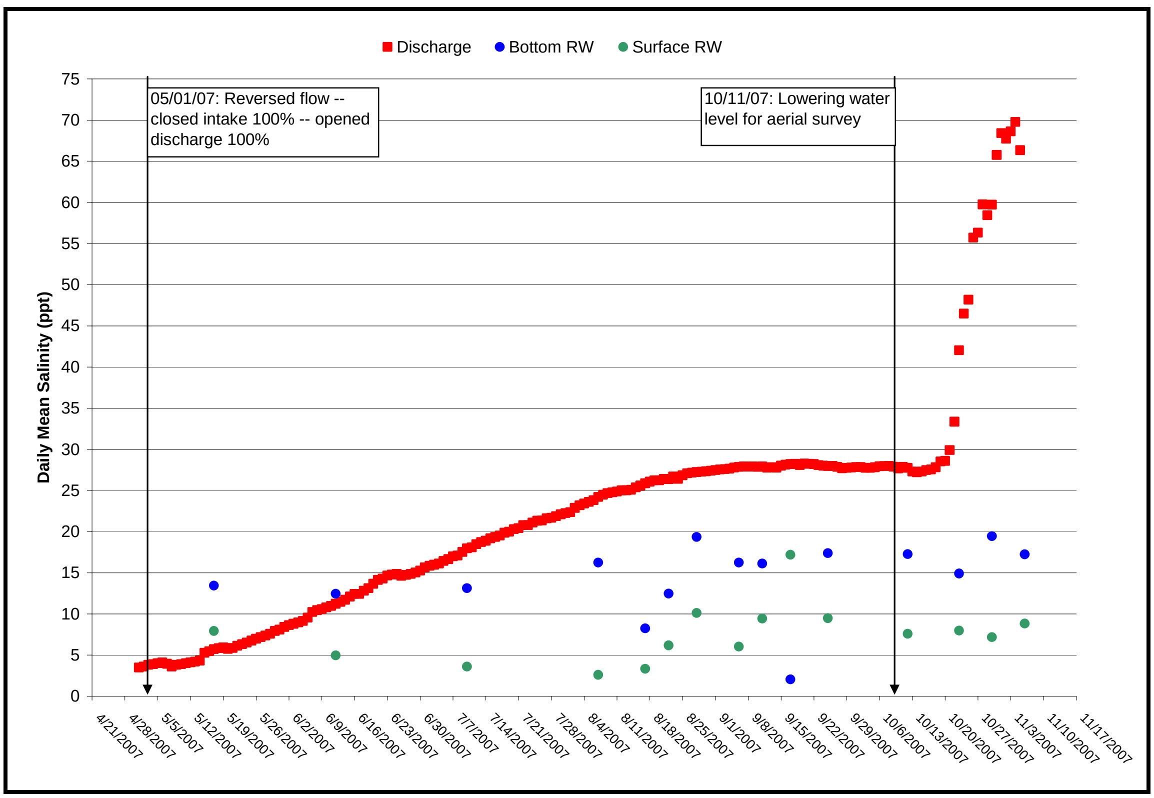


Figure A-6: Salinity of Pond A16 vs. Artesian Slough

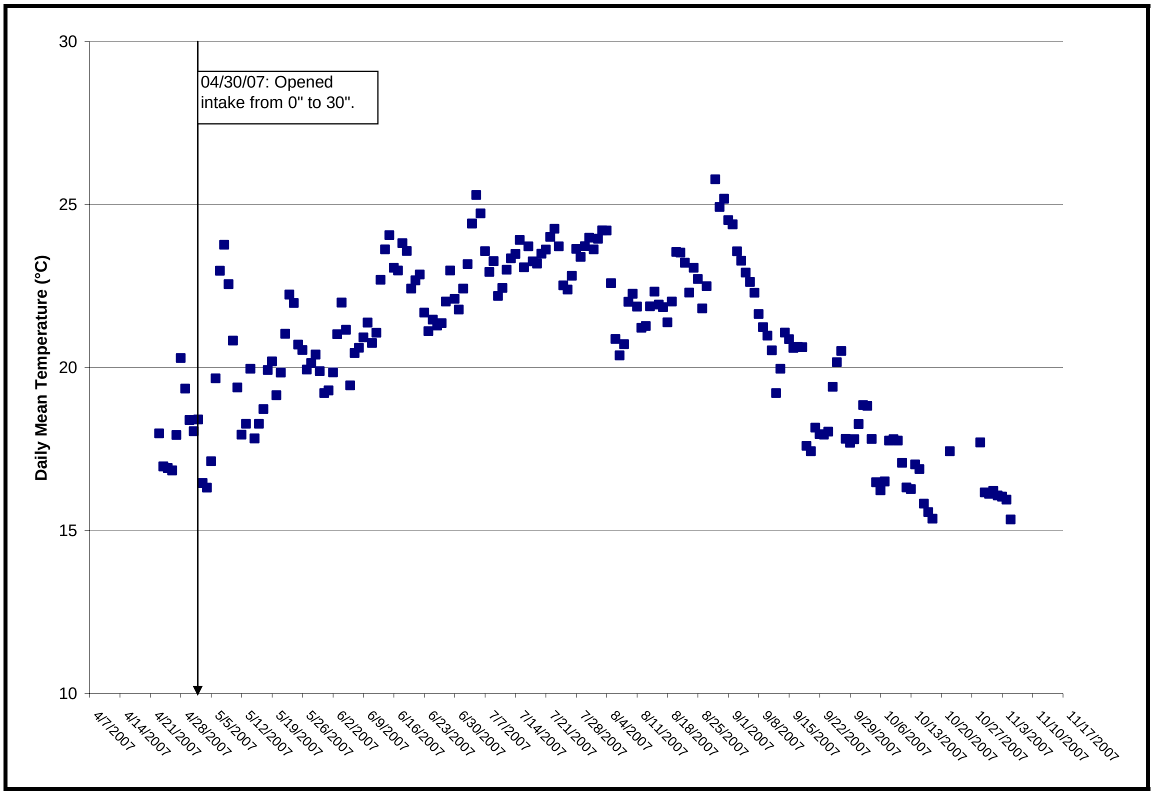


Figure A-7: Temperature of Pond A2W

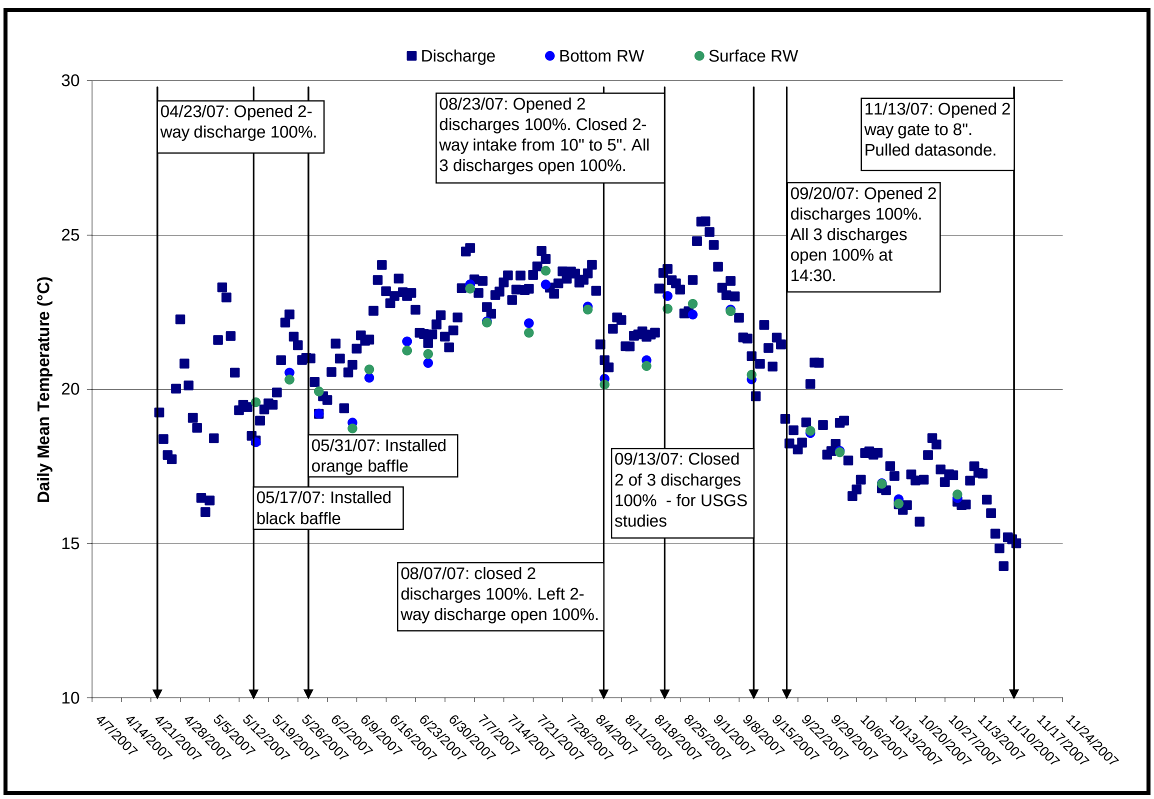


Figure A-8: Temperature of Pond A3W vs. Guadalupe Slough

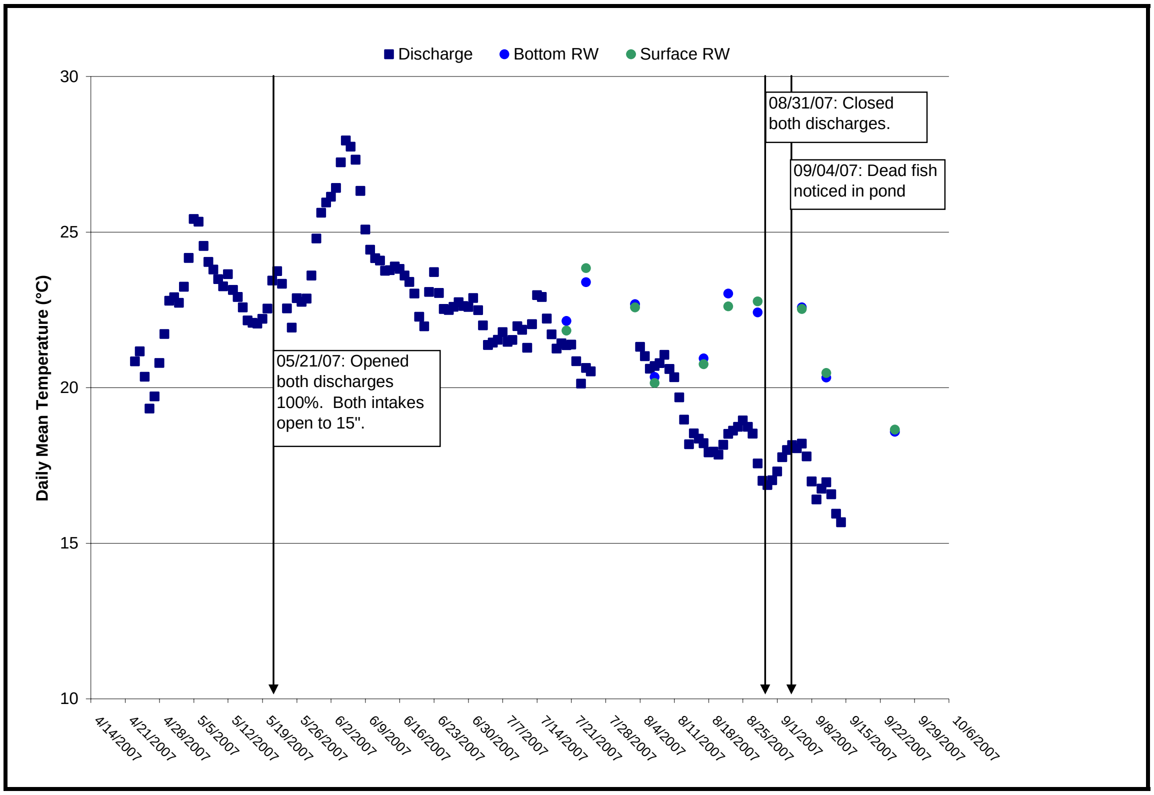


Figure A-9: Temperature of Pond A5 vs. Guadalupe Slough

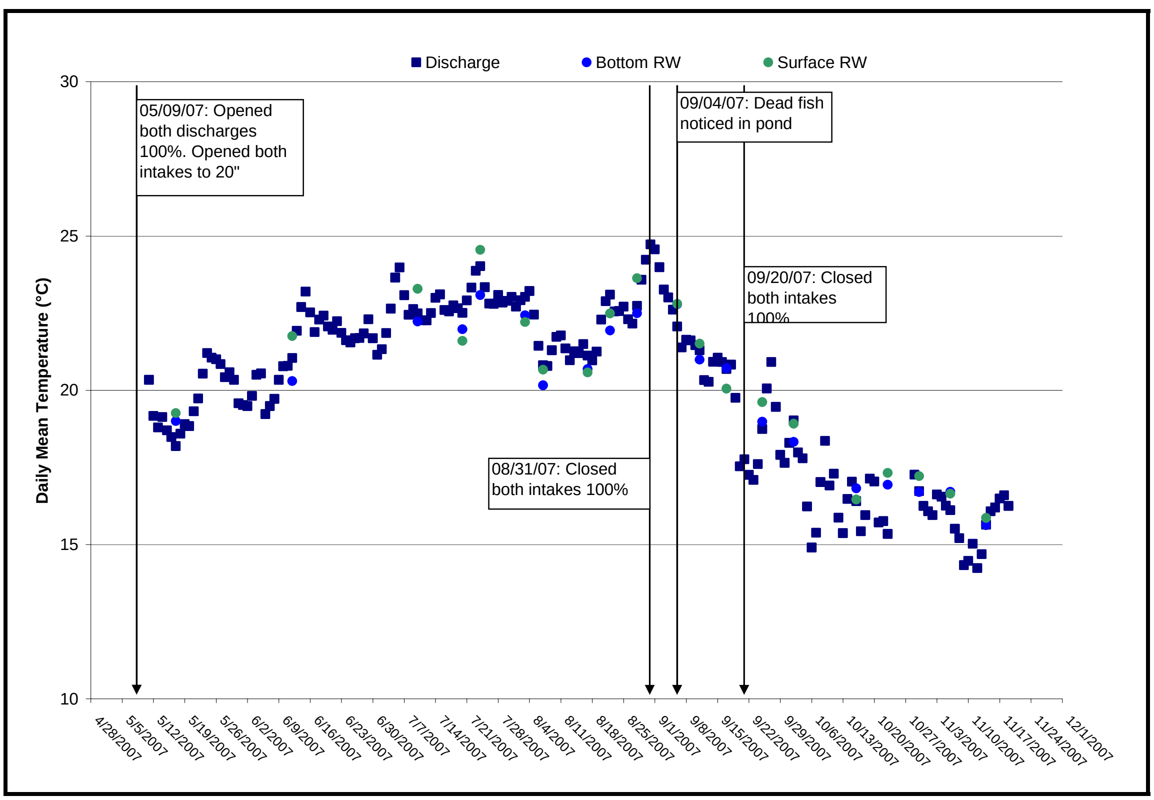


Figure A-10: Temperature of Pond A7 vs. Alviso Slough

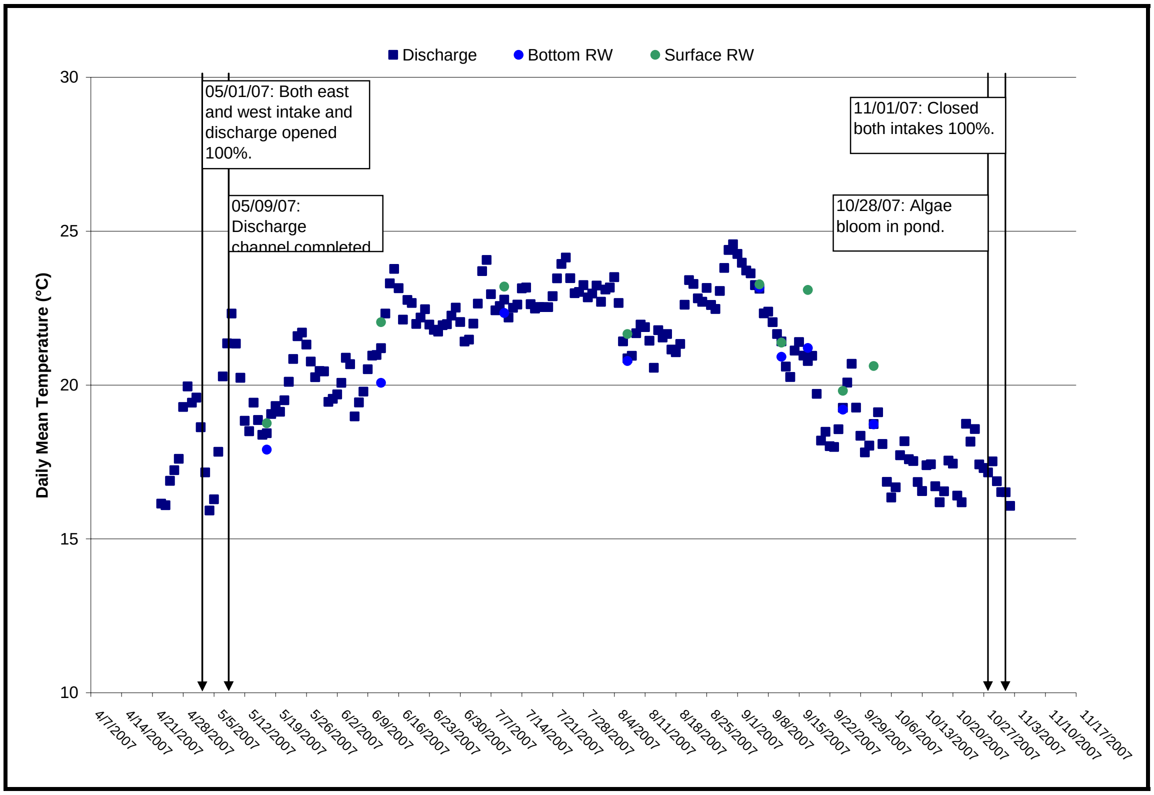


Figure A-11: Temperature of Pond A14 vs. Coyote Creek

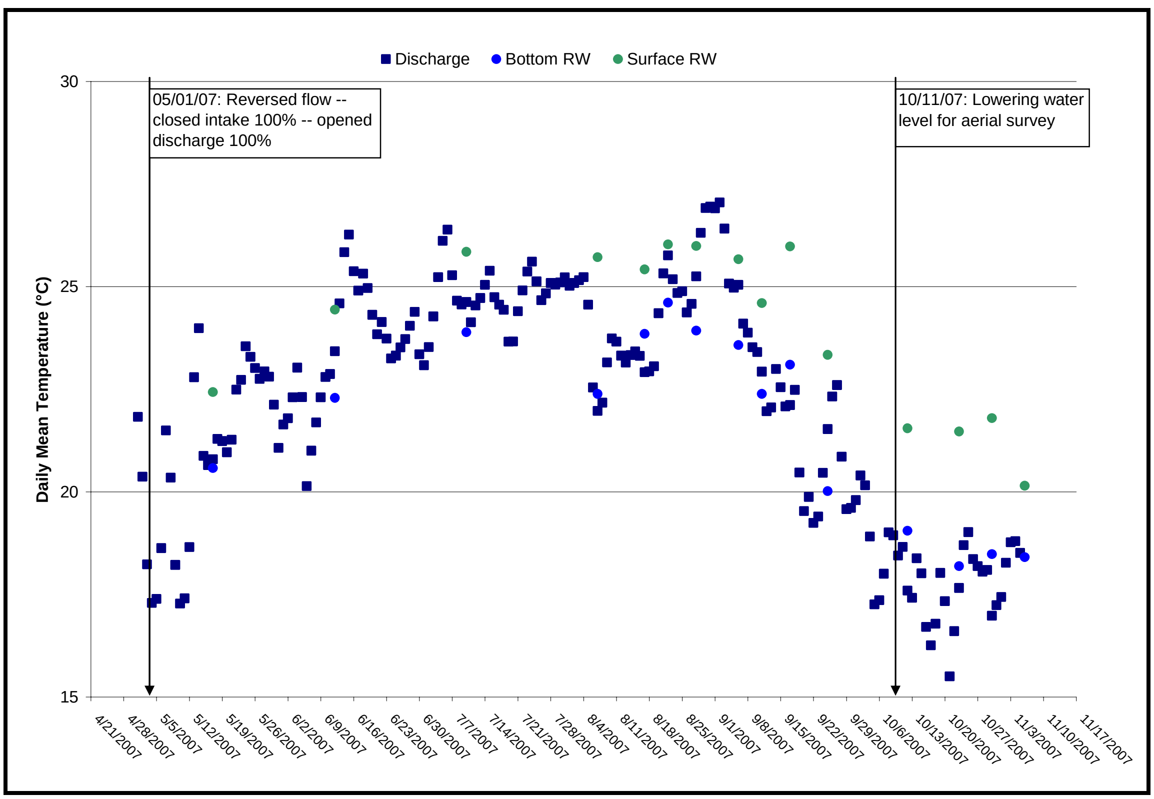


Figure A-12: Temperature of Pond A16 vs. Artesian Slough

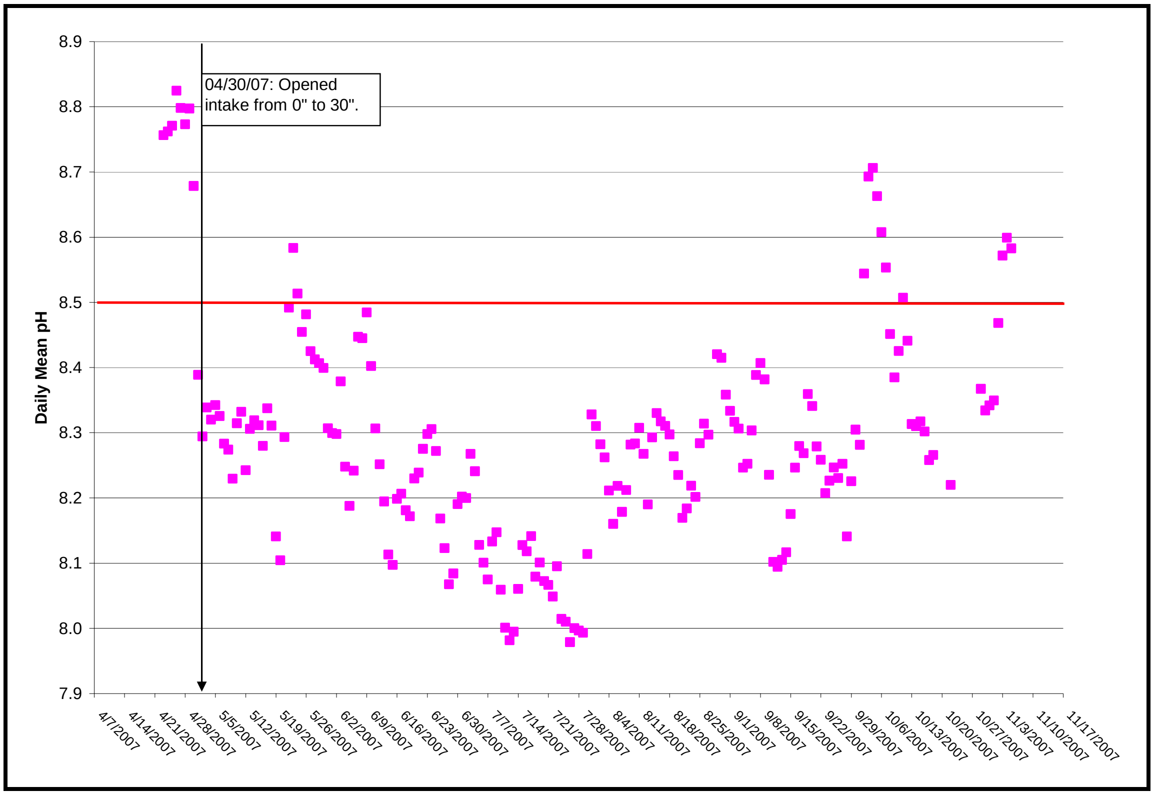


Figure A-13: pH of Pond A2W

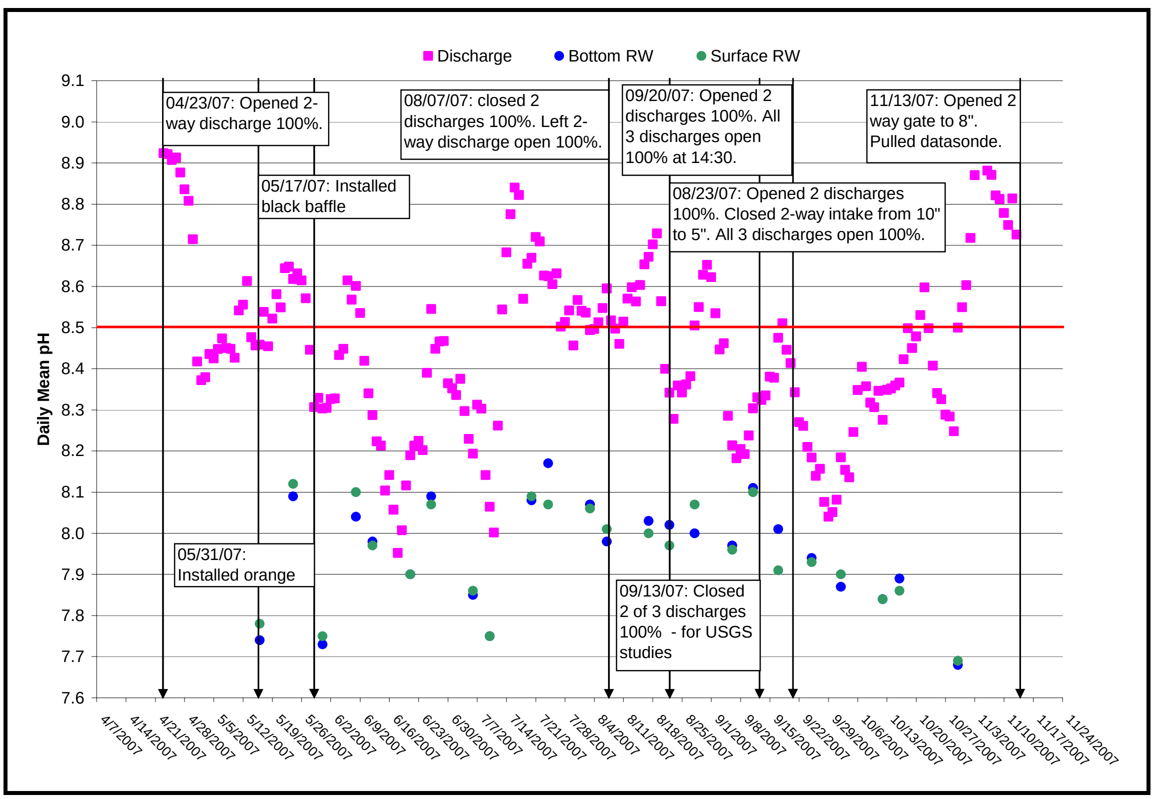


Figure A-14: pH of Pond A3W vs. Guadalupe Slough

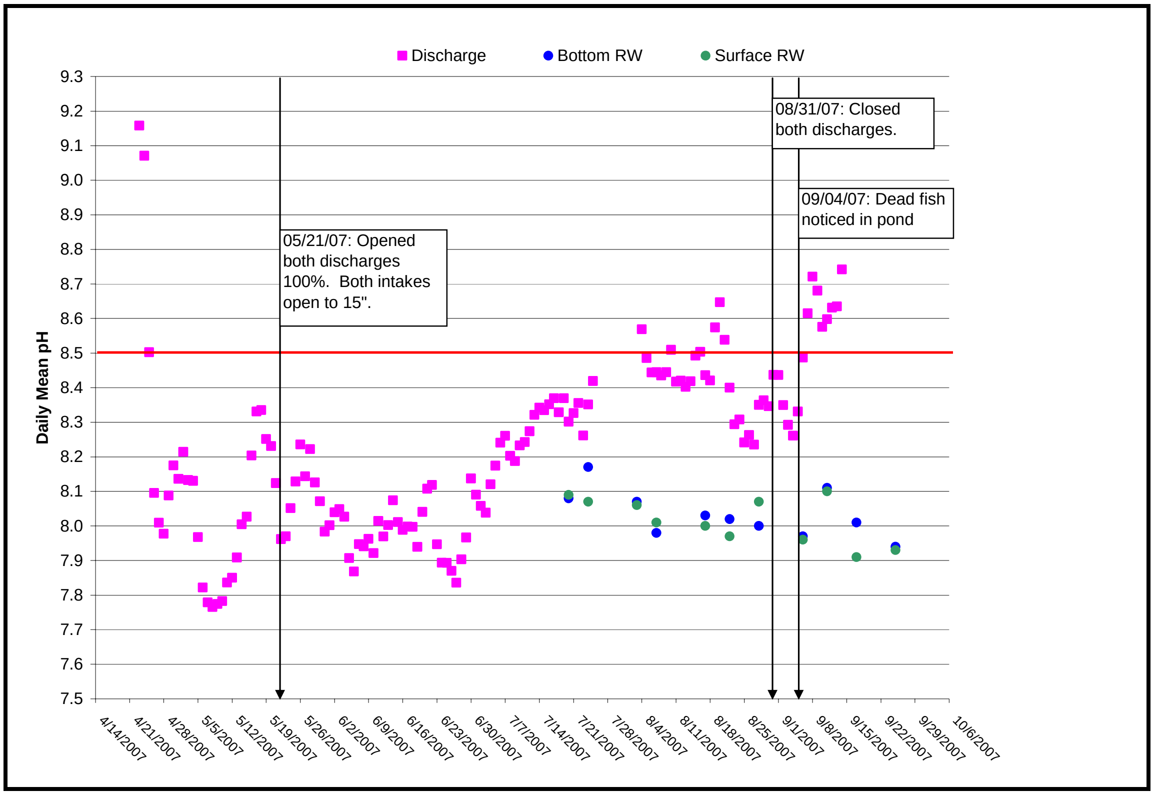


Figure A-15: pH of Pond A5 vs. Guadalupe Slough

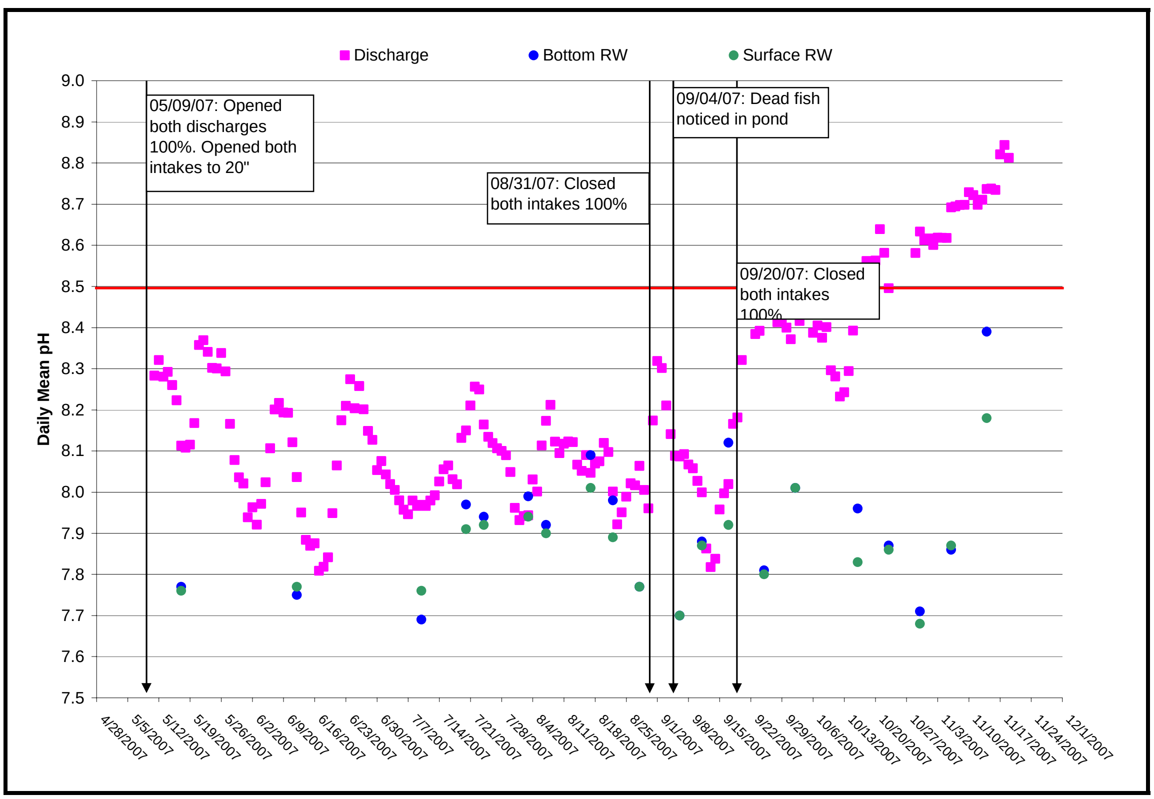


Figure A-16: pH of Pond A7 vs. Alviso Slough

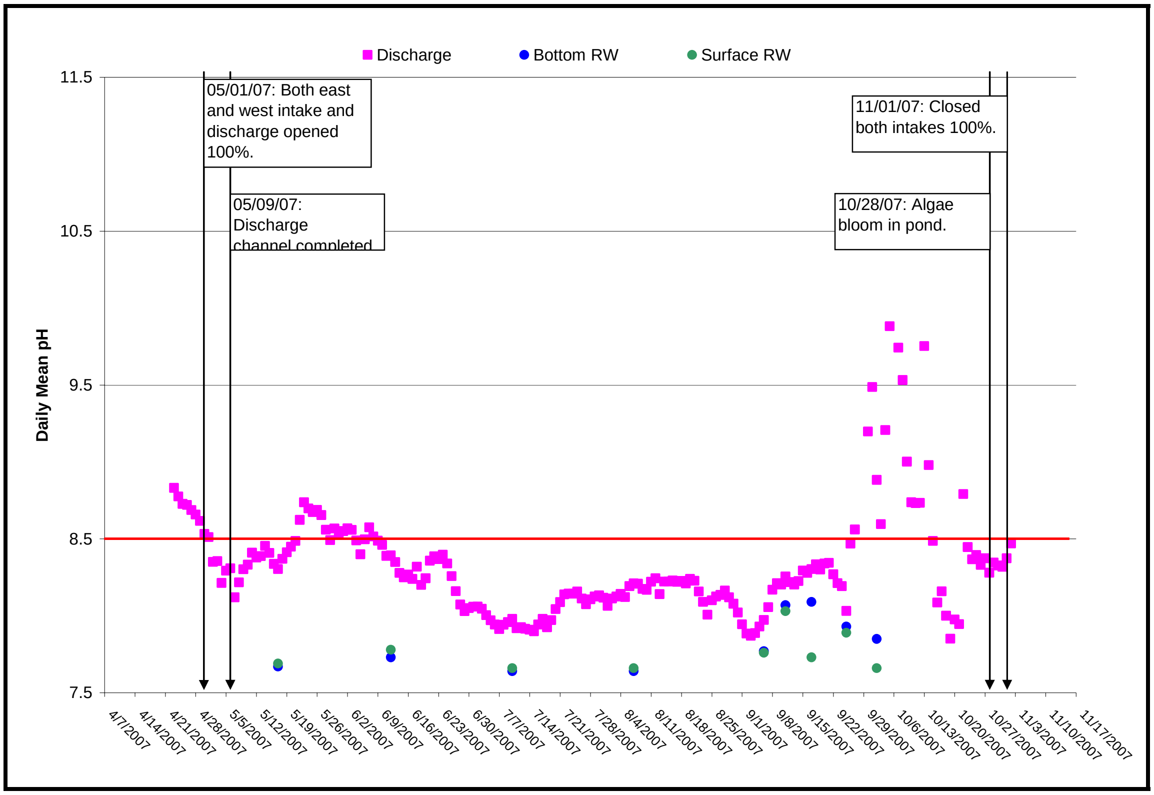


Figure A-17: pH of Pond A14 vs. Coyote Creek

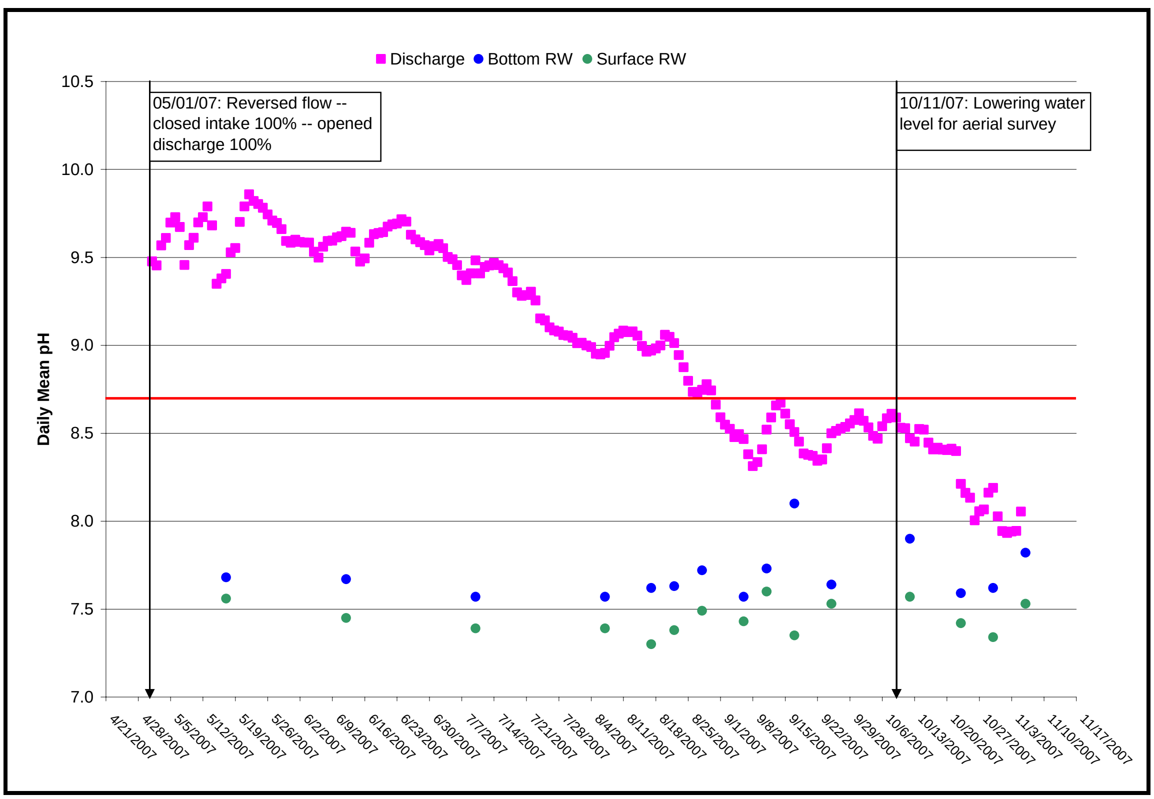


Figure A-18: pH of Pond A16 vs. Artesian Slough

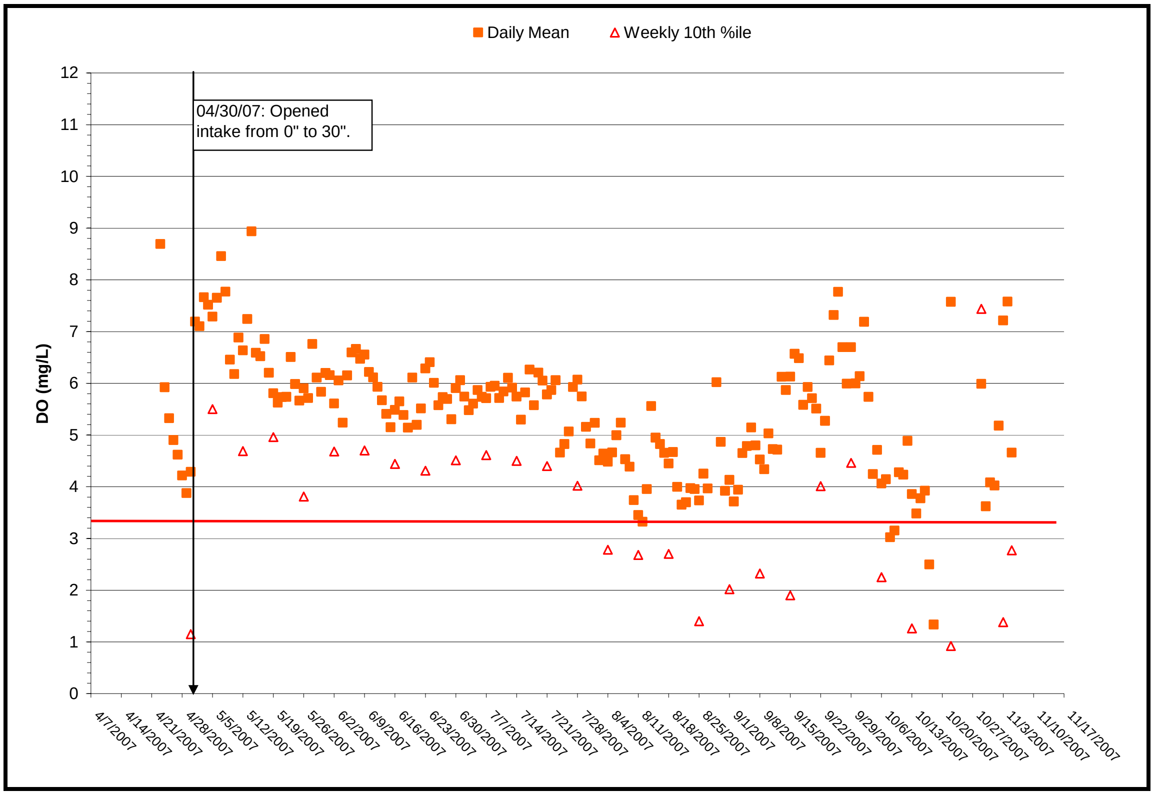


Figure A-19: Dissolved Oxygen of Pond A2W

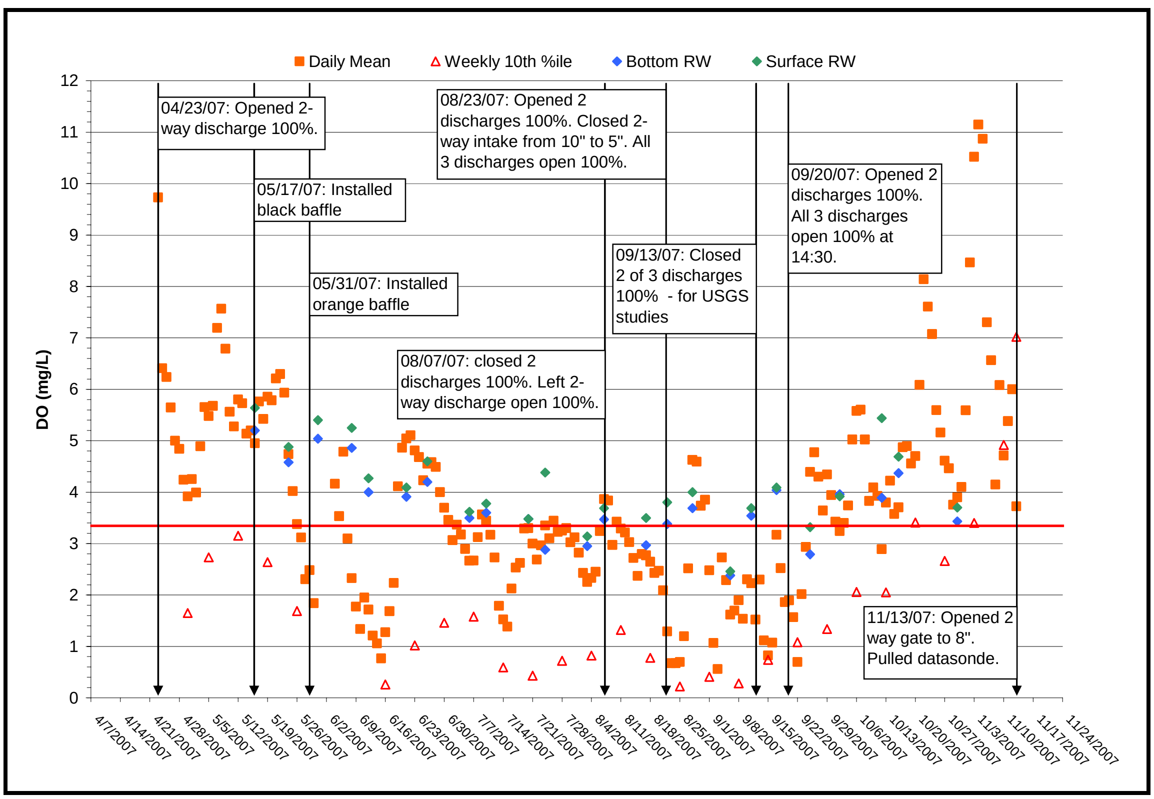


Figure A-20: Dissolved Oxygen of Pond A3W vs. Guadalupe Slough

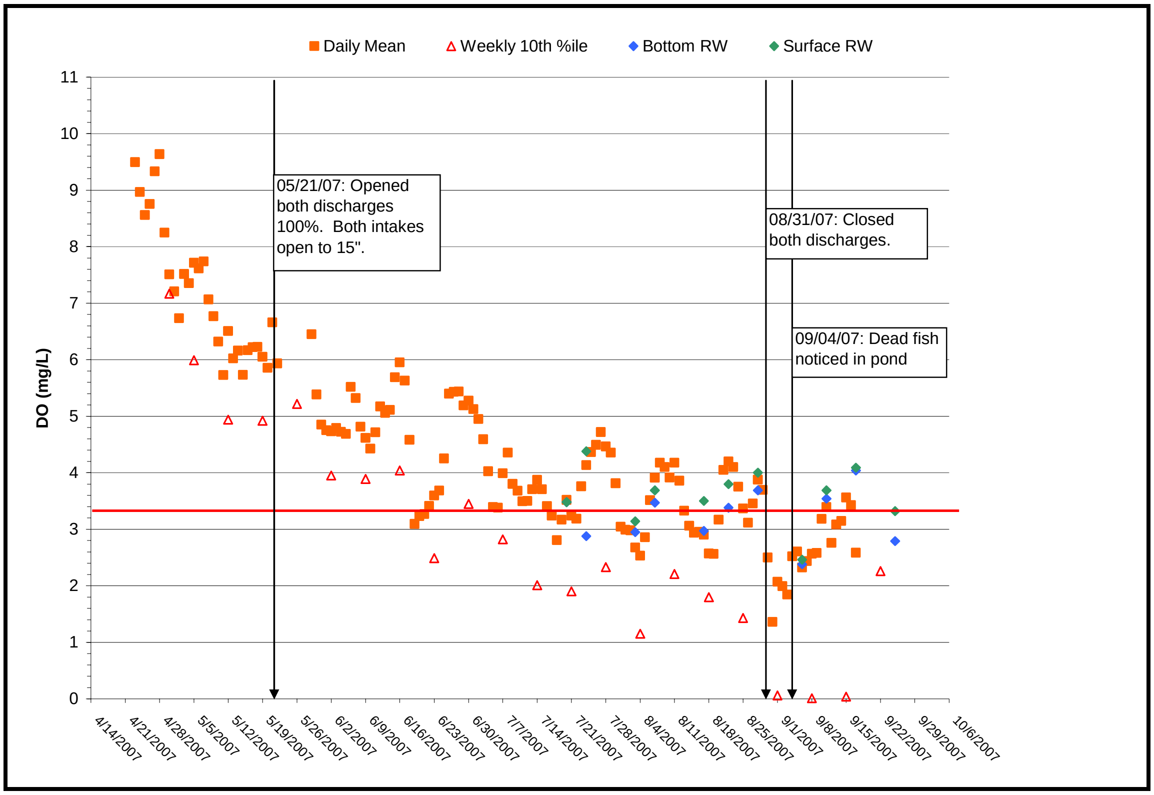


Figure A-21: Dissolved Oxygen of Pond A5 vs. Guadalupe Slough

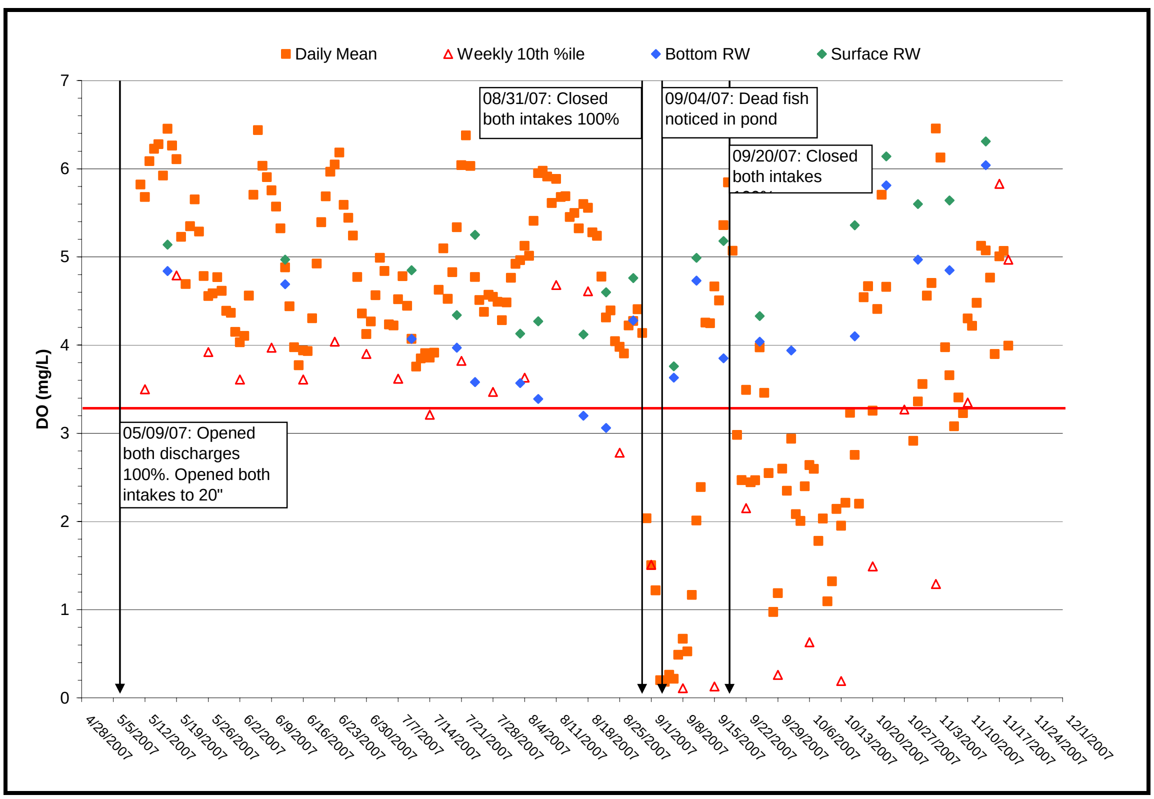


Figure A-22: Dissolved Oxygen of Pond A7 vs. Alviso Slough

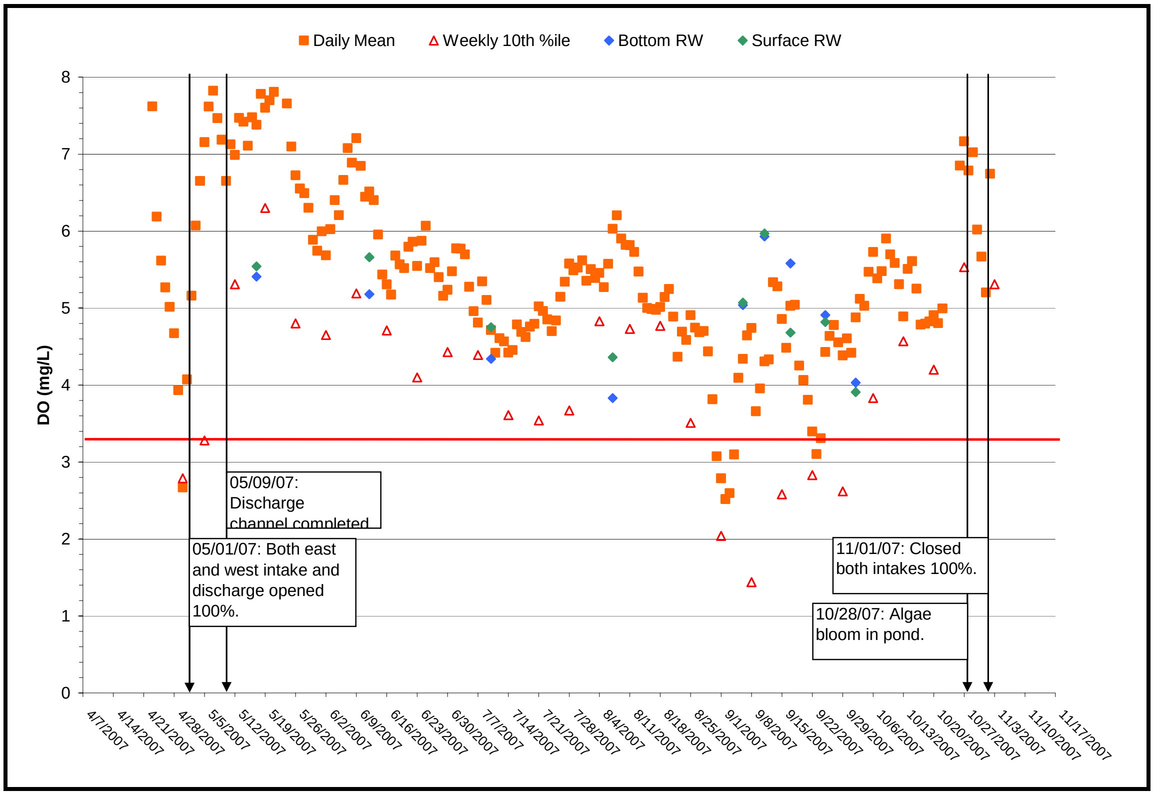


Figure A-23: Dissolved Oxygen of Pond A14 vs. Coyote Creek

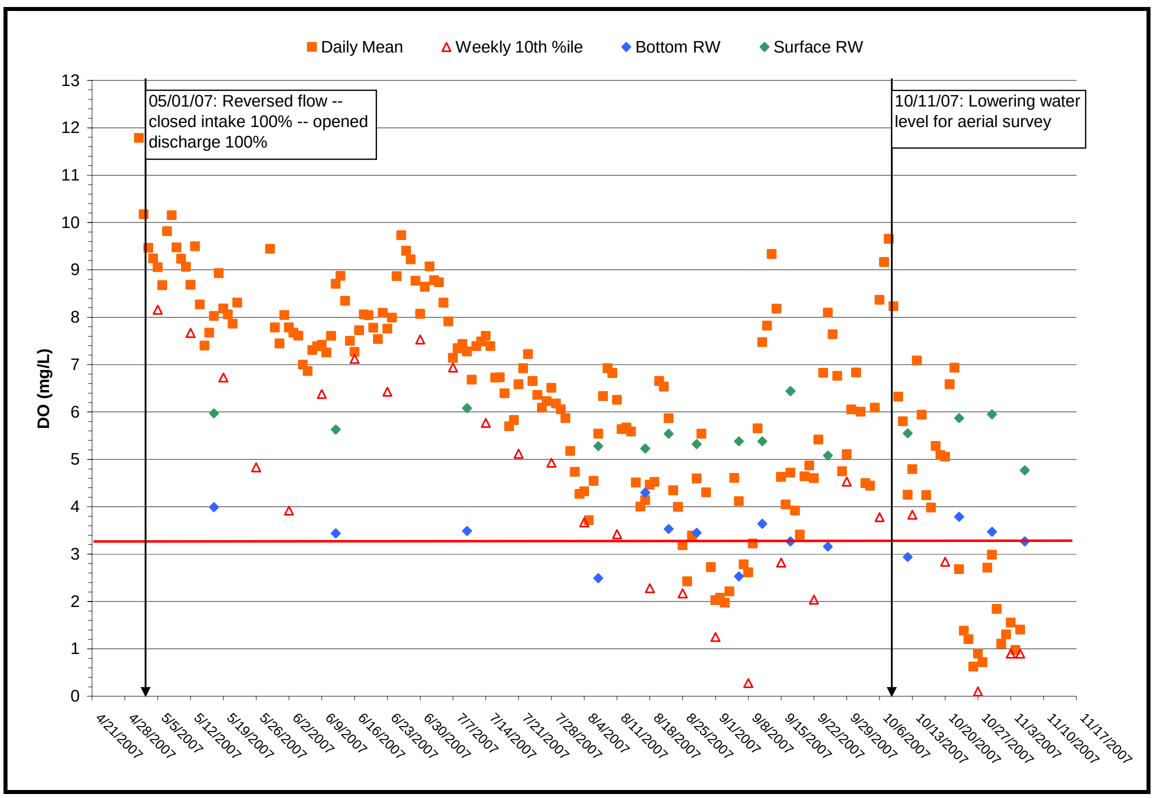


Figure A-24: Dissolved Oxygen of Pond A16 vs. Artesian Slough

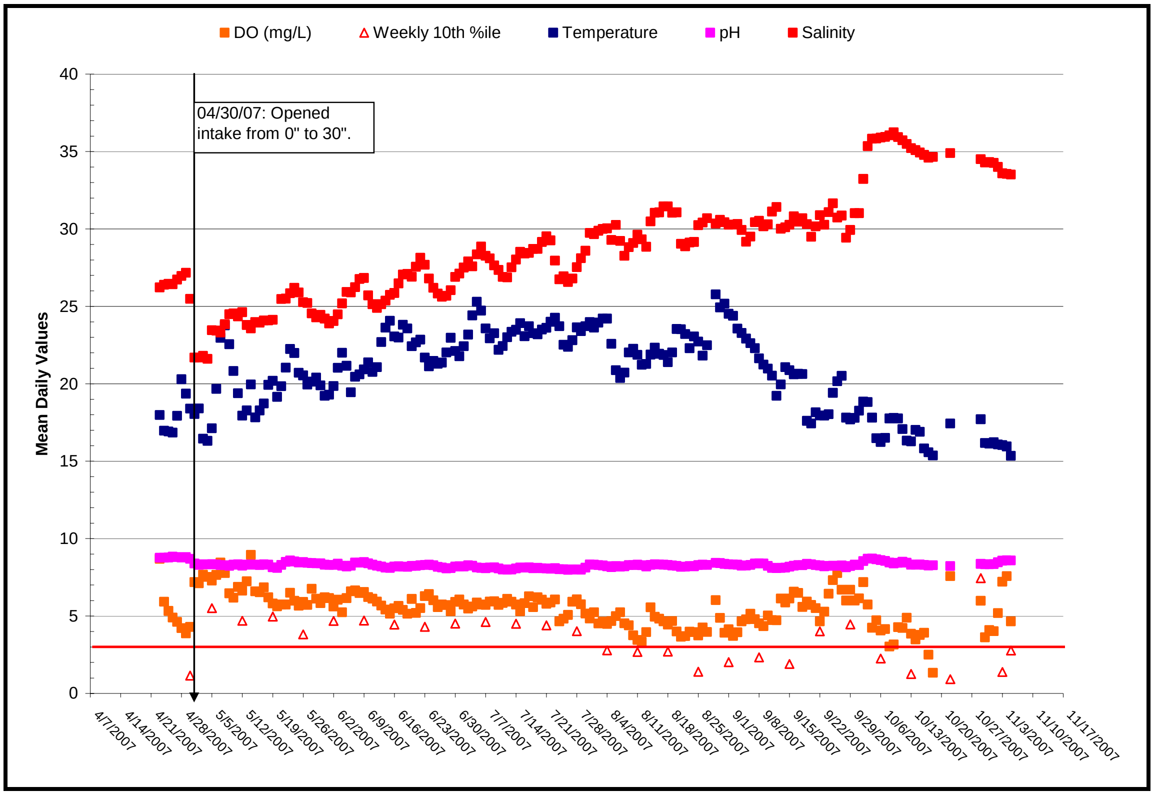


Figure A-25: Mean Values of Pond A2W for All Water Quality Parameters

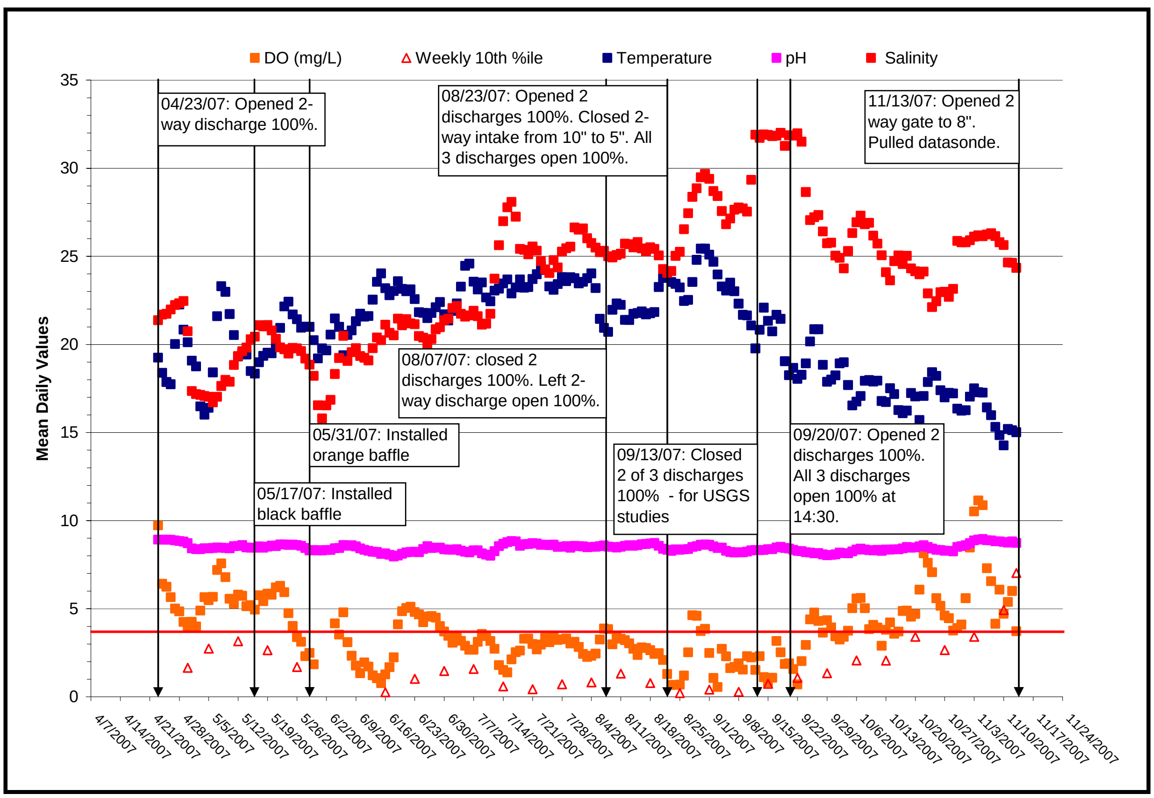


Figure A-26: Mean Values of Pond A3W for All Water Quality Parameters

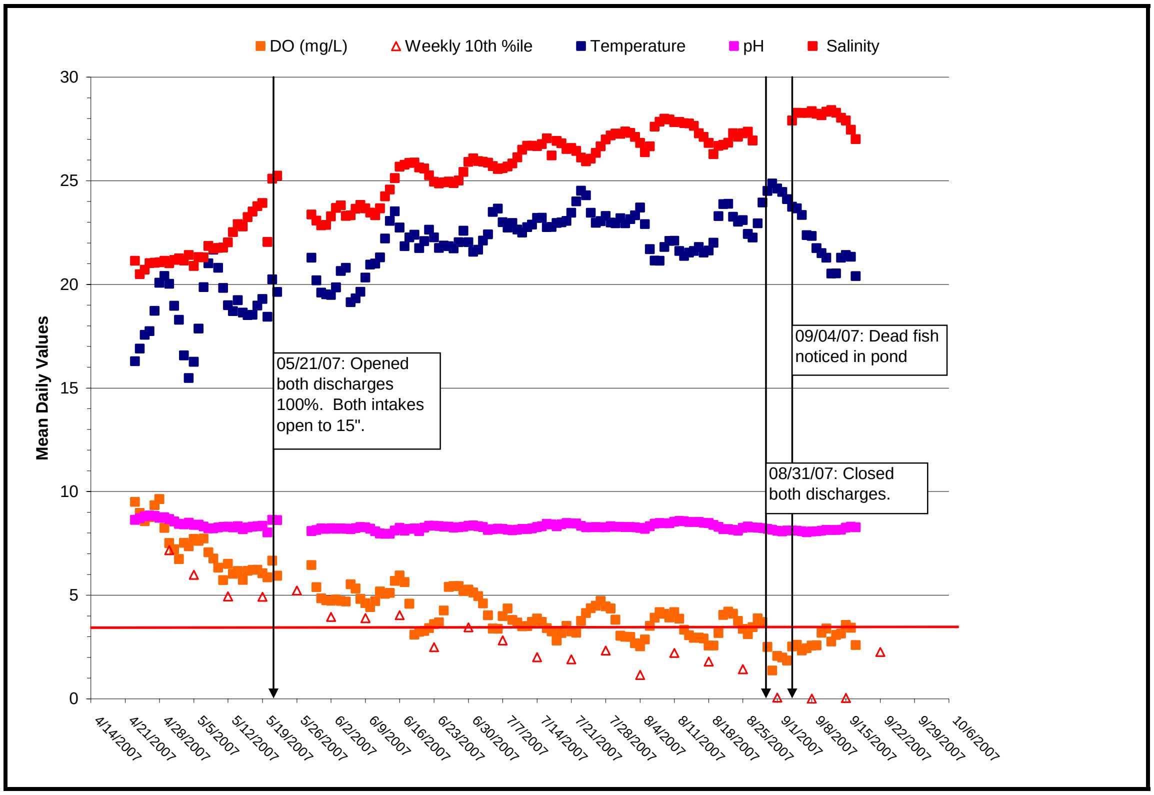


Figure A-27: Mean Values of Pond A5 for All Water Quality Parameters

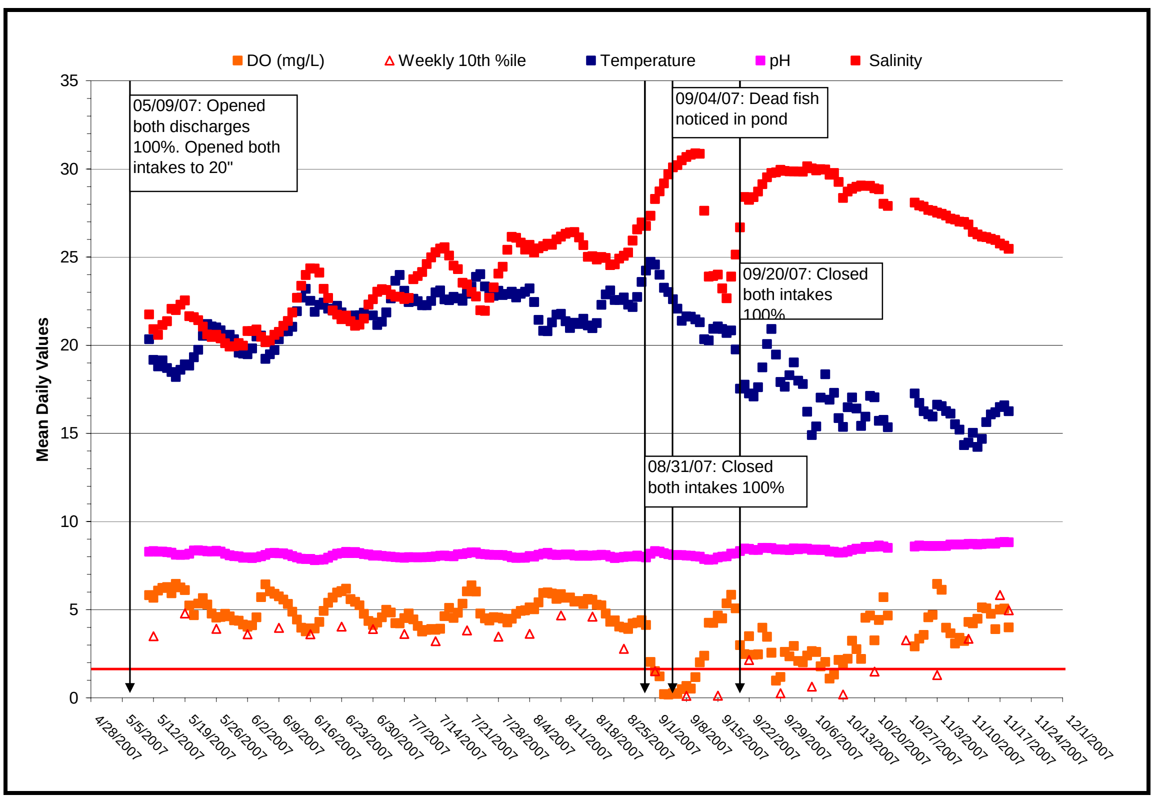


Figure A-28: Mean Values of Pond A7 for All Water Quality Parameters

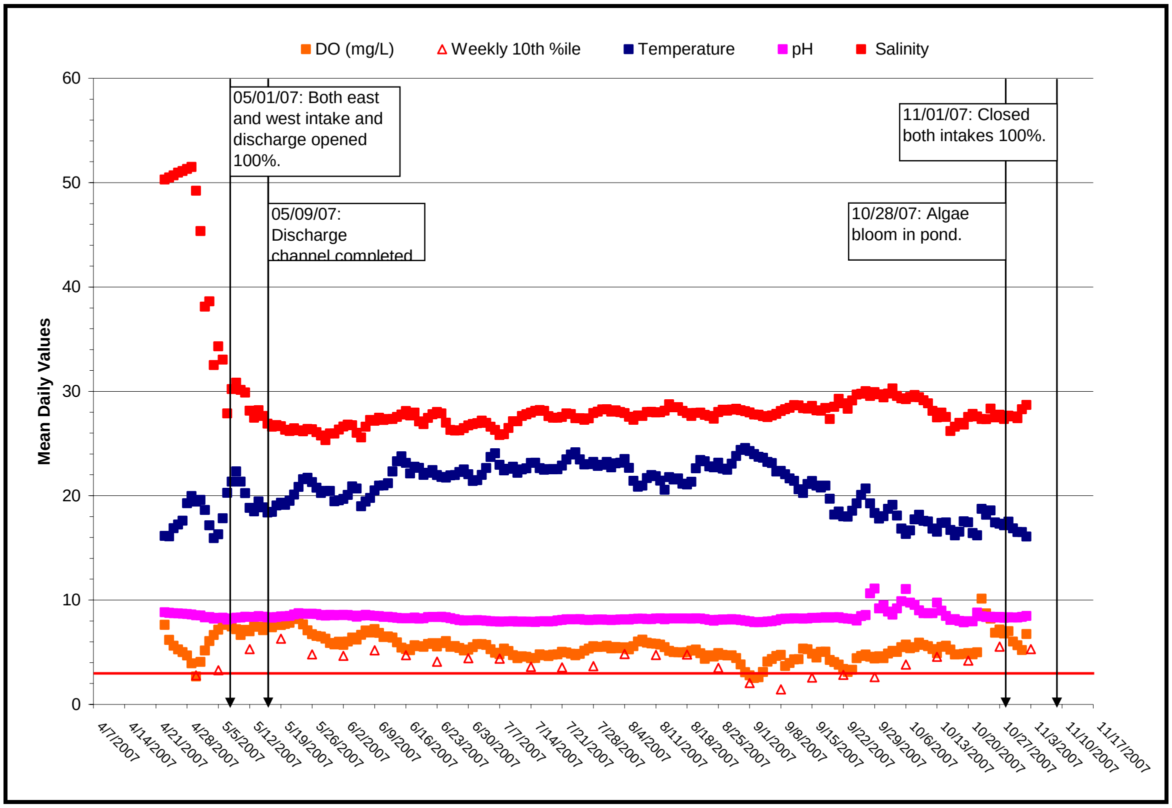


Figure A-29: Mean Values of Pond A14 for All Water Quality Parameters

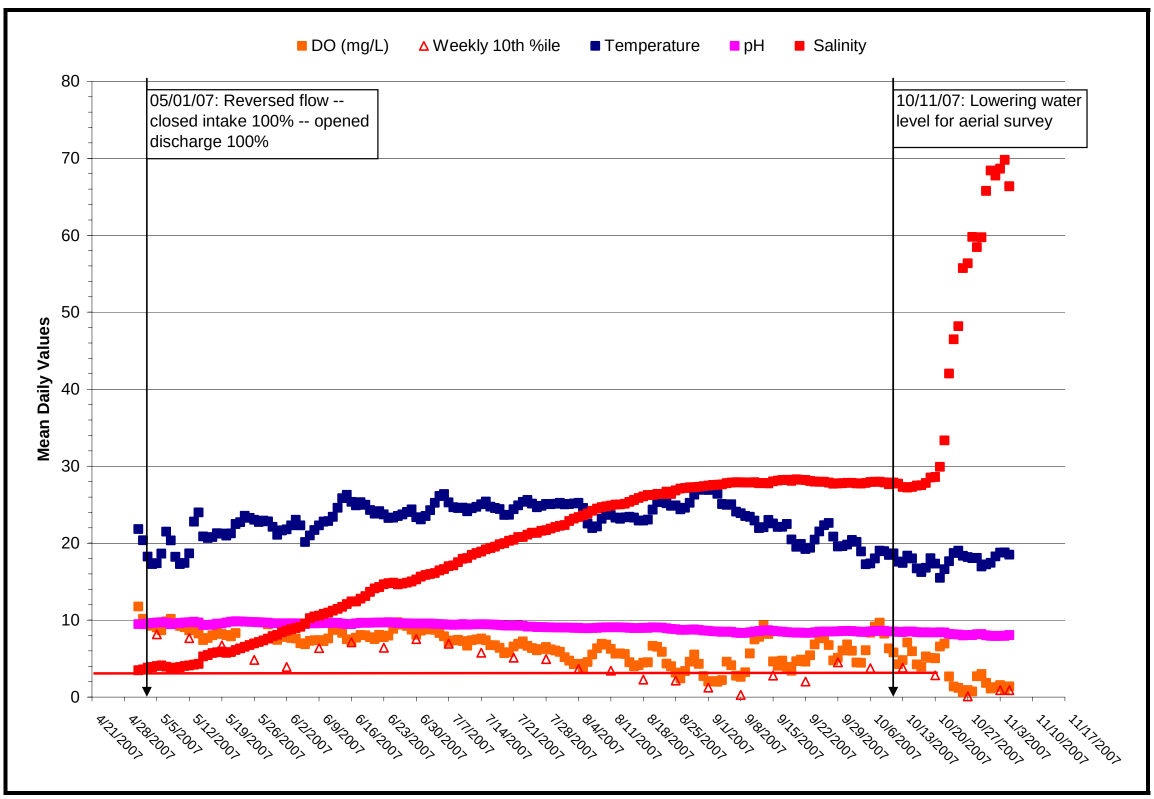
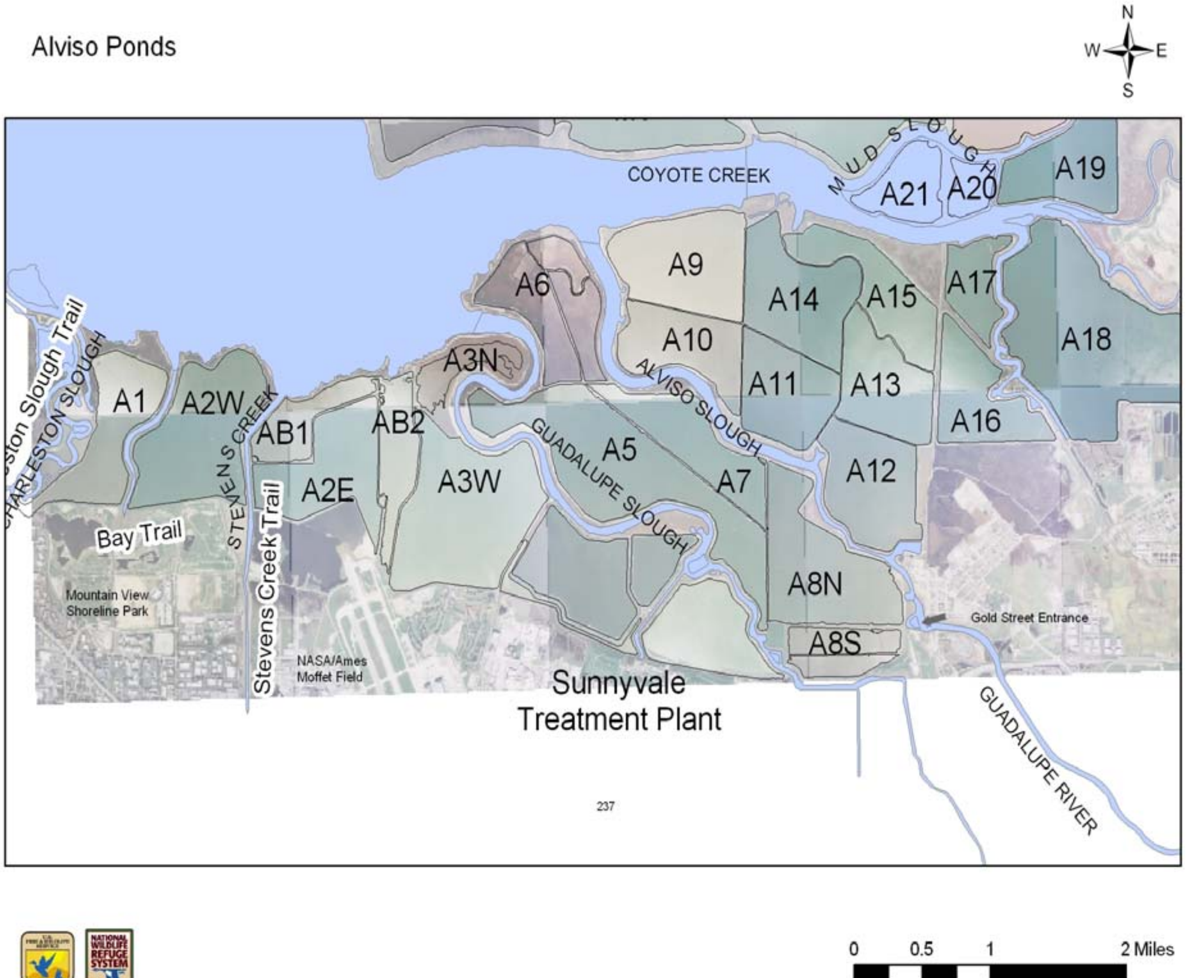


Figure A-30: Mean Values of Pond A16 for All Water Quality Parameters

Appendix B
Water Management Operation Plan
Pond System A2W

Pond System A2W Water Management Operation Plan – Alviso System 2008



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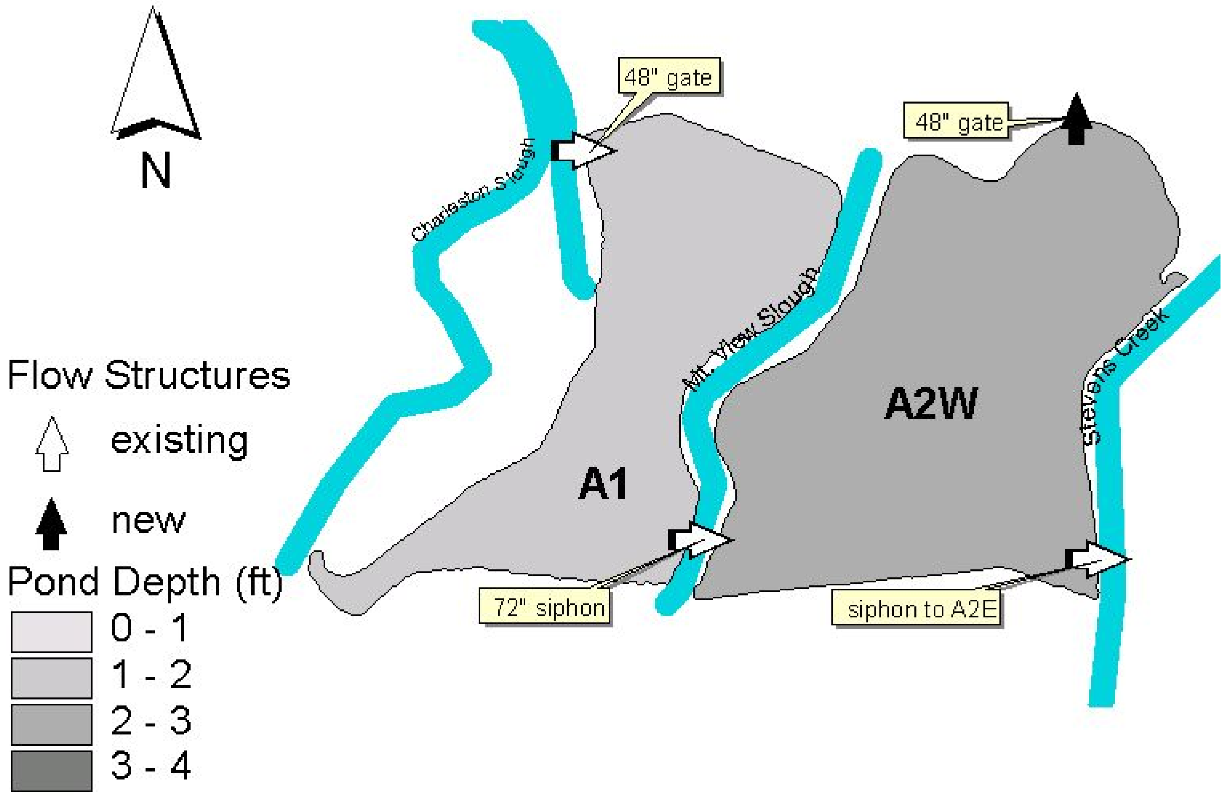


Objectives

Maintain full tidal circulation through ponds A1 and A2W while maintaining discharge salinities to the Bay at less than 40 ppt and meet the other water quality requirements in the Water Board's Waste Discharge Permit. This program will also include monitoring for pH, dissolved oxygen, temperature, avian botulism, and potential for inorganic mobilization.

Structures

The A2W system includes the following structures needed for water circulation in the ponds:

- Existing 48" gate intake at A1 from lower Charleston Slough
- New NGVD gauge at A1
- Existing 72" siphon under Mountain View Slough between A1 and A2W
- Existing staff gauge (no datum) at A1
- New 48" gate outlet structure with 24' weir box at A2W to the Bay
- New NGVD gauge at A2W
- Note that existing siphon to A2E should be closed

System Description

The intake for the A2W system is located at the northwest end of pond A1 and includes one 48" gate from lower Charleston Slough near the Bay. The system outlet is located at the north end of pond A2W, with one 48" gate to the Bay. The flow through the system proceeds from the intake at A1 though the 72" siphon under Mountain View Slough to A2W. An existing siphon under Stevens Creek to Pond A2E was used for salt pond operations. It should remain closed for normal operations, though it is available for unforeseen circumstances.

Operations of the A2W system should require little active management of gate openings to maintain appropriate flows. Summer and winter operations are described below to indicate predicted operating levels during the dry and wet seasons. The system will discharge when the tide is below 3.6 ft. MLLW.

Summer Operation

The summer operation is intended to provide circulation flow to makeup for evaporation during the summer season. The average total circulation inflow is approximately 19 cfs, or 38 acre-feet/day, with an outlet flow of about 14 cfs (28 acre-feet/day). The summer operation would normally extend from May through October.

Summer Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
A1	277	-1.8	-0.4	2.0
A2W	429	-2.4	-0.5	NA

Summer Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
A1 intakes	50	19
A2W	100	48
Weir	-1.2 ft NGVD	6 boards

Water Level Control

The water level in A2W is the primary control for the pond system. The outlet at A2W includes both a control gate and control weir. Either may be used to limit flow through the system. The system flow is limited by the outlet capacity. Normal operation would have the outlet gates fully open, and the weir set at elevation -1.2 ft NGVD, approximately 0.7 feet below the normal water level. The normal water level in A2W should be at -0.5 ft NGVD in summer. The level may vary by 0.2 due to the influence of weak and strong tides.

The A1 intake gate can be adjusted to control the overall flow though the system. The maximum water level in either A1 or A2W should generally be less than 1.2 ft NGVD. This is to maintain freeboard on the internal levees, limit wind wave erosion, and to preserve existing islands within the system used by nesting birds.

Design Water Level Ranges

Pond	Design Water Level Elev. (ft, NGVD)	Maximum Water Elev. (ft, NGVD)	Maximum Water Level (ft, Staff Gage)	Minimum Water Elev. (ft, NGVD)	Minimum Water Level (ft, Staff Gage)
A1	-0.4	1.2	3.6	-0.6	1.8
A2W	-0.5	1.1	NA	-0.7	NA

The minimum and maximum water levels are based on our observations in the ponds for the period 2005.

There is no existing staff gage in pond A2W. Therefore, there is no record of existing minimums and maximums. Based on system hydraulics, pond A2W would typically be about 0.1 feet below pond A1.

100 Percent Coverage Water Level

Pond	Design Water Level Elev. (ft, NGVD)	100 % Coverage Water Elev. (ft, NGVD)	100 % Coverage Water Level (ft, Staff Gage)
A1	-0.4	-0.7	1.7
A2W	-0.5	NA	NA

The 100 percent coverage values represent the estimated water level which begins to expose part of the pond bottom area. Lower water levels would expose large areas of the pond bottom to drying and may cause odor problems.

Salinity Control

The summer salinity in the system will increase from the intake at A1 to the outlet at A2W, due to evaporation within the system. The design maximum salinity for the discharge at A2W is 40 ppt. The intake flow at A1 should be increased when the salinity in A2W is close to 35 ppt. If the gate at A1 is fully open, the flow can be increased by lowering the weir elevation at the A2W outlet structure. Increased flow will increase the water level in A2W. Water levels above elevation 1.1 ft NGVD should be avoided as they may increase wave erosion of the levees.

Dissolved Oxygen and pH Control

If summer monitoring shows that DO levels in discharges from the Pond A2W fall below a 10^{th} percentile of 3.3 mg/L (calculated on a calendar weekly basis), the FWS will conduct within-pond monitoring and notify and consult with the Water Board as to which Best Management Practices described below for increasing dissolved oxygen levels in discharge water should be implemented:

1. Increase the flows in the system by opening the A1 inlet further. If increased flows are not possible, open the A2W gate to allow the pond to become fully muted or partially muted tidal system until pond DO levels revert to levels at or above conditions in the Creek.

2. Set in a series of flow diversion baffles at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake.

3. Cease nighttime discharges due to diurnal pattern.

4. Close discharge gates completely until DO levels meet standards.

5. Close discharge gates completely for a period of time each month when low tides occur primarily at night.

6. Mechanically harvest dead algae.

To help minimize significant downtime on continuous monitoring devices used for DO and pH, the FWS will:

1. Have an extra monitor on hand, in case there is a break down.
2. Get a loaner unit through Hydrolab (within a week), if the extra monitor is being used.
3. Work with Hydrolab to insure a quick repair of monitors (within 2 weeks).

Avian botulism

Avian botulism outbreaks most typically occur in late summer/early fall when warm temperatures and an abundance of decaying organic matter (vegetation and invertebrates) combine to present ideal conditions for the anaerobic soil bacterium *Clostridium botulism* along water bodies. If summer monitoring shows that DO levels in the pond drop the BMPs listed under the section on Dissolved Oxygen and pH Control will be implemented to increase the DO. Monitoring of weather for long periods of hot, dry, windless days during late August and early September will trigger on the ground monitoring for any signs of botulism. FWS will be in contact with the adjacent landowners such as the San Jose and Sunnyvale Treatment plants to determine if botulism is occurring on their ponds. Additionally, if any bird carcasses in the ponds or nearby receiving waters are observed, they will be promptly collected and disposed of.

Winter Operation

The winter operation is intended to provide less circulation flow than the summer operation. Evaporation is normally minimal during the winter. The winter operation is intended to limit large inflows during storm tide periods and to allow rain water to drain from the system.

The average total circulation inflow is approximately 9 cfs, or 18 acre-feet/day, with an outlet flow of about 9 cfs (18 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.

Winter Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
A1	277	-1.8	-0.6	1.8
A2W	429	-2.4	-0.6	NA

Winter Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
A1 intakes	30	12
A2W	100	48
Weir	-1.2 ft NGVD	6 boards

Water Level Control

The water level in A2W is the primary control for the pond system. The system flow is limited by the both the intake and outlet capacities. Normal winter operation would have the intake gate partially open to reduce inflow during extreme storm tides. Water levels in the ponds are controlled by the outlet weir setting. The normal winter water level in A2W should be at -0.6 ft NGVD, approximately 0.6 ft above the outlet weir. The pond water level may vary by 0.2 ft due to the influence of weak and strong tides, and over 0.5 ft due to storms

During winter operations, the water levels should not fall below the outlet weir elevation. If the elevation does decrease in April, it may be necessary to begin summer operation in April instead of May.

During winter operations, if the water levels exceed approximately 1.2 ft NGVD, the A1 intake should be closed to allow the excess water to drain. Note that without rainfall or inflow, it will take approximately 3 weeks to drain 1.0 ft from the ponds.

Salinity Control

The winter salinity in the system may decrease from the intake at A1 to the outlet at A2W, due to rainfall inflows within the system, which may exceed winter evaporation. During very wet winters, the intake salinities and system salinities may decrease to as low as 11 ppt.

Monitoring

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

Weekly Monitoring Program

Location	Parameter
A1 intakes	Salinity
A1	Depth, Salinity, Observations
A2W	Depth, Salinity, Observations

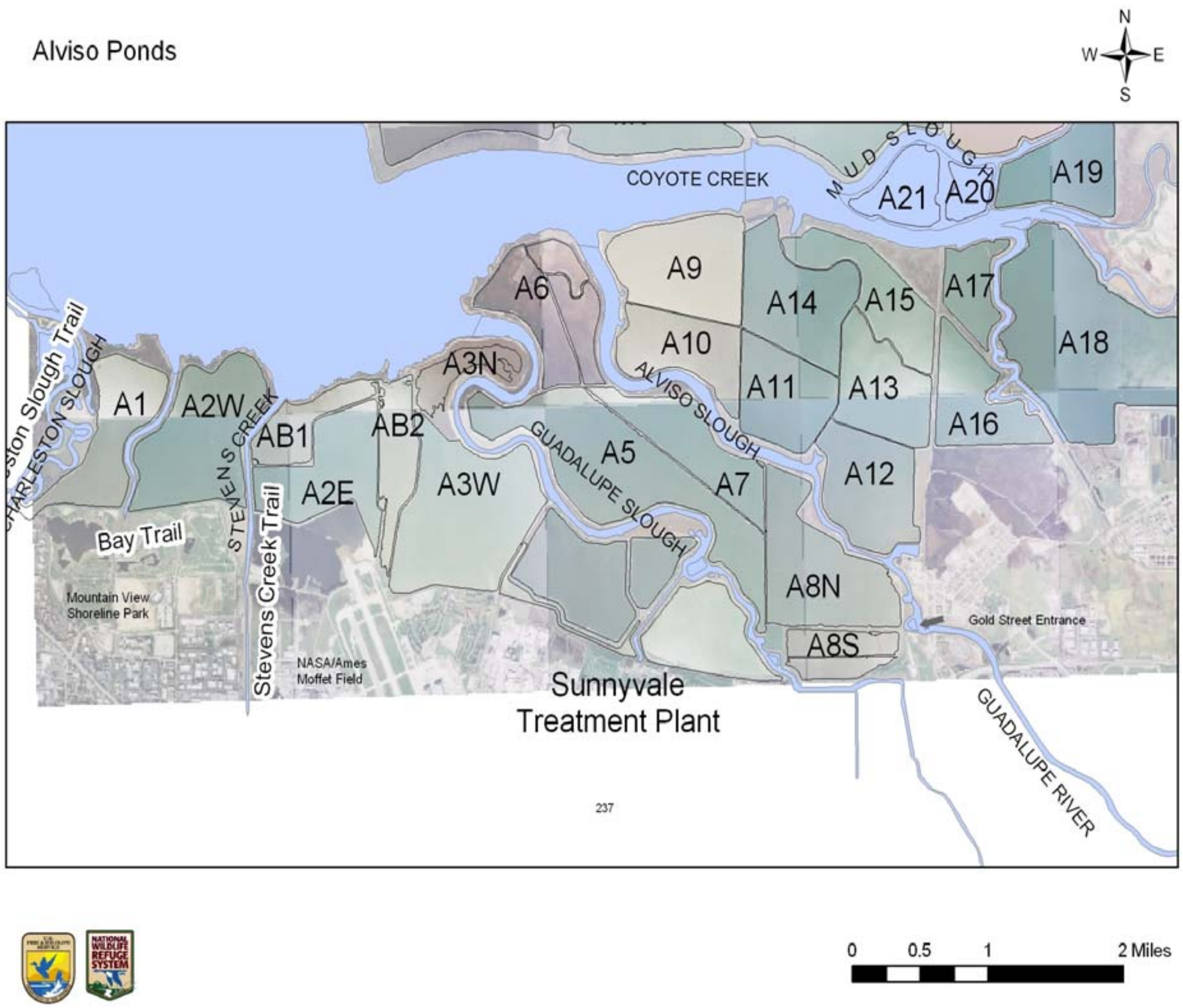
The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the formal monitoring listed below.

Additional monitoring required by the RWQCB discharge permit includes the following:

Location	**Frequency**	**Parameters**
A2W(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity

APPENDIX C
WATER MANAGEMENT OPERATION PLAN
POND SYSTEM A3W

Pond System A3W Water Management Operation Plan – Alviso System 2008



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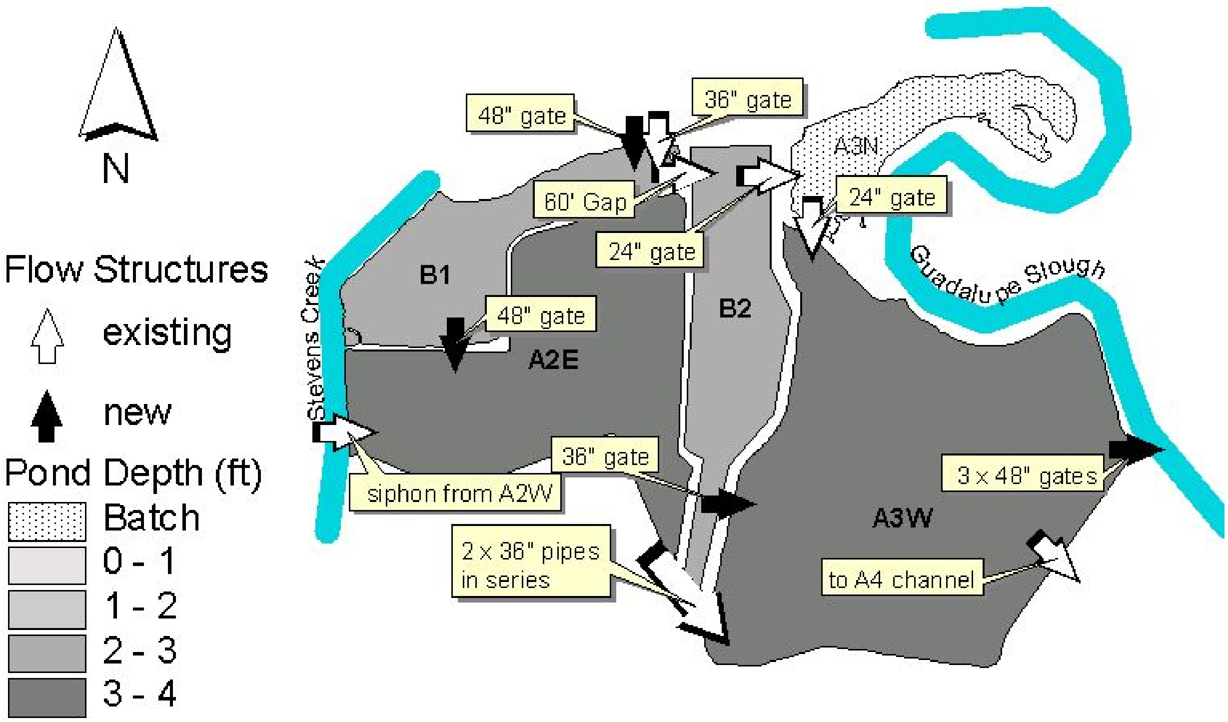


Objectives

Maintain full tidal circulation through ponds B1, B2, A2E, and A3W while maintaining discharge salinities to Guadalupe Slough at less than 40 ppt and meet the other water quality requirements in the Water Board's Waste Discharge Permit. This program will also include monitoring for pH, dissolved oxygen, temperature, avian botulism, and potential for inorganic mobilization.

Maintain pond A3N as a seasonal pond. If results of wildlife population monitoring indicate the need, operate pond A3N as a batch pond (i.e., at higher salinities).

Maintain water surface levels lower in winter to reduce potential overtopping of A3W levee adjacent to Moffett Field.

Structures

The A3W system includes the following structures needed for water circulation in the ponds:

- Existing 36" gate intake structure from the Bay at B1
- New 48" gate intake from the Bay at B1
- New 48" gate between B1 and A2E
- Existing 2x36" pipes in series between A2E and A3W (no gates).
- New 36" gate between B2 and A3W

- Existing gap between B1 and B2
- Existing 24” gate between B2 and A3N
- Existing 24” gate between A3N and A3W
- New 3x48” gate outlet at A3W to Guadalupe Slough. Two are outlet only, and one allows both inflow and outflow, no weir.
- Existing staff gauges at all ponds and new NGVD gauges at all ponds
- Existing siphon from A2W is closed, but available if needed

System Description

The intake for the A3W system is located at the northeast end of pond B1 and includes one 48” gate and one 36” gate from the bay. The system outlet is located at the eastern end of pond A3W, with three 48” gates into Guadalupe Slough. The normal flow through the system follows two parallel routes. One route is from B1 to A2E and then to A3W. The second route is from B1 to B2 and then to A3W. Flow through the two routes is controlled by gates from B1 to A2E, and from B2 to A3W. There is an uncontrolled gap between ponds B1 and B2. Due to the size of pond A2E, the majority of the flow should be through A2E, with only minimal circulation flow through B2. Because of the flap gates and the relative elevation of the tides and pond levels, all gravity intake flow would occur at high tide, and all outflows would occur when the tide is below 3.1 ft. MLLW.

Pond A3N is a seasonal pond. Therefore, for the ISP period, the pond will be drained, and left to partially fill with rain water during the winter and to evaporate completely during the summer. However, if wildlife population monitoring during this period indicates the need for additional higher salinity habitats or if mercury monitoring indicates an increase in methylation due to reduction in water levels, Pond A3N could be operated as a batch pond.

Summer Operation

The summer operation is intended to provide circulation flow to makeup for evaporation during the summer season. The average total circulation inflow is approximately 35 cfs, or 70 acre-feet/day. The summer operation would normally extend from May through October.

Summer Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
B1	142	-0.8	0.4	1.3
B2	170	-0.6	0.4	1.3
A2E	310	-3.1	-0.5	3.0
A3W	560	-3.2	-1.4	2.1
A3N	163	-1.4	NA	NA

* Pond B1 and B2 will be operated at lower water levels on an experimental basis in an attempt to improve shorebird nesting and foraging habitat. If water quality or operations are jeopardized from lower water levels in Ponds B1 or B2, the system will be reverted back to normal operating levels.

Summer Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
B1 west intake	100	36
B1 east intake	90	39
B1 – A2E	38	14
A2E – A3W	NA	NA
B2 – A3W	41	12
A3W outlets	100	48
A3W intake	0	0
B2 – A3N	0	0
A3N – A3W	0	0

Water Level Control

The water level in A3W is the primary control for the pond system. The system flow is limited by the outlet capacity. Normal operation would have the outlet gates fully open. Water levels are controlled by the intake gate settings. The normal water level in A3W should be at -1.4 ft NGVD (2.1 ft gage). The level may vary by 0.2 due to the influence of weak and strong tides.

The flow through B2 to A3W is only required to maintain circulation through B2. This circulation prevents local stagnant areas which may create areas of higher salinity or algal blooms. The gate can be set to a standard opening and would not require frequent adjustment.

The flow through A2E is controlled by the gates from B1 to A2E. The partial gate opening is to maintain the water level differences between A2E and B1. Again, the setting should not require frequent adjustment. There are no gates on the culverts between A2E and A3W, therefore the water levels in those two ponds should be similar.

The B1 intake gates should be adjusted to control the overall flow though the system. The water levels in B1 (and therefore B2) will change due to the change in inflow. The maximum water level should be less than 1.6 ft NGVD (2.5 ft gage). This is to maintain freeboard on the internal levees and limit wind wave erosion.

Water levels in Pond AB1 and Pond AB2 of Pond A3W system will be lowered during the summer to improve shorebird nesting and foraging habitat

<u>Design Water Level Ranges</u>

Pond	Design Water Level Elev. (ft, NGVD)	Maximum Water Elev. (ft, NGVD)	Maximum Water Level (ft, Staff Gage)	Minimum Water Elev. (ft, NGVD)	Minimum Water Level (ft, Staff Gage)
B1	0.4	1.6	2.5	-0.2	0.7
B2	0.4	1.6	2.5	-0.2	0.7
A2E	-0.5	-0.2	3.3	-2.0	1.5
A3W	-1.4	-0.2	3.3	-2.0	1.5
A3N	NA	NA	2.6	NA	NA

The minimum and maximum water levels are based on our observations in the ponds for the period 2005.

<u>100 Percent Coverage Water Level</u>

Pond	Design Water Level Elev. (ft, NGVD)	100 % Coverage Water Elev. (ft, NGVD)	100 % Coverage Water Level (ft, Staff Gage)
B1	0.4	-0.8	0.1
B2	0.4	-0.8	0.1
A2E	-0.5	-2.2	1.3
A3W	-1.4	-2.7	0.8
A3N	NA	NA	NA

The 100 percent coverage values represent the estimated water level which begins to expose part of the pond bottom area. Lower water levels would expose large areas of the pond bottom to drying and may cause odor problems.

Salinity Control

The summer salinity in the system will increase from the intake at B1 to the outlet at A3W, due to evaporation within the system. The design maximum salinity for the discharge at A3W is 40 ppt. The intake flow at B1 should be increased when the salinity in A3W is close to 35 ppt. Increased flow will increase the water level in A3W. Water levels in pond A3W above elevation -0.2 ft NGVD (3.3 ft gauge) should be avoided as they may increase wave erosion of the levees.

Dissolved Oxygen and pH Control

If summer monitoring shows that DO levels in discharges from the Pond A3W fall below a 10^{th} percentile of 3.3 mg/L (calculated on a calendar weekly basis), the FWS will accelerate receiving water monitoring to weekly, conduct within-pond monitoring and notify and consult with the Water Board as to which Best Management Practices described below for increasing dissolved oxygen levels in discharge water should be implemented:

1. Increase the flows in the system by opening the B1 inlet further. If increased flows are not possible, open A3W gate to allow the pond to become fully muted tidal or partially muted tidal system until pond DO levels revert to levels at or above conditions in the slough.

2. Set in a series of flow diversion baffles at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake.

3. Cease nighttime discharges due to diurnal pattern.

4. Close discharge gates completely until DO levels meet standards.

5. Close discharge gates completely for a period of time each month when low tides occur primarily at night.

6. Mechanically harvest dead algae.

.

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 discharging pH on the receiving waters will be performed. If it is determined that discharge is impacting receiving water pH outside the range of 6.5 – 8.5, ammonia monitoring in the receiving water will be done to document potential toxicity affects associated with unionized ammonia.

To help minimize significant downtime on continuous monitoring devices used for DO and pH, the FWS will:

1. Have an extra monitor on hand, in case there is a break down.
2. Get a loaner unit through Hydrolab (within a week), if the extra monitor is being used.
3. Work with Hydrolab to insure a quick repair of monitors (within 2 weeks).

Avian botulism

Avian botulism outbreaks most typically occur in late summer/early fall when warm temperatures and an abundance of decaying organic matter (vegetation and invertebrates) combine to present ideal conditions for the anaerobic soil bacterium *Clostridium botulism* along water bodies. If summer monitoring shows that DO levels in the pond drop the BMPs listed under the section on Dissolved Oxygen and pH Control will be implemented to increase the DO. Monitoring of weather for long periods of hot, dry, windless days during late August and early September will trigger on the ground monitoring for any signs of botulism. FWS will be in contact with the adjacent landowners such as the San Jose and Sunnyvale Treatment plants to determine if botulism is occurring on their ponds. Additionally, if any bird carcasses in the ponds or nearby receiving waters are observed, they will be promptly collected and disposed of.

Winter Operation

The winter operation is intended to provide less circulation flow than the summer operation. Evaporation is normally minimal during the winter. The winter operation is intended to limit large inflows during storm tide periods and to allow rain water to drain from the system.

The average total circulation inflow is approximately 16 cfs, or 32 acre-feet/day, with an average outflow of approximately 18 cfs (36 acre-feet per 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.

Winter Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
B1	142	-0.8	0.9	1.8
B2	170	-0.6	0.9	1.8
A2E	310	-3.1	-1.8	1.7
A3W	560	-3.2	-1.8	1.7
A3N	163	-1.4	NA	NA

Winter Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
B1 west intake	34	10
B1 east intake	25	10
B1 – A2E	16	6
A2E – A3W	NA	NA
B2 – A3W	21	6
A3W outlets	100	48
A3W intake	0	0
B2 – A3N	0	0
A3N – A3W	0	0

Water Level Control

The water level in A3W is the primary control for the pond system. The system flow is limited by the outlet capacity. Normal winter operation would have the A3W outlet gates fully open. Water levels are controlled by the intake gate settings. The normal water level in A3W should be near -1.8 ft NGVD (1.7 ft gage). The level may vary by 0.2 due to the influence of weak and strong tides, storm tides, and rainfall inflows.

The water levels in A3W are important to prevent levee overtopping. The south levee separates the pond from the Moffit Field drainage ditch. The levee is low, and subject to erosion with high water levels. If the water level in A3W exceeds -0.6 ft NGVD (2.9 ft gage), the intake gate openings at B1 should be reduced or closed. The internal gates from B1 and B2 would also require adjustment. If the water level in A3W exceeds -0.2 ft NGVD (3.3 ft gauge), the intake gates and all internal gates should be closed until the water level in A3W is back to normal. This may take one to two weeks depending on the weather. The water levels in the upper ponds (B1, B2, and A2E) may increase due to rainfall during this period, but are less sensitive to higher water levels. The historic high elevation in pond A3W has been -0.2 ft NGVD (3.3 ft gauge).

Whenever possible, the system intake at B1 should be closed in anticipation of heavy winter rains and high tides. When the system intake gates are closed, the internal gates from B1 to A2E and from B2 to A3W should also be closed to keep water in the upper ponds (B1 and B2).

There is no gate between A2E and A3W. During winter operations with reduced flows through the system, the A2E water level will be similar to the A3W water level. During the summer, the higher flows will establish approximately 0.9 ft difference due to the head loss through the two pipes in series which connect the ponds.

Salinity Control

The winter salinity in the system may decrease from the intake at B1 to the outlet at A3W, due to rainfall inflows within the system, which may exceed winter evaporation. During very wet winters, the intake salinities and system salinities may decrease to as low as 10 ppt.

Monitoring

The system monitoring will require weekly site visits to record pond and intake readings, as well as to inspect water control structures, siphons and levees. The monitoring parameters are listed below.

<u>Weekly Monitoring Program</u>

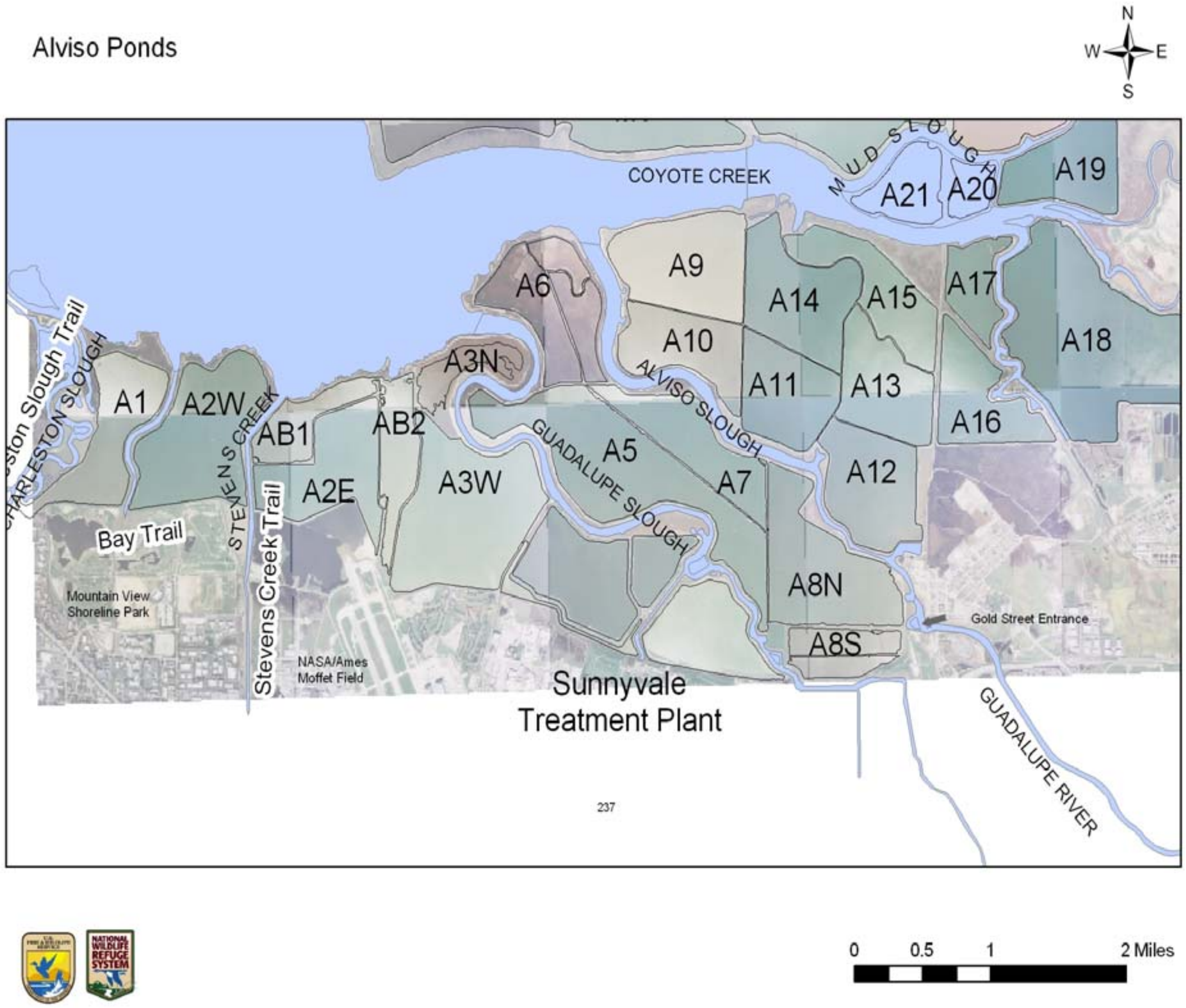
Location	Parameter
B1 intakes	Salinity
B1	Depth, Salinity, Observations
B2	Depth, Salinity, Observations
A2E	Depth, Salinity, Observations
A3W	Depth, Salinity, Observations
A3N	Depth, Salinity, Observations

The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the formal monitoring listed below.

Location	**Frequency**	**Parameters**
A3W(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Guadalupe.Sl.	Monthly (May –Oct)	DO, pH, Temp., Salinity

APPENDIX D
WATER MANAGEMENT OPERATION PLAN
POND SYSTEM A7

Pond System A7 Water Management Operation Plan – Alviso System 2008



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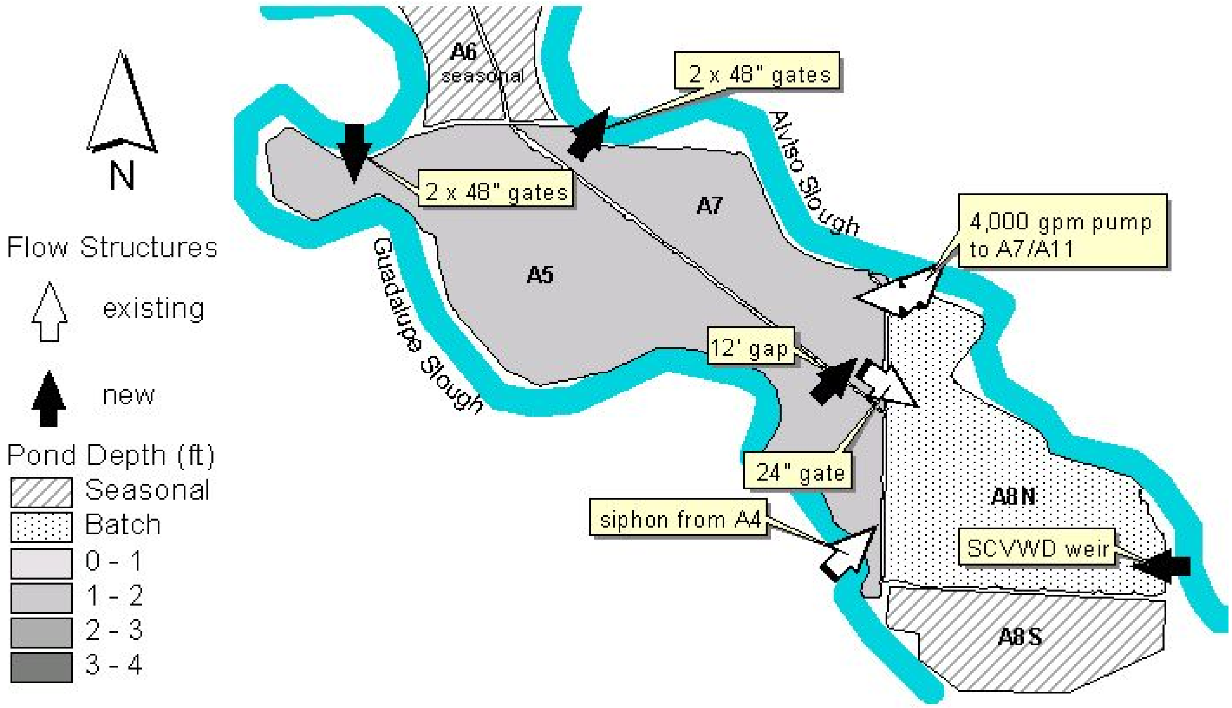


Objectives

Maintain full tidal circulation through ponds A5 and A7 while maintaining discharge salinities to the Bay at less than 40 ppt. and meet the other water quality requirements in the Water Board's Waste Discharge Permit. This program will also include monitoring for pH, dissolved oxygen, temperature, avian botulism, and potential for inorganic mobilization.

Maintain pond A8 as a seasonal pond. If results of wildlife population monitoring indicate the need, operate pond A8 as a batch pond.

Maintain option to reverse flows if needed.

Structures

The A7 system includes the following structures needed for water circulation in the ponds:

- New 2x48" gate intake at A5 from Guadalupe Slough.
- New cut at the internal levee between A5 and A7.
- Existing 24" control gate from A7 to A8.
- Existing 4,000 gpm pump from A8 to A11. Outlet piping modified to allow discharge to A7 in addition to A11.
- New 2x48" gate outlet with two 24' weir boxes at A7 into Alviso Slough.
- Existing staff gages in both ponds; New NGVD gages at both new structures
- Existing siphon from A4 should generally be closed.

System Description

The intake for the A7 system is located at the northwest end of pond A5 and includes two 48-inch gates from lower Guadalupe Slough. The system outlet is located at the northeast end of pond A7, with two 48-inch gates to Alviso Slough. In normal operations, the flow through the system starts at the intake at A5 though a cut at the southern end of the levee between A5 and A7, and flows out to Alviso Slough through two 48-inch outlet gates. Both sections of Pond A8 (A8N and A8S) will be operated as seasonal ponds filling with winter rains and generally drying during the summer, though some makeup water can be added A8N through a 24-inch gate from pond A7. If necessary in the future, following bird monitoring studies, A8N may be operated as a batch pond with higher salinities. Because of the flap gates and the relative elevation of the tides and pond levels, all gravity intake flow would occur at high tide, and all outflows would occur when the tide is below 4.8 ft. MLLW.

The Santa Clara Valley Water District has built a weir at Pond A8 to allow flood overflow waters from Alviso Slough to enter the pond during 10-year storm events, or greater. Some flood waters may overtop the levees and enter Ponds A5 and A7 as well. When the ponds fill with floodwaters, the District is responsible for pumping the pond waters back to Alviso Slough or Guadalupe Slough and monitoring for increased mercury levels in sediments/pond waters.

The A7 system can be reversed by changing the control gate settings to intake water from Alviso Slough and release water to Guadalupe Slough. However, the reversed flow circulation does not have an outlet weir at the A5 structure. Therefore, the A5 gates must be set to maintain minimum water levels in the ponds. The reverse flow condition may conflict with the seasonal intake limitations from Alviso Slough for salmonid protection. The A7 structure should not be used as an intake during the winter (December to April) to avoid entrainment of migrating juvenile salmonids. The only reason to use the reversed flow circulation is to avoid potential poor water quality conditions in Guadalupe Slough, if necessary.

The A7 system would require very limited management, unless Pond A8 is operated as a batch pond. Note that for a period of time, the SCVWD may request to continue pumping waters from Pond A4 into Pond A5. At that time, they will provide data analyses and operations plans to assure that A7 discharges will remain below our RWQCB permit limits.

Summer Operation

The summer operation is intended to provide circulation flow to makeup for evaporation during the summer season. The average total circulation inflow is approximately 22 cfs, or 44 acre-feet/day, with an outlet flow of about 16 cfs (32 acre-feet/day). The summer operation would normally extend from May through October.

Summer Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
A5	615	-0.6	0.4	1.9
A7	256	-0.5	0.4	1.8
A8N	406	-3.4	NA	NA

Summer Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
A5 intakes	30	12
A7 outlet	100	48
A7/A8	0	0
Weir	0.0 ft NGVD	6 boards

Water Level Control

The bottom elevations in both Ponds A5 and A7 are similar and inlet/outlet capacities are the same. Due to the levee cut to connect the ponds, the water levels are similar in both ponds. Flows will occur in either direction based on inlet and outlet gate settings

The A5 intake gate should be adjusted to control the overall flow though the system. The maximum water level in either A5 or A7 should be less than 0.6 ft NGVD (2.1 ft gage). This is to maintain freeboard on the internal levees and limit wind wave erosion. The maximum water level is also intended to preserve the existing islands within the ponds used by nesting birds.

If a significant volume of water is to be diverted into Pond A8, the A5 inlet structure may need to be open further to bring in additional water. Diversions to A8 are controlled by the A7 to A8 gate. One foot of water in A8 (400 acre-feet) represents approximately 0.5 ft in A5/A7, or the net inflow to the system over approximately 10 days.

Design Water Level Ranges

Pond	Design Water Level Elev. (ft, NGVD)	Maximum Water Elev. (ft, NGVD)	Maximum Water Level (ft, Staff Gage)	Minimum Water Elev. (ft, NGVD)	Minimum Water Level (ft, Staff Gage)
A5	0.4	0.6	2.1	-0.3	1.2
A7	0.4	0.6	2.0	-0.3	1.1
A8N	NA	-1.0	0.5	-2.5	-1.0

The minimum and maximum water levels are based on our observations in the ponds for the period 2004.

100 Percent Coverage Water Level

Pond	Design Water Level Elev. (ft, NGVD)	100 % Coverage Water Elev. (ft, NGVD)	100 % Coverage Water Level (ft, Staff Gage)
A5	0.4	0.2	1.4
A7	0.4	0.2	1.4
A8N	NA	-2.5	-1.0

The 100 percent coverage values represent the estimated water level which begins to expose part of the pond bottom area. Lower water levels would expose large areas of the pond bottom to drying and may cause odor problems.

Salinity Control

The summer salinity in the system will increase from the intake at A5 to the outlet at A7 due to evaporation within the system. The design maximum salinity for the discharge at A7W is 40 ppt. The intake flow at A5 should be increased if the salinity in A7 is close to 35 ppt. Increased flow may increase the water level in A7. Water levels above elevation 0.6 ft NGVD (2.1 ft gage) should be avoided as they may increase wave erosion of the levees.

Dissolved Oxygen and pH Control

If summer monitoring shows that DO levels in discharges from the Pond A7 fall below a 10^{th} percentile of 3.3 mg/L (calculated on a calendar weekly basis), the FWS will accelerate receiving water monitoring to weekly, conduct within-pond monitoring and notify and consult with the Water Board as to which Best Management Practices described below for increasing dissolved oxygen levels in discharge water should be implemented:

1. Increase the flows in the system by opening the A5 inlet further. If increased flows are not possible, open both the A5 and A7 gates to allow the ponds to become fully muted tidal or partially muted tidal systems until pond DO levels revert to levels at or above conditions in the Creek.

2. Set in a series of flow diversion baffles at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake.

3. Cease nighttime discharges due to diurnal pattern.

4. Close discharge gates completely until DO levels meet standards.

5. Close discharge gates completely for a period of time each month when low tides occur primarily at night.

6. Mechanically harvest dead algae.

7. Install solar aeration circulators.

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 discharging pH on the receiving waters will be performed. If it is determined that discharge is impacting receiving water pH outside the range of 6.5 – 8.5, ammonia monitoring in the receiving water will be done to document potential toxicity affects associated with unionized ammonia.

To help minimize significant downtime on continuous monitoring devices used for DO and pH, the FWS will:

1. Have an extra monitor on hand, in case there is a break down.
2. Get a loaner unit through Hydrolab (within a week), if the extra monitor is being used.
3. Work with Hydrolab to insure a quick repair of monitors (within 2 weeks

Avian botulism

Avian botulism outbreaks most typically occur in late summer/early fall when warm temperatures and an abundance of decaying organic matter (vegetation and invertebrates) combine to present ideal conditions for the anaerobic soil bacterium *Clostridium botulism* along water bodies. If summer monitoring shows that DO levels in the pond drop the BMPs listed under the section on Dissolved Oxygen and pH Control will be implemented to increase the DO. Monitoring of weather for long periods of hot, dry, windless days during late August and early September will trigger on the ground monitoring for any signs of botulism. FWS will be in contact with the adjacent landowners such as the San Jose and Sunnyvale Treatment plants to determine if botulism is occurring on their ponds. Additionally, if any bird carcasses in the ponds or nearby receiving waters are observed, they will be promptly collected and disposed of.

Winter Operation

The winter operation is intended to provide circulation flow and to allow rain water to drain from the system. The proposed winter operation would be the same as the summer operation.
The average total circulation inflow is approximately 22 cfs, or 44 acre-feet/day, with an outlet flow of about 23 cfs (46 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.

<u>Winter Pond Water Levels</u>

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
A5	615	-0.6	0.4	1.8
A7	256	-0.5	0.4	1.8
A8N	406	-3.4	NA	NA

Winter Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
A5 intakes	30	12
A7 outlet	100	48
A7/A8	0	0
Weir	0.0 NGVD	6 boards

Water Level Control

Consideration may be made to reduce water levels in the ponds prior to winter storm events and high tides by closing or reducing the gate opening at the A5 inlet structure. Approximately three weeks would be needed to reduce pond levels by 0.5 feet. Water levels above elevation 0.6 ft NGVD (2.1 ft gage) should be avoided as they may increase wave erosion of the levees.

Salinity Control

The winter salinity in the system may decrease from the intake at A5 to the outlet at A7, due to rainfall inflows within the system, which may exceed winter evaporation. During very wet winters, the intake salinities and system salinities may decrease below 10 ppt.
If the SCVWD weir has a significant flood spill into pond A8N, the flood water may overflow into A5 and A7. The intake gates and outlet gates can be opened to the maximum after the flood event to aid in lowering the water level in the system. The volume in A8 below the elevation of the cross levee will not drain by gravity, and will need to be pumped from the ponds by the SCVWD.

Monitoring

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

Weekly Monitoring Program

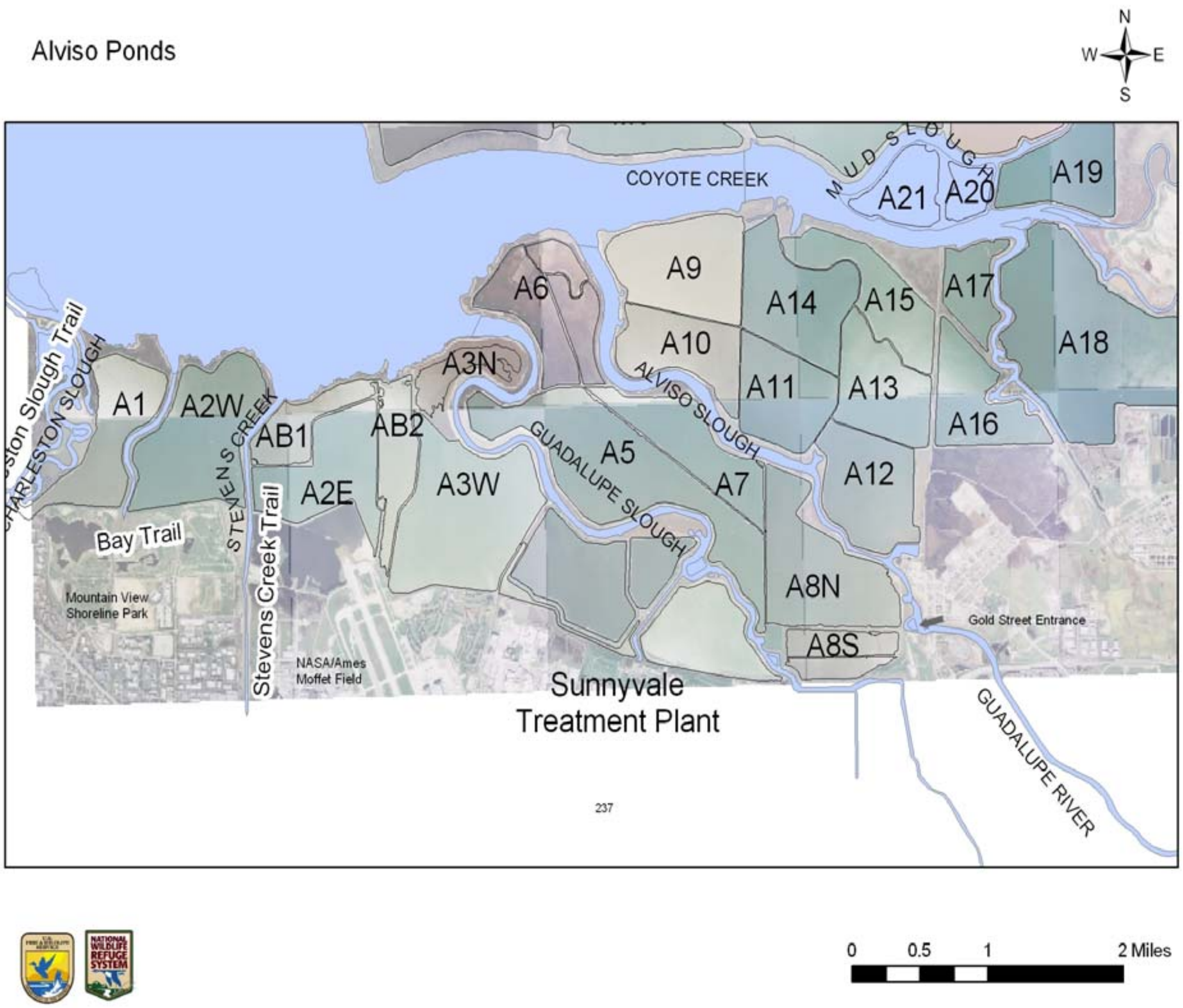
Location	Parameter
A5 intake	Salinity
A5	Depth, Salinity, Observations
A7	Depth, Salinity, Observations
A8	Depth, salinity, observations

The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the formal monitoring listed below.

Location	**Frequency**	**Parameters**
A7(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Alviso Slough	Monthly (May –Oct)	DO, pH, Temp., Salinity

APPENDIX E
WATER MANAGEMENT OPERATION PLAN
POND SYSTEM A14

Pond System A14 Water Management
Operation Plan – Alviso System
2008



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- **A. Weekly Monitoring**
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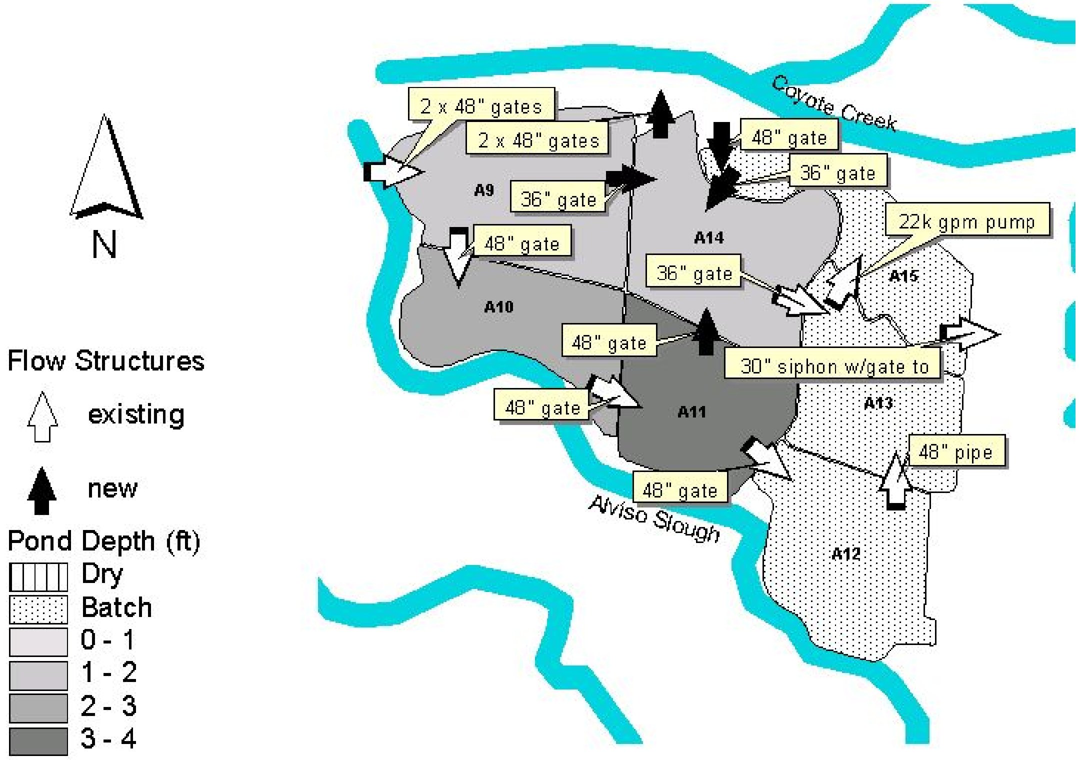


Objectives

Maintain full tidal circulation through pondsA9, A10, A11 and A14, while maintaining discharge salinities to Coyote Creek at less than 40 ppt. and meet the other water quality requirements in the Water Board's Waste Discharge Permit. This program will also include monitoring for pH, dissolved oxygen, temperature, avian botulism, and potential for inorganic mobilization.

Maintain pond A12, A13 and A15 as batch ponds. Operate batch ponds at a higher salinity (80 – 120 ppt) during summer to favor brine shrimp.

Minimize entrainment of salmonids by limiting inflows during winter.

Maintain water surface levels lower in winter to reduce potential overtopping.

Structures

The A14 system includes the following structures needed for water circulation in the ponds:

- Existing 2 x 48" gate intake at A9 from Alviso Slough
- Existing 48" gate between A9 and A10
- New 48" gate between A9 and A14
- Existing 48" gate between A10 and A11
- New 48" gate between A11 and A14
- Existing 48" gate between A11 and A12
- Existing 48" gate between A12 and A13
- Existing 36" gate between A14 and A13
- Existing siphon from A15 to A16
- Existing 36" gate between A15 and A14
- Existing 22,000 gpm pump from A13 to A15
- New 48" gate intake at A15 from Coyote Creek
- New 2 x 48" gate outlet at A14 into Coyote Creek
- Existing staff gages at all ponds and new NGVD gages at all pond

System Description

The intake for the A14 system is located at the northwest end of pond A9 and includes two 48" gates from Alviso slough near the Bay. The system outlet is located at the northerly end of A14, with two 48" gates into Coyote Creek. The normal flow through the system proceeds from the intake at A9, then flow through A10 and A11 to the outlet at A14. Because of the flap gates and the relative elevation of the tides and pond levels, all gravity intake flow would occur at high tide, and all outflows would occur when the tide is below 6.2 ft. MLLW.

Ponds A12, A13, and A15 will be operated as batch ponds to control the individual pond volumes and salinities.

Operations of the A14 system should require little active management of gate openings to maintain appropriate circulation flows. Summer and winter operations are described below to indicate predicted operating levels during the dry and wet seasons.

Summer Operation

The summer operation is intended to provide circulation flow to makeup for evaporation during the summer season. The average total circulation inflow is approximately 38 cfs, or 17,000 gpm. The summer operation would normally extend from May through October.

Summer Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
A9	385	-0.2	2.0	3.3
A10	249	-0.8	1.8	3.0
A11	263	-1.8	1.3	2.5
A14	341	-0.0	0.9	2.3
A12	309	-2.0	1.2	2.5
A13	269	-1.1	1.1	2.6
A15	249	0.7	2.8	4.1

Summer Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
A9 north intake	100	48
A9 south intake	100	48
A9 – A10	100	48
A10 – A11	100	48
A11 – A14	100	48
A14 west outlet	100	48
A14 east outlet	100	48
A9 – A14	0	0
A11 – A12	0	0
A12 – A13	0	0
A13 – A15	0	0
A14 – A13	0	0
A15 – A14	0	0
A15 intake	0	0
A14 weir	0.0 ft NGVD	

Water Level Control

The water level in A14 is the primary control for the pond system. The system flow is limited by the inlet capacity at A9. Normal operation would have the outlet gates fully open. Water levels are controlled by the weir elevation at A14. The A14 weir should be at approximately 0.0 ft NGVD to maintain the summer water level in A14 at 0.9 ft NGVD (2.3ft gage). The level may vary by 0.2 due to the influence of weak and strong tides.

The route of flow through this system will be from A9 to A10 to A11 to A14. The partial gate opening is to maintain the water level differences between the ponds. Again, the setting should not require frequent adjustment.

The A9 intake gates should be adjusted to control the overall flow though the system. The water levels in A9 will change due to the change in inflow. The maximum water level should be less than 2.5 ft NGVD (3.8 ft gage). This is to maintain freeboard on the internal levees and limit wind wave erosion.

100 Percent Coverage Water Level

Pond	Design Water Level Elev. (ft, NGVD)	100 % Coverage Water Elev. (ft, NGVD)	100 % Coverage Water Level (ft, Staff Gage)
A9	2.0	1.6	3.0
A10	1.8	-0.2	1.0
A11	1.3	-0.2	1.0
A14	0.9	0.8	2.2
A12	NA	-0.3	1.0
A13	NA	-0.3	1.2
A15	NA	0.7	2.0

The 100 percent coverage values represent the estimated water level which begins to expose part of the pond bottom area. Lower water levels would expose large areas of the pond bottom to drying and may cause odor problems. The 100 percent coverage water levels are intended for information purposes only. Operating the ponds at or near minimum depths will interfere with circulation through the ponds and may cause significant increases in pond salinity during the summer evaporation season.

Pond A14 has an estimated average bottom elevation at 0.0 ft NGVD, but portions of the pond bottom are at 0.8 ft NGVD, very near the design water level. The proposed A14 water level may need to be adjusted to maintain circulation through the pond.

Salinity Control

The summer salinity in the system will increase from the intake at A9 to the outlet at A14, due to evaporation within the system. The design maximum salinity for the discharge at A14 is 40 ppt. The intake flow at A9 should be increased when the salinity in A14 is close to 35 ppt. Increased flow may increase the water level in A14. The inflow at A9 is constrained by the tide level in Alviso Slough since the intake gates would be fully open. The inflow can be increased by partially opening the gate from A9 to A14 to lower the water level in A9 and increase the gravity inflow. This would increase the flow through A9 and A14, but reduce the flow through A10 and A11. Water levels in pond A14 above elevation 2.0 ft NGVD (3.4 ft gage) should be avoided as they may increase wave erosion of the levees.

Batch Ponds A12, A13, and A15 summer salinity levels should be between 80 and 120 ppt, to provide habitat for brine shrimp and wildlife which feeds on brine shrimp. Salinity control for the batch ponds will require both inflows to replace evaporation losses, and outflows to reduce the salt mass in the ponds and create space for lower salinity inflows. Ponds A12 and A13 would operate as a single unit, with inflow from pond A11 and outflows to either A14 or A15. The water levels in A12 and A13 would generally be between the elevations in A11 (higher than A12) and A14 (lower than A13). Therefore inflows from A11 and outflows to A14 would be by gravity. Outflows from A13 can also be pumped to A15. Water can also be pumped from A13 to A14 if the water levels are low in A13. Pond A15 would operate as a separate batch pond at a higher elevation than A13 or A14. Inflows to A15 would be pumped from A13, or by gravity from Coyote Creek with the supplemental intake at A15. Outflows from A15 would be by gravity to either A14 or A16.

The batch pond operation will require the outflow of approximately 0.5 to 0.7 ft of water from the batch ponds each month. This represents approximately 25 percent of the pond volumes. Because the A14 and A17 system have no circulation inflows from Coyote Creek for dilution from December through April, the outflow would normally occur during the evaporation season. The preferred operation would be to maintain the pond salinities near 100 ppt as much as possible, with consistent small outflows during the month from A13 to A14 and from A15 to A16. These gates should only be open approximately 10 percent, depending on the pond water levels. The inflows would be on a batch basis to add approximately 0.5 ft to the batch ponds about every other week.

If the salinity levels are high in A14 or A16, it may be necessary to reduce or suspend outflows from the batch ponds and allow the batch pond salinity to increase until later in the season. The salinity in a batch pond will increase by approximately 10 ppt per month during the peak evaporation months. If the batch pond salinities are high at the end of the circulation season, it may be necessary to continue to operate the A16 system with reverse flow during the winter continue to dilute the batch pond outflows until a reasonable salinity level is reached to start the next evaporation season.

Dissolved Oxygen and pH Control

If summer monitoring shows that DO levels in discharges from the Pond A14 fall below a 10^{th} percentile of 3.3 mg/L (calculated on a calendar weekly basis), the FWS will accelerate receiving water monitoring to weekly, conduct within-pond monitoring and notify and consult with the Water Board as to which Best Management Practices described below for increasing dissolved oxygen levels in discharge water should be implemented:

1. Increase the flows in the system by opening the A9 inlet further. If increased flows are not possible, open A14 gates to allow the ponds to become fully muted tidal or partially muted tidal systems until pond DO levels revert to levels at or above conditions in the Creek.

2. Set in a series of flow diversion baffles at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake.

3. Cease nighttime discharges due to diurnal pattern.

4. Close discharge gates completely until DO levels meet standards.

5. Close discharge gates completely for a period of time each month when low tides occur primarily at night.

6. Mechanically harvest dead algae.

7. Install solar aeration circulators.

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 discharging pH on the receiving waters will be performed. If it is determined that discharge is impacting receiving water pH outside the range of 6.5 – 8.5, ammonia monitoring in the receiving water will be done to document potential toxicity affects associated with unionized ammonia.

To help minimize significant downtime on continuous monitoring devices used for DO and pH, the FWS will:

1. Have an extra monitor on hand, in case there is a break down.
2. Get a loaner unit through Hydrolab (within a week), if the extra monitor is being used.
3. Work with Hydrolab to insure a quick repair of monitors (within 2 weeks).

Avian botulism

Avian botulism outbreaks most typically occur in late summer/early fall when warm temperatures and an abundance of decaying organic matter (vegetation and invertebrates) combine to present ideal conditions for the anaerobic soil bacterium *Clostridium botulism* along water bodies. If summer monitoring shows that DO levels in the pond drop the BMPs listed under the section on Dissolved Oxygen and pH Control will be implemented to increase the DO. Monitoring of weather for long periods of hot, dry, windless days during late August and early September will trigger on the ground monitoring for any signs of botulism. FWS will be in contact with the adjacent landowners such as the San Jose and Sunnyvale Treatment plants to determine if botulism is occurring on their ponds. Additionally, if any bird carcasses in the ponds or nearby receiving waters are observed, they will be promptly collected and disposed of.

Winter Operation

During the winter season, the A9 intake will be closed to prevent entrainment of migrating salmonids. The winter operation period would normally extend from December through May 31. During the winter, rainfall would tend to increase the water levels in the ponds. The water levels in the ponds would be set by a weir at the outfall or adjustment of the control gates to avoid flooding of the existing internal levees or wave damage to the levees. The gates from A9, A10, and A11 will be partially open to allow rainfall to drain to A14. Excess water from rainfall would be drained from the system after larger storms and will require additional active management to adjust the interior control gates.

Winter Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
A9 north intake	0	0
A9 south intake	0	0
A9 – A10	100	48
A10 – A11	100	48
A11 – A14	100	48
A14 west outlet	0	0
A14 east outlet	100	48
A9 – A14	0	0
A11 – A12	0	0
A12 – A13	0	0
A13 – A15	0	0
A14 – A13	0	0
A15 – A14	0	0
A15 intake	0	0

Winter Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
A9	385	-0.2	1.5	2.8
A10	249	-0.8	1.5	2.7
A11	263	-1.8	1.4	2.6
A14	341	-0.0	1.3	2.7
A12	309	-2.0	1.4	2.7
A13	269	-1.1	1.2	2.7
A15	249	0.7	2.8	4.1

Salinity Control

The winter salinity in the system may decrease from the intake at A9 to the outlet at A14, due to rainfall inflows within the system, which may exceed winter evaporation. During very wet winters, the intake salinities and system salinities may decrease to as low as 11 ppt.

Monitoring

The system monitoring will require weekly site visits to record pond and intake readings, as well as to inspect water control structures, siphons and levees. The monitoring parameters are listed below.

Weekly Monitoring Program

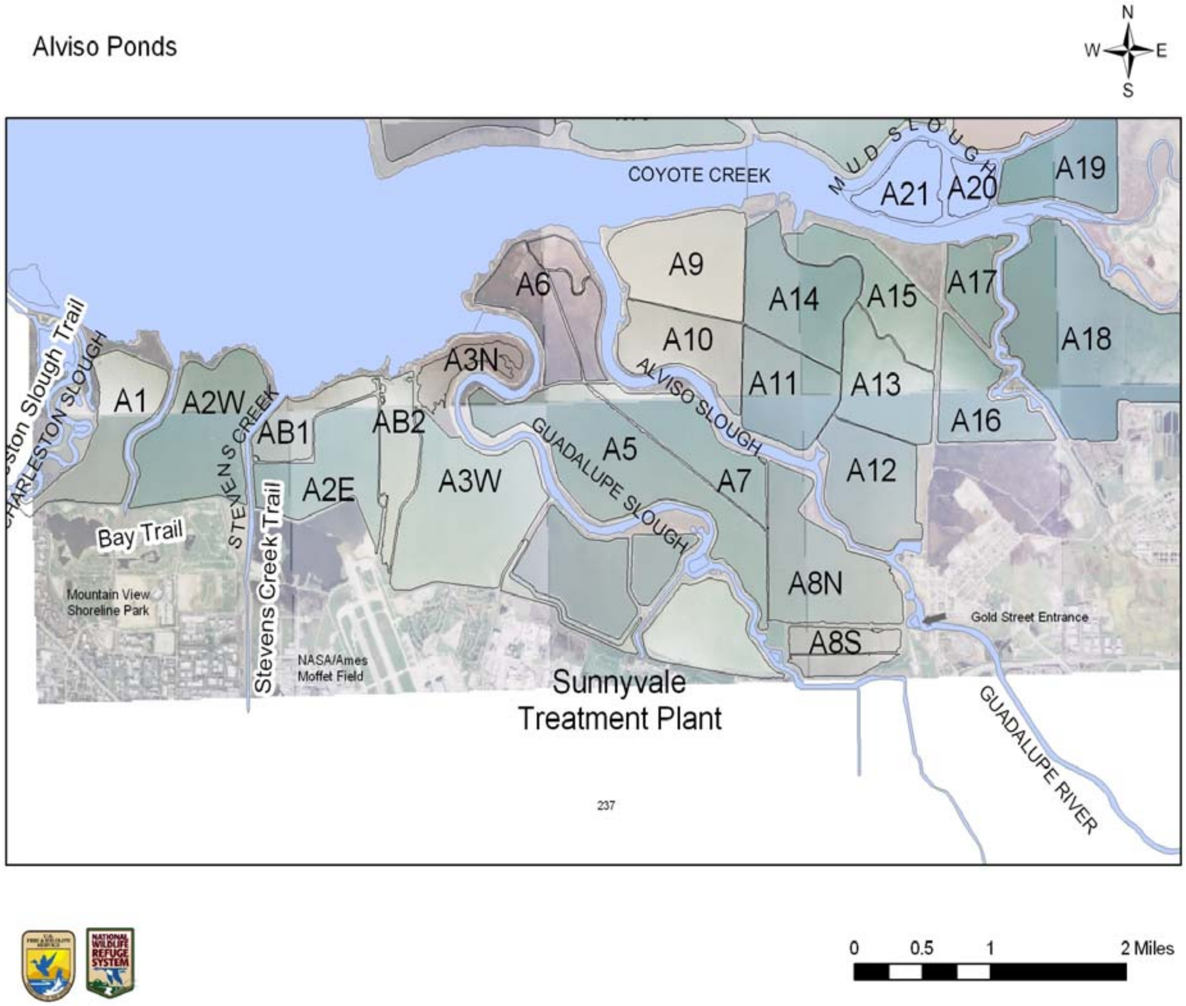
Location	Parameter
A9 intakes	Salinity
A10	Depth, Salinity, Observations
A11	Depth, Salinity, Observations
A14	Depth, Salinity, Observations
A12	Depth, Salinity, Observations
A13	Depth, Salinity, Observations
A15	Depth, Salinity, Observations

The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the formal monitoring listed below.

Location	**Frequency**	**Parameters**
A14(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Coyote Creek	Monthly (May –Oct)	DO, pH, Temp., Salinity

APPENDIX F
WATER MANAGEMENT OPERATION PLAN
POND SYSTEM A16

Pond System A16 Water Management Operation Plan – Alviso System 2008



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Winter Operation **8**

- **A. Water Level Control**
- **B. Salinity Control**

Monitoring **9**

- **A. Weekly Monitoring**
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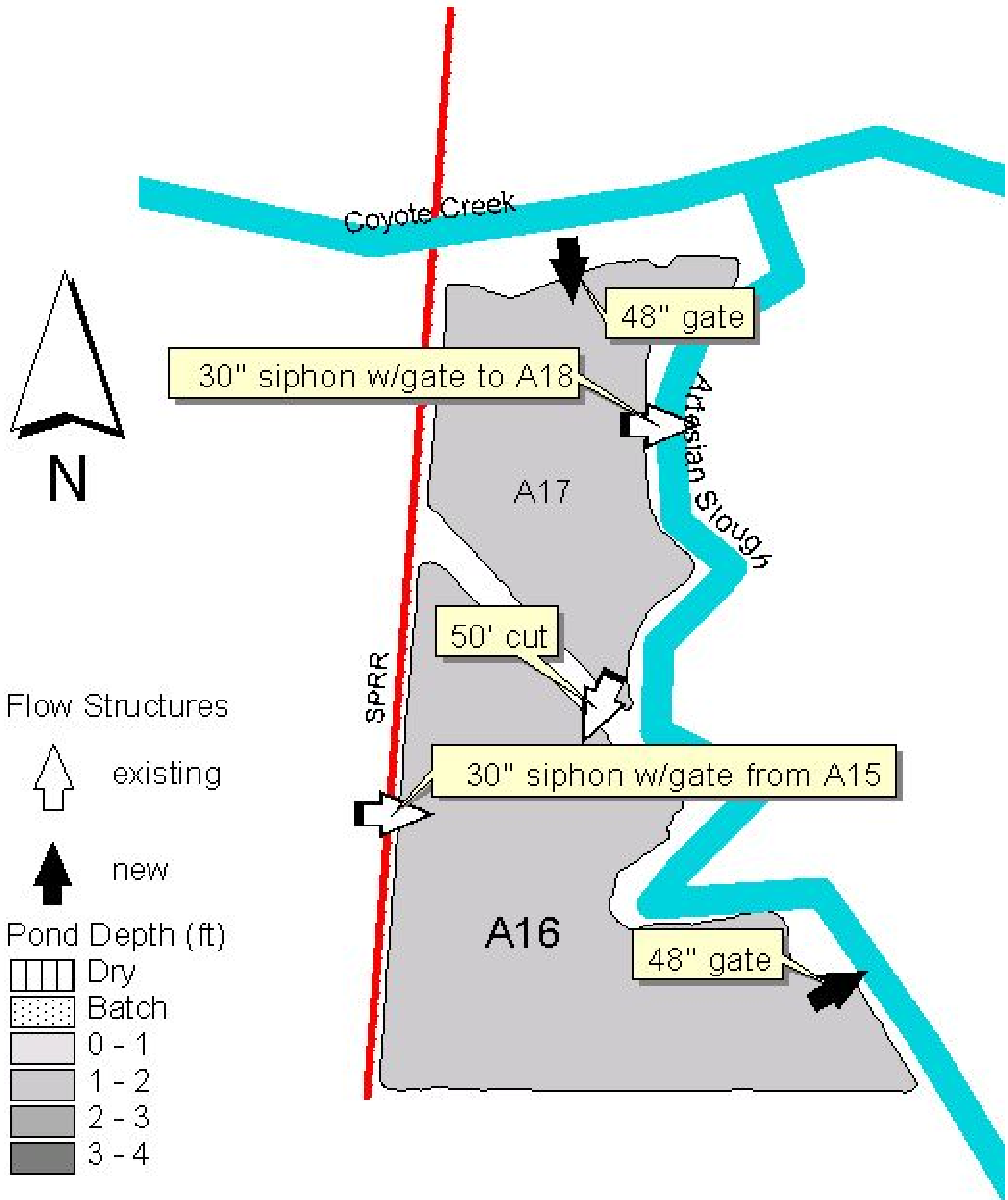

Objectives

Maintain full tidal circulation through ponds A17 and A16 while maintaining discharge salinities to the Artesian Slough lower than 40 ppt. and meet the other water quality requirements in the Water Board's Waste Discharge Permit. This program will also include monitoring for pH, dissolved oxygen, temperature, avian botulism, mercury methylation, and potential for inorganic mobilization.

Minimize entrainment of salmonids by:
Close A17 intake during winter, or
Reverse of intake and outlet flow during winter.

Structures
The A16 system includes the following structures needed for water circulation in the ponds:

- New 48" gate intake at A17 from Coyote Creek
- New 48" gate outlet structure at A16 into Artesian Slough
- Existing siphon between A15 (from system A14) to A16
- Existing gap between A17 and A16
- Existing siphon between A17 and A18
- Existing staff gauges (no datum) , plus new NGVD gauges to be installed

System Description

The intake for the A16 system is located at the northern end of pond A17 and includes one 48" gate from lower Coyote Creek. The system outlet is located at the southeast end of pond A16, with one 48" gate to the Artesian Slough. The flow through the system proceeds from the intake at A17 though a 50' cut in the levee between A17 and A16, then through the 48" gate at the outlet A16. An existing siphon from A15 to A16 will be used to release excess water from ponds A12, A13, and A15 on a batch basis. The existing siphon between A17 and A18 will not be used for system circulation, and may be sealed in the future. A18 will be owned and operated by the City of San Jose.

Operations of the A16 system should require limited active management of gate openings to maintain appropriate flows. Because of the flap gates and the relative elevation of the tides and pond levels, all gravity intake flow would occur at high tide, and all outflows would occur when the tide is below 7.2 ft. MLLW. Summer and winter operations are described below to indicate predicted operating levels during the dry and wet seasons.

Summer Operation

The summer operation is intended to provide circulation flow to makeup for evaporation during the summer season. The average total circulation inflow is approximately 15 cfs, or 6,800 gpm, with an outlet flow of about 12 cfs (5,400 gpm). The summer operation would normally extend from May through October.

<u>Summer Pond Water Levels</u>

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
A17	131	1.1	2.3	1.3
A16	243	0.6	2.3	0.7

<u>Summer Gate Settings</u>

Gate	Setting (% open)	Setting (in, gate open)
A17 intake	100	48
A16 outlet	100	48
A16 weir	1.9 ft NGVD	

Water Level Control

The water level in A16 is the primary control for the pond system. The system flow is limited by the outlet capacity. Normal operation would have the outlet gates fully open, and the water level in A16 would be controlled by the elevation of the outlet weir at A16. The estimated weir elevation would be 1.9 ft NGVD to maintain the pond water level at 2.3 ft NGVD in summer. The level may vary by 0.2 feet during a month due to the influence of weak and strong tides.

The A17 intake gate can be adjusted to control the overall flow though the system. The maximum water level in either A17 or A16 should generally be less than 3.0 ft NGVD during the summer. This is to maintain freeboard on the internal levees and limit wind wave erosion. The maximum historic water level in A16 and A17 has been 3.8 ft NGVD during the winter.

<u>100 Percent Coverage Water Level</u>

Pond	Design Water Level Elev. (ft, NGVD)	100 % Coverage Water Elev. (ft, NGVD)	100 % Coverage Water Level (ft, Staff Gage)
A17	2.3	1.1	0.1
A16	2.3	1.6	0.1

The 100 percent coverage values represent the estimated water level which begins to expose part of the pond bottom area. Lower water levels would expose large areas of the pond bottom to drying and may cause odor problems. The 100 percent coverage water levels are intended for information purposes only. Operating the ponds at or near minimum depths will interfere with circulation through the ponds and may cause significant increases in pond salinity during the summer evaporation season.

Salinity Control

The summer salinity in the system will increase from the intake at A17 to the outlet at A16 due to evaporation within the system. The design maximum salinity for the discharge at A16 is 40 ppt. The discharge permit requires that the discharge salinity not exceed 44 ppt.

The system circulation flow should be increased when the salinity in A16 reaches approximately 35 ppt during the summer. There are two operational measures available to increase the circulation flow. First, the level of the outlet weir can be lowered to lower the pond water level and the gravity inflow to the system. The weir structure includes weir boards on three sides of the structure. In general, the overall weir elevation should not be lowered more than 0.5 ft, but it may be more practical to lower one side by 1.0 ft or less.

The second operational measure to increase the circulation flow would be to adjust the intake gate at the A16 outlet structure to allow inflow from Artesian Slough at high tide. With the A16 intake gate fully open, the overall circulation flow would be approximately double the flow with A17 alone. In addition, the salinity in Artesian Slough at high tide is lower than in Coyote Creek and would directly lower the salinity in A16. The weir level at A16 should be adjusted to increase the outflow from A16 to account for the increased inflow.

The A16 system is intended to be the discharge for flows from pond A15 in the A14 system. A15 is a batch pond with operating salinities in the range of 80 to 120 ppt. Water will be transferred from A15 to A16 to lower the water levels in A15 and provide capacity for lower salinity inflows control the batch pond salinity. The intention is to dilute the higher salinity water with the pond A16 circulation. The siphon from A15 should be approximately 10 to 25 percent open, and the 22,000 gpm pump from A13 to A15 should operate approximately two to 3 days per month. The pump can add approximately 0.4 ft of water to A15 in one day.

Dissolved Oxygen and pH Control

If summer monitoring shows that DO levels in discharges from the Pond A16 fall below a 10^{th} percentile of 3.3 mg/L (calculated on a calendar weekly basis), the FWS will accelerate receiving water monitoring to weekly, conduct within-pond monitoring and notify and consult with the Water Board as to which Best Management Practices described below for increasing dissolved oxygen levels in discharge water should be implemented:

1. Increase the flows in the system by opening the A17 inlet further. If increased flows are not possible, open both the A17 and A16 gates to allow the ponds to become fully

muted tidal or partially muted tidal systems until pond DO levels revert to levels at or above conditions in the Creek.

2. Set in a series of flow diversion baffles at the pond discharge for directing the water from more suitable DO water levels to achieve maximum oxygen uptake.

3. Cease nighttime discharges due to diurnal pattern.

4. Close discharge gates completely until DO levels meet standards.

5. Close discharge gates completely for a period of time each month when low tides occur primarily at night.

6. Mechanically harvest dead algae.

7. Install solar aeration circulators.

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 discharging pH on the receiving waters will be performed. If it is determined that discharge is impacting receiving water pH outside the range of 6.5 – 8.5, ammonia monitoring in the receiving water will be done to document potential toxicity affects associated with unionized ammonia.

To help minimize significant downtime on continuous monitoring devices used for DO and pH, the FWS will:

1. Have an extra monitor on hand, in case there is a break down.
2. Get a loaner unit through Hydrolab (within a week), if the extra monitor is being used.
3. Work with Hydrolab to insure a quick repair of monitors (within 2 weeks).

Avian botulism

Avian botulism outbreaks most typically occur in late summer/early fall when warm temperatures and an abundance of decaying organic matter (vegetation and invertebrates) combine to present ideal conditions for the anaerobic soil bacterium *Clostridium botulism* along water bodies. If summer monitoring shows that DO levels in the pond drop the BMPs listed under the section on Dissolved Oxygen and pH Control will be implemented to increase the DO. Monitoring of weather for long periods of hot, dry, windless days during late August and early September will trigger on the ground monitoring for any signs of botulism. FWS will be in contact with the adjacent landowners such as the San Jose and Sunnyvale Treatment plants to determine if botulism is occurring on their ponds. Additionally, if any bird carcasses in the ponds or nearby receiving waters are observed, they will be promptly collected and disposed of.

Winter Operation

During the winter season, the A17 intake will be closed to prevent entrainment of migrating salmonids in Coyote Creek. The winter operation period would normally extend from November through April. During the winter, rainfall would tend to increase the water levels in the ponds. The inflow and outflow direction of the system will be reversed, where intake at A16 from Artesian Slough during the winter to minimize potential entrapment of migrating salmonids in Coyote Creek. The outlet at A17 includes both a control gate and control weir. Either may be used to limit flow through the system. The water levels in the ponds would be set by a weir at the outfall of A17 or adjustment of the control gates to avoid flooding of the existing internal levees or wave damage to the levees. The winter operation is intended to provide less circulation flow than the summer operation. Evaporation is normally minimal during the winter.

Winter Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
A17	131	1.1	2.2	1.2
A16	243	0.6	2.2	0.6

Winter Gate Settings

Gate	Setting (% open)	Setting (in, gate open)
A17 intake	0	0
A16	25	12
Weir	2.1 ft NGVD	

Water Level Control

The water level in A17 is the primary control for the pond system. The A17 water level is controlled by the outlet weir structure. Normal winter operation would have the A16 intake gate partially open to reduce inflow during extreme storm tides. Water levels in the ponds are controlled by the outlet weir setting. The normal winter water level in A17 should be at 2.2 ft NGVD, approximately 0.1 ft above the outlet weir. The pond water level may vary by 0.2 ft due to the influence of weak and strong tides, and over 0.5 ft due to storms.
During winter operations, the water levels should not fall below the outlet weir elevation.

During winter operations, if the water levels exceed approximately 3.0ft NGVD, the A16 gate should be closed to allow the excess water to drain. Note that without rainfall or inflow, it will take approximately 3 weeks to drain 1.0 ft from the ponds.

Salinity Control

The winter salinity in the system may decrease from the intake at A16 to the outlet at A17, due to rainfall inflows within the system, which may exceed winter evaporation. During very wet winters, the intake salinities and system salinities may decrease to as low as 5 ppt.

Monitoring

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

Weekly Monitoring Program

Location	Parameter
A17 intake	Salinity
A17	Depth, Salinity, Observations
A16	Depth, Salinity, Observations

The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the formal monitoring listed below.

Location	**Frequency**	**Parameters**
A16(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Artesian Slough	Monthly (May –Oct)	DO, pH, Temp., Salinity