United States Department of the Interior

FISH AND WILDLIFE SERVICE

November 25, 2005

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

Subject: Review of Revised Operation Plans and Annual Self-Monitoring Report, South San Francisco Bay Low Salinity Salt Ponds, Alameda, Santa Clara, and San Mateo Counties. Order No. R2-2004-0018, WDID No. 2 019438001.

Dear Mr. Wolfe:

This letter is in response to your October 5, 2005, file No. 2199.9438 (RS), Review of Revised Operation Plans and Annual Self-Monitoring Report, South San Francisco Bay Low Salinity Salt Ponds, Alameda, Santa Clara, and San Mateo Counties. Thank you for you and your staff's time spent in helping the Refuge maintain the San Francisco Bay's water quality while providing improved habitat for wildlife.

Your letter requested that the USFWS resubmit its final versions of Operations Plans, Annual Self-Monitoring Report (ASMR), and Methylmercury Study to address specific issues communicated in the October 5, 2005 letter. The attached report provides the requested revisions to our Operations Plan and ASMR which optimizes operations for protection of water quality and evaluates the effectiveness of best management practices. These revisions provide clearer cross-referencing between the two documents.

We would be pleased to discuss with your staff whether information in this report would be better presented or described in a different manner.

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

Sincerely yours,

Clyde Morris, Manager
Don Edwards San Francisco
Bay National Wildlife Refuge

Enclosures
1. Revised Operations Plans
2. Revised Self Monitoring Report
3. Revised Methylmercury Study

2004 Annual Self Monitoring Program
for Alviso Ponds within
South San Francisco Bay Low Salinity Salt Ponds
Alameda, Santa Clara, and San Mateo Counties

Order No. R2-2004-0018

WDID No. 2 019438001

Prepared for:

California Regional Water Quality Control Board
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Self-Monitoring Report

1.0. Introduction:

This annual report summarizes the results of the 2004 water quality sampling conducted at the Alviso Salt Ponds in Santa Clara County, which are part of the South San Francisco Bay Low Salinity Salt Ponds. Operations occurred from July through December 2004. Sampling was performed on a continuous, weekly, monthly or bi-monthly schedule as required by the Final Order (No. R2-2004-0018). Sampling was performed by U.S. Geological Survey (USGS) on behalf of the U.S. 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 covered 15,100 acres of ponds in Alameda, Santa Clara and San Mateo Counties. This report only covers Alviso Pond Systems A2W, A3W and A7 operated by the Don Edwards San Francisco Bay National Wildlife Refuge in Santa Clara County. Other ponds in Santa Clara County and the ponds in San Mateo County were not opened to the Bay in 2004 and hence are not covered in the 2004 Annual Report. The California Department of Fish and Game will be submitting a report for the Eden Landing (Baumberg) Ponds under a separate cover.

The ponds are generally being operated as flow-through systems with Bay waters entering an intake pond at high tides through a tide gate, passing through one or more ponds, and exiting the discharge pond to a tidal slough or the bay at low tides. The ponds only discharge at low tides, generally about 6 or 8 hours per day. Two ponds in the Alviso system (Ponds A3N and A8) were operated as seasonal ponds during 2004 and were not connected to the flow-through system.

The Final Order recognized two periods of discharges from the ponds: the Initial Release Period when salinity levels would decrease from the initial levels in the ponds and a Continuous Circulation period after salinities reached the 44 ppt salinity discharge limit. Different monitoring plans were identified in the Final Order for each specific period.

2.0. 2004 Annual Summary

This section summarizes the activities performed during the 2004 calendar year at the Alviso Pond Complex to comply with RWQCB Final Order.

2.1 Water Quality Monitoring Summary

The site location is shown in Figure 1 and sampling locations are shown in Figures 2a and 2b. Initial Release Period monitoring parameters are shown on Table 1a; Continuous Circulation Period monitoring parameters are shown on Table 1b.

Pond Systems A2W and A3W were opened to the Bay on July 19, 2004 and Pond System A7 was opened to the Bay on July 26, 2004. Pond Systems A2W and A3W met the 44 ppt salinity discharge limit and hence the requirements for the Continuous Circulation Period monitoring on

July 19. However, in addition to Pond System A7, we monitored Pond System A3W in accordance with the Initial Release Monitoring Plan in order to gather additional information for future releases. Because of miscommunications at the early stages of release as to which monitoring plan would be followed for each pond system, invertebrate data was not collected before beginning discharge at A3W and A7, though subsequent samples were immediately collected.

The data for this sampling period are presented in several ways. Tables 2 and 3a-c present data for receiving waters and discharges as daily averages. Figures 3 through 14 show daily average discharge data plotted with actual site specific data for receiving waters. Appendix D presents all receiving water data as well as all continuous monitoring data on the computer disk attached to this report. Other water quality data collected are shown in various tables, including benthic sampling (Tables 4a - b), chlorophyll-a (Table 5) and metals in the water column (Table 6). The results of required "management sampling" are shown in Appendix B.

The results of the 2004 sampling events indicate:

Salinity

- Pond System A7 was the only one of the three pond systems initially above the 44 ppt salinity required for Continuous Circulation. Salinities behaved as predicted. When opened on July 26, salinities discharging from A7 were at 51 ppt, rose to almost 54 ppt on July 28 and then fell to below 44 ppt by August 10, 2004. The salinities fell below 35 ppt by September 1. (See Figure 11).

- The salinity levels for all ponds now remain well below 44 ppt and generally reflect slightly higher salinities than the intake waters from the bay and sloughs. (See Figures 3, 7 and 11).

Temperature

- Temperature levels in the ponds generally matched the temperature levels in the intake and receiving waters and therefore met the discharge limits of not exceeding natural temperatures of the receiving waters by 20^{o}F. (See Figures 5, 9 and 13).

pH

- Levels of pH varied differently in each Pond System, but were generally greater than 8.5. In A2W, pH increased to above 9.0 within a month after the initial start of operations and then fell below 9.0 and leveled off until mid October when rains began and pH levels fell. Pond System A3W followed a similar pattern although it stayed above 9.0 for a longer period than A2W. Pond System A7 stayed generally between 8.5 and 9.0 throughout the initial release period but increased above 9.0 in mid-November after heavy rains. (See Figures 4, 8 and 12).

- Levels of pH in receiving waters remained below the 8.5 discharge limits on all but two occasions. On July 28, one sample at the mouth of Guadalupe Slough was recorded at 8.7, though other samples throughout the slough and closer to the discharge point were below 8.5. (See Figure 8 and Appendix C). This sample was taken on an incoming tide close to the Bay and pH level is assumed not to be a result of this discharge. On August 23, the most upstream sample point in Alviso Slough showed a pH level of 8.9 though other samples through the slough and closer to the discharge point were below 8.5. (See Figure 12 and Appendix D). This sample was taken at the ebb of the daily higher low tide and it is presumed that the waters at this upstream sample point should have contained mostly flows coming from the Guadalupe River to Alviso Slough. Hence the high pH level at that point is presumed to be more influenced by Guadalupe flows than the A7 discharge.

Dissolved Oxygen

- Based on daily averages of our continuous monitoring for dissolved oxygen, discharges were below the 5.0 mg/L compliance limit as follows: Pond System A2W: 109 total recorded days with 39 days below 5.0 mg/L; Pond System A3W**:** 99 total recorded days, with 91 days below 5.0 mg/L; and Pond System A7**:** 118 total recorded days with 77 days with a daily average dissolved oxygen below 5.0 mg/L.

- Based on the number of days when dissolved oxygen levels fell below 5.0 mg/L during any 15-minute increment during the 6-8 hour low tide period when discharges occurred, discharges were below 5.0 mg/L as follows: Pond System A2W: 109 total recorded days with 82 days below 5.0 mg/L; Pond System A3W: 99 total recorded days with 95 below 5.0 mg/L; and Pond System A7: 118 total recorded days with 106 days with actual days dissolved oxygen below 5.0 mg/L.

- Monitoring efforts showed that dissolved oxygen levels in Ponds A2W and A7 exhibited a strong diurnal pattern (low dissolved oxygen near dawn and higher levels at mid-day), but that receiving water monitoring in the Bay and Alviso Slough did not detect reductions in dissolved oxygen levels from these discharges. The discharge from Pond A3W showed consistently low dissolved oxygen levels, and monitoring of Guadalupe Slough indicates that Pond A3W may have caused dissolved oxygen depressions in certain areas. For that reason, the discharge gates for Pond A3W were closed from September 9 through October 16, when heavy rains were predicted, and subsequently fell.

- To evaluate why dissolved oxygen levels in Pond A3W were severely depressed on a consistent basis (i.e., below 1 mg/L), the Discharger 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.

- The ROWD and the Final Order recognized that the ponds would likely exhibit a diurnal dissolved oxygen pattern, with saturated conditions during the day, and low levels during the night and predawn hours. This was not expected to cause significant dissolved oxygen depression in sloughs, and the monitoring indicates that it did not cause problems under these normal diurnal conditions. However, in situations where the discharge point is near accumulating dead algae, the discharge could produce a significant DO sag in receiving waters and actions should be taken. FWS has installed flow diversion baffles in Pond A3W, to move the flow of water away from algae buildup and to increase oxygen uptake. However, further discussions need to be pursued with the RWQCB concerning alternatives to achieving the discharge limits for dissolved oxygen in natural diurnal situations such as at A2W and A7.

Metals

- Annual water column sampling data indicated that levels of metals in discharge waters for all Alviso ponds met water quality objectives for San Francisco Bay receiving waters. (See Table 6).

Invertebrates

- Analysis of preliminary data from Alviso and Guadalupe Sloughs indicates more diverse populations of invertebrates than expected. Seventeen taxa were found in Guadalupe Slough and fourteen taxa were found in Alviso Slough. (See Tables 4a-b). Although pre-discharge samples were not collected, no linear patterns could be detected to indicate any immediate potential effects from the discharge. Identification of benthos at additional sample points and QA/QC has been completed. (See Appendix E)

2.2. Water Quality Monitoring Methodology

Continuous Pond Discharge Sampling (Initial Release and Continuous Circulation): USGS installed continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, CO) in Alviso ponds A2W, A3W, and A7, , prior to their initial release dates and through October (A2W) or November (A3W and A7) 2004. Datasondes were installed on the inside of the water control structures at the discharge into the slough and/or San Francisco Bay using a PVC holder attached to a ground-mounted pole to allow for free water circulation around the sensors. The devices were installed at a depth of at least 25cm to ensure that all sensors were submerged, and these depths were monitored and adjusted to maintain constant submersion as the pond water levels fluctuated.

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.

Receiving Water Sampling (Initial Release and Continuous Circulation): Receiving waters were measured outside pond discharge locations one week prior to discharge, one, three and seven days after initial discharge, and then weekly by USGS at sites along Guadalupe Slough adjacent to Alviso pond A3W (8 sites) and Alviso Slough adjacent to Alviso pond A7 (7 sites) from July 2004 through November 2004. Additionally, water quality measurements were collected after initial discharge and then monthly in San Francisco Bay outside the water control structure in pond A2W (3 sites) from July 2004 until October 2004.

Sampling locations were marked using a GPS waypoint. USGS accessed slough sampling sites via boat from San Francisco Bay and used a GPS to navigate to sampling locations. When the boat was approximately 50-25 meters from the site, the engine would be cut or reduced to allow for drifting caused by current and wind to the site location. Every effort was made to ensure that the sample reading was collected from the center of the slough. A recently calibrated Hydrolab Minisonde (Hydrolab-Hach Company, Loveland, CO) was used to measure salinity, pH, turbidity, temperature, and dissolved oxygen at each location.

From July 2004 through September 2004, readings were collected only from the near-surface at a depth of approximately 25 cm. From October 2004 through November 2004, samples were collected from the near-bottom of the water column in addition to the near-surface at each sampling location. Depth readings of sample locations were collected at the completion of each Minisonde measurement to account for drift during the reading equilibration period. The specific gravity of each site was additionally measured with a hydrometer (Ertco, West Paterson, New Jersey) scaled for the appropriate range. This sample was collected concurrently with the near-surface Minisonde measurement. The majority of the samples were collected on the rising or high tide in order to gain access to the sampling sites, which were not accessible at tides less than 3.5 ft MLLW. Alviso pond A2W receiving water sites could only be accessed during high tides over 6.0 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, fisher people and other recreational activities

E) Hydrographic conditions – time and height of tides, and depth of water column and sampling depths.

F) Weather conditions – air temp, wind direction and velocity, and precipitation.

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

Pond Management Sampling (for Initial Release and Continuous Circulation): USGS conducted water quality measurements twice monthly in Alviso salt ponds A2E, AB2, A2W, A3W, and A7 salt ponds from May through July 2004 (i.e., two months prior to the initial release of ponds A2W, A3W, and A7). Management sampling in ponds A2E, AB2, and A3N were continued monthly following the initial release of the ponds, according to the schedule for

Continuous Circulation Monitoring. One sampling location was established for each salt pond and samples were collected between 0800 and 1000 hours (Appendix A). A Hydrolab Minisonde (Hydrolab-Hach Company, Loveland, CO) was calibrated prior to use and measured salinity, pH, turbidity, temperature, and dissolved oxygen. Readings were collected from the near-surface at a depth of approximately 25cm. Because sondes may not measure salinity accurately at concentrations greater than 40 ppt, an additional method was used. USGS measured specific gravity of each pond (corrected for temperature and converted to salinity) with an appropriately-scaled hydrometer (Ertco, West Paterson, New Jersey) to a precision of 0.0005. At hypersaline ponds (>70 ppt), only hydrometers were used to measure salinity.

***Chlorophyll-a sampling (for Continuous Circulation Monitoring*):** USGS collected chlorophyll samples monthly in Alviso salt ponds A2E, AB2, and A3N in September and October 2004. Two to three sampling locations were established for each salt pond and water quality measurements were collected between 0800 and 1000 hours of the same day or within one day of chlorophyll sample collection. A recently calibrated Hydrolab Minisonde (Hydrolab-Hach Company, Loveland, CO) was used to measure salinity, pH, turbidity, temperature, and dissolved oxygen at each location. Readings were collected from the near-surface at a depth of approximately 25cm.

USGS determined Chlorophyll-a levels using a TD700 fluorometer. Water samples were collected at 2-3 established sampling locations per pond using a water collection pole and 500ml dark Nalgene bottles. Samples were packed in ice for transport, and filtered by USGS staff in within 24 hours of collection. Samples were filtered with 25 mm Whatman GF/F (glass fiber filters) (Whatman International, Maidstone, England) and filters were frozen at least 24 hours. Extraction solvent (90% acetone) was then added to the filters at least 48 hours after filtration. Absorbance of the extracts was read using a TD700 fluorometer. Chlorophyll concentration was calculated using the Fluorometric equations for extracted chlorophyll-a and pheopigments (Holm-Hansen et al.1965).

Annual Water Column Sampling for Metals: Water column samples were collected on 23 September 2004, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels). Pre-cleaned sample containers conforming to EPA protocols were provided by ToxScan, Inc. Samples from ponds A2W and A3W were collected approximately 30 meters west of each pond's water control structure, whereas pond A7 was sampled 30 meters north of its water control structure. Salinity, temperature, pH, and dissolved oxygen were measured concurrently with water column sample collection using a Hydrolab Minisonde (Hach Hydrolab, Loveland, CO). Collected samples were immediately stored on ice in a cooler and shipped overnight to ToxScan, Inc. (Watsonville, CA).
Dissolved mercury samples were immediately filtered by ToxScan, Inc., and all mercury samples were shipped to Columbia Analytical Services, Inc. (Kelso, WA), where the samples were analyzed using EPA method 1631. ToxScan, Inc. analyzed total and dissolved chromium, nickel, copper, zinc, silver, cadmium, and lead using EPA method 200.8; total and dissolved selenium (EPA 270.3) and arsenic (EPA 206.3) were determined with more sensitive analyses recommended for those metals. Total Suspended Solids (TSS) samples were forwarded to Soil Control Lab (Watsonville, CA) for analysis. All labs reported that the samples arrived intact and were handled with the proper chain-of-custody procedures, and that appropriate QA/QC guidelines were employed during the analysis on a minimum 5% basis.

Benthic Invertebrate Sampling: The results of the 2004 benthic invertebrate sampling did not detect impacts from the Alviso Salt Pond discharges. Some trends were observed during sampling; however, the results of the sampling could have been more definitive if more data was obtained and the pre-release samples were taken closer to the post-release samples. It is possible that the results were confounded by the difference in the sampling seasons rather than the difference in the water quality coming from the ponds. To improve on the 2004 benthic invertebrate sampling, in 2005 we have included pre-release samples taken just 7 days before the first release from the Phase 2 ponds. The results from the 2005 sampling should provide us with a more appropriate comparison between pre-release and post-release benthic populations.

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. Dissolved oxygen sensors were particularly problematic due to the addition of self-cleaning brush attachments on the equipment which tended to damage the surface of the membrane more frequently. The problem of algae and other substances interfering with the moving parts such as on the self-cleaning brush and circulator was improved with the use of nylon stockings. This allowed for maximum water flow past the sensor but stopped algae from wrapping around and binding the moving parts. Copper mesh and wire was used to inhibit growth in ponds with high concentrations of barnacles and hard algae, which could interfere with sensor function. 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.

2.3 Sediment Monitoring Summary

In late summer and early fall of 2003 and 2004, USGS completed baseline sampling of sediments for mercury and methyl mercury in all Alviso Ponds included in the 2004 release (Ponds A1 through A8). Additional baseline sampling was completed for many Alviso Ponds scheduled to be released in 2005. A full report of their data collection efforts is presented in Appendix C.

USGS collected surface (top 5 centimeters) and inner (15-20 centimeters below surface) sediments from the ponds and analyzed them variously for total mercury and methyl mercury. In addition, sulfide levels were determined for sediment samples collected in 2004. Total mercury results were comparable for surface and inner sediments. However, methyl mercury was significantly higher in surface sediments. Sulfide concentrations alone were poor predictors of either total or methyl mercury concentrations.

Ponds closest to Alviso Slough contained the highest levels of both total mercury and methyl mercury, though Pond A3N at the mouth of Guadalupe Slough contained the highest levels of methyl mercury in the Alviso ponds prior to discharge. Pre- and post discharge data are not yet sufficient to determine the potential impacts of management operations. Additional samples for this pond series will be collected this winter and again in late summer at Ponds AB1, A5 and A7 where north/south depth gradients result in exposed mudflats in portions of these ponds, as well as Pond A3N which contained the highest levels of methyl mercury prior to discharge and is now being managed as a seasonal pond.

3.0 Compliance Evaluation Summary

Continuous Monitoring Datasondes were installed on the water control structures and collected at 15 minute intervals at the outflow of the discharge into the slough at A2W, A3W and A7. . Based on the requirement that DO could never be discharged at levels below 5.0 mg/L, violations are summarized below:

Pond	Sampling Period	Parameters	Total No. of Sample days	No. of Sample days in Violation (based on daily averages)[1]	No. of Sample Days in Violation (based on any discharge of 15 minutes or more)[2]
A2W	7/16/04 – 11/1/04	DO	109	39	82
A3W[3]	7/16/04 – 11/29/04	DO	99	91	95
A7	7/27/04 – 11/29/04	DO	118	77	106

1 Sample day was determined to be in violation if daily average of dissolved oxygen was below 5.0 mg/L.
2 Sample day was determined to be in violation if dissolved oxygen was below 5.0 mg/L during any 15-minute interval when tidal discharge gates were open.
3 A3W discharge gates were closed from 9/9/04 – 10/16/04 and not included in sampling days.

4.0 Data Reporting for Results Not Yet Available:

5.0 Future Monitoring Plans

For the 2005 monitoring period the USFWS will provide the time period each day that ponds discharge as well as an estimate for the quantity of discharge into the sloughs. This will provide context of the amount of pond waters entering sloughs and the Bay relative to ambient flows, intermittent nature of the discharges, and to document the effect of manipulating flow rates on receiving water quality.
We asked Keith Miles from USGS to revise last year's Hg monitoring plan based on the results from the 1st year Hg monitoring. He submitted his proposed plan which we have forwarded to you for your comment. Because the purpose of the Hg monitoring in the ponds is to help us better design the long-term restoration project (South Bay Salt Pond Restoration Project), with your permission, we have asked the SBSP science team to review the Miles revised Hg monitoring plan. They will review the plan in light of the existing Hg studies in the north and South San Francisco Bay as well as the recently proposed Hg study centered on Pond A8 and Alviso Slough. Once we receive these review comments (1 or 2 months), we will work with the

California Department of Fish and Game, USGS and your office to finalize a fundable Hg monitoring plan to add to the ASMR.

Communications: To improve communication and analyze effectiveness of proposed corrective methods an evaluating discharge data, the USFWS will work more closely with USGS and RWQCB to report water quality concerns and discharge violations in a timely manner. As part of internal changes for better communication among Agencies, the USGS and USFWS implemented protocols to stay in weekly and often daily contact concerning water quality issues.

Table 1a – Initial Release Monitoring Plan for Alviso Ponds

Sampling Stations	D.O.	pH	Temperature	Salinity	Benthos	Sample Function
A-A2W-0	E	E	E	E		Management
A-A2W-1	A	A	A	A		Discharge
A-A2W-2	A	A	A	A	D	Receiving Water
A-A2W-3	A	A	A	A	D	Receiving Water
A-A2W-4a	B	B	B	B	D	Receiving Water
A-A2W-4b	B	B	B	B	D	Receiving Water
A-A2W-4c	B	B	B	B	D	Receiving Water
A-A2E-0	E	E	E	E		Management
A-B2-0	E	E	E	E		Management
A-A3W-0	E	E	E	E		Management
A-A3W-1	A	A	A	A		Discharge
A-A3W-2	A	A	A	A	D	Receiving Water
A-A3W-3	A	A	A	A	D	Receiving Water
A-A3W-4	A	A	A	A	D	Receiving Water
A-A3W-6	A	A	A	A	D	Receiving Water
A-A3W-7	A	A	A	A	D	Receiving Water
A-A3W-8	A	A	A	A	D	Receiving Water
A-A3W-9	A	A	A	A	D	Receiving Water
A-A7-0	E	E	E	E		Management
A-A7-1	A	A	A	A		Discharge
A-A7-2	A	A	A	A	D	Receiving Water
A-A7-3	A	A	A	A	D	Receiving Water
A-A7-4	A	A	A	A	D	Receiving Water
A-A7-5	A	A	A	A	D	Receiving Water
A-A7-7	A	A	A	A	D	Receiving Water
A-A7-8	A	A	A	A	D	Receiving Water

Legend for Table 1a

A = Receiving water samples shall be collected at discrete locations from downstream to upstream around high tide at the following frequency: one week before initiating discharge, one day after the initial discharge, +3, +7, then weekly until the Discharger documents that the discharge salinity levels are below 44 ppt. Once discharge begins, discharge pond samples shall be collected before pond water mixes with receiving water using a continuous monitoring device. For days it collects receiving water samples, the Discharger shall also report standard observations, as described in Section D of SMP.

B = Receiving water samples shall be collected at discrete locations in the Bay at the following frequency: one week before initiating discharge, one day after the initial discharge, +3, +7, then weekly until the Discharger documents that discharge salinity levels are below 44 ppt. For days it collects receiving water samples, the Discharger shall also report standard observations, as described in Section D of the SMP.

C = Not Used

D = Samples for benthos shall be collected from discrete locations at the convenient stage of the tide at the following frequency: One week before initiating discharge, 14 days after the initial discharge, +28, once in the late summer (August/September), and then once in the late summer of the following year.

E = Samples shall be collected within ponds at least twice per month for at least the previous 2 months before discharges commences. Dissolved oxygen samples shall be collected between 0800 and 1000 hours. Time of sampling shall be reported.

Table 1b – Continuous Circulation Monitoring for Alviso Ponds

Sampling Station	D.O.	pH	Temp.	Salinity	Chlorophyll a	Metals/Water Column	Sample Function
A-A2W-1	A	A	A	A		C	Discharge
A-A2W-4a	B		B	B			Receiving Water
A-A2W-4b	B		B	B			Receiving Water
A-A2E-0	E	E	E	E	E		Management
A-B2-0	E	E	E	E	E		Management
A-A3N-0	E	E	E	E	E		Management
A-A3W-1	A	A	A	A		C	Discharge
A-A3W-3	A		A	A			Receiving Water
A-A3W-6	A		A	A			Receiving Water
A-A7-1	A	A	A	A		C	Discharge
A-A7-3	A		A	A			Receiving Water
A-A7-7	A		A	A			Receiving Water
A-A8-0	E	E	E	E	E		Management

Legend for Table 1b

A = Receiving water slough samples represent one point upstream and one point downstream of the discharge point. The positions indicated on Figure 2 should be considered approximate. It should be the intent of the Discharger to collect upstream samples at a point where the receiving water is unaffected by the discharge, and downstream samples at a point where the discharge has completely mixed with the receiving water, but as close to the discharge point as practicable. Receiving water slough samples shall be collected monthly from May through October as close to low tide as practicable. Discharge pond samples shall be collected before pond water mixes with receiving water using a continuous monitoring device from May through October. For days it collects receiving waters samples, the Discharger shall also report standard observations, as described in Section D of the SMP.

B = Receiving water bay samples represent one point above and one point below the discharge point. The positions indicated on Figure 2 should be considered approximate. It should be the intent of the Discharger to collect samples as close to the discharge point as practicable with one point unaffected by the discharge, and one point where the discharge has completely mixed with the bay. Receiving water bay samples shall be collected monthly from May through October as close to low tide as practicable. For days it collects receiving water samples, the Discharger shall also report standard observations, as described in Section D of the SMP.

C = Water column samples for total and dissolved arsenic, chromium, nickel, copper, zinc, selenium, silver, cadmium, lead and mercury shall be collected annually in august or September. When collecting metals samples, the Discharger shall also monitor for salinity, and total suspended solids.

D = Not used.

E = Samples shall be collected within ponds monthly from May through October. Dissolved oxygen samples shall be collected between 0800 and 1000 hours. Time of sampling shall be reported.

Table 2: Daily Average for all Sample Points in Receiving Waters

Pond	Date	DO (mg/L)	pH	Temp C	Salinity
A2W	7/11/2004	7.2	7.8	22.2	20.7
A2W	8/9/2004	5.5	7.9	22.6	22.0
A2W	9/20/2004	5.9	7.8	17.1	26.5
A2W	10/27/2004	5.8	7.8	13.3	22.3
A3W	7/12/2004	5.1	7.9	22.9	16.9
A3W	7/20/2004	6.3	7.9	24.4	18.8
A3W	7/22/2004	5.6	7.9	25.5	19.7
A3W	7/26/2004	3.4	8.0	26.5	22.0
A3W	7/29/2004	6.6	8.0	23.9	22.2
A3W	8/2/2004	4.5	7.8	21.3	25.2
A3W	8/9/2004	5.0	8.3	24.2	19.0
A3W	8/16/2004	4.7	7.9	23.4	23.4
A3W	8/23/2004	3.6	8.3	22.6	20.1
A3W	8/30/2004	4.7	7.7	24.5	25.0
A3W	9/13/2004	5.2	7.9	22.8	23.0
A3W	9/20/2004	7.4	7.7	17.9	8.2
A3W	9/27/2004	4.5	7.7	19.8	18.6
A3W	10/4/2004	7.1	7.9	18.8	10.0
A3W	10/12/2004	6.5	7.9	19.0	19.6
A3W	10/18/2004	3.5	8.2	18.0	15.9
A3W	10/27/2004	4.1	7.6	14.9	14.6
A3W	11/5/2004	5.9	7.8	13.7	16.2
A3W	11/12/2004	6.9	7.8	14.6	20.6
A3W	11/19/2004	7.6	8.0	14.8	14.8
A3W	11/24/2004	7.3	7.9	11.7	21.3
A3W	11/30/2004	9.0	8.1	9.6	15.7
A7	7/12/2004	5.4	7.9	24.0	14.5
A7	7/20/2004	5.9	7.7	25.0	10.2
A7	7/27/2004	5.7	7.9	25.0	12.9
A7	7/29/2004	6.0	7.8	24.7	19.4
A7	8/2/2004	3.9	7.7	21.6	20.1
A7	8/9/2004	5.3	7.9	23.7	13.8
A7	8/16/2004	5.4	8.0	23.5	18.2
A7	8/23/2004	5.2	8.2	22.9	15.2
A7	8/30/2004	3.9	7.7	24.5	19.9
A7	9/13/2004	6.8	8.0	23.0	14.9
A7	9/20/2004	6.1	7.9	19.0	7.4
A7	9/27/2004	5.3	7.7	20.6	21.9
A7	10/4/2004	6.2	8.0	19.7	16.2
A7	10/12/2004	6.1	7.9	20.4	22.3
A7	10/18/2004	5.1	8.0	18.8	16.5
A7	10/27/2004	5.2	7.8	15.8	21.0
A7	11/5/2004	5.0	7.9	14.3	15.6
A7	11/12/2004	6.6	7.8	15.0	23.8
A7	11/19/2004	6.1	8.0	15.3	11.9
A7	11/24/2004	6.2	7.8	12.5	23.3
A7	11/30/2004	8.5	8.0	10.6	18.0

Table 3a: Daily Averages of Continuous Monitoring of A2W Discharge

Date	DO (mg/L)	pH	Temp C	Salinity
7/16/2004	6.1	7.9	23.7	30.2
7/17/2004	4.3	7.8	23.3	
7/18/2004	4.4	7.8	23.6	
7/19/2004	3.8	7.8	24.0	
7/20/2004	3.7	7.7	23.5	
7/21/2004	3.8	7.7	23.7	
7/22/2004	2.7	7.6	24.6	
7/23/2004	1.7	7.5	24.3	
7/24/2004	2.7	7.6	24.2	
7/25/2004	3.8	7.8	24.6	30.4
7/26/2004	4.8	7.9	24.8	28.9
7/27/2004	4.2	7.9	24.4	31.1
7/28/2004	3.3	7.9	23.8	31.3
7/29/2004	4.1	7.9	23.4	31.5
7/30/2004	4.2	7.9	23.3	29.0
7/31/2004	4.9	8.0	23.0	31.4
8/1/2004	4.6	8.0	22.3	31.6
8/2/2004	5.6	8.1	21.8	31.5
8/3/2004	6.1	8.2	21.7	31.7
8/4/2004	6.1	8.2	22.2	31.6
8/5/2004	6.3	8.3	22.5	31.3
8/6/2004	5.8	8.3	22.4	31.2
8/7/2004	6.2	8.4	23.5	31.2
8/8/2004	6.3	8.5	24.3	30.8
8/9/2004	5.7	8.5	23.6	31.1
8/10/2004	6.3	8.6	22.9	31.4
8/11/2004	6.2	8.9	23.9	31.9
8/12/2004	5.9	8.8	24.0	31.9
8/13/2004	5.9	8.9	23.7	32.1
8/14/2004	5.0	8.8	23.1	32.0
8/15/2004	5.3	8.9	22.5	32.3
8/16/2004	4.9	8.9	23.1	32.5
8/17/2004	4.7	9.1	23.7	32.6
8/18/2004	4.9	9.1	23.7	32.7
8/19/2004	4.8	8.9	23.6	32.8
8/20/2004	5.3	8.7	23.5	32.5
8/21/2004	4.9	8.8	23.5	32.7
8/22/2004	5.3	8.8	22.9	32.8
8/23/2004	5.3	8.8	23.1	32.8
8/24/2004	5.3	8.8	23.6	32.8
8/25/2004	5.1	8.8	23.5	32.9
8/26/2004	5.4	8.8	23.6	32.8
8/27/2004	5.3	8.7	24.4	32.8
8/28/2004	5.1	8.7	24.8	32.9
8/29/2004	4.9	8.7	24.5	32.9
8/30/2004	5.1	8.7	24.0	32.9

Table 3a continued

Date	DO (mg/L)	pH	Temp C	Salinity
8/31/2004	4.8	8.7	23.8	32.6
9/1/2004	4.8	8.7	23.0	33.1
9/2/2004	5.2	8.7	22.6	33.2
9/3/2004	5.6	8.7	22.8	33.2
9/4/2004	5.7	8.6	23.9	33.3
9/5/2004	5.3	8.6	24.8	33.2
9/6/2004	4.8	8.6	25.1	33.3
9/7/2004	4.1	8.6	25.1	33.8
9/8/2004	3.9	8.6	25.1	34.1
9/9/2004	3.3	8.5	24.6	34.2
9/10/2004	3.1	8.5	23.7	34.3
9/11/2004	3.1	8.5	23.5	34.4
9/12/2004	3.4	8.6	23.5	34.5
9/13/2004	3.6	8.6	22.6	34.6
9/14/2004	5.0	8.6	22.6	34.6
9/15/2004	5.7	8.6	23.1	34.5
9/16/2004	4.8	8.6	23.4	34.5
9/17/2004	4.3	8.6	22.9	34.5
9/18/2004	3.9	8.6	20.1	34.6
9/19/2004	4.5	8.7	18.1	34.1
9/20/2004	5.3	8.8	18.4	34.0
9/21/2004	6.8	8.9	19.2	33.9
9/22/2004	7.6	8.9	20.0	33.9
9/23/2004	7.2	8.9	20.9	33.8
9/24/2004	6.6	8.9	21.6	33.6
9/25/2004	5.9	8.9	21.4	33.7
9/26/2004	6.2	8.9	21.2	33.7
9/27/2004	5.7	8.9	20.5	33.6
9/28/2004	5.7	8.9	20.5	33.5
9/29/2004	4.2	8.9	20.2	33.5
9/30/2004	4.0	8.8	19.8	33.5
10/1/2004	4.4	8.8	19.1	33.5
10/2/2004	4.7	8.8	19.0	33.5
10/3/2004	4.6	8.8	18.9	33.4
10/4/2004	4.6	8.8	18.9	33.4
10/5/2004	5.2	8.9	19.3	33.2
10/6/2004	4.8	8.9	19.4	33.0
10/7/2004		8.9	20.1	32.9
10/8/2004		8.9	20.1	32.8
10/9/2004		8.9	19.9	32.7
10/10/2004		8.8	19.3	32.6
10/11/2004		8.9	19.7	32.8
10/12/2004		8.8	20.1	32.8
10/13/2004		8.8	20.4	32.7
10/14/2004		8.8	20.9	32.6
10/15/2004		8.7	20.7	32.6
10/16/2004		8.7	19.7	32.6
10/17/2004		8.7	19.2	32.3
10/18/2004		8.6	18.0	32.2
10/19/2004		8.5	16.3	31.6
10/20/2004		8.5	15.6	31.1

Table 3a continued

Date	DO (mg/L)	pH	Temp C	Salinity
10/21/2004		8.5	15.4	31.2
10/22/2004		8.6	15.9	31.1
10/23/2004		8.6	15.8	31.0
10/24/2004		8.5	16.0	30.8
10/25/2004	8.6	8.6	15.6	30.8
10/26/2004	6.2	8.6	15.3	30.5
10/27/2004	6.4	8.6	14.7	30.6
10/28/2004	7.0	8.6	14.1	30.6
10/29/2004	6.3	8.6	14.5	30.5
10/30/2004	6.7	8.6	15.2	30.7
10/31/2004	5.8	8.6	16.1	30.6
11/1/2004	5.2	8.6	15.5	30.3
11/2/2004		8.6	15.5	29.9
11/3/2004		8.5	14.6	29.8
11/4/2004		8.5	12.8	29.7
11/5/2004		8.7	12.5	29.5
11/6/2004		8.6	13.4	29.7
11/7/2004		8.6	14.2	29.7
11/8/2004		8.5	14.0	29.7
11/9/2004		8.4	14.1	29.8
11/10/2004		8.5	14.4	29.6
11/11/2004		8.4	14.7	29.2
11/12/2004		8.5	14.9	28.9
11/13/2004		8.5	15.5	28.9
11/14/2004		8.5	15.2	29.1
11/15/2004		8.4	15.1	29.2
11/16/2004		8.3	15.3	29.4
11/17/2004		8.2	14.8	29.6
11/18/2004		8.1	14.6	29.6
11/19/2004		8.1	14.6	29.7
11/20/2004		8.1	13.0	29.8
11/21/2004		8.6	11.0	29.8
11/22/2004		8.5	10.4	28.9
11/23/2004		8.4	10.9	29.9
11/24/2004		8.3	11.2	29.9
11/25/2004		8.2	12.0	30.0
11/26/2004		8.4	13.3	29.8
11/27/2004		8.2	13.4	29.7
11/28/2004		8.4	10.1	29.5
11/29/2004		8.5	7.9	29.4

Table 3b: Daily Averages of Continuous Monitoring of A3W Discharge

Date	DO (mg/L)	pH	Temp C	Salinity
7/16/2004	0.1		24.6	33.2
7/17/2004	0.1		23.8	33.6
7/18/2004	0.1		24.2	34.0
7/19/2004	0.4		24.5	33.8
7/20/2004	0.9		23.9	34.0
7/21/2004	0.8		24.9	34.1
7/22/2004	0.6		24.9	34.2
7/23/2004	0.8		24.4	34.0
7/24/2004	0.9		24.2	33.9
7/25/2004	1.9		24.8	33.7
7/26/2004	1.2	8.6	25.4	33.6
7/27/2004	0.8	8.6	25.2	33.8
7/28/2004	0.8	8.6	24.7	33.7
7/29/2004	0.7	8.6	24.2	33.5
7/30/2004	0.5	8.6	23.9	33.6
7/31/2004	0.7	8.6	23.3	33.0
8/1/2004	1.5	8.7	22.1	33.4
8/2/2004	1.7	8.8	20.2	33.2
8/3/2004	0.8	8.6	21.0	33.5
8/4/2004	1.0	8.6	23.2	33.8
8/5/2004	0.9	8.7	21.9	34.7
8/6/2004	0.8	8.9	24.4	33.2
8/7/2004	2.7	9.1	24.3	33.9
8/8/2004	1.4	9.0	24.9	33.0
8/9/2004	0.5	8.9	23.8	33.3
8/10/2004	0.4	8.9	23.3	33.0
8/11/2004	0.6	8.8	24.2	32.4
8/12/2004	0.5	8.8	24.5	32.8
8/13/2004	0.2	8.8	24.1	32.7
8/14/2004	0.2	8.7	23.3	32.0
8/15/2004	0.5	8.8	22.5	32.5
8/16/2004	1.0	8.9	23.1	32.7
8/17/2004	0.8	8.9	23.8	32.2
8/18/2004	0.6	8.8	23.6	31.5
8/19/2004	0.8	9.1	23.6	32.5
8/20/2004	1.0	9.3	23.9	33.0
8/21/2004	0.6	9.3	23.5	33.0
8/22/2004	0.3	9.3	22.9	33.1
8/23/2004	0.4	9.2	23.0	32.2
8/24/2004	0.7	9.2	23.6	31.8
8/25/2004	0.5	9.2	23.3	32.0
8/26/2004	0.2	9.2	23.3	31.1
8/27/2004	0.3	9.1	24.8	30.9
8/28/2004	0.2	9.0	25.3	31.2

Table 3b continued

Date	DO (mg/L)	pH	Temp C	Salinity
8/29/2004	0.7	9.0	24.3	30.4
8/30/2004	0.7	8.9	23.9	30.6
8/31/2004	0.9	8.9	23.3	31.6
9/1/2004	0.7	8.8	22.3	31.4
9/2/2004	0.7	8.9	22.3	31.7
9/3/2004	1.0	9.1	23.0	31.7
9/4/2004	1.3	9.1	24.2	31.4
9/5/2004	0.7	9.0	25.5	32.0
9/6/2004	0.2	9.0	25.7	32.2
9/7/2004	0.1	8.9	25.3	32.2
9/8/2004	0.1	8.8	25.4	32.4
9/9/2004	0.1	8.6	24.1	32.8
9/10/2004	1.1	8.5	23.9	
9/11/2004	2.1	8.6	23.9	
9/12/2004	0.9	8.8	23.9	
9/13/2004	0.4	8.8	22.6	30.4
9/14/2004	0.9	8.8	22.6	30.6
9/15/2004	0.1	8.8	23.5	30.6
9/16/2004	0.3	8.8	23.4	30.7
9/17/2004	0.2	8.8	22.8	30.8
9/18/2004	1.1	8.8	19.2	30.9
9/19/2004	0.1	8.8	17.8	31.1
9/20/2004	0.4	8.8	18.6	31.1
9/21/2004	1.9	8.9	19.1	31.5
9/22/2004	3.2	8.9	20.4	
9/23/2004	2.8	8.9	21.3	29.5
9/24/2004	2.1	8.9	22.1	29.4
9/25/2004	0.7	8.7	21.5	29.5
9/26/2004	0.3	8.8	21.8	29.7
9/27/2004	0.1	8.8	20.7	29.6
9/28/2004	1.3	8.9	20.6	29.8
9/29/2004	1.6	9.0	20.4	30.0
9/30/2004	3.3	9.0	19.6	30.1
10/1/2004	2.1	8.9	19.3	30.1
10/2/2004	1.0	8.6	19.3	29.9
10/3/2004	0.6	8.7	19.0	29.8
10/4/2004	0.4	8.8	18.8	30.1
10/5/2004	1.4	8.7	19.4	30.0
10/6/2004	2.8	8.7	20.1	29.9
10/7/2004	2.1	8.7	20.5	29.9
10/8/2004	0.7	8.7	20.4	30.0
10/9/2004	1.1	8.7	20.1	30.1
10/10/2004	0.7	8.8	19.3	30.3
10/11/2004	2.4	8.8	20.1	30.3
10/12/2004	3.7	8.8	20.9	30.3
10/13/2004	3.7	8.8	21.3	30.4
10/14/2004	3.8	8.7	21.6	30.5
10/15/2004	2.3	8.7	21.2	30.3

Table 3b continued

10/16/2004	3.5	8.8	19.6	30.5
10/17/2004	1.2	8.7	19.2	30.4
10/18/2004	0.4	8.6	18.0	30.4
10/19/2004	2.3	8.6	16.1	29.8
10/20/2004	4.0	8.6	16.2	29.4
10/21/2004	3.4	8.5	16.0	29.4
10/22/2004	4.8	8.6	16.5	29.5
10/23/2004	4.5	8.6	15.8	29.6
10/24/2004	2.6	8.5	16.2	29.2
10/25/2004	6.0	8.6	16.4	29.0
10/26/2004	6.8	8.6	15.7	28.4
10/27/2004	5.9	8.6	15.2	28.4
10/28/2004	5.3	8.6	14.4	28.4
10/29/2004	3.8	8.5	15.1	28.3
10/30/2004	2.8	8.5	16.1	28.4
10/31/2004	1.7	8.4	16.4	27.9
11/1/2004	4.1	8.5	15.3	28.1
11/2/2004	6.1	8.6	16.1	28.4
11/3/2004	2.9	8.5	14.8	27.8
11/4/2004	4.2	8.6	12.4	28.5
11/5/2004	5.3	8.6	12.7	28.5
11/6/2004	6.0	8.7	14.1	28.6
11/7/2004	6.3	8.7	15.1	28.8
11/8/2004	4.5	8.6	14.5	26.4
11/9/2004	4.7	8.4	14.2	23.6
11/10/2004	6.4	8.3	14.3	22.8
11/11/2004	5.8	8.2	14.5	20.4
11/12/2004	6.3	8.2	15.3	17.5
11/13/2004	7.0	8.2	15.3	18.0
11/14/2004	5.9	8.1	15.4	18.2
11/15/2004	5.5	8.1	15.0	18.3
11/16/2004	5.3	8.0	15.0	17.7
11/17/2004	5.3	8.1	15.0	17.5
11/18/2004	5.6	8.1	15.1	16.9
11/19/2004	5.6	8.3	14.5	16.5
11/20/2004	6.0	8.5	13.2	16.9
11/21/2004	4.2	8.4	12.0	18.2
11/22/2004	6.8	8.5	11.7	19.1
11/23/2004	11.6	8.7	11.9	19.1
11/24/2004	11.8	8.7	11.8	19.1
11/25/2004	11.6	8.7	12.3	19.2
11/26/2004	10.0	8.7	13.2	18.6
11/27/2004	7.7	8.8	13.1	20.2
11/28/2004	9.5	8.8	10.4	19.1
11/29/2004	6.8	8.6	9.2	16.7

Table 3c: Daily Averages of Continuous Monitoring of A7 Discharge

Date	DO (mg/L)	pH	Temp C	Salinity
7/27/2004	1.8		24.0	51.7
7/28/2004	5.1	9.0	24.4	52.9
7/29/2004	3.3	9.0	23.0	52.3
7/30/2004	3.5	8.9	22.8	51.3
7/31/2004	2.2	8.8	22.4	51.0
8/1/2004	1.7	8.8	22.5	50.8
8/2/2004	1.4	8.8	21.6	50.2
8/3/2004	2.2	8.8	21.2	49.4
8/4/2004	2.5	8.7	21.9	48.4
8/5/2004	3.0	8.7	22.6	47.5
8/6/2004	4.8	8.7	22.4	45.9
8/7/2004	6.1	8.8	23.4	44.8
8/8/2004	5.9	8.9	24.4	43.8
8/9/2004	4.8	8.9	24.1	43.1
8/10/2004	4.6	8.9	23.1	42.4
8/11/2004	5.1	9.0	23.5	41.0
8/12/2004	4.5	8.9	23.8	40.1
8/13/2004	4.6	8.9	23.6	39.3
8/14/2004	4.2	8.9	23.0	39.0
8/15/2004	4.2	8.9	22.7	38.9
8/16/2004	4.5	8.9	22.8	38.5
8/17/2004	4.7	8.9	23.4	37.9
8/18/2004	4.6	8.9	23.6	37.6
8/19/2004	4.6	8.9	23.4	36.8
8/20/2004	4.9	8.9	23.4	36.5
8/21/2004	4.7	8.9	23.5	36.3
8/22/2004	5.1	8.9	23.3	35.8
8/23/2004	5.0	8.9	23.2	35.7
8/24/2004	5.1	8.9	23.7	35.4
8/25/2004	4.9	8.9	23.6	35.3
8/26/2004	4.0	8.9	23.3	35.3
8/27/2004	4.4	8.9	23.5	35.4
8/28/2004	3.7	8.9	24.0	35.2
8/29/2004	3.1	8.9	24.3	35.2
8/30/2004	3.4	8.9	23.9	35.1
8/31/2004	3.2	8.9	23.6	35.1
9/1/2004	2.6	8.9	22.9	34.9
9/2/2004	2.4	8.9	22.7	34.7
9/3/2004	2.2	8.8	22.6	34.5
9/4/2004	2.2	8.8	23.1	34.3
9/5/2004	2.3	8.8	23.9	34.1
9/6/2004	2.4	8.8	24.6	33.9
9/7/2004	3.6	8.8	24.8	33.9
9/8/2004	3.6	8.9	24.9	33.9
9/9/2004	2.4	8.8	24.2	34.1

Table 3c continued

Date	DO (mg/L)	pH	Temp C	Salinity
9/10/2004	2.0	8.8	23.5	34.4
9/11/2004	2.0		22.7	34.7
9/12/2004	1.4		21.9	35.0
9/13/2004	1.4	8.8	21.7	35.0
9/14/2004	2.4	8.9	21.9	35.0
9/15/2004	2.9	8.9	22.3	34.7
9/16/2004	2.0	8.9	22.8	34.6
9/17/2004	2.2	8.9	22.4	33.8
9/18/2004	1.2	8.9	20.0	33.4
9/19/2004	3.2	8.9	17.5	32.8
9/20/2004	3.5	8.9	17.1	32.1
9/21/2004	3.9	8.8	18.1	31.8
9/22/2004	7.0	8.7	19.0	31.4
9/23/2004	5.5	8.7	19.7	31.3
9/24/2004	3.6	8.6	20.5	31.5
9/25/2004	1.4	8.6	20.8	31.8
9/26/2004	1.3	8.5	21.0	31.9
9/27/2004	1.3	8.5	20.4	32.0
9/28/2004	2.3	8.5	20.5	31.9
9/29/2004	2.3	8.5	19.8	32.0
9/30/2004	2.3	8.5	19.3	32.2
10/1/2004	3.0	8.5	18.6	32.3
10/2/2004	3.5	8.5	18.2	32.6
10/3/2004	4.3	8.5	18.4	32.6
10/4/2004	4.5	8.5	18.6	32.4
10/5/2004	6.5	8.6	18.9	32.3
10/6/2004	8.6	8.8	19.4	31.9
10/7/2004	7.4	8.8	19.7	31.7
10/8/2004	6.4	8.8	20.0	31.6
10/9/2004	4.9	8.8	20.0	31.4
10/10/2004	6.3	8.9	19.3	31.2
10/11/2004	8.3	8.9	19.1	30.7
10/12/2004	8.9	9.0	19.5	30.2
10/13/2004	8.3	9.0	19.7	29.8
10/14/2004	7.9	9.0	20.3	29.6
10/15/2004	6.5	9.0	20.5	29.7
10/16/2004	6.2	9.0	19.7	29.6
10/17/2004	5.9	9.0	19.1	29.4
10/18/2004	4.3	9.0	17.5	29.2
10/19/2004	3.8	8.8	15.3	28.5
10/20/2004	4.2	8.7	15.2	28.2
10/21/2004	4.5	8.7	15.0	28.5
10/22/2004	6.4	8.7	14.6	28.5
10/23/2004	7.9	8.8	15.2	27.9
10/24/2004	5.3	8.8	15.7	27.6
10/25/2004	5.1	8.8	15.6	26.8
10/26/2004	4.6	8.8	14.4	25.5
10/27/2004	4.4	8.7	14.4	25.7

Table 3c continued

Date	DO (mg/L)	pH	Temp C	Salinity
10/28/2004	4.6	8.8	13.9	25.5
10/29/2004	2.7	8.7	14.0	25.6
10/30/2004	1.5	8.6	14.6	25.5
10/31/2004	1.7	8.6	15.8	25.3
11/1/2004	2.3	8.6	15.9	25.3
11/2/2004	3.6	8.6	15.2	25.4
11/3/2004	2.3	8.5	14.8	25.2
11/4/2004	2.6	8.5	13.1	25.1
11/5/2004	3.3	8.5	12.2	25.0
11/6/2004	4.5	8.5	12.1	24.8
11/7/2004	4.5	8.5	13.2	24.9
11/8/2004	3.4	8.7	13.6	25.0
11/9/2004		9.1	14.2	25.3
11/10/2004		9.1	14.5	25.3
11/11/2004		9.0	14.6	25.1
11/12/2004		9.1	14.8	25.0
11/13/2004		9.1	14.9	25.1
11/14/2004		9.1	14.8	25.2
11/15/2004		9.1	14.8	25.3
11/16/2004		9.2	14.9	25.4
11/17/2004	8.2	8.9	15.0	25.4
11/18/2004	5.6	8.6	14.7	25.4
11/19/2004	5.4	8.7	14.7	25.4
11/20/2004	5.5	8.7	13.4	25.6
11/21/2004	6.5	8.7	11.2	25.7
11/22/2004	6.7	8.7	10.9	25.7
11/23/2004	8.4	8.8	10.9	25.8
11/24/2004	7.8	8.8	11.0	25.9
11/25/2004	8.8	8.8	11.4	26.1
11/26/2004	8.8	8.8	12.4	26.3
11/27/2004	7.3	8.7	12.8	26.4
11/28/2004	7.0	8.7	11.5	26.3
11/29/2004	7.9	8.7	9.8	26.4

TABLE 4a – Benthic Invertebrate Sampling in Guadalupe Slough (A3W Receiving water)

		Upstream								
		4/6/2004			7/29/2004		8/2/2004		8/16/2004	
		GUAB1A	GUAB1B	GUAB1C	A3W-3	A3W-4	A3W-3	A3W-4	A3W-3	A3W-4
Annelida	*Capitella*	0	0	0	40	12	71	4	99	134
	Cirratulus	0	0	0	0	0	0	0	0	0
	Eteone	0	0	0	0	0	0	0	0	0
	Goniadidae	0	0	0	0	0	0	0	0	0
	Heteromastus	0	0	0	0	0	0	0	0	0
	Nereis	0	0	0	0	0	0	0	0	0
	Polydora	0	0	0	4	2	0	1	5	0
	Sabellidae	0	0	0	0	0	0	0	0	1
	Spionidae	0	0	3	0	0	0	0	0	1
	Streblospio	0	0	0	0	0	0	0	0	0
	Tubificoides	7	2	121	0	0	0	0	0	0
Nematoda	Nematoda	0	0	2	0	0	0	0	0	0
Bivalvia	*Gemma gemma*	0	0	0	0	0	0	0	1	0
	Macoma balthica	0	0	0	2	0	1	0	0	1
	Potamacorbula	0	0	0	0	0	1	0	2	3
Crustacea	*Balanus*	0	0	0	0	0	0	0	0	0
	Copepoda	0	0	0	0	0	0	0	0	0
	Corophium	0	0	0	0	0	0	0	1	0
	Cumacea	0	1	33	52	10	8	0	12	23
	Ericthonius	0	0	0	0	0	0	0	0	0
	Melita Californica	0	0	0	0	0	0	0	0	0
	Synidotea	0	0	0	1	0	0	0	0	0

		Midstream												
		4/6/2004			7/29/2004			8/2/2004			8/16/2004		
		GUAB2A	GUAB2B	GUAB2C	A3W-1	A3W-2	A3W-6	A3W-1	A3W-2	A3W-6	A3W-1	A3W-2	A3W-6
Annelida	*Capitella*	0	0	0	263	151	410	93	220	41	0	0	5
	Cirratulus	0	0	0	2	0	2	0	0	0	0	0	0
	Eteone	0	0	1	0	0	0	0	0	1	1	0	0
	Goniadidae	0	0	0	0	0	0	1	0	0	0	0	0
	Heteromastus	0	0	0	5	0	0	0	0	86	64	73	0
	Nereis	1	0	0	0	0	0	0	0	1	0	0	1
	Polydora	0	0	0	0	0	0	0	0	0	1	0	0
	Sabellidae	0	0	0	0	0	0	0	0	0	0	0	0
	Spionidae	0	0	0	0	0	0	0	0	0	0	0	0
	Streblospio	4	0	20	0	0	0	0	0	0	0	0	0
	Tubificoides	3	5	82	0	0	0	33	0	36	210	0	0
Nematoda	Nematoda	4	4	0	0	0	8	0	0	0	2	0	0
Bivalvia	*Gemma gemma*	0	0	0	0	0	0	0	0	0	0	0	0
	Macoma balthica	3	3	0	0	16	15	9	8	5	5	4	6
	Potamacorbula	0	1	0	0	0	3	1	0	13	1	1	6
Crustacea	*Balanus*	0	0	0	0	0	0	0	0	0	0	0	0
	Copepoda	0	1	0	0	0	0	0	0	0	0	0	0
	Corophium	0	0	0	0	0	1	0	0	0	0	0	0
	Cumacea	13	5	105	45	2	66	15	33	5	6	1	27
	Ericthonius	0	0	1	0	0	0	0	0	0	0	0	0
	Melita Californica	0	0	0	0	0	0	0	0	1	0	0	0
	Synidotea	0	0	0	0	0	0	0	0	2	0	0	0

		Mouth											
		4/6/2004			7/29/2004			8/2/2004			8/16/2004		
		GUAB3A	GUAB3B	GUAB3C	A3W-7	A3W-8	A3W-9	A3W-7	A3W-8	A3W-9	A3W-7	A3W-8	A3W-9
Annelida	*Capitella*	0	0	0	11	0	0	0	0	0	7	0	0
	Cirratulus	0	0	0	0	0	0	0	0	0	0	0	0
	Eteone	0	0	4	0	0	0	0	0	0	0	0	0
	Goniadidae	0	0	0	0	0	0	0	0	0	0	0	0
	Heteromastus	1	0	1	0	0	0	0	1	0	0	0	0
	Nereis	0	0	0	0	0	2	0	2	0	1	0	1
	Polydora	0	0	0	3	0	0	0	0	0	7	0	0
	Sabellidae	0	0	0	0	0	0	0	0	0	1	0	0
	Spionidae	0	0	0	0	0	1	0	0	0	0	0	2
	Streblospio	20	1	21	0	0	0	0	0	0	0	0	0
	Tubificoides	12	7	449	0	0	0	0	0	0	0	0	0
Nematoda	Nematoda	3	3	89	0	0	0	0	0	0	0	0	0
Bivalvia	*Gemma gemma*	0	0	0	0	0	0	0	0	0	0	0	0
	Macoma balthica	2	1	7	0	0	23	2	6	4	16	0	3
	Potamacorbula	0	0	0	53	0	63	4	49	84	17	29	83
Crustacea	*Balanus*	0	0	0	0	0	0	0	0	0	0	2	0
	Copepoda	0	0	0	0	0	0	0	0	0	0	0	0
	Corophium	0	0	0	0	0	0	0	0	0	0	0	0
	Cumacea	11	1	52	3	0	6	0	1	0	8	0	0
	Ericthonius	0	0	0	0	0	0	0	0	0	0	0	0
	Melita Californica	0	0	0	0	0	0	0	0	0	0	0	0
	Synidotea	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 4b – Benthic Invertebrate Sampling in Alviso Slough (A7 Receiving water)

		Upstream								
		4/7/2004			7/29/2004		8/9/2004		8/23/2004	
		ALVB1A	ALVB1B	ALVB1C	A7-4	A7-5	A7-4	A7-5	A7-4	A7-5
Annelida	*Capitella*	0	0	1	0	19	0	60	0	20
	Cirratulus	0	0	0	0	0	0	0	0	25
	Eteone	0	0	1	0	0	0	1	0	0
	Fabricia berkeleyi	0	0	0	0	27	0	0	0	0
	Heteromastus	1	0	1	0	0	0	0	9	1
	Mediomastus	0	0	0	0	0	0	0	0	0
	Nereis	5	1	1	0	1	3	0	0	0
	Phyllodocidae	0	0	0	0	0	0	0	1	0
	Polydora	0	0	1	0	135	0	0	0	5
	Pseudopolydora	0	0	0	0	0	0	0	0	0
	Sabellidae	0	0	0	0	0	2	0	0	4
	Spionidae	0	0	0	0	0	3	0	0	0
	Streblospio	16	3	14	1	67	0	0	0	0
	Tubificoides	0	0	0	0	0	0	0	0	0
Bivalvia	*Gemma gemma*	0	0	0	0	0	0	0	0	0
	Macoma balthica	2	0	2	5	0	1	12	3	0
	Mya arenaria	0	0	0	0	0	0	0	0	0
	Potamacorbula	0	1	1	0	0	1	5	4	2
Crustacea	*Balanus*	0	0	0	0	0	0	0	0	0
	Cirripedia	0	0	0	0	0	0	0	0	0
	Corophium	0	2	0	0	1	0	0	0	0
	Cumacea	0	1	391	0	5	9	4	13	21
	Ericthonius	1	0	0	0	0	0	0	0	0
	Melita Californica	0	0	0	0	0	0	0	0	0
	Synidotea	0	0	0	0	0	0	0	0	0

		Midstream											
		4/7/2004			7/29/2004			8/9/2004			8/23/2004		
		ALVB2A	ALVB2B	ALVB2C	A7-1	A7-2	A7-3	A7-1	A7-2	A7-3	A7-1	A7-2	A7-3
Annelida	*Capitella*	0	0	0	0	11	70	0	0	64	2	0	0
	Cirratulus	0	0	0	0	0	0	0	0	0	0	0	0
	Eteone	0	0	0	0	0	0	0	0	1	0	0	0
	Fabricia berkeleyi	0	0	0	0	0	0	0	0	0	0	0	0
	Heteromastus	0	0	0	0	0	3	0	1	0	0	0	0
	Mediomastus	0	0	0	0	0	0	0	0	0	0	0	0
	Nereis	3	7	6	0	4	2	1	1	0	1	1	2
	Phyllodocidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydora	0	1	2	0	0	0	0	0	0	0	0	0
	Pseudopolydora	0	0	0	0	0	0	3	0	0	0	0	0
	Sabellidae	0	0	0	0	0	0	0	0	0	0	0	0
	Spionidae	0	0	0	0	2	0	0	0	1	0	0	0
	Streblospio	0	1	40	0	0	0	0	0	0	0	0	0
	Tubificoides	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	*Gemma gemma*	0	0	0	0	0	0	0	0	0	0	0	0
	Macoma balthica	2	0	0	0	16	14	18	7	14	6	8	9
	Mya arenaria	0	0	0	0	0	0	0	0	0	0	0	0
	Potamacorbula	2	4	7	0	8	0	15	12	6	13	7	2
Crustacea	*Balanus*	0	0	0	0	0	0	0	0	0	0	0	0
	Cirripedia	4	0	0	0	0	0	0	0	0	0	0	0
	Corophium	2	11	5	0	0	0	0	0	0	0	0	0
	Cumacea	1	0	8	0	0	36	2	0	3	8	5	5
	Ericthonius	10	13	0	0	0	0	0	0	0	0	0	0
	Melita Californica	0	0	0	0	0	0	0	0	0	0	0	0
	Synidotea	0	0	0	0	0	0	0	0	0	2	0	0

		Mouth								
		4/7/2004			7/29/2004		8/9/2004		8/23/2004	
		ALVB3A	ALVB3B	ALVB3C	A7-7	A7-8	A7-7	A7-8	A7-7	A7-8
Annelida	*Capitella*	0	0	0	0	0	0	0	0	0
	Cirratulus	0	0	0	0	0	0	0	0	0
	Eteone	0	0	0	0	0	0	0	0	0
	Fabricia berkeleyi	0	0	0	0	0	0	0	0	0
	Heteromastus	0	0	0	0	2	1	4	0	8
	Mediomastus	0	0	0	0	0	0	3	3	0
	Nereis	0	0	1	0	1	1	1	5	2
	Phyllodocidae	0	0	0	0	0	0	0	0	0
	Polydora	0	0	0	0	5	0	0	0	0
	Pseudopolydora	0	0	0	0	0	0	0	0	0
	Sabellidae	0	0	0	0	0	0	0	0	0
	Spionidae	0	1	0	0	0	3	0	10	0
	Streblospio	0	2	58	0	2	0	0	0	0
	Tubificoides	0	1	60	0	0	0	0	0	0
Bivalvia	*Gemma gemma*	0	0	0	1	0	0	0	2	4
	Macoma balthica	1	1	2	3	2	8	6	3	0
	Mya arenaria	1	0	0	0	0	0	0	0	0
	Potamacorbula	1	1	0	9	34	23	38	8	4
Crustacea	*Balanus*	0	0	0	0	0	1	0	0	0
	Cirripedia	0	0	0	0	0	0	0	0	0
	Corophium	0	0	0	0	0	0	0	0	5
	Cumacea	12	10	124	0	0	1	6	6	0
	Ericthonius	0	0	0	0	0	0	0	0	0
	Melita Californica	0	0	0	0	0	0	0	0	5
	Synidotea	0	0	0	0	0	0	0	0	0

Table 5: Chlorophyll-a Sampling

	Chl *a* (µg/L)	
Date/ Pond	9/13/2004	10/20/2004
A2E	22.99 ± 28.13 n=3	111.42 ± 7.50 n=6
A3N	295.24 ± 9.94 n=2	24.94 ± 1.37 n=4
AB2	116.16 ± 71.64 n=3	12.51 ± 8.60 n=6

Table 6: Annual Water Column Monitoring for Metals

	Ag		Cd		Cr		Cu		Ni	
Pond	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L
A2W	ND	ND	ND	ND	2.50	ND	4.60	3.90	ND	ND
A3W	ND	ND	ND	ND	ND	ND	3.70	3.40	ND	ND
A7	ND	ND	ND	ND	2.30	ND	4.00	3.20	ND	ND

	Pb		Zn		As		Hg		Se		
Pond	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. ng/L	Dis. ng/L	Tot. µg/L	Dis. µg/L	TSS mg/L
A2W	ND	ND	6.80	11.00	7.20	6.60	6.00	1.70	ND	ND	9.60
A3W	ND	ND	12.00	8.00	7.90	7.60	5.10	1.30	ND	ND	4.80
A7	ND	ND	ND	7.30	5.90	5.80	9.20	2.50	ND	ND	6.00

All results are in micrograms/L except for total suspended solids which is reported in mg/L.

Legend for Sample Methodology

Metal	EPA Method
Arsenic(Dis.)	206.3D
Arsenic (Tot.)	206.3TR
Mercury (Dis & Tot)	1631.00
Metals (Tot & Dis)	200.80
Selenium (Tot & Dis)	270.30
Total Suspended Solids	160.20

ND refers to no detected level

Detection Limits

As	Hg	Ag	Cd	Cr
1.0 ug/L	1.0 ng/L	1.0 ug/L	1.0 ug/L	2.0 ug/L
Cu	**Ni**	**Pb**	**Zn**	**Se**
1.0 ug/L	2.0 ug/L	1.0 ug/L	5.0 ug/L	1.0 ug/L

Estimated Maximum Salinities and Metals Levels for Continuous Circulation [1]

Maximum Salinity	CR	Ni	Cu	Zn	As	Se	Ag	Cd	Hg	Pb
44	1.22	8.05	2.98	1.83	10.7	0.4	0.012	0.078	1.8	0.307
WQO [2]	11.4	27	13	86	36	5	2.2	0.27	50	3.2

[1] To estimate the maximum metals concentrations from the Alviso System for continuous discharges, the ROWS considered an average of RMP data from 1997 - 1999 at the South Bay Station and salt ponds with salinities of 31.6 and 42 ppt.

[2] The Basin plan only specifies water quality objectives south of the Dumbarton Bridge for copper and nickel. For the other inorganics, water quality objectives are from the California Toxics Rule. Since the Board must express limits for metals in the total recoverable form, Board staff used default translators to convert dissolved water quality objectives of 100 mg/L as $CaCO_3$, which is
the lowest value found in sloughs (in this case Guadalupe Slough) monitored near the discharge in the Regional Monitoring Program.

Table 7a Closing of Discharge Gates

Pond A2W

All data — Discharges open 100% of the time

From	To	10th percentile	Mean	Median	
7/16/2004	**11/29/2004**	**2.75**	**5.03**	**5.01**	
7/16/2004	7/17/2004	1.94	5.00	5.40	
7/18/2004	7/24/2004	0.20	3.25	2.66	
7/25/2004	7/31/2004	1.97	4.19	4.00	
8/1/2004	8/7/2004	3.96	5.84	5.94	
8/8/2004	8/14/2004	4.37	5.91	5.31	
8/15/2004	8/21/2004	3.49	4.99	4.73	
8/22/2004	8/28/2004	3.81	5.25	5.01	
8/29/2004	9/4/2004	3.39	5.16	4.92	
9/5/2004	9/11/2004	2.37	3.95	3.78	
9/12/2004	9/18/2004	2.56	4.39	4.25	
9/19/2004	9/25/2004	4.14	6.25	6.01	
9/26/2004	10/2/2004	3.00	4.97	4.76	
10/3/2004	10/9/2004	2.85	4.80	5.08	
10/10/2004	10/16/2004				no data
10/17/2004	10/23/2004				no data
10/24/2004	10/30/2004	5.26	6.65	6.50	
10/31/2004	11/6/2004	4.32	5.52	5.49	
11/7/2004	11/13/2004				no data
11/14/2004	11/20/2004				no data
11/21/2004	11/27/2004				no data
11/28/2004	12/4/2004				no data

Discharges open only from 10 am - 10pm

From	To	10th percentile	Mean	Median	
7/16/2004	**11/29/2004**	**3.85**	**5.96**	**5.95**	
7/16/2004	7/17/2004	4.48	6.05	6.28	
7/18/2004	7/24/2004	1.81	5.00	5.00	
7/25/2004	7/31/2004	3.09	5.04	5.01	
8/1/2004	8/7/2004	5.57	6.84	7.03	
8/8/2004	8/14/2004	5.08	7.00	6.96	
8/15/2004	8/21/2004	4.40	5.96	5.73	
8/22/2004	8/28/2004	4.60	6.09	5.99	
8/29/2004	9/4/2004	4.28	6.27	6.24	
9/5/2004	9/11/2004	2.75	4.58	4.51	
9/12/2004	9/18/2004	3.69	5.32	5.26	
9/19/2004	9/25/2004	4.91	7.11	7.08	
9/26/2004	10/2/2004	3.82	5.86	5.74	
10/3/2004	10/9/2004	4.03	5.36	5.50	
10/10/2004	10/16/2004				no data
10/17/2004	10/23/2004				no data
10/24/2004	10/30/2004	5.33	7.11	7.17	
10/31/2004	11/6/2004	5.15	5.92	5.71	
11/7/2004	11/13/2004				no data
11/14/2004	11/20/2004				no data
11/21/2004	11/27/2004				no data
11/28/2004	12/4/2004				no data

Table 7b Closing of Discharge Gates

Pond A3W

All times Discharges open 100% of the time

From	To	10th percentile	Mean	Median
7/16/2004	**11/29/2004**	**0.07**	**2.50**	**1.15**
7/16/2004	7/17/2004	0.06	0.10	0.10
7/18/2004	7/24/2004	0.06	0.64	0.08
7/25/2004	7/31/2004	0.08	0.90	0.40
8/1/2004	8/7/2004	0.09	1.40	0.54
8/8/2004	8/14/2004	0.10	0.55	0.16
8/15/2004	8/21/2004	0.10	0.77	0.25
8/22/2004	8/28/2004	0.08	0.39	0.15
8/29/2004	9/4/2004	0.06	0.85	0.39
9/5/2004	9/11/2004	0.05	0.62	0.07
9/12/2004	9/18/2004	0.06	0.56	0.12
9/19/2004	9/25/2004	0.07	1.62	0.88
9/26/2004	10/2/2004	0.06	1.40	0.77
10/3/2004	10/9/2004	0.07	1.31	0.86
10/10/2004	10/16/2004	0.08	2.86	2.65
10/17/2004	10/23/2004	0.03	2.92	2.86
10/24/2004	10/30/2004	1.76	4.72	4.62
10/31/2004	11/6/2004	0.78	4.32	4.30
11/7/2004	11/13/2004	3.83	5.85	5.39
11/14/2004	11/20/2004	3.98	5.59	5.17
11/21/2004	11/27/2004	3.34	9.09	9.43
11/28/2004	12/4/2004	5.75	8.60	7.20

Discharges open only from 10am-10pm

From	To	10th percentile	Mean	Median
7/16/2004	**11/29/2004**	**0.07**	**2.72**	**1.02**
7/16/2004	7/17/2004	0.06	0.09	0.08
7/18/2004	7/24/2004	0.06	0.81	0.09
7/25/2004	7/31/2004	0.08	0.90	0.21
8/1/2004	8/7/2004	0.09	1.54	0.42
8/8/2004	8/14/2004	0.10	0.28	0.13
8/15/2004	8/21/2004	0.10	0.72	0.19
8/22/2004	8/28/2004	0.08	0.17	0.11
8/29/2004	9/4/2004	0.06	0.61	0.33
9/5/2004	9/11/2004	0.05	0.66	0.06
9/12/2004	9/18/2004	0.06	0.68	0.14
9/19/2004	9/25/2004	0.07	1.74	1.12
9/26/2004	10/2/2004	0.06	1.51	0.73
10/3/2004	10/9/2004	0.04	1.29	0.81
10/10/2004	10/16/2004	0.06	3.24	3.05
10/17/2004	10/23/2004	0.03	3.38	3.35
10/24/2004	10/30/2004	1.70	5.17	5.10
10/31/2004	11/6/2004	0.56	4.91	5.11
11/7/2004	11/13/2004	4.40	6.80	6.05
11/14/2004	11/20/2004	4.34	5.69	5.30
11/21/2004	11/27/2004	4.36	10.44	10.01
11/28/2004	12/4/2004	7.27	11.43	12.41

Table 7c Closing of Discharge Gates

Pond A7

All times — Discharges open 100% of the time

From	To	10th percentile	Mean	Median
7/27/2004	**11/29/2004**	**0.98**	**4.10**	**3.86**
7/25/2004	7/31/2004	0.80	3.29	2.94
8/1/2004	8/7/2004	0.37	3.09	2.60
8/8/2004	8/14/2004	2.77	4.82	5.11
8/15/2004	8/21/2004	3.11	4.62	4.25
8/22/2004	8/28/2004	2.73	4.59	4.33
8/29/2004	9/4/2004	1.18	2.72	2.57
9/5/2004	9/11/2004	0.59	2.60	2.05
9/12/2004	9/18/2004	0.45	1.93	1.53
9/19/2004	9/25/2004	0.34	4.01	3.99
9/26/2004	10/2/2004	0.32	2.27	1.56
10/3/2004	10/9/2004	2.27	6.09	5.39
10/10/2004	10/16/2004	3.53	7.48	7.51
10/17/2004	10/23/2004	2.52	5.26	4.94
10/24/2004	10/30/2004	1.59	4.02	3.96
10/31/2004	11/6/2004	1.30	2.91	2.40
11/7/2004	11/13/2004	2.50	4.05	3.27
11/14/2004	11/20/2004	3.54	5.88	5.51
11/21/2004	11/27/2004	4.00	6.18	6.09

Discharges open only from 10am-10pm

From	To	10th percentile	Mean	Median
7/27/2004	**11/29/2004**	**1.91**	**5.35**	**5.12**
7/25/2004	7/31/2004	1.81	4.53	4.01
8/1/2004	8/7/2004	1.14	3.89	3.90
8/8/2004	8/14/2004	4.61	5.60	5.65
8/15/2004	8/21/2004	3.59	5.46	5.80
8/22/2004	8/28/2004	3.88	5.53	5.55
8/29/2004	9/4/2004	1.74	3.46	3.54
9/5/2004	9/11/2004	1.19	3.76	3.95
9/12/2004	9/18/2004	1.19	2.90	2.53
9/19/2004	9/25/2004	1.30	5.02	5.17
9/26/2004	10/2/2004	0.87	3.45	3.10
10/3/2004	10/9/2004	4.19	8.02	7.66
10/10/2004	10/16/2004	5.29	8.81	8.97
10/17/2004	10/23/2004	3.06	6.00	5.76
10/24/2004	10/30/2004	1.79	4.44	4.47
10/31/2004	11/6/2004	1.55	3.75	3.37
11/7/2004	11/13/2004	3.41	5.34	5.14
11/14/2004	11/20/2004	5.13	7.26	7.02
11/21/2004	11/27/2004	6.85	9.04	8.39

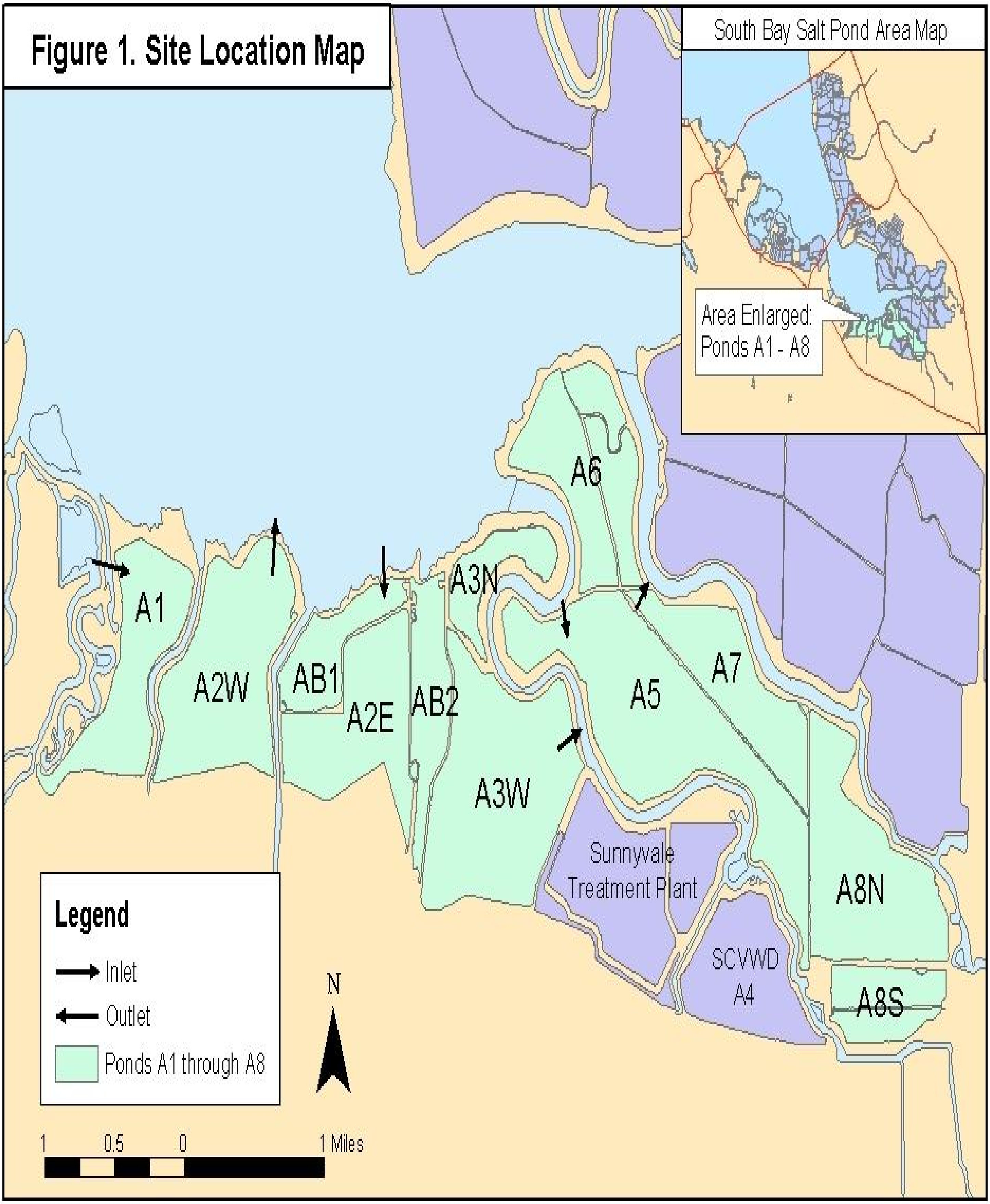
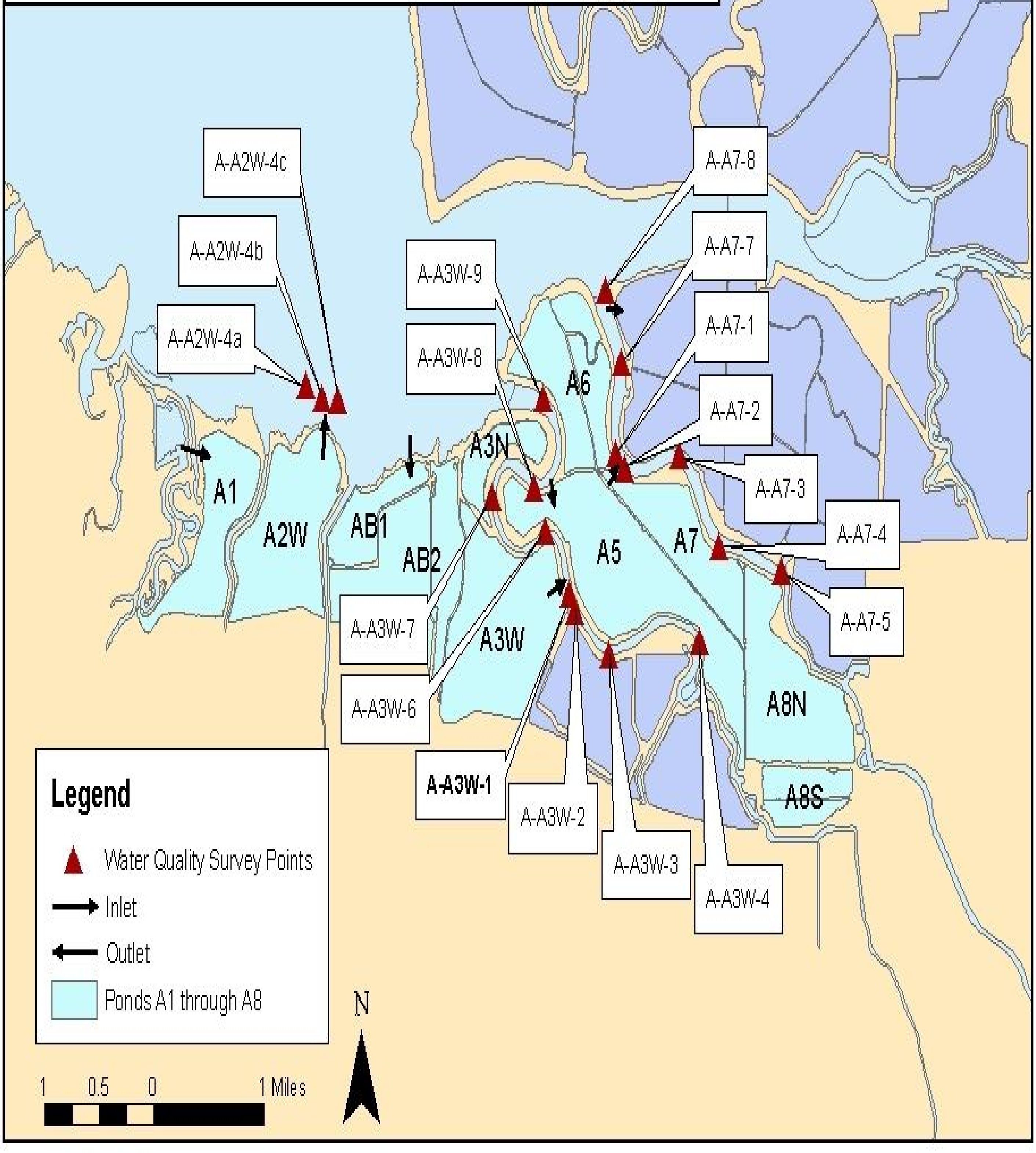


Figure 1. Site Location Map
South Bay Salt Pond Area Map
Area Enlarged:
Ponds A1 - A8
A1
A2W
AB1
A2E
AB2
A3N
A3W
A6
A5
A7
A8N
A8S
Sunnyvale
Treatment Plant
SCVWD
A4
Legend
Inlet
Outlet
Ponds A1 through A8
N
1
0.5
0
1 Miles

Figure 2a. Sampling Locations for Receiving Waters



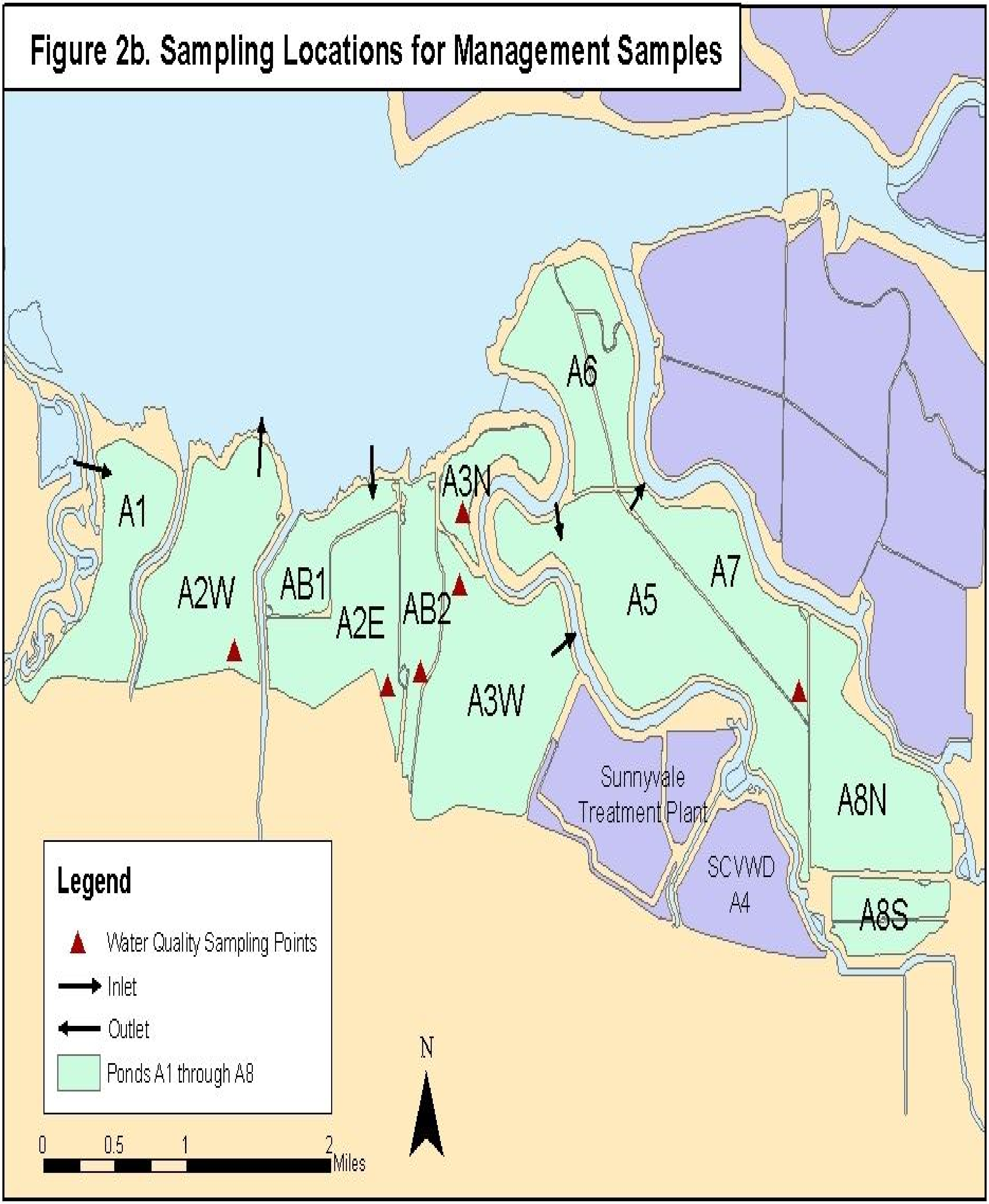


Figure 2b. Sampling Locations for Management Samples
A1
A2W
AB1
A2E
AB2
A3N
A3W
A6
A5
A7
A8N
A8S
Sunnyvale
Treatment Plant
SCVWD
A4
Legend
Water Quality Sampling Points
Inlet
Outlet
Ponds A1 through A8
N
0
0.5
1
2
Miles

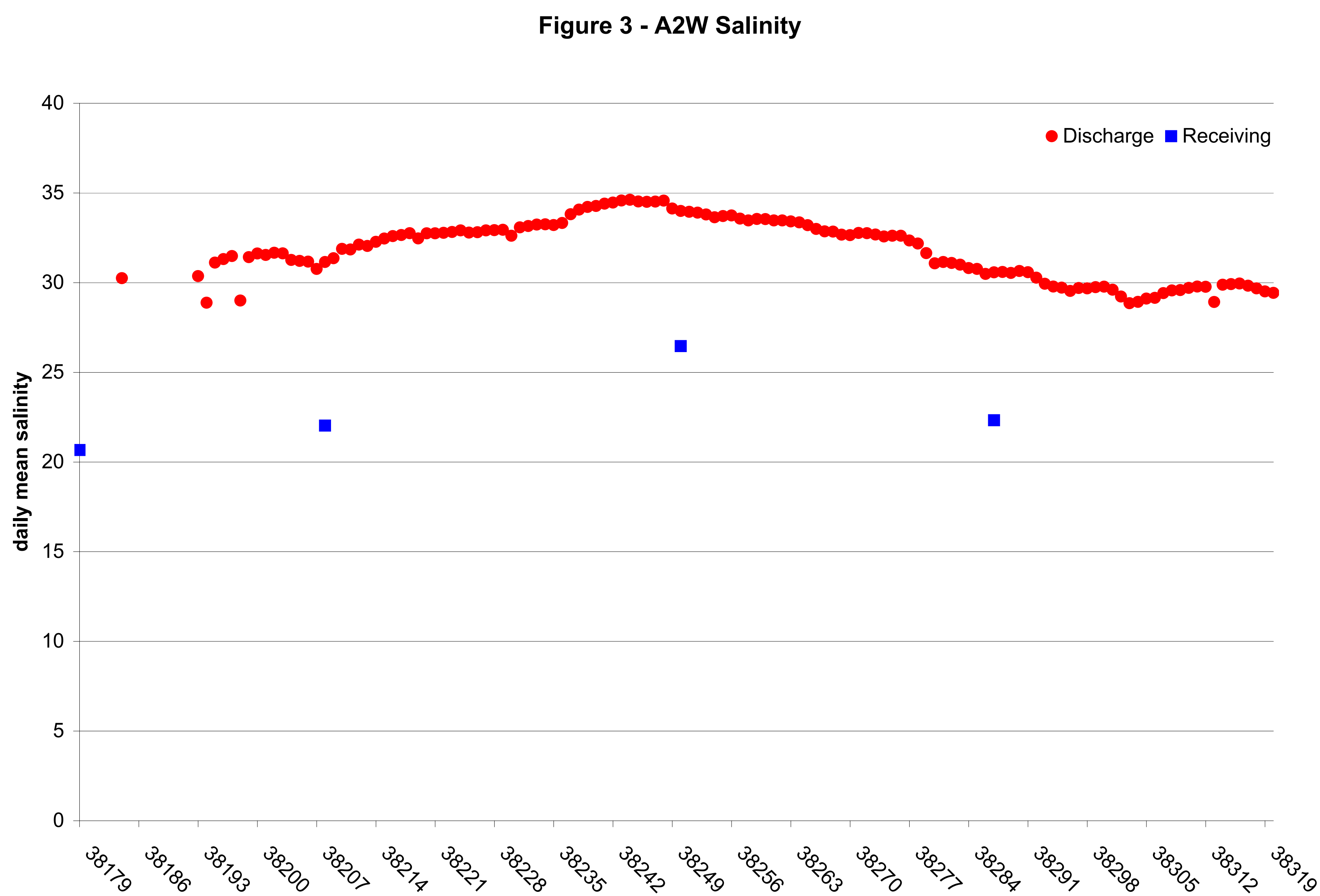
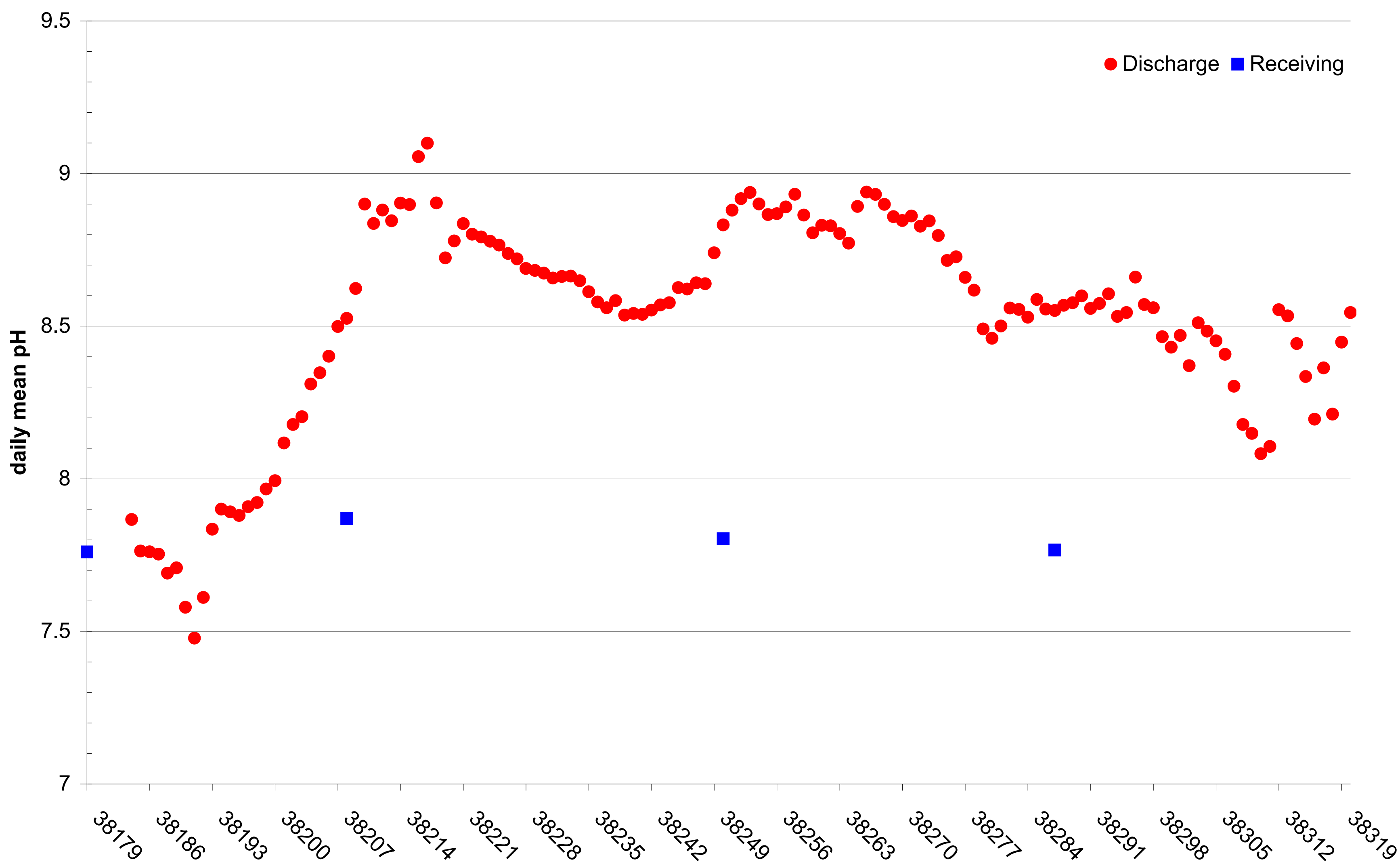


Figure 3 - A2W Salinity
daily mean salinity
Discharge
Receiving
0
5
10
15
20
25
30
35
40
38179
38186
38193
38200
38207
38214
38221
38228
38235
38242
38249
38256
38263
38270
38277
38284
38291
38298
38305
38312
38319

Figure 4 - A2W pH



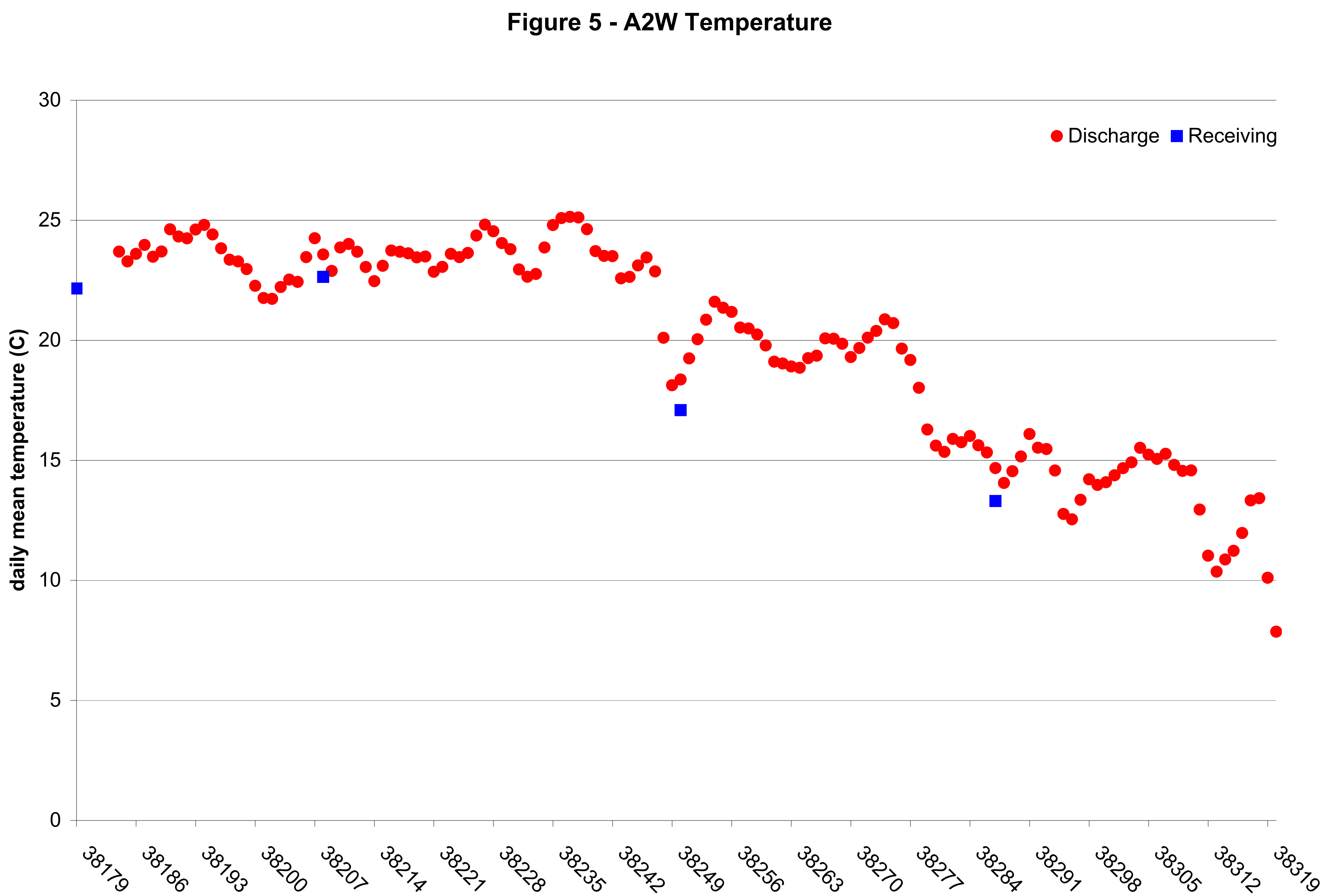


Figure 5 - A2W Temperature
Discharge
Receiving
daily mean temperature (C)
30
25
20
15
10
5
0
38179
38186
38193
38200
38207
38214
38221
38228
38235
38242
38249
38256
38263
38270
38277
38284
38291
38298
38305
38312
38319

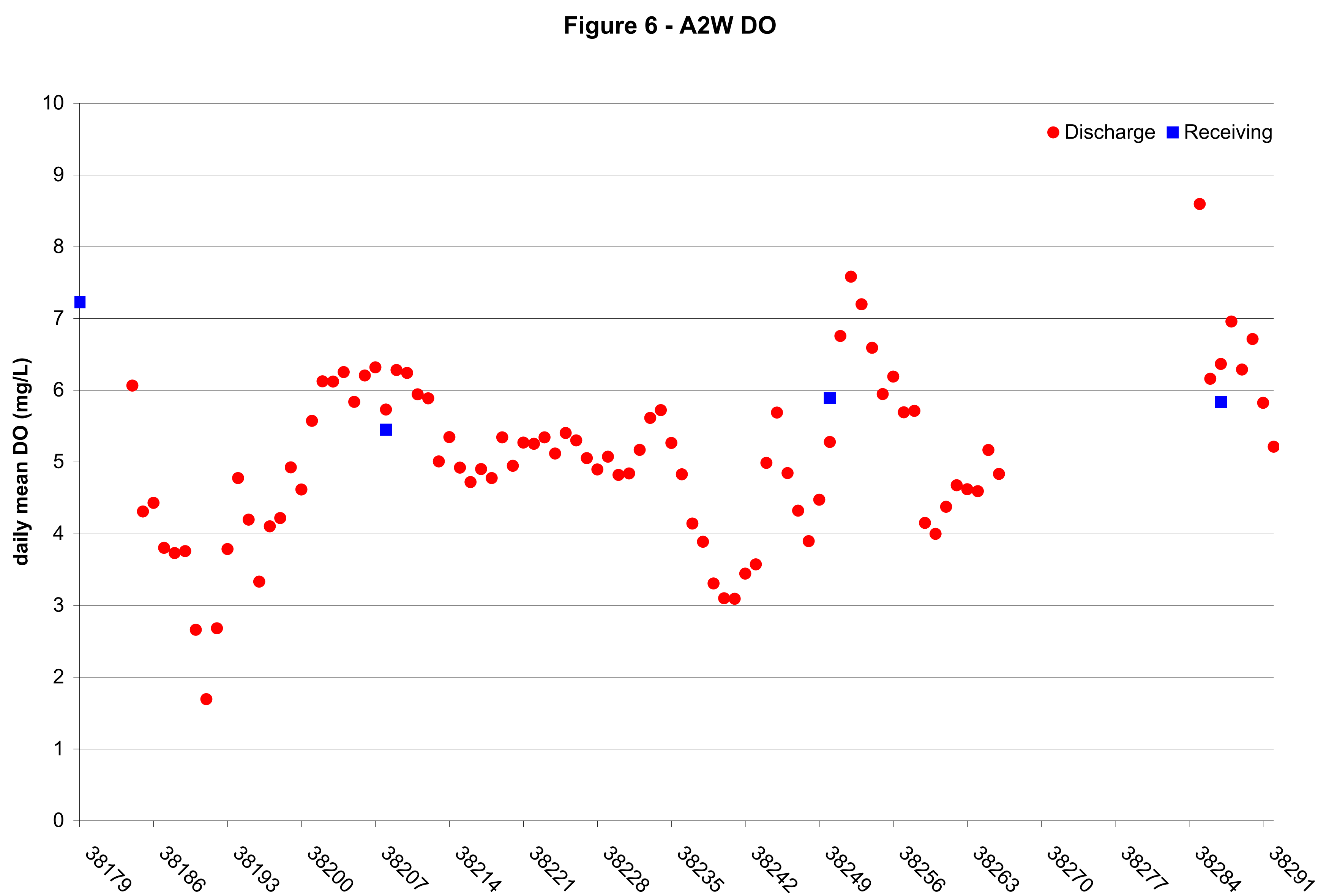


Figure 6 - A2W DO
daily mean DO (mg/L)
Discharge
Receiving
0
1
2
3
4
5
6
7
8
9
10
38179
38186
38193
38200
38207
38214
38221
38228
38235
38242
38249
38256
38263
38270
38277
38284
38291

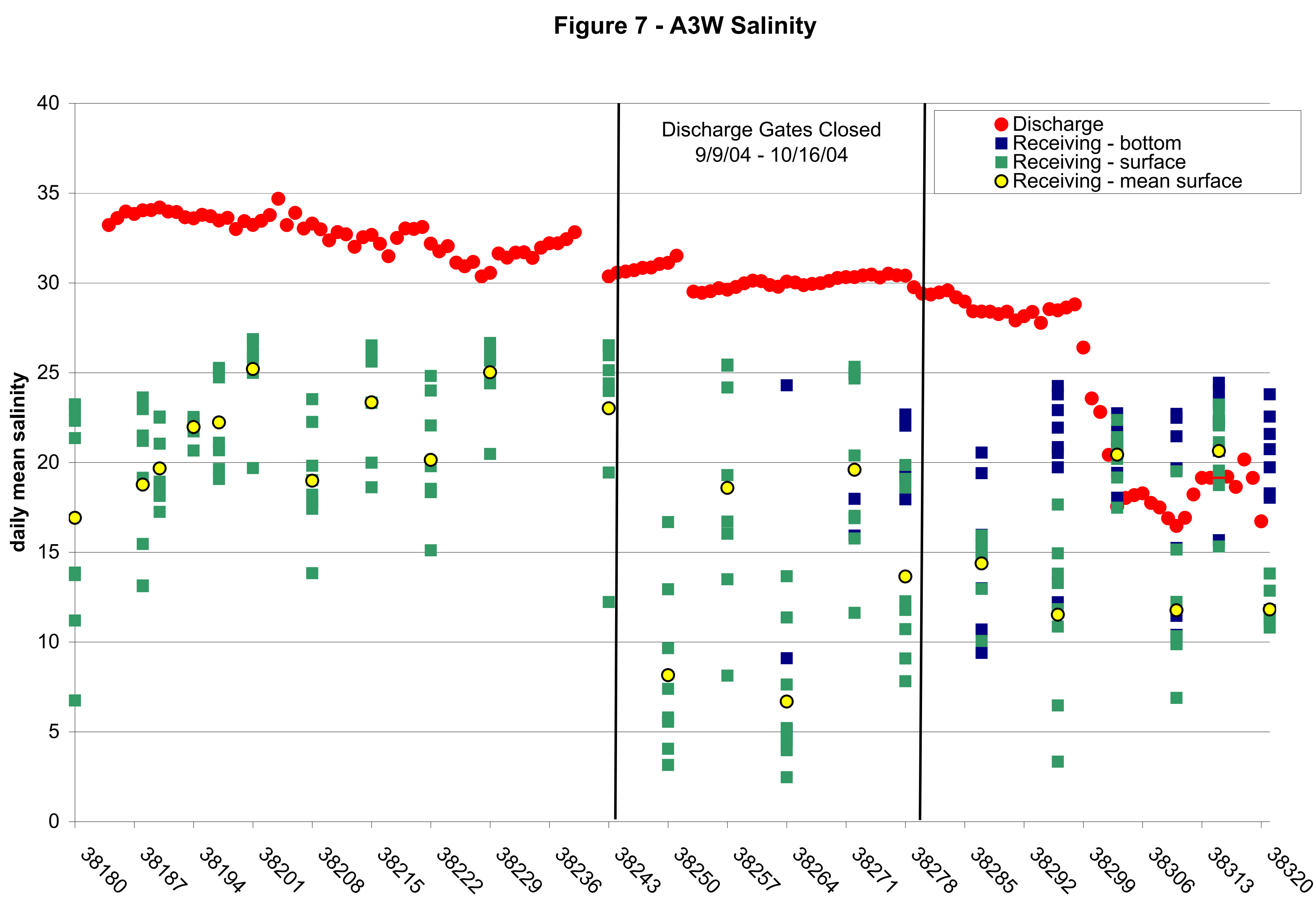


Figure 7 - A3W Salinity
Discharge Gates Closed
9/9/04 - 10/16/04
Discharge
Receiving - bottom
Receiving - surface
Receiving - mean surface
daily mean salinity
40
35
30
25
20
15
10
5
0
38180
38187
38194
38201
38208
38215
38222
38229
38236
38243
38250
38257
38264
38271
38278
38285
38292
38299
38306
38313
38320

Figure 8 - A3W pH

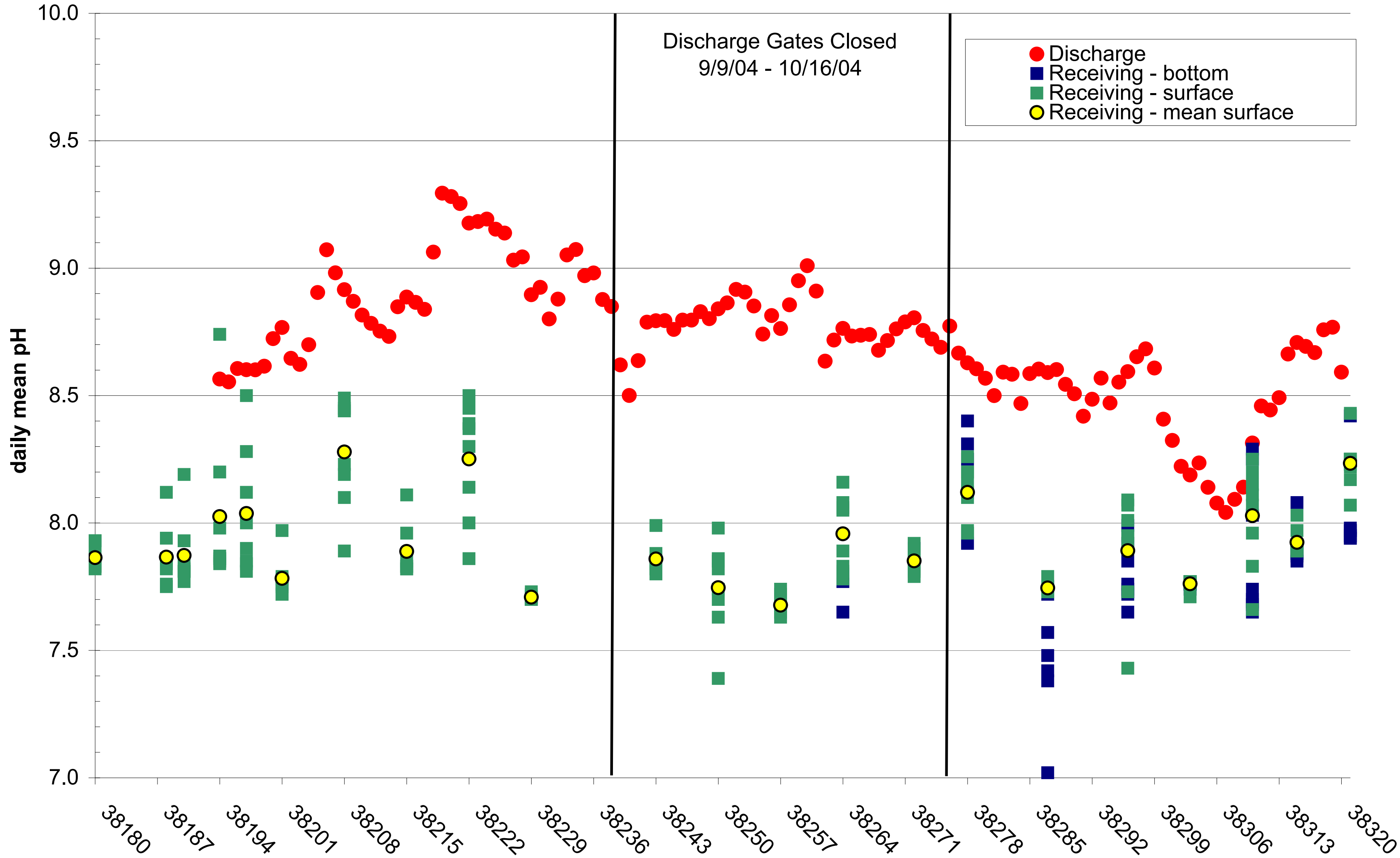


Figure 9 - A3W Temperature

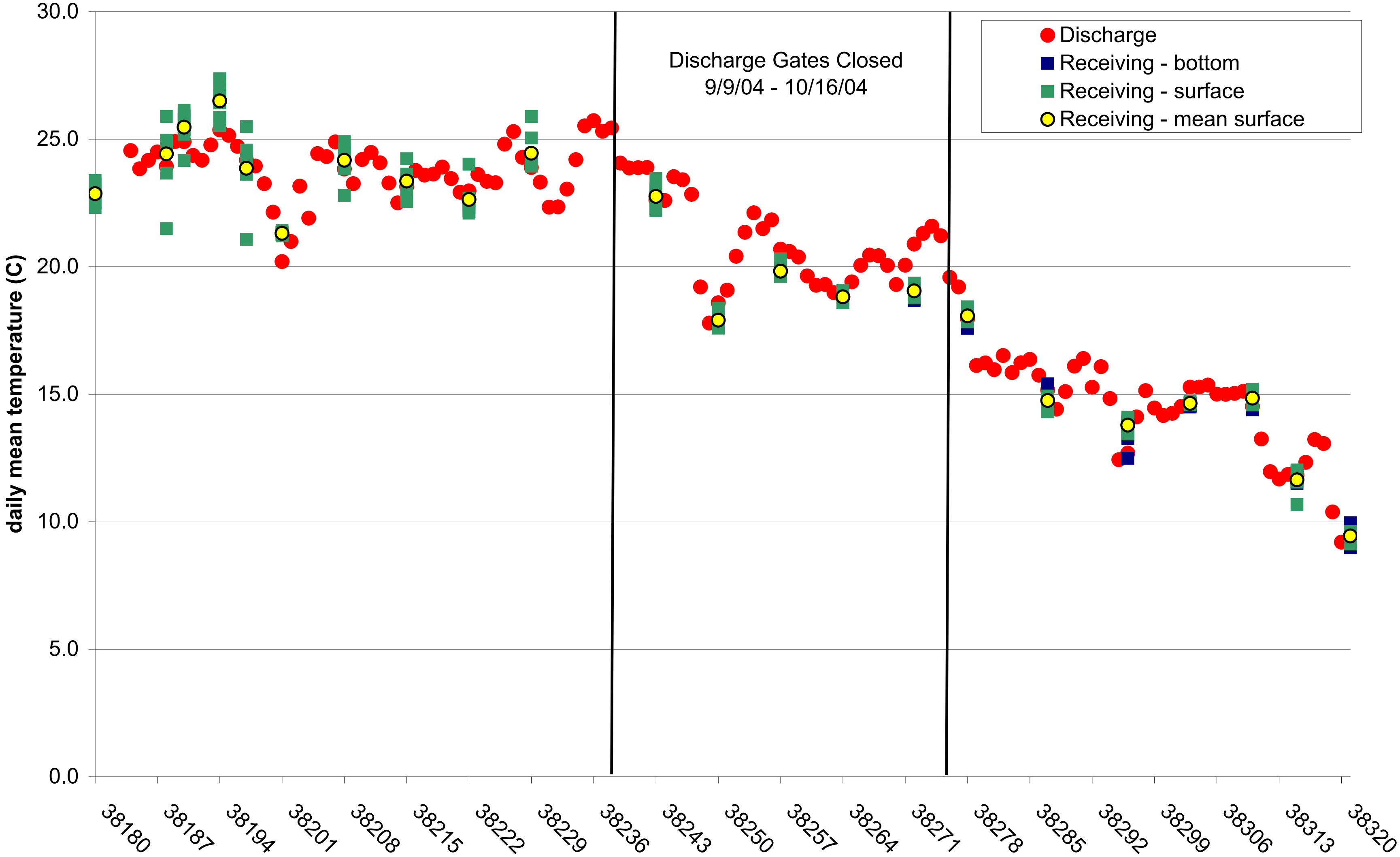


Figure 10 - A3W DO

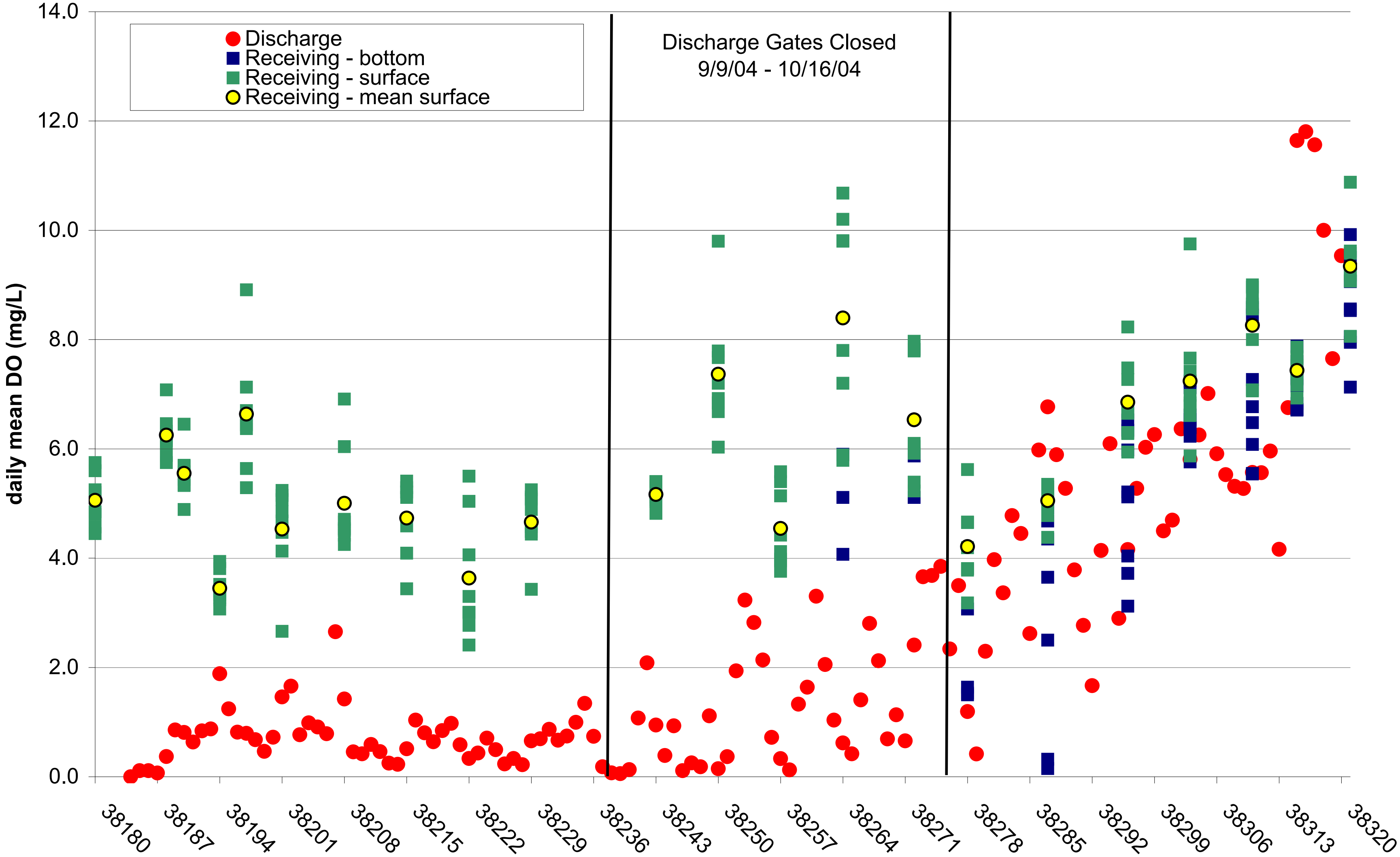


Figure 11 - A7 Salinity

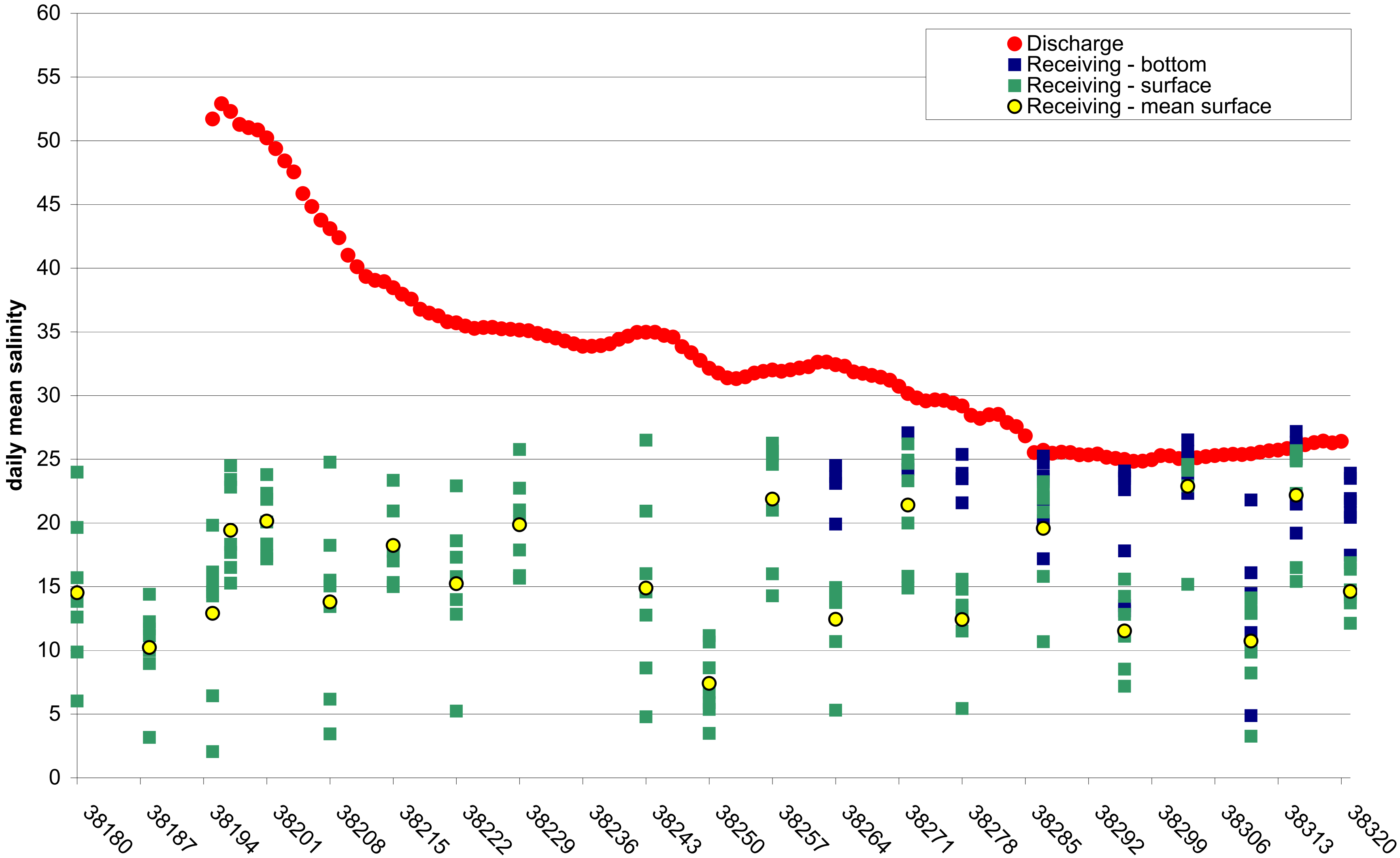
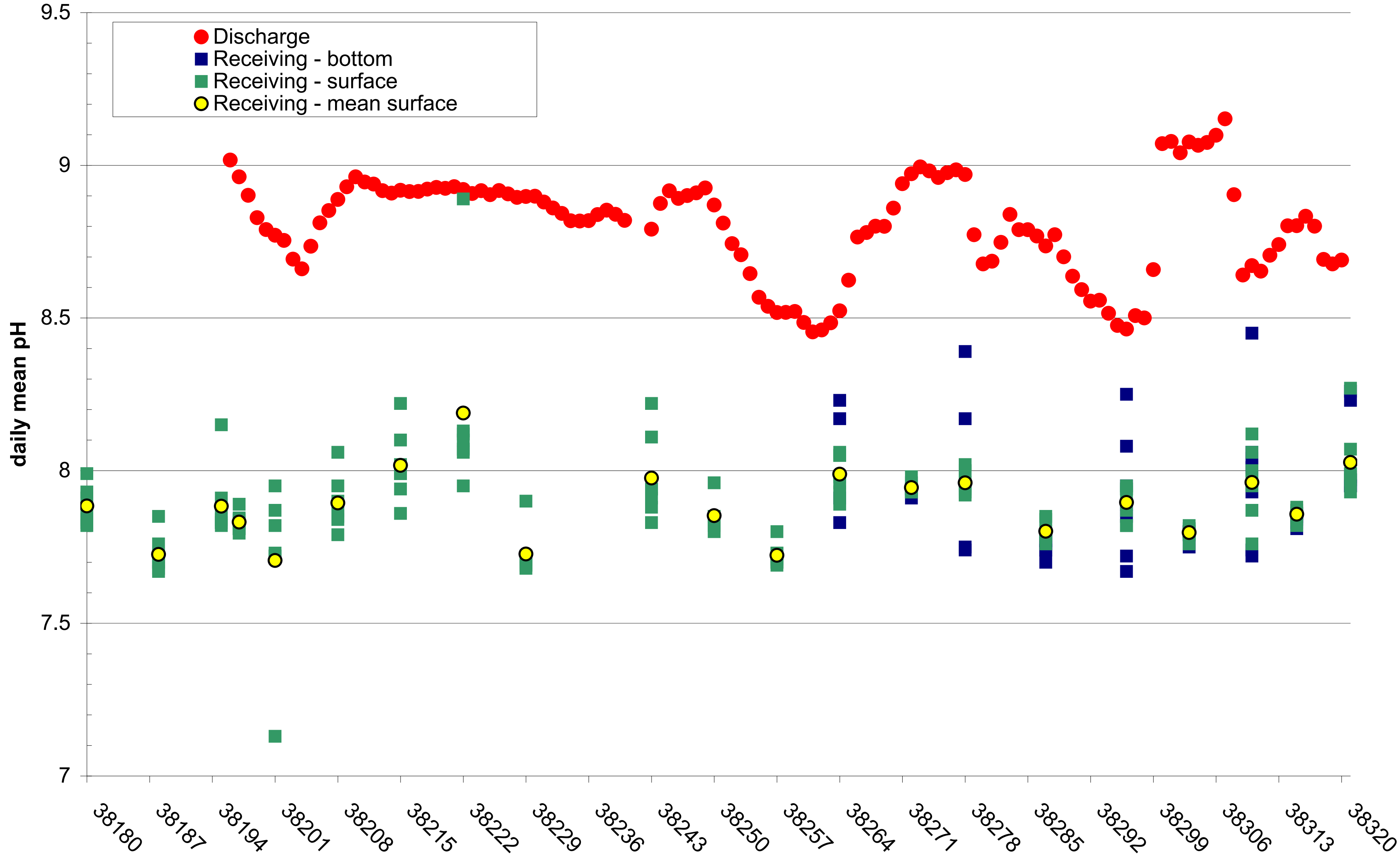


Figure 12 - A7 pH



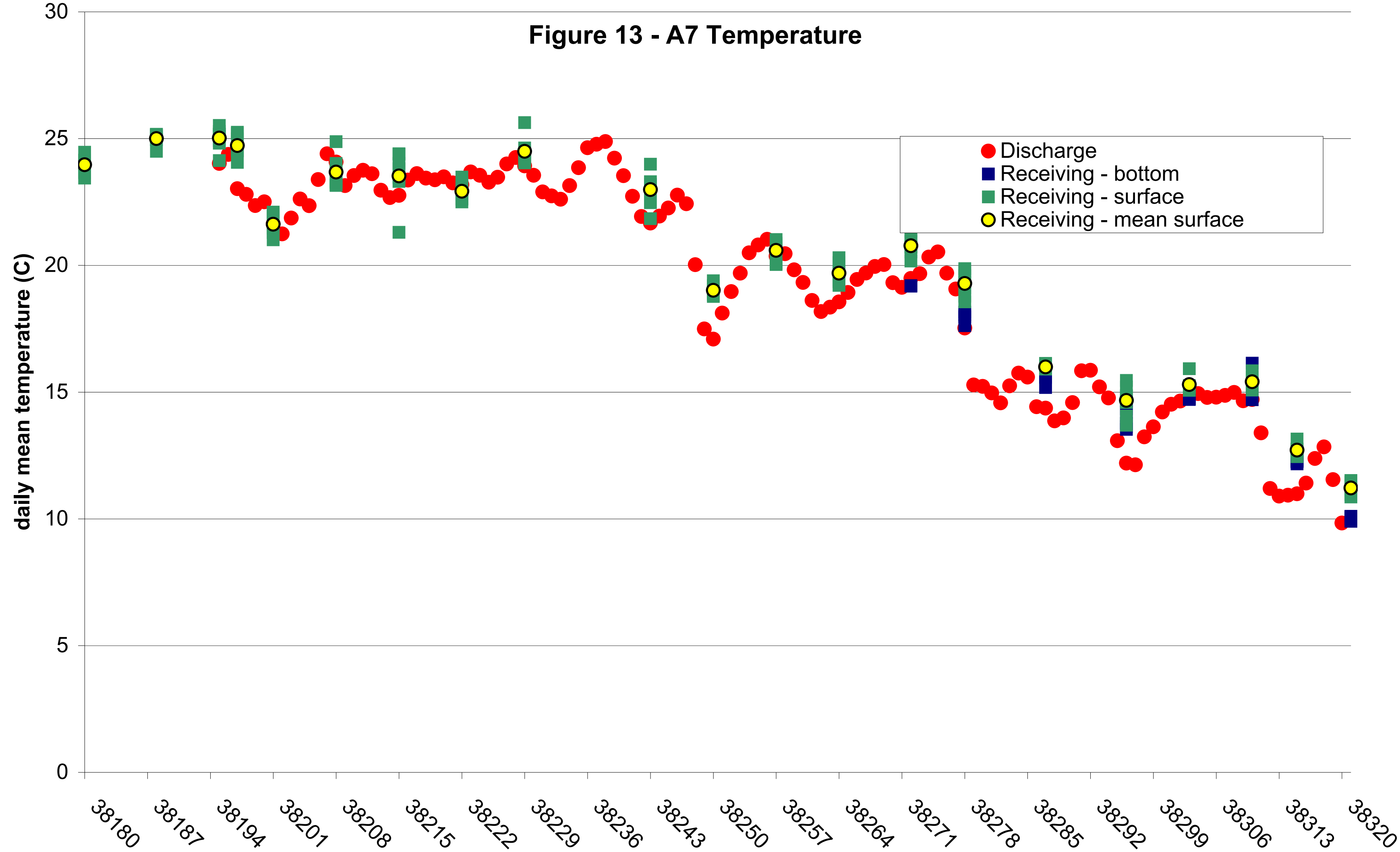
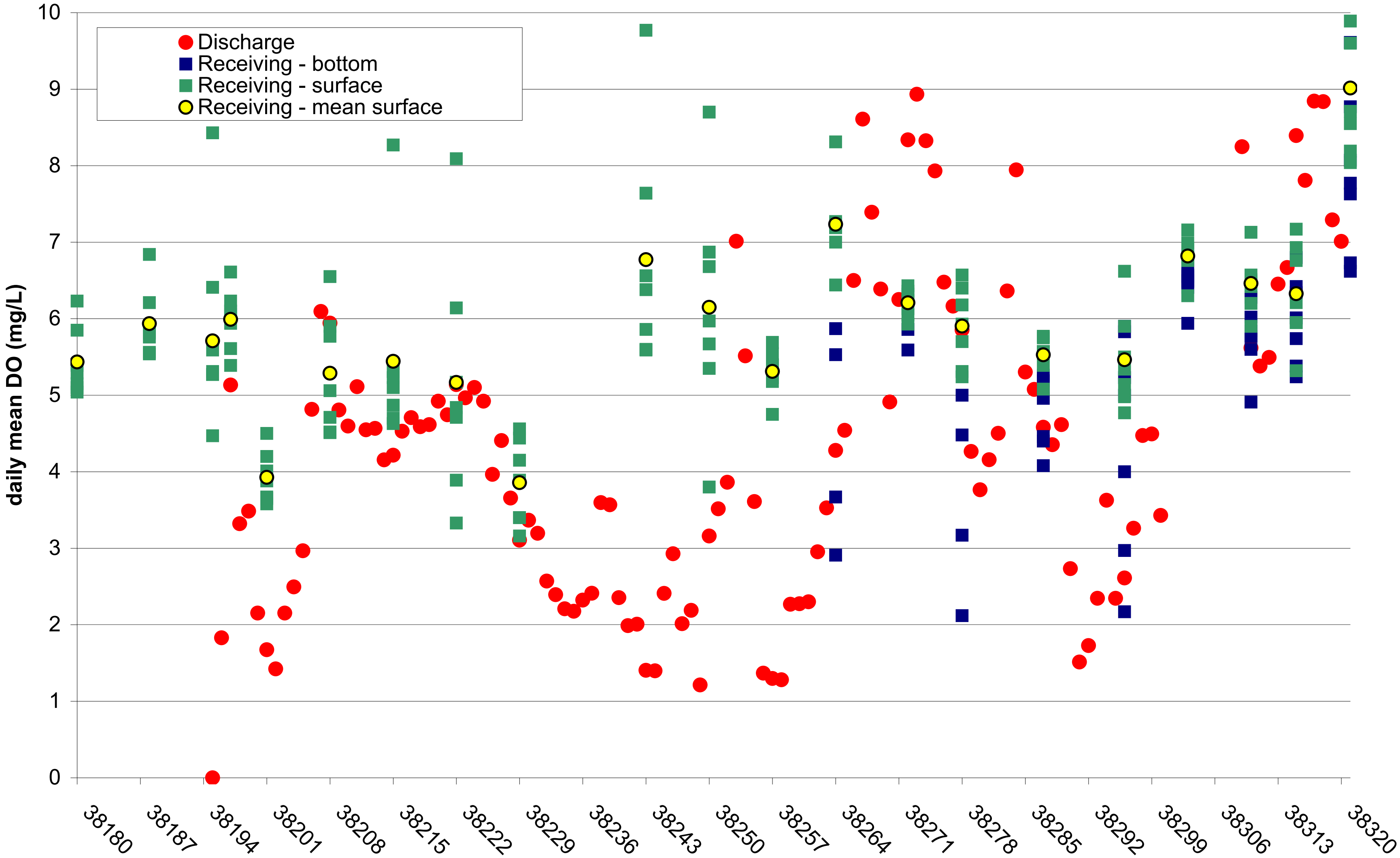


Figure 13 - A7 Temperature
daily mean temperature (C)
30
25
20
15
10
5
0
Discharge
Receiving - bottom
Receiving - surface
Receiving - mean surface
38180
38187
38194
38201
38208
38215
38222
38229
38236
38243
38250
38257
38264
38271
38278
38285
38292
38299
38306
38313
38320

Figure 14 - A7 DO



Appendix A: Discharge Limitations in Final Order

1. For the initial discharge, ponds shall not discharge waters that exceed the following limits:

Pond System	Salinity (ppt) Instantaneous Maximum
A2W	60
A3W	50
A7	90

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

Constituent	Instantaneous Maximum	Instantaneous Minimum	Units
Salinity for continuous circulation	44		ppt
Dissolved Oxygen[1]		5	mg/L
pH[2]	8.5	6.5	

[1] This limitation applies when receiving waters contain at least 5.0 mg/L of dissolved oxygen. In cases where receiving waters do not meet the Basin Plan objective, pond discharges must be at or above the dissolved oxygen level in the receiving water.

[2] The Discharger may determine compliance with the pH limitation at the point of discharge or in the receiving water.

3. Pond waters discharging to the Bay or Sloughs shall not exceed the natural temperature of the receiving waters by 20°F, or more.

4. Dissolved Oxygen Trigger. Within each pond, once the salinity levels at the discharge point are below 44 ppt, if the dissolved oxygen concentration falls below 1.0 mg/L, the Discharger shall implement corrective measures to increase dissolved oxygen concentrations to above 1.0 mg/L in the pond systems in question, and revise its Operation Plan as necessary to minimize reoccurrence.

Appendix B: Summary of Management Sampling

POND	Location	Grid	Date	Time	Depth S= Surf. B= Bot.	Cond. uS/cm	Temp.	Turbidity (NTU)	pH	D.O. mg/L	Hydrometer Salinity	Spec. Grav.	Sonde Salinity
A2E	A-A2E-0	A2EE5	5/4/2004	8:12	S		19.43		8.03	3.31	#REF!	1.0170	
A2E	A-A2E-0	A2EE5	5/18/2004	8:14	S		17.26	24.4	8.12	5.70	#REF!	1.0175	
A2E	A-A2E-0	A2EG6	6/1/2004	8:46	S		20.83	153.5	7.85	3.21	#REF!	1.0200	
A2E	A-A2E-0	A2EG6	6/15/2004	8:26	S		20.82	24.2	7.90	1.86	#REF!	1.0195	
A2E	A-A2E-0	A2EG6	6/29/2004	8:51	S		21.78	24.5	8.29	3.55	#REF!	1.0220	
A2E	A-A2E-0	A2EG6	7/13/2004	8:49	S	47.8	20.87	13	8.66	4.65	#REF!	1.0230	31.21
A2E	A-A2E-0	A2EF6	7/27/2004	8:13	S	48.3	23.02	9.9	9.12	7.15	#REF!	1.0205	31.58
A2E	A-A2E-0	A2EF6	8/17/2004	9:06	S	45.61	23.93		9.43	6.92	#REF!	1.0185	29.58
A2E	A-A2E-0	A2EF6	8/25/2004	8:32	S	44.25	22.38	6.5	9.18	4.36	#REF!	1.0190	28.55
A2E	A-A2E-0	A2EF1	9/13/2004	14:51	S	40.72	24.86		8.5	1.89			26.07
A2E	A-A2E-0	A2EF6	9/13/2004	15:03	S	43.85	23.87		8.6	4.27			28.32
A2E	A-A2E-0	A2EH7	9/13/2004	15:10	S	44.57	24.89		8.7	7.10			28.87
A2E	A-A2E-0	A2EF6	9/14/2004	8:15	S	43.36	20.89	27.1	8.78	3.98	#REF!	1.0200	27.98
A2E	A-A2E-0	A2EF1	10/20/2004	14:15	S	40.59	18.13		8.35	7.39			26.00
A2E	A-A2E-0	A2EF6	10/20/2004	14:23	S	40.49	17.53	97.5	8.35	6.62			25.91
A2E	A-A2E-0	A2EH7	10/20/2004	14:36	S	40.20	17.82		8.4	9.03			25.67
A2W	A-A2W-0	A2WF4	5/5/2004	8:00	S		18.86	125.0	7.91	0.81	#REF!	1.0150	
A2W	A-A2W-0	A2WF4	5/19/2004	8:14	S		17.66	29.8	8.08	4.73	#REF!	1.0161	
A2W	A-A2W-0	A2WH6	6/1/2004	9:30	S		21.44	132.2	7.79	3.89	#REF!	1.0180	
A2W	A-A2W-0	A2WH6	6/15/2004	9:15	S		21.75	21.5	8.06	4.02	#REF!	1.0175	
A2W	A-A2W-0	A2WH6	6/29/2004	8:33	S		21.73	45.9	8.02	2.26	#REF!	1.0200	
A2W	A-A2W-0	A2WH6	7/13/2004	8:33	S	44.97	20.32	56.3	8.21	3.52	#REF!	1.0205	29.16
A2W	A-A2W-0	A2WH5	7/27/2004	8:54	S	46.03	23.00	21.8	8.54	6.21	#REF!	1.0215	29.91
A3N	A-A3N-0	A3ND2	7/27/2004	8:27	S	93.19	20.29	75.6	8.65	0.61	#REF!	1.0490	65.50
A3N	A-A3N-0	A3ND2	8/17/2004	9:32	S	n/a	22.98	32.3	8.94	4.68	#REF!	1.0560	70.74
A3N	A-A3N-0	A3ND2	8/25/2004	8:48	S	n/a	20.15	54.8	8.73	1.55	#REF!	1.0610	
A3N	A-A3N-0	A3NB1	9/13/2004	15:56	S	n/a	23.55		8.69	3.83			
A3N	A-A3N-0	A3ND1	9/13/2004	15:47	S	n/a	24.50		9.09	9.34			
A3N	A-A3N-0	A3ND2	9/14/2004	8:38	S		19.47	164.6	8.98	2.25	#REF!	1.0700	
A3N	A-A3N-0	A3NB1	10/20/2004	13:07	S	77.12	15.99	125	8.29	4.18			53.22
A3N	A-A3N-0	A3ND1	10/20/2004	13:19	S	75.31	18.18	118.3	8.23	4.87			51.71
A3W	A-A3W-0	A3WD4	5/4/2004	9:31	S		20.45	33.5	8.51	4.98	#REF!	1.0190	
A3W	A-A3W-0	A3WD4	5/18/2004	9:35	S		17.94	18.5	8.51	5.94	#REF!	1.0205	
A3W	A-A3W-0	A3WA3	6/1/2004	9:00	S		20.6	97.1	8.25	3.95	#REF!	1.0215	
A3W	A-A3W-0	A3WA3	6/15/2004	8:36	S		20.66	62.1	8.20	3.76	#REF!	1.0220	
A3W	A-A3W-0	A3WA3	6/29/2004	9:07	S		20.39	42.2	8.33	4.25	#REF!	1.0235	
A3W	A-A3W-0	A3WG2	7/13/2004	9:36	S	50.66	21.78		8.57	4.24	#REF!	1.0240	33.29
A3W	A-A3W-0	A3WA3	7/27/2004	8:24	S	53.78	21.44	8.1	8.95	7.83	#REF!	1.0255	35.60

Appendix B Continued

POND	Location	Grid	Date	Time	Depth S= Surf. B= Bot.	Cond. uS/cm	Temp.	Turbidity (NTU)	pH	D.O. mg/L	Hydrometer Salinity	Spec. Grav.	Sonde Salinity
A7	A-A7-0	A7E8	5/5/2004	9:05	S		18.52	66.5	9.52	4.80	#REF!	1.0345	
A7	A-A7-0	A7E8	5/19/2004	9:23	S		18.05	41.5	9.54	6.15	#REF!	1.0355	
A7	A-A7-0	A7G9	6/1/2004	10:00	S		23.6	235.4	9.55	11.01	#REF!	1.0310	
A7	A-A7-0	A7G9	6/15/2004	9:48	S		24.36	110	9.41	10.66	#REF!	1.0370	
A7	A-A7-0	A7G9	6/29/2004	9:46	S		22.94	76.3	9.33	6.37	#REF!	1.0390	
A7	A-A7-0	A7G9	7/14/2004	8:36	S	81.43	20.82	108.5	9.11	2.67	#REF!	1.0425	56.53
A7	at breach	A7A2	7/27/2004	9:54	S	78.71	23.90	97.5	8.98	2.04	#REF!	1.0365	54.48
A7	A-A7-0	A7G9	7/27/2004	9:33	S	70.79	23.56	58.1	8.87	9.50	#REF!	1.0350	48.41
AB2	A-B2-0	AB2D1	5/4/2004	8:47	S		19.12	329.0	9.11	6.55	#REF!	1.0147	
AB2	A-B2-0	AB2D1	5/18/2004	8:50	S		15.94	10.9	9.39	7.01	#REF!	1.0143	
AB2	A-B2-0	AB2I1	6/1/2004	9:10	S		18.86	75.1	8.89	0.25	#REF!	1.0170	
AB2	A-B2-0	AB2I1	6/15/2004	8:50	S		19.66	19.6	9.00	0.41	#REF!	1.0195	
AB2	A-B2-0	AB2I1	6/29/2004	8:58	S		20.95	22.6	9.55	2.44	#REF!	1.0200	
AB2	A-B2-0	AB2H1	7/13/2004	9:31	S	48.12	20.57		9.38	2.68	#REF!	1.0230	31.45
AB2	A-B2-0	AB2H2	7/27/2004	8:34	S	42.43	21.36	39.5	9.22	2.60	#REF!	1.0190	27.32
AB2	A-B2-0	AB2H2	8/17/2004	9:17	S	40.67	21.58	60.5	8.76	0.89	#REF!	1.0180	25.99
AB2	A-B2-0	AB2H2	8/25/2004	8:40	S	42.29	18.25	26.2	8.25	0.41	#REF!	1.0180	27.23
AB2	A-B2-0	AB2A2	9/13/2004	16:02	S	45.27	25.28		8.39	8.09			29.34
AB2	A-B2-0	AB2C2	9/13/2004	15:34	S	40.89	26.19		8.29	5.02			26.23
AB2	A-B2-0	AB2I2	9/13/2004	15:22	S	43.76	26.61		8.61	9.92			28.31
AB2	A-B2-0	AB2H2	9/14/2004	8:23	S	42.08	18.11	105.3	8.36	0.29	#REF!	1.0200	27.05
AB2	A-B2-0	AB2A2	10/20/2004	13:02	S	36.13	16.94	64.2	8.09	7.51			22.81
AB2	A-B2-0	AB2C2	10/20/2004	13:28	S	37.62	15.87	75.9	8.15	5.71			23.87
AB2	A-B2-0	AB2I2	10/20/2004	13:58	S	38.35	17.88	37.2	8.07	4.78			24.39
A2E	A-A2E-0	A2EF6	10/28/2004	9:26	S	40.31	13.03	n/a	8.67	7.89	#REF!	1.0200	25.83
AB2	A-B2-0	AB2H2	10/28/2004	9:57	S	37.94	12.51	n/a	8.80	6.79	#REF!	1.0175	24.10
A3N	A-A3N-0	A3ND2	10/28/2004	9:44	S	56.56	11.95	n/a	8.64	11.07	#REF!	1.0280	38.06

Appendix B Continued

POND	Location	Grid	Date	Time	Staff	REMARKS	Thermo
A2E	A-A2E-0	A2EE5	5/4/2004	8:12	2.85	Turbidity sensor guard blocked sensor during sample	18.25
A2E	A-A2E-0	A2EE5	5/18/2004	8:14	3.00	NE wind >6mph, BMP 770	17
A2E	A-A2E-0	A2EG6	6/1/2004	8:46	3.00	SE wind >6mph, BMP 753.5	21
A2E	A-A2E-0	A2EG6	6/15/2004	8:26	2.95	NE wind >6mph, BMP 757.5	21
A2E	A-A2E-0	A2EG6	6/29/2004	8:51	2.85		21
A2E	A-A2E-0	A2EG6	7/13/2004	8:49	2.85		20.5
A2E	A-A2E-0	A2EF6	7/27/2004	8:13			22.00
A2E	A-A2E-0	A2EF6	8/17/2004	9:06		water clear - turbidity in shade; lots of sunken algae	24.00
A2E	A-A2E-0	A2EF6	8/25/2004	8:32	2.60		22.50
A2E	A-A2E-0	A2EF1	9/13/2004	14:51			n/a
A2E	A-A2E-0	A2EF6	9/13/2004	15:03			n/a
A2E	A-A2E-0	A2EH7	9/13/2004	15:10			n/a
A2E	A-A2E-0	A2EF6	9/14/2004	8:15	3.00		20.00
A2E	A-A2E-0	A2EF1	10/20/2004	14:15		algae around turbidity sensor, reading was very high	n/a
A2E	A-A2E-0	A2EF6	10/20/2004	14:23			n/a
A2E	A-A2E-0	A2EH7	10/20/2004	14:36			n/a
A2W	A-A2W-0	A2WF4	5/5/2004	8:00		NW wind 8mph	17.25
A2W	A-A2W-0	A2WF4	5/19/2004	8:14		NE wind 6mph, BMP 773.5	17.3
A2W	A-A2W-0	A2WH6	6/1/2004	9:30		Salinity = 23.40; SE wind >6mph, BMP 753.5	21
A2W	A-A2W-0	A2WH6	6/15/2004	9:15		Salinity = 24.32; NE wind >6mph, BMP 757.5	21.5
A2W	A-A2W-0	A2WH6	6/29/2004	8:33			21
A2W	A-A2W-0	A2WH6	7/13/2004	8:33			21
A2W	A-A2W-0	A2WH5	7/27/2004	8:54			22.50
A3N	A-A3N-0	A3ND2	7/27/2004	8:27			19.50
A3N	A-A3N-0	A3ND2	8/17/2004	9:32	1.2 - in mud		24.00
A3N	A-A3N-0	A3ND2	8/25/2004	8:48	1.30		20.00
A3N	A-A3N-0	A3NB1	9/13/2004	15:56			n/a
A3N	A-A3N-0	A3ND1	9/13/2004	15:47			n/a
A3N	A-A3N-0	A3ND2	9/14/2004	8:38	dry		19.00
A3N	A-A3N-0	A3NB1	10/20/2004	13:07	Dry	road too wet/muddy, walked to sites	n/a
A3N	A-A3N-0	A3ND1	10/20/2004	13:19	Dry	road too wet/muddy, walked to sites	n/a
A3W	A-A3W-0	A3WD4	5/4/2004	9:31	0.88	very stinky and lots of algae and bacteria bloom	20.5
A3W	A-A3W-0	A3WD4	5/18/2004	9:35	0.95	turbidity 12-42 fluctuating in shade; stable at 18.5	18
A3W	A-A3W-0	A3WA3	6/1/2004	9:00		Salinity = 28.21; SE wind >6mph, BMP 753.5	20
A3W	A-A3W-0	A3WA3	6/15/2004	8:36	0.90	Salinity = 29.95; NE wind >6mph, BMP 757.5	20.5
A3W	A-A3W-0	A3WA3	6/29/2004	9:07	0.85		20
A3W	A-A3W-0	A3WG2	7/13/2004	9:36	0.85	turbidity in the shade	21.5

Appendix B Continued

POND	Location	Grid	Date	Time	Staff	REMARKS	Thermo
A3W	A-A3W-0	A3WA3	7/27/2004	8:24			20.50
A7	A-A7-0	A7E8	5/5/2004	9:05		NW wind > 6mph, BMP 767.5	18.5
A7	A-A7-0	A7E8	5/19/2004	9:23	1.60	NE wind 6mph, BMP 773.5	20
A7	A-A7-0	A7G9	6/1/2004	10:00	1.40	Water flowing from pond 7 to pond 8,SE wind >6mph, BMP 753.5	22
A7	A-A7-0	A7G9	6/15/2004	9:48		Salinity = 50.04; NE wind >6mph, BMP 757.5	24
A7	A-A7-0	A7G9	6/29/2004	9:46	1.60		23
A7	A-A7-0	A7G9	7/14/2004	8:36	1.15	Reading taken at outflow into A8, water moving	20.5
A7	at breach	A7A2	7/27/2004	9:54			23.50
A7	A-A7-0	A7G9	7/27/2004	9:33			24.00
AB2	A-B2-0	AB2D1	5/4/2004	8:47	1.50		18
AB2	A-B2-0	AB2D1	5/18/2004	8:50	1.30	Lots of algae near bottom, turbidity 0-72 in shade	16.5
AB2	A-B2-0	AB2I1	6/1/2004	9:10	2.40	Lots of algae; SE wind >6mph, BMP 753.5	20
AB2	A-B2-0	AB2I1	6/15/2004	8:50	1.70	Lots of algae; NE wind >6mph, BMP 757.5	20
AB2	A-B2-0	AB2I1	6/29/2004	8:58		algae 100% covering bottom	20.5
AB2	A-B2-0	AB2H1	7/13/2004	9:31		turbidity in the sun	20.5
AB2	A-B2-0	AB2H2	7/27/2004	8:34			20.00
AB2	A-B2-0	AB2H2	8/17/2004	9:17	(L)=1 (R)=.8	lots of decomposing algae	22.00
AB2	A-B2-0	AB2H2	8/25/2004	8:40	-0.75	lots of decomposing algae; smelly	19.00
AB2	A-B2-0	AB2A2	9/13/2004	16:02			n/a
AB2	A-B2-0	AB2C2	9/13/2004	15:34			n/a
AB2	A-B2-0	AB2I2	9/13/2004	15:22			n/a
AB2	A-B2-0	AB2H2	9/14/2004	8:23	(L)=.6 (R)=.3	lots of decomposing algae	23.00
AB2	A-B2-0	AB2A2	10/20/2004	13:02		road too wet/muddy, walked to sites	n/a
AB2	A-B2-0	AB2C2	10/20/2004	13:28		road too wet/muddy, walked to sites	n/a
AB2	A-B2-0	AB2I2	10/20/2004	13:58		road too wet/muddy, walked to sites	n/a
A2E	A-A2E-0	A2EF6	10/28/2004	9:26	2.3	Used Minisonde S/N 40868 w/out turbidity	13.25
AB2	A-B2-0	AB2H2	10/28/2004	9:57	(L)=.75 (R)=.2	Used Minisonde S/N 40868 w/out turbidity	13.75
A3N	A-A3N-0	A3ND2	10/28/2004	9:44	2.4	Used Minisonde S/N 40868 w/out turbidity	12.75

Appendix B Continued

POND	Location	Grid	Date	Time	Depth (cm)	Bottom	Weather
A2E	A-A2E-0	A2EE5	5/4/2004	8:12	65	hard	sunny, clear, 0% cc, light breeze
A2E	A-A2E-0	A2EE5	5/18/2004	8:14	45	soft	sunny, 40% cc, slight breeze
A2E	A-A2E-0	A2EG6	6/1/2004	8:46	45	firm	sunny, clear, 0%cc
A2E	A-A2E-0	A2EG6	6/15/2004	8:26	50	firm	sunny, 10%cc, warm
A2E	A-A2E-0	A2EG6	6/29/2004	8:51	35	frim	95% CC, cool and overcast, Wind 7 mph NE
A2E	A-A2E-0	A2EG6	7/13/2004	8:49	35	semi-soft	50% CC, wind 8mph W, sunny
A2E	A-A2E-0	A2EF6	7/27/2004	8:13	50	firm	100% cc, foggy, wind >6mph SE
A2E	A-A2E-0	A2EF6	8/17/2004	9:06	35	firm	0%cc, sunny, warm, BMP=724.5, wind >6mph NW
A2E	A-A2E-0	A2EF6	8/25/2004	8:32	32	firm	5%cc, sunny, warm, BMP=729, wind >6mph NW
A2E	A-A2E-0	A2EF1	9/13/2004	14:51	25	soft	8%cc, sunny, warm, wind 10 mph NW, gusts to 15mph
A2E	A-A2E-0	A2EF6	9/13/2004	15:03	65	firm	8%cc, sunny, warm, wind 10 mph NW, gusts to 15mph
A2E	A-A2E-0	A2EH7	9/13/2004	15:10	25	semi-firm	8%cc, sunny, warm, wind 10 mph NW, gusts to 15mph
A2E	A-A2E-0	A2EF6	9/14/2004	8:15	35	semi-firm	0%cc, sunny, warm, BMP=730.5, wind >6mph NW
A2E	A-A2E-0	A2EF1	10/20/2004	14:15	45	firm	70%cc, overcast and dark, wind >6mph
A2E	A-A2E-0	A2EF6	10/20/2004	14:23	60	semi-firm	70%cc, overcast and dark, wind >6mph
A2E	A-A2E-0	A2EH7	10/20/2004	14:36	40	semi-firm	70%cc, overcast and dark, wind >6mph
A2W	A-A2W-0	A2WF4	5/5/2004	8:00	65	semi-firm	clear, sunny, 20%cc (fog)
A2W	A-A2W-0	A2WF4	5/19/2004	8:14	65	soft	sunny, 0%cc, clear. Slight breeze
A2W	A-A2W-0	A2WH6	6/1/2004	9:30	35	semi-firm	sunny, clear, 0%cc
A2W	A-A2W-0	A2WH6	6/15/2004	9:15	35	semi-firm	sunny, 10%cc, warm
A2W	A-A2W-0	A2WH6	6/29/2004	8:33	40	semi-soft	95% CC, cool and overcast, Wind 7 mph NE
A2W	A-A2W-0	A2WH6	7/13/2004	8:33	30	firm	50% CC, wind 8mph W, sunny
A2W	A-A2W-0	A2WH5	7/27/2004	8:54	50	firm	100% cc, foggy, wind >6mph SE
A3N	A-A3N-0	A3ND2	7/27/2004	8:27	20	firm	100% cc, foggy, wind >6mph SE
A3N	A-A3N-0	A3ND2	8/17/2004	9:32	65	semi-firm	0%cc, sunny, warm, BMP=724.5, wind >6mph NW
A3N	A-A3N-0	A3ND2	8/25/2004	8:48	55	firm	5%cc, sunny, warm, BMP=729, wind >6mph NW
A3N	A-A3N-0	A3NB1	9/13/2004	15:56	45	semi-firm	8%cc, sunny, warm, wind 10 mph NW, gusts to 15mph
A3N	A-A3N-0	A3ND1	9/13/2004	15:47	35	soft	8%cc, sunny, warm, wind 10 mph NW, gusts to 15mph
A3N	A-A3N-0	A3ND2	9/14/2004	8:38	40	semi-soft	0%cc, sunny, warm, BMP=730.5, wind >6mph NW
A3N	A-A3N-0	A3NB1	10/20/2004	13:07	50	firm	65%cc, overcast and dark, wind >6mph
A3N	A-A3N-0	A3ND1	10/20/2004	13:19	67	firm	65%cc, overcast and dark, wind >6mph
A3W	A-A3W-0	A3WD4	5/4/2004	9:31	55	semi-soft	sunny, clear, 0% cc, light breeze
A3W	A-A3W-0	A3WD4	5/18/2004	9:35	30	hard	sunny, 40% cc, slight breeze
A3W	A-A3W-0	A3WA3	6/1/2004	9:00	38	firm	sunny, clear, 0%cc
A3W	A-A3W-0	A3WA3	6/15/2004	8:36	35	firm	sunny, 10%cc, warm
A3W	A-A3W-0	A3WA3	6/29/2004	9:07	25	firm	95% CC, cool and overcast, Wind 7 mph NE

Appendix B Continued

POND	Location	Grid	Date	Time	Depth (cm)	Bottom	Weather
A3W	A-A3W-0	A3WG2	7/13/2004	9:36	40	firm	50% CC, wind 8mph W, sunny
A3W	A-A3W-0	A3WA3	7/27/2004	8:24	15	firm	100% cc, foggy, wind >6mph SE
A7	A-A7-0	A7E8	5/5/2004	9:05	70	firm	clear, sunny, 20%cc (fog)
A7	A-A7-0	A7E8	5/19/2004	9:23	55	soft	sunny, 0%cc, clear. Slight breeze
A7	A-A7-0	A7G9	6/1/2004	10:00	55	firm	sunny, clear, 0%cc
A7	A-A7-0	A7G9	6/15/2004	9:48	55	semi-soft	sunny, 10%cc, warm
A7	A-A7-0	A7G9	6/29/2004	9:46	60	firm	CC 60%, Wind 7 mph N
A7	A-A7-0	A7G9	7/14/2004	8:36	40	firm	95% CC, sun shining through, wind 6mph
A7	at breach	A7A2	7/27/2004	9:54	55	soft	100% cc, foggy, wind >6mph SE
A7	A-A7-0	A7G9	7/27/2004	9:33	45	firm	100% cc, foggy, wind >6mph SE
AB2	A-B2-0	AB2D1	5/4/2004	8:47	55	semi-soft	sunny, clear, 0% cc, light breeze
AB2	A-B2-0	AB2D1	5/18/2004	8:50	25	firm	sunny, 40% cc, slight breeze
AB2	A-B2-0	AB2I1	6/1/2004	9:10	95	semi-soft	sunny, clear, 0%cc
AB2	A-B2-0	AB2I1	6/15/2004	8:50	75	semi-firm	sunny, 10%cc, warm
AB2	A-B2-0	AB2I1	6/29/2004	8:58	25	semi-firm	95% CC, cool and overcast, Wind 7 mph NE
AB2	A-B2-0	AB2H1	7/13/2004	9:31	20	semi-firm	50% CC, wind 8mph W, sunny
AB2	A-B2-0	AB2H2	7/27/2004	8:34	90	semi-firm	100% cc, foggy, wind >6mph SE
AB2	A-B2-0	AB2H2	8/17/2004	9:17	90	semi-soft	0%cc, sunny, warm, BMP=724.5, wind >6mph NW
AB2	A-B2-0	AB2H2	8/25/2004	8:40	45	firm	5%cc, sunny, warm, BMP=729, wind >6mph NW
AB2	A-B2-0	AB2A2	9/13/2004	16:02	50	firm	8%cc, sunny, warm, wind 10 mph NW, gusts to 15mph
AB2	A-B2-0	AB2C2	9/13/2004	15:34	15	firm	8%cc, sunny, warm, wind 10 mph NW, gusts to 15mph
AB2	A-B2-0	AB2I2	9/13/2004	15:22	45	firm	8%cc, sunny, warm, wind 10 mph NW, gusts to 15mph
AB2	A-B2-0	AB2H2	9/14/2004	8:23	35	semi-firm	0%cc, sunny, warm, BMP=730.5, wind >6mph NW
AB2	A-B2-0	AB2A2	10/20/2004	13:02	90	firm	65%cc, overcast and dark, wind >6mph
AB2	A-B2-0	AB2C2	10/20/2004	13:28	25	firm	65%cc, overcast and dark, wind >6mph
AB2	A-B2-0	AB2I2	10/20/2004	13:58	150	semi-firm	65%cc, overcast and dark, wind >6mph
A2E	A-A2E-0	A2EF6	10/28/2004	9:26	30	semi-firm	10%cc, sunny, warm, wind >6mph NW
AB2	A-B2-0	AB2H2	10/28/2004	9:57	150	firm	10%cc, sunny, warm, wind >6mph NW
A3N	A-A3N-0	A3ND2	10/28/2004	9:44	60	firm	10%cc, sunny, warm, wind >6mph NW

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Progress Report for Mercury in Sediments of the Alviso and Eden Landing Salt Ponds – Results from Winter 2005 Sampling

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Overview

We collected sediment cores for analysis of total (THg) and methyl (meHg) mercury during winter 2005 from the Alviso and Eden Landing 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 herein summarize efforts from winter 2005 and are presented with summaries from previous sampling conducted during late summer-early fall 2003 and 2004 (Miles et al. 2005).

The protocol set forth in the proposed scope of work for the monitoring study (Miles and Takekawa 2003, Stallings 2003) identified 2 main objectives: 1) establish a set of baseline concentrations of total and meHg in south bay salt ponds, primarily during late summer – early fall or winter, and 2) conduct additional sampling in ponds with highest baseline meHg concentrations, scheduled for changing water and salinity regimes, or characterized by important physical features. Results from ponds sampled during late summer – fall during 2003 and 2004 were reported previously (Miles et al. 2005) and, along with consultation with FWS, were used to determine ponds for sampling during winter 2005. Specifically,

- Ponds A3N, A12, and A13 were re-sampled because they contained surface sediments with the highest geometric mean concentrations of meHg during late summer – early fall.

- AB1, A5, and A7 are characterized by increasing depth associated with increasing distance from the south bay, causing exposed mudflats as water flow changes and higher methylation potential. Thus, we sampled 3 points (near, midway, and farthest from the bay) in order describe potential within pond variation in Hg concentrations associated with depth.

- Alviso ponds A9, A15, A17, A19, A20, and A21 were sampled to establish baseline Hg concentrations during winter. Water regime changes either have been conducted or soon will be conducted on these ponds.

- Finally, we collected sediment samples to obtain winter baseline THg and meHg concentrations in all Eden Landing Ponds (B1, B2, B4, B5, B6, B7, B8, B9, B10, B11, B12, B14, B1C, B2C, B4C, B5C, B6A, B6B, and B6C). In addition, 4 Eden Landing ponds were sampled in late summer – fall (B1, B2, B4, and B7).

- Concentrations of meHg in surface sediments from Alviso ponds A1, A2E, A2W, A3W, A5, A7, AB1, and AB2 sampled during late summer – fall 2004 were not available for inclusion in the January 2005 Progress Report. Results are included in this report which completes the baseline dataset for late summer – early fall.

Methods

Collection protocols and results for sediments collected during 2003 and 2004 were described previously (Miles et al. 2005). Briefly, we sampled 3 sites at each pond using a 2 cm diameter corer made of PVC pipe driven approximately 20 cm into the sediment. GPS coordinates and discrete water quality measurements (e.g. pH, temperature, salinity, Redox potential, dissolved oxygen) were recorded. For ponds sampled in multiple seasons or years, we collected sediment samples at the same sites to control for geographical variation whenever possible. Sites within ponds were generally 1) near an area of water exchange, 2) a distance of about halfway across the pond and 3) a distance at the far end of the pond away from water exchange. At each site, 3 surface sediment (0 – 5 cm) samples were collected approximately 5 – 10 m apart and placed in chemically clean jars (VWR Trace Clean 300 series ©). Previous analyses demonstrated significantly higher concentrations of THg and meHg in surface sediments compared to inner sediments (15 – 20 cm), so we only analyzed surface sediments. Site specific samples from Eden Landing ponds and Alviso ponds A19, A20, and A21 were composited into one sample per pond, while samples from all remaining Alviso ponds were left un-composited to enable examination of within pond Hg variation.

Battelle Marine Sciences Lab (Sequim, WA) conducted all Hg analyses. THg analyses followed EPA guidelines (1996; Method 1631, Appendix A, digestion and cold vapor)) and meHg analyses followed Bloom et al. 1989 and 1997. Limits of detection averaged 0.005 μg/g for THg and 0.014 ng/g for meHg. QA/QC criteria were met for THg and meHg: relative percent difference for duplicate samples ranged from 0 – 11 %, and recovery of matrix spikes ranged from 83 – 125 %. All concentrations reported herein are dry weight.

Preliminary Results

Alviso-winter 2005

We analyzed 31 sediment samples from the Alviso salt ponds collected from 3 February 2005 to 10 March 2005 (Appendix 1).

- Mercury concentrations were highest but also variable within pond A12; THg ranged from 0.27 to 4.2 μg/g, and meHg ranged from 1.8 to 9.0 ng/g (Figure 1). Notably, sample A12-4 was collected from recently dredged sediments and contained the lowest concentrations of THg and meHg.
- Sites A13-1 (1.5 μg/g) and A7-1 (1.7 μg/g) had concentrations of THg exceeding the US EPA criteria for contaminated sediments of 1.0 μg/g (Nichols et al 1991).
- Site A7-2 (0.9 μg/g) exceeded the Effects Range – Median (ERM) of 0.71 ug/g, (Long and Macdonald 1992). The ERM represents the 50^{th} percentile of concentrations from other studies associated with toxic effects, is used as a general, non-absolute baseline.
- Nearly all non-composited sediments had THg concentrations exceeding the Effects Range – Low (ERL) of 0.15 μg/g (Long and Macdonald 1992). The ERL represents the 10^{th} percentile of concentrations from other studies associated with toxic effects, and like the ERM, is used as a general, non-absolute baseline.
- In addition to A12, several sites in ponds A13, A15, A17, A9, A7, and A3N had relatively high meHg (> 2.0 ng/g). Furthermore, within pond concentrations of meHg were more variable than THg concentrations (Figures 2, 3).
- Logarithmic concentrations of THg were significantly correlated with meHg (P = 0.001), but similar to previous sampling the relationship was not strong (R^2 = 0.32) (Figure 4A).

Sediments from ponds A19, A20, and A21 were composited due to cost constraints. THg concentrations were either slightly above or below the ERL, and meHg did not appear substantially elevated (Figure 1).

Overall, water quality measurements (i.e., dissolved oxygen, pH, Redox potential) were not significantly correlated ($R^2 < 0.06$, $P \geq 0.27$) with either THg or meHg concentrations in non–composited samples from Alviso ponds. Water depth was positively (but not strongly) correlated with THg ($R^2 = 0.25$, $P = 0.02$), but not correlated with meHg ($R^2 = 0.09$, $P = 0.17$) (Figure 5). Within ponds AB1, A5, and A7 (the ponds hypothesized to have a strong depth – Hg association), no relation was apparent between depth and THg (Figure 6). However, meHg appeared to increase with depth in ponds AB1 and A5.

Eden Landing winter 2005

We analyzed 20 composite sediment samples from Eden Landing salt ponds collected from 11 January 2005 to 28 January 2005 (Appendix 2).

- Overall, THg concentrations were low (Figure 7).

- Pond B1C had the highest THg concentration (0.16 μg/g) followed by B1 and B11 (0.13 μg/g), while the concentration in B4C was lowest (0.05 μg/g).
- Concentrations of meHg were highest in B11 (3.1 ng/g) followed by B12 (2.8 ng/g) and B6B (2.3 ng/g), while B6C and B7 had lowest concentrations (0.3 ng/g).
- Similar to Alviso ponds, logarithmic concentrations of THg were significantly correlated with meHg (P = 0.008), but predictability the relationship was not strong (R^2 = 0.33) (Figure 4B).

Comparison among all seasons and ponds: 2003 – 2005.

For THg across all years and seasons:

- Alviso ponds A12, A13 (except winter), and A8 had concentrations above 1.0 μg/g in most seasons (Table 1, Figure 8).
- Alviso ponds A7 (late summer – fall 2004 and winter 2005), A10, A11, and A2W had concentrations at or exceeding the ERM.
- All years and seasons had concentrations at or exceeding the ERL except A21.
- In contrast, no Eden Landing pond contained THg concentrations exceeding 1.0 μg/g, and only B11 during late summer – fall 2004 and B1C during winter 2004 had concentrations exceeding the ERL (Table 2, Figure 8).
- THg concentrations did not differ significantly between seasons (paired t-test: t = 1.2, P = 0.24) among ponds sampled in both seasons (n = 12).

For meHg across all years and seasons:

- Alviso ponds A3N, A7 (except fall 2004), A12, A13, A11, A2W, and A9 had concentrations above the average meHg concentration for all Alviso samples ($\overline{x}$ = 2.6 ng/g) (Table 1, Figure 9).
- A3N had the highest elevated concentration (6.8 ng/g) in fall 2003, while samples from A1, A3W, and A5 had very low concentrations ($\leq$ 0.32 ng/g) in late summer-fall 2004.
- Notably, mean meHg concentrations in A5 were 9–fold higher in winter 2005 compared to late-summer – fall 2004, when methylation was expected to be higher.
- Eden Landing ponds B11, B12, B6B, B1, B1C, B14, and B4 had concentrations above the average concentration for all Eden Landing samples ($\overline{x}$ = 1.7 ng/g), and were generally lower than those in the Alviso ponds (Table 2, Figure 9).
- Pond B11 contained very elevated concentrations in late summer – fall 2003 ($\overline{x}$ = 10.7), but declined over 3–fold in winter 2005 ($\overline{x}$ = 3.1 ng/g).
- On average, however, meHg concentrations did not differ significantly between seasons (paired t-test: t = 0.81, P = 0.43) among ponds sampled in both seasons (n = 12).

- Percentages of THg comprised of meHg ranged from 0.03% to 1.5% in Alviso ponds (Table 1), and 0.2% to 6.9% in Eden Landing ponds (Table 2).

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Table 1. Summary results for concentrations (dry weight) of total Hg (THg) and methyl Hg (meHg) in surface sediments from salt ponds in the Alviso Salt Pond Complexes. Arithmetic (and geometric) means are calculated for non composited samples (*n* > 1).

Pond Complex	Year	season	Pond	*n*	THg (μg/g)	meHg (ng/g)	% meHg [a]
Alviso	2003	late summer - fall	A2E	3	0.487 (0.486)	0.788 (0.724)	0.15%
			A3N	3	0.438 (0.380)	6.793 (5.772)	1.52%
			A7	5	0.855 (0.810)	4.808 (2.825)	0.35%
			A8	3	1.362 (0.695)	2.063 (1.449)	0.21%
			A10	3	0.723 (0.722)	1.451 (1.425)	0.20%
			A11	3	0.690 (0.649)	2.834 (2.308)	0.36%
			A12	3	2.200 (1.697)	3.909 (3.344)	0.20%
			A13	3	1.454 (1.068)	3.299 (3.027)	0.28%
			A14	3	0.303 (0.276)	1.509 (1.435)	0.52%
			A16	3	0.441 (0.411)	1.382 (1.209)	0.29%
			Mean		*0.925 (0.635)*	*2.833 (1.954)*	0.32%
Alviso	2004	late summer - fall	A1	1	0.301	0.322	0.11%
			A2E	1	0.436	1.190	0.27%
			A2W	1	0.307	2.540	0.83%
			A3W	1	0.181	0.271	0.15%
			A5	1	0.736	0.233	0.03%
			A7	1	0.554	2.150	0.39%
			AB1	1	0.390	1.910	0.49%
			AB2	1	0.387	0.731	0.19%
			Mean	*1.168*	*0.412 (0.382)*	*1.168 (0.810)*	0.22%
Alviso	2004	winter	A12	4	1.594 (0.948)	4.525 (3.817)	0.40%
			A13	3	0.919 (0.832)	3.086 (3.075)	0.37%
			A15	3	0.533 (0.491)	2.237 (2.217)	0.45%
			A17	3	0.210 (0.204)	2.208 (1.939)	0.95%
			A19	1	0.1373	0.6828	0.50%
			A20	1	0.2539	1.6928	0.67%
			A21	1	0.1100	1.2175	1.11%
			A3N	3	0.295 (0.256)	3.286 (3.030)	1.18%
			A5	3	0.419 (0.407)	2.293 (2.115)	0.52%
			A7	3	0.960 (0.769)	3.230 (2.040)	0.27%
			A9	3	0.564 (0.560)	3.044 (2.585)	0.46%
			AB1	3	0.382 (0.380)	1.178 (0.989)	0.26%
			Mean		0.532 (0.363)	2.391 (1.911)	0.59%
Alviso - USFWS [b]	2002	late summer - fall	A1	3	0.313	na	
			AB1	3	0.563	na	
			A5	3	0.372	na	
			A9	3	0.479	na	
			A10	3	0.919	na	
			A16	3	0.533	na	

[a] based on geometric means for non-composited samples

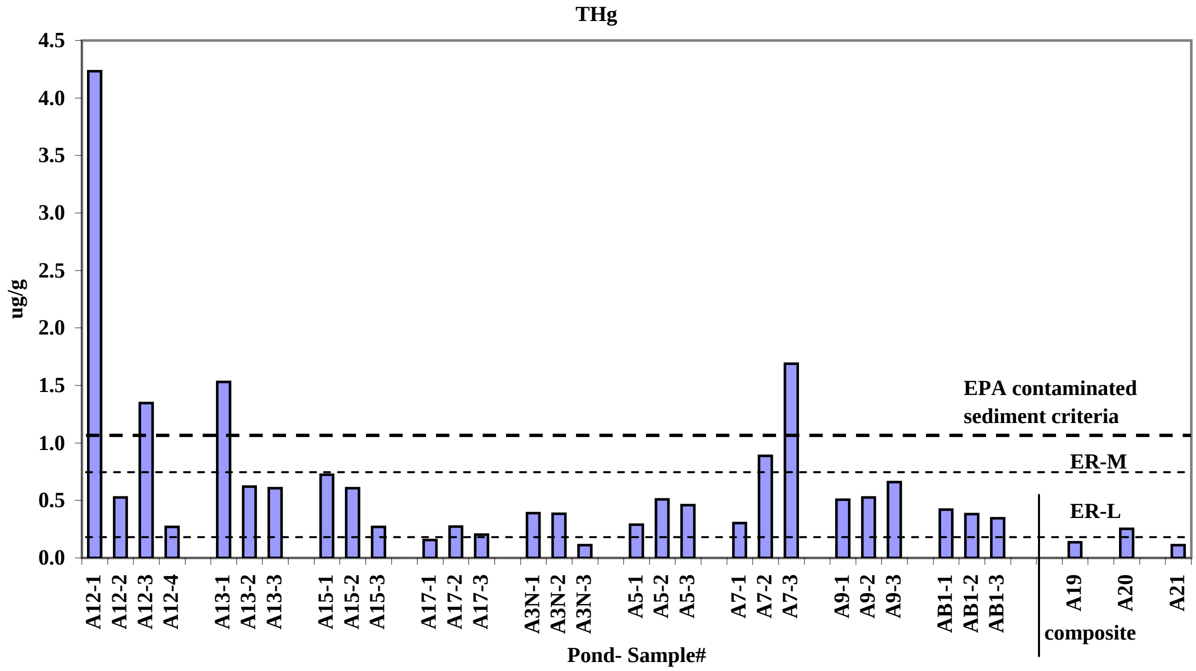
[b] data from Maurer and Adelsbach (Phase 2 Environmental Site Assessment, USFW Environmental Contaminants Division, Sacramento CA). Samples collected in top 10-15 cm

na = not analyzed

Table 2. Summary results for concentrations (dry weight) of total Hg (THg) and methyl Hg (meHg) in surface sediments from salt ponds in the Eden Landing and Ravenswood Salt Pond Complexes. Arithmetic (and geometric) means are calculated for non composited samples (*n* > 1).

Pond Complex	Year	Season [a]	Pond	*n*	THg (μg/g)	meHg (ng/g)	% meHg [a]
Eden Landing	2003	late summer - fall	B2	3	0.136 (0.134)	0.751 (0.655)	0.5%
			B6A	3	0.070 (0.070)	0.128 (0.121)	0.2%
			B11	2	0.156 (0.156)	10.71 (10.71)	6.9%
			B12	2	0.067 (0.064)	2.083 (2.073)	3.2%
			Mean		*0.107 (0.098)*	*3.419 (1.150)*	*1.2%*
	2004	late summer - fall	B1	1	0.145	1.710	1.2%
			B2	1	0.142	0.616	0.4%
			B4	1	0.103	2.170	2.1%
			B7	1	0.080	0.467	0.6%
			Mean		*0.177 (0.114)*	*1.241 (1.016)*	*0.9%*
	2005	winter	B1	1	0.134	2.160	1.6%
			B1C	1	0.161	1.790	1.1%
			B2	1	0.118	1.240	1.1%
			B2C	1	0.070	0.535	0.8%
			B4	1	0.121	1.480	1.2%
			B4C	1	0.054	0.484	0.9%
			B5	1	0.091	0.819	0.9%
			B5C	1	0.116	0.413	0.4%
			B6	1	0.066	0.484	0.7%
			B6A	1	0.076	1.600	2.1%
			B6B	1	0.092	2.330	2.5%
			B6C	1	0.070	0.325	0.5%
			B7	1	0.090	0.256	0.3%
			B8	1	0.075	0.663	0.9%
			B8A	1	0.130	0.983	0.8%
			B9	1	0.091	2.240	2.5%
			B10	1	0.088	0.986	1.1%
			B11	1	0.128	3.070	2.4%
			B12	1	0.125	2.760	2.2%
			B14	1	0.091	1.680	1.9%
			Mean		*0.099 (0.096)*	*1.315 (1.033)*	*1.1%*
Ravenswood	2003	late summer - fall	R2	3	0.048 (0.044)	1.413 (0.882)	2.0%
			R4	3	0.041 (0.039)	0.368 (0.295)	0.8%
			Mean		*0.045 (0.041)*	*0.891 (0.510)*	*1.2%*

[a] based on geometric means for non-composited samples



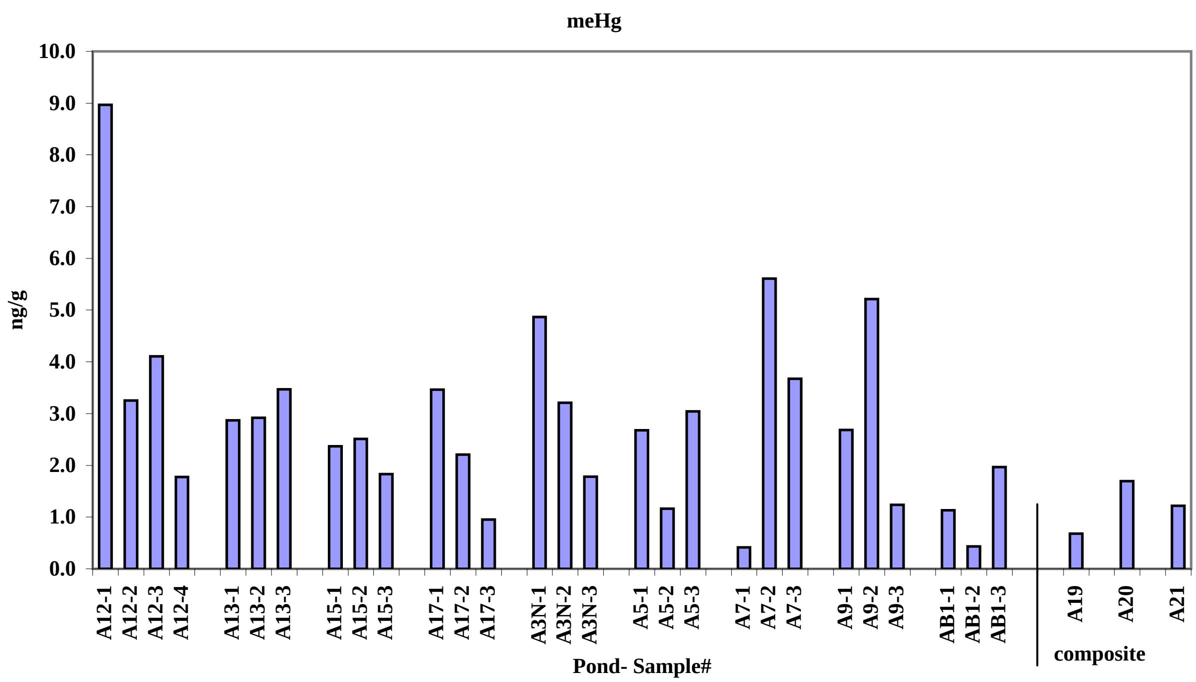


Figure 1. Concentrations of THg and meHg from site specific and composite sediment samples from Aviso salt ponds, winter 2005. Baseline biological effect levels for THg are indicated by doted lines: 1.0 ng/g = US EPA criteria for contaminated sediment, 0.71 μg/g = Effects Range-Median (ER-M), 0.15 μg/g = Effects Range-Low (ER-L).

Figure 2. Concentrations of THg in surface sediment samples from Alviso Salt Ponds during February and March 2005. Points represent sampling locations except A19, 20, and 21 which were composite samples. Water exchange points taken from the Salt Pond ISP.

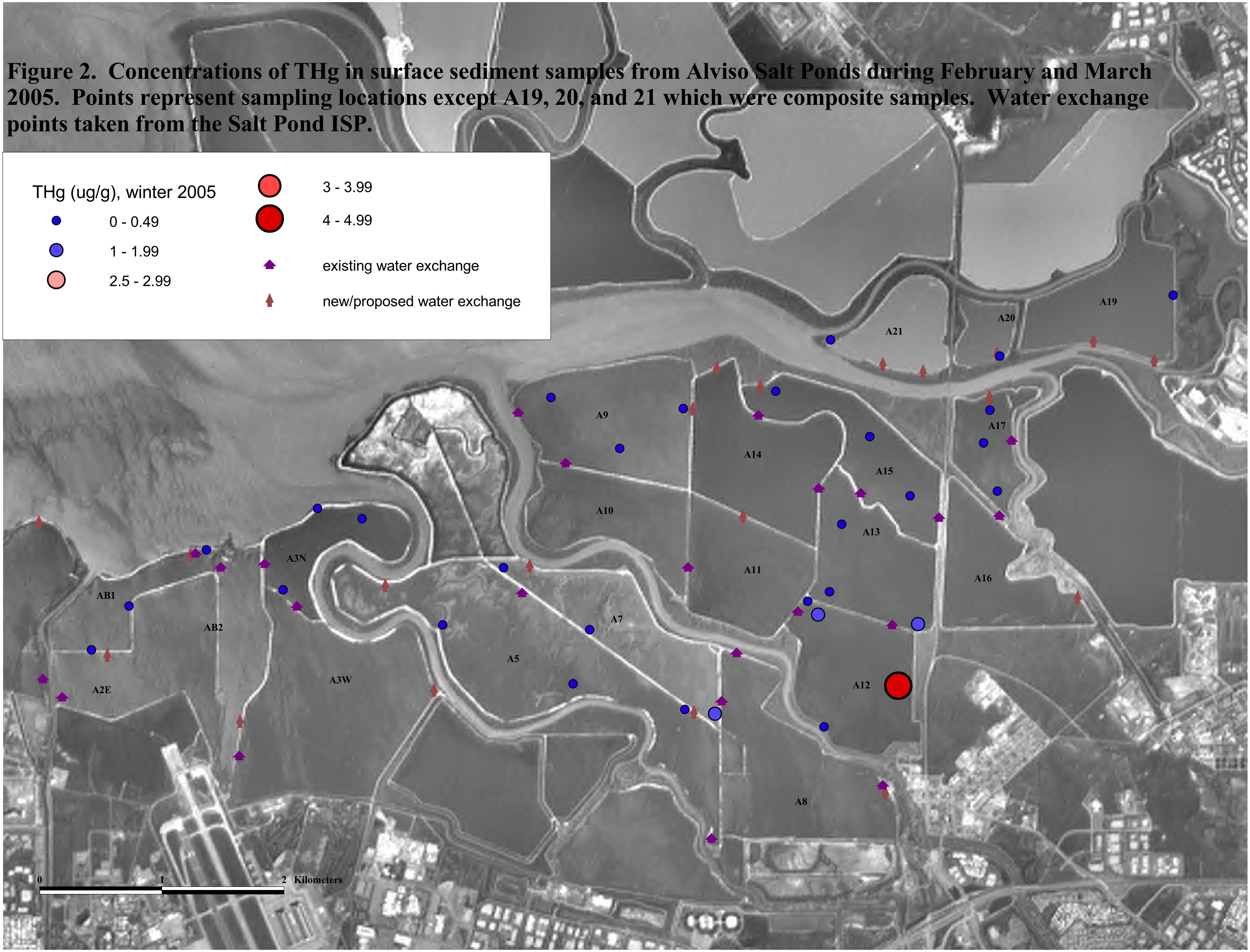
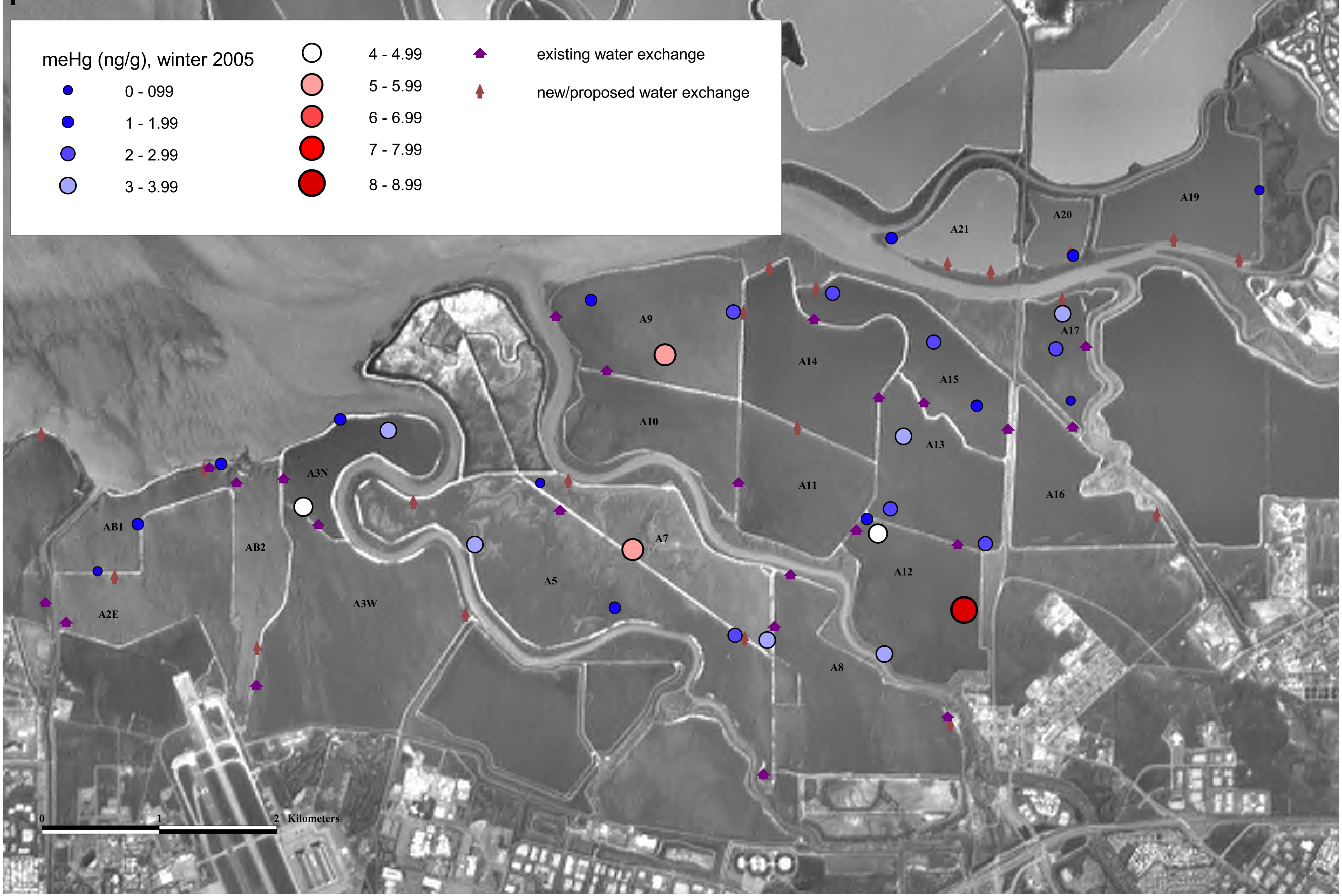
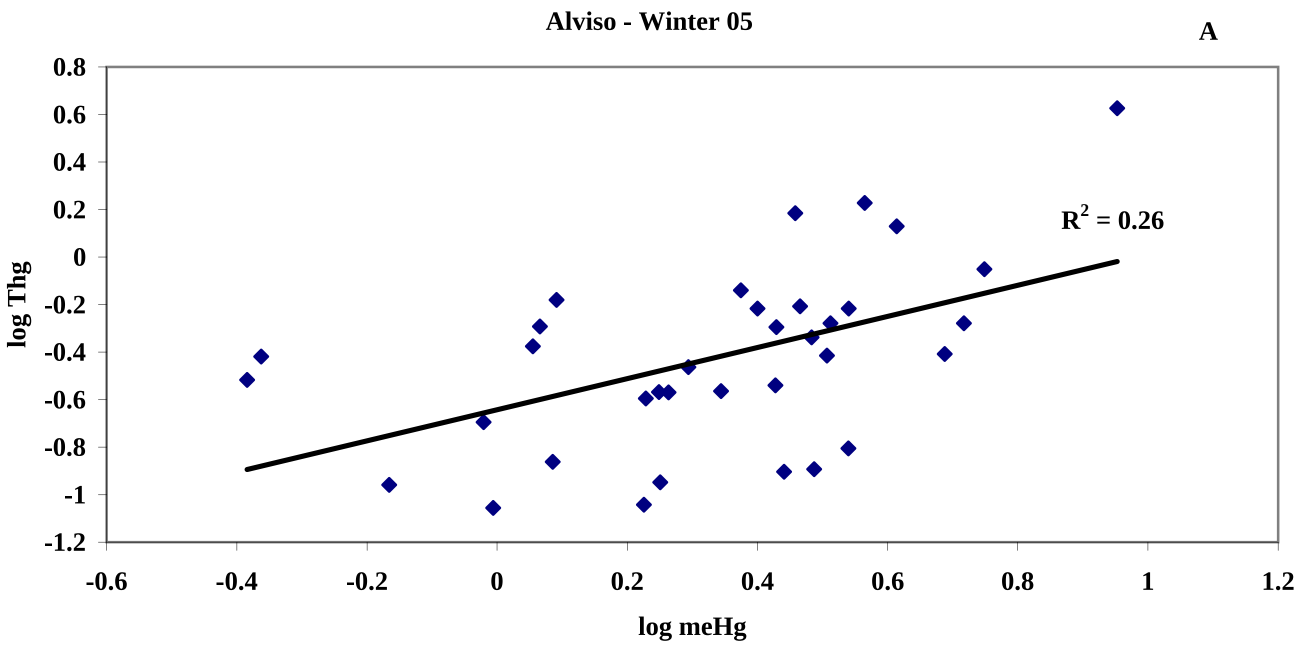


Figure 3. Concentrations of meHg in surface sediment samples from Alviso Salt Ponds during February and March 2005. Points represent sampling locations except A19, 20, and 21 which were composite samples. Water exchange points taken from the Salt Pond ISP.





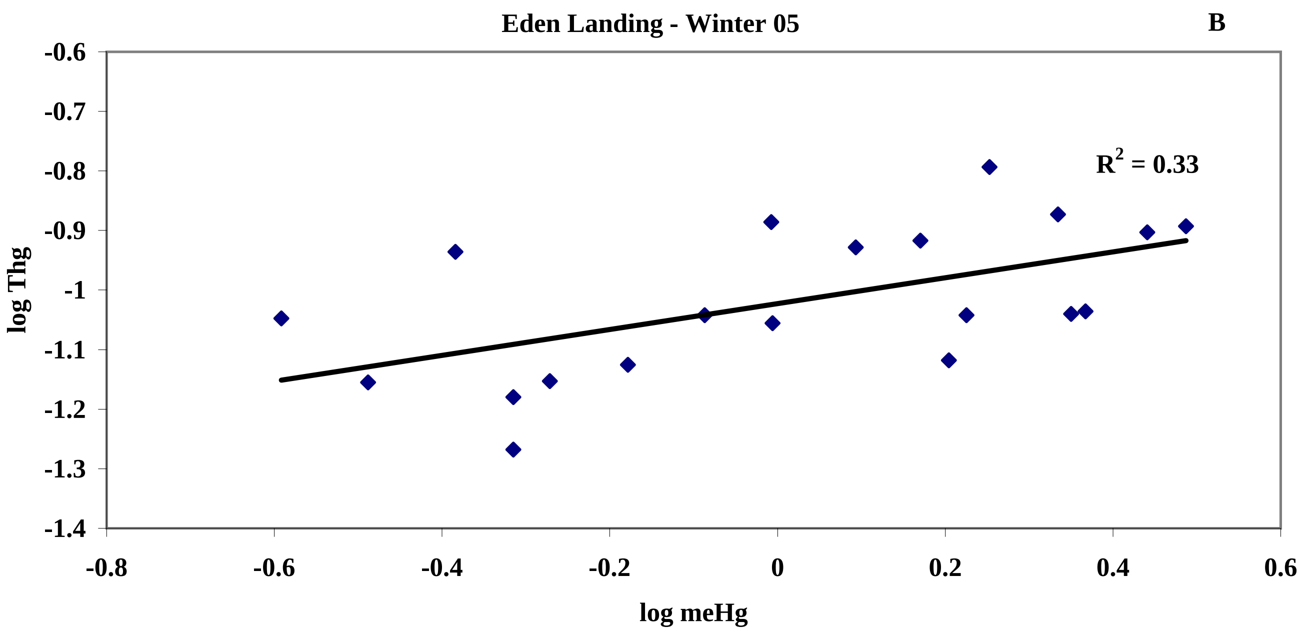


Figure 4. Correlations between log transformed concentrations of THg and meHg in Alviso (A) and Eden Landing (B) salt ponds sampled during winter 2005.

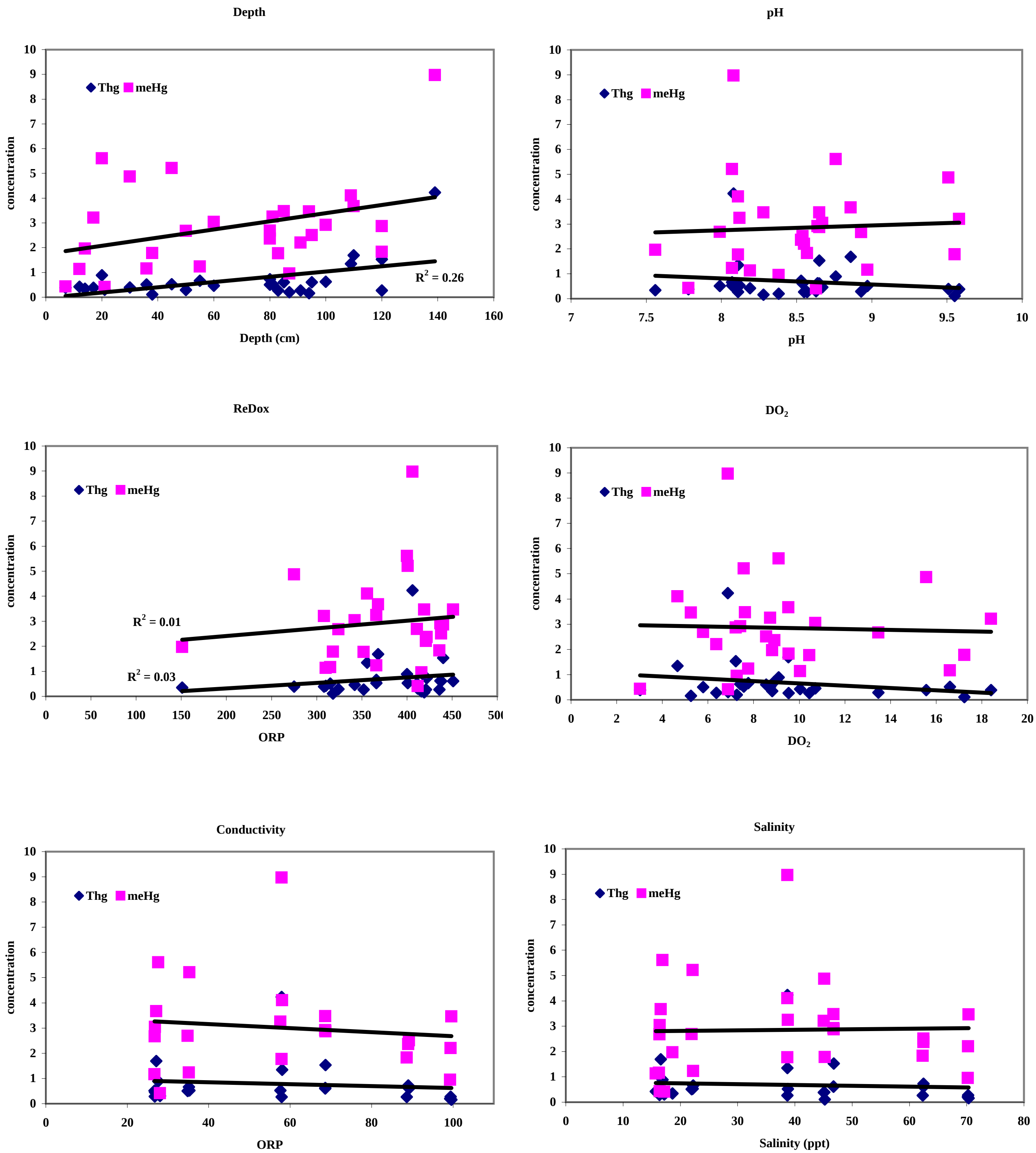
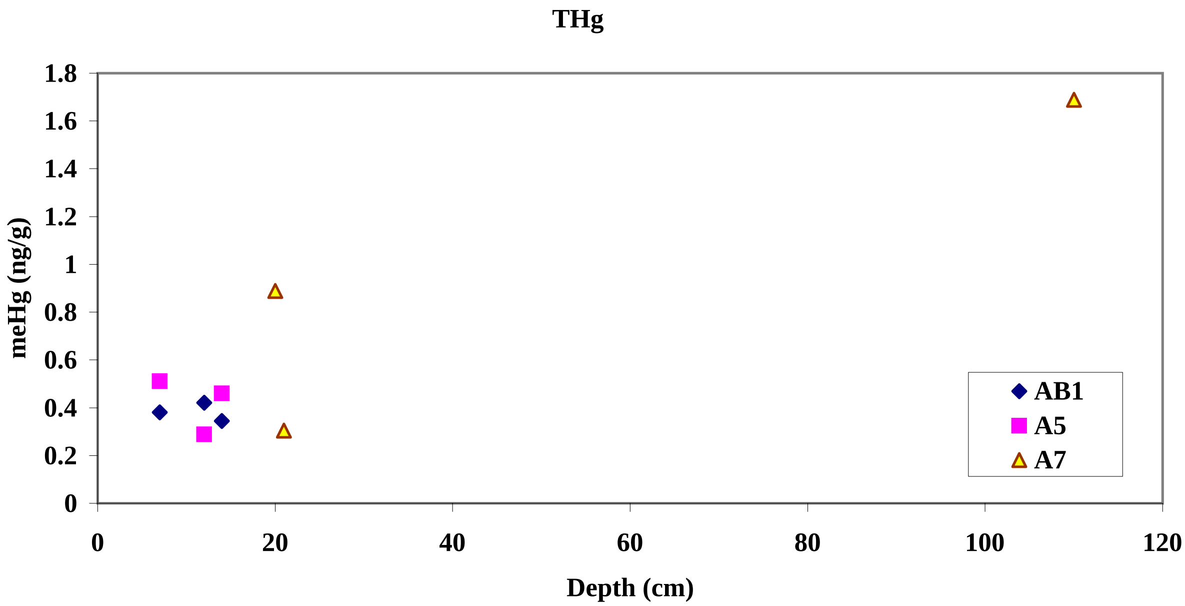


Figure 5. Correlations between water chemistry and concentrations of THg and meHg in site specific (non composited) sediment samples from Alviso salt ponds, winter 2005. Only depth vs. THg was significant (*P* < 0.001).



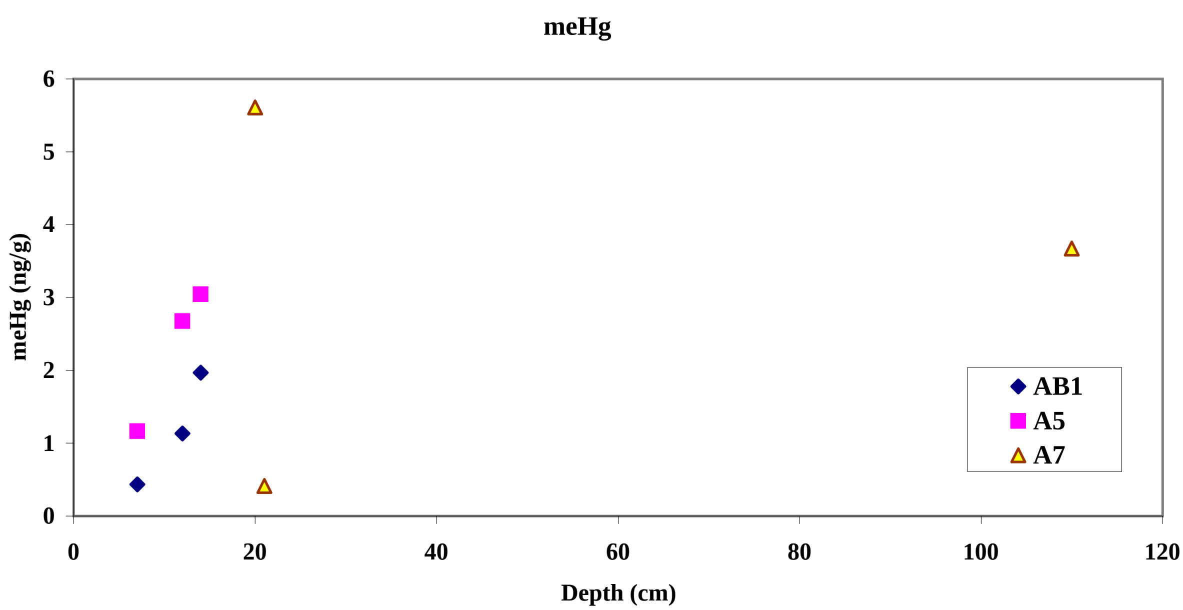
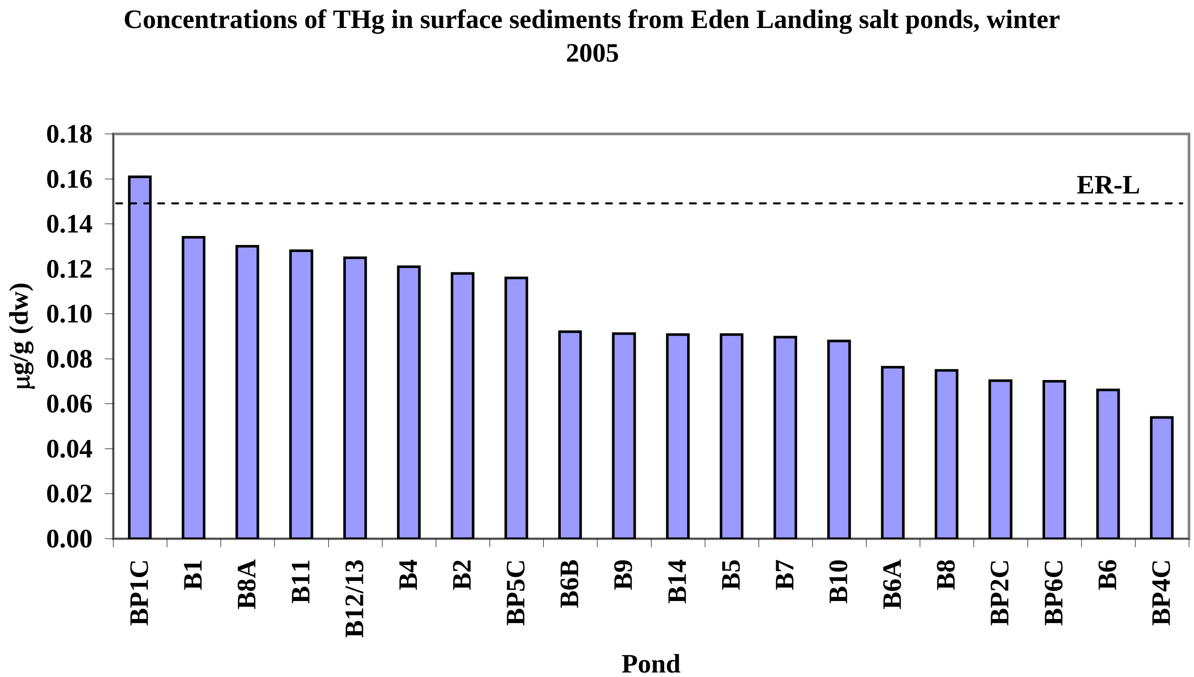


Figure 6: Simple graphical relations between water depth and concentrations of THg and meHg in Alviso ponds AB1 A5, and A7.



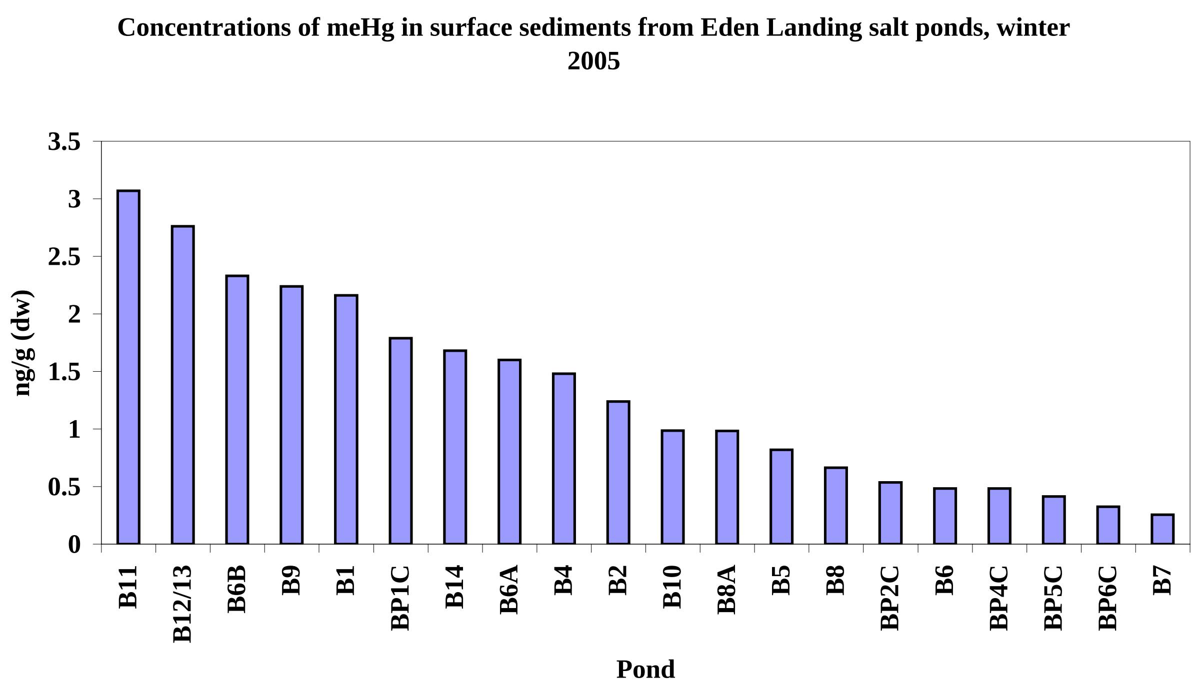
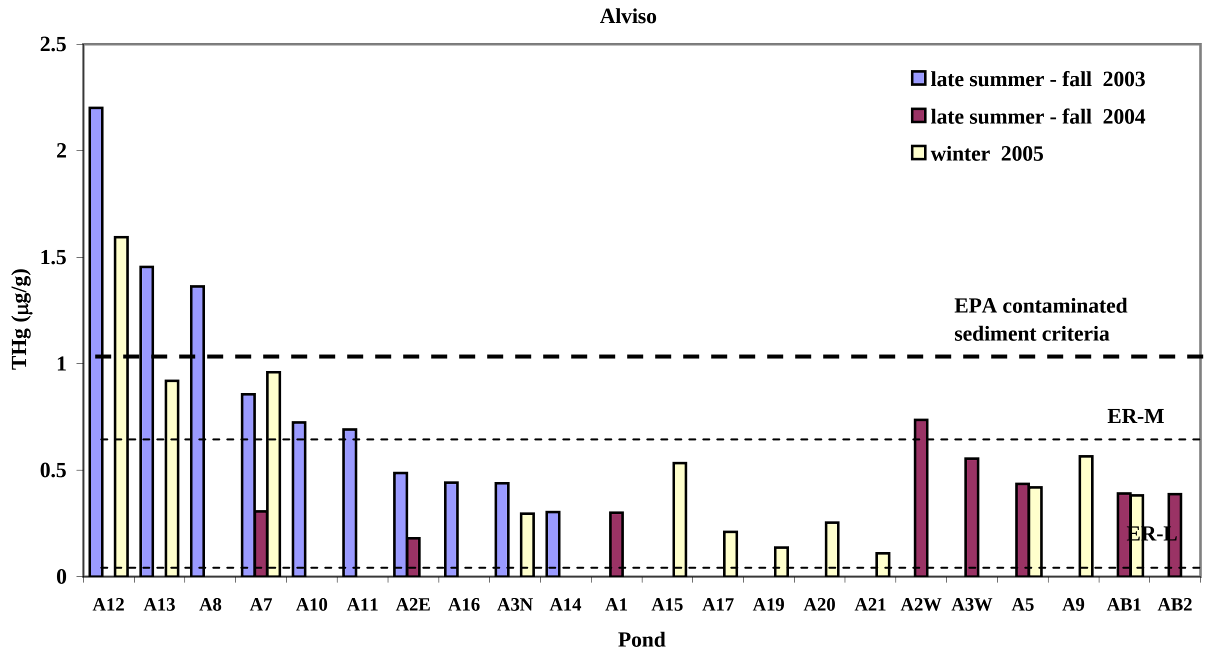


Figure 7. Concentrations of THg and meHg in composite surface sediment samples collected from Eden Landing salt ponds, winter 2005. ER-L = Effects Range-Low.



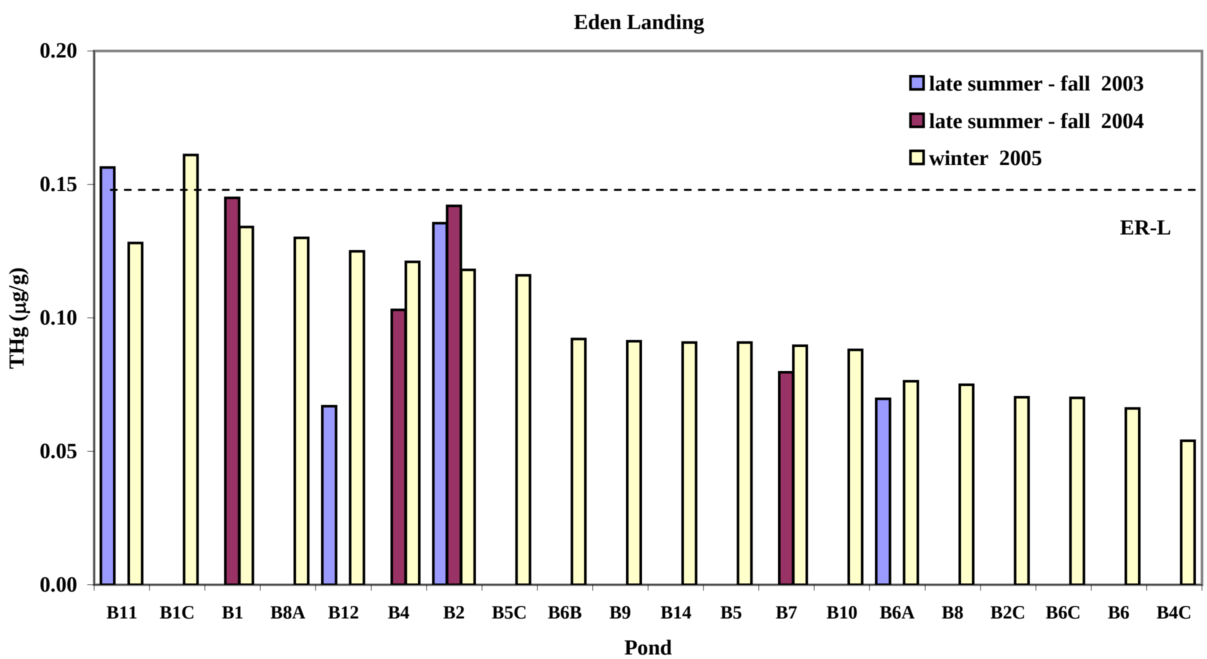


Figure 8. THg concentrations (mean or single composite value) in Alviso and Eden Landing pond surface sediments, fall 2003 - winter 2005. Note y-axis varies between pond complexes. Baseline biological effect levels for THg are indicated by doted lines: 1.0 ng/g = US EPA criteria for contaminated sediment, 0.71 mg/g = Effects Range-Median (ER-M), 0.15 mg/g = Effects Range-Low (ER-L).

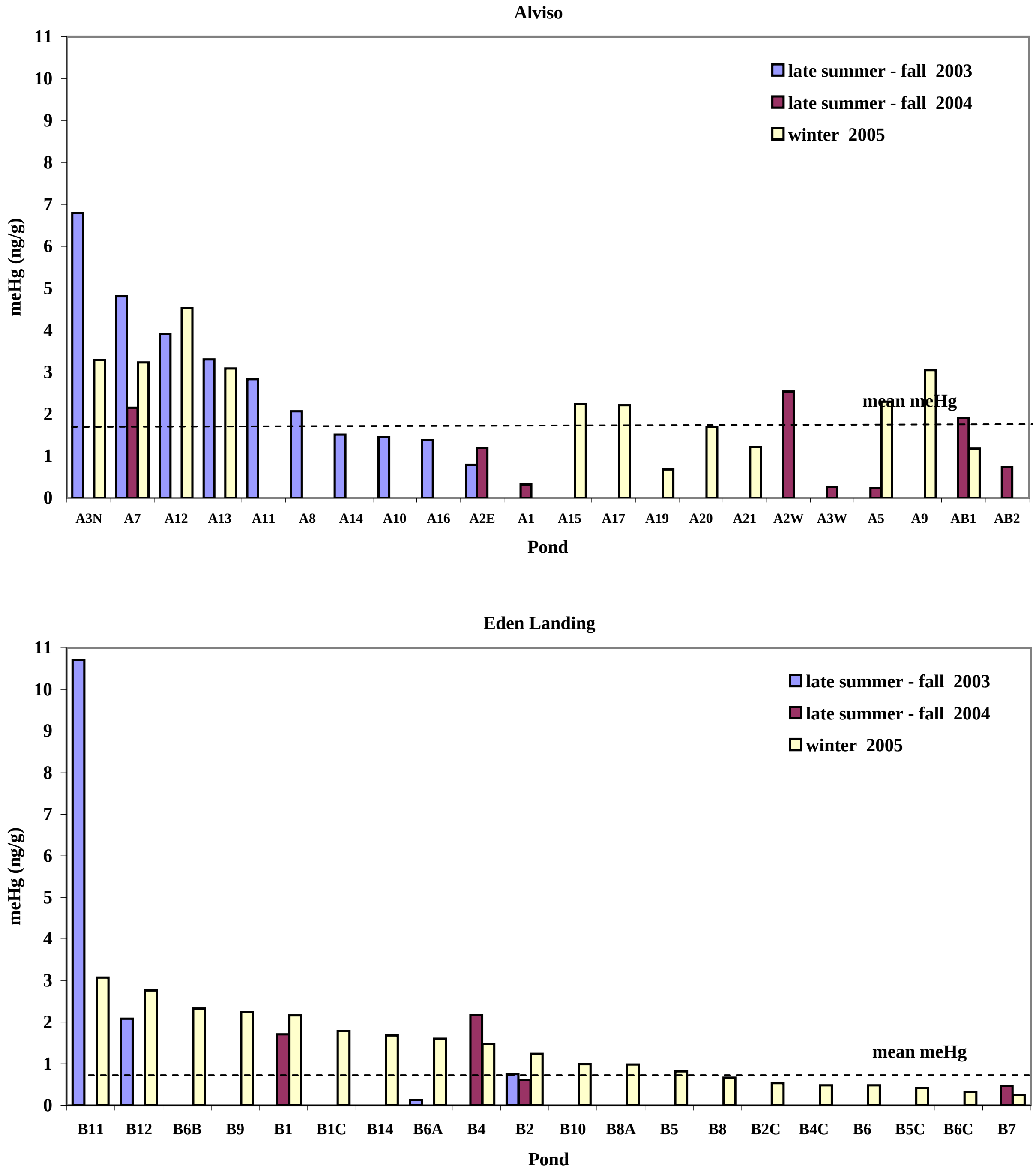
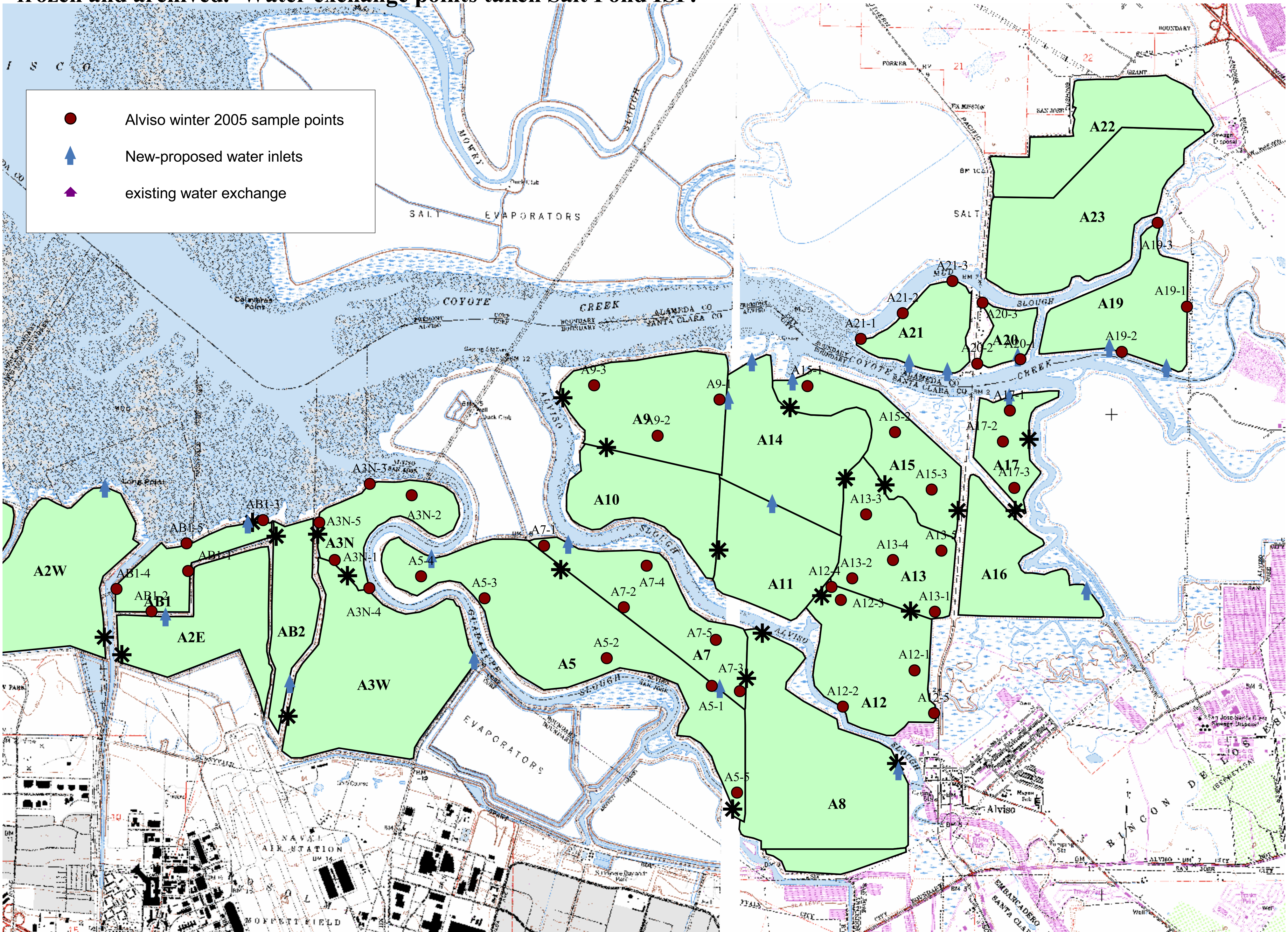
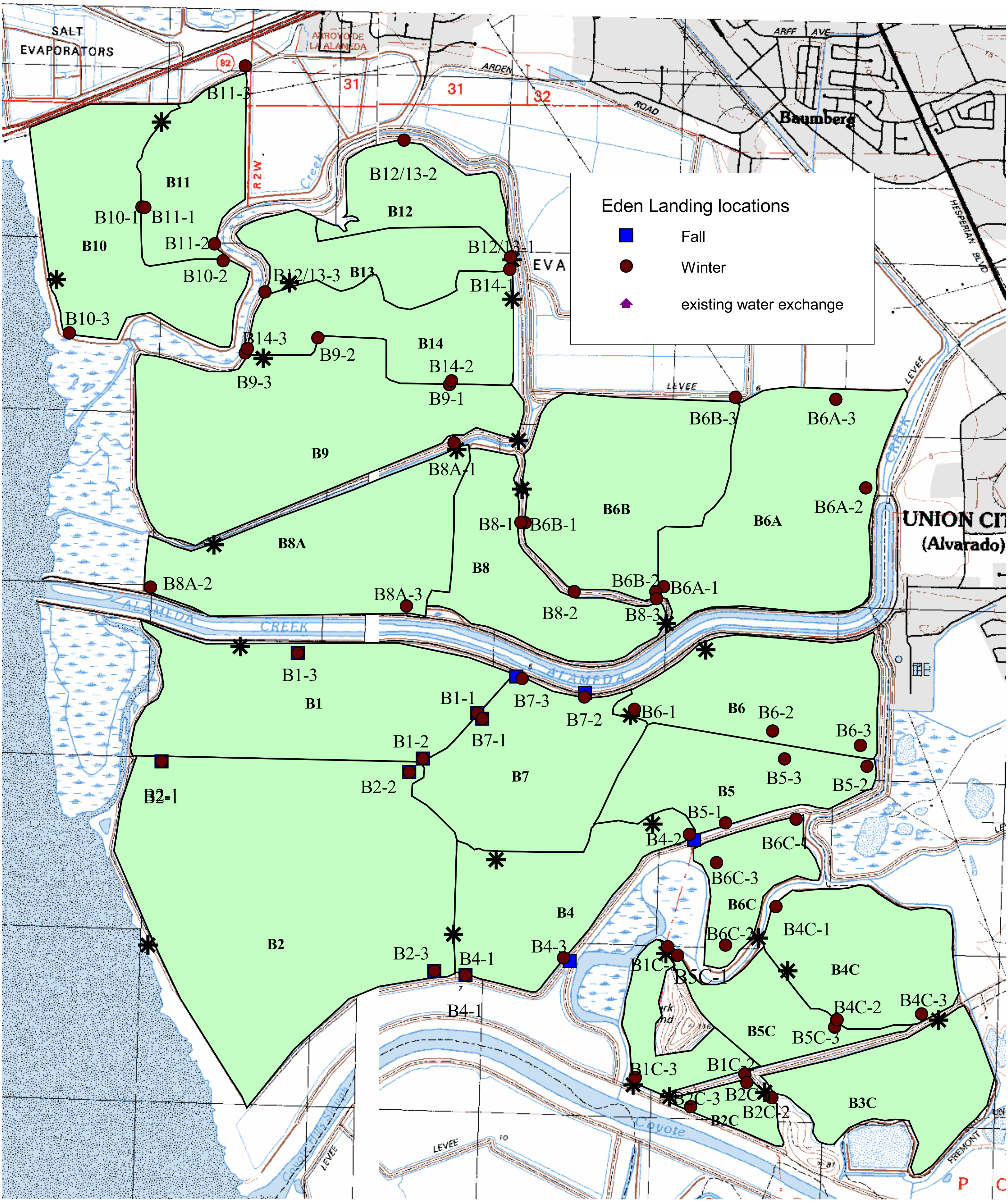


Figure 9. MeHg concentrations (mean or single composite value) in Alviso and Eden Landing pond surface sediments, fall 2003 - winter 2005. Baseline biological effect levels for THg are indicated by doted lines: 1.0 ng/g = US EPA criteria for contaminated sediment, 0.71 mg/g = Effects Range-Median (ER-M), 0.15 mg/g = Effects Range-Low (ER-L).

Appendix 1. Sediment sampling locations for Hg analysis in Alviso sat ponds, winter 2005. Note 1-2 additional samples in ponds AB1, A3N, A13, A5, and A7 were collected which were not analyzed for Hg but were frozen and archived. Water exchange points taken Salt Pond ISP.



Appendix 2. Sediment sampling locations for Hg analysis in Eden Landing salt ponds, late summer-fall 2004 and winter 2005. Water exchange points taken from Salt Pond ISP.



Appendix E

Benthic Invertebrate Sampling

Methods

USGS collected benthic slough samples at Alviso and Guadalupe Slough receiving water sampling locations concurrently with receiving water quality samples on three occasions during July and August 2004. The required sampling schedule for pond A7 was 7 days prior to pond release, 14 days following pond release, and 28 days following pond release, followed by a sample late the following summer (August 2005). Due to a communication error, samples were not taken 7 days before release of either pond A7 (Alviso Slough) or A3W (Guadalupe Slough), but were taken immediately upon discovery of the error. For pond A3W, for which the benthic sampling was elective, the first sample was taken 10 days following the 19 July release; for pond A7, for which the sampling was required, the first sample was taken 3 days following the 26 July release. The subsequent sampling was conducted on schedule relative to the release dates. Although samples were not collected the week before the initial release of the ponds, pre-release invertebrate samples were collected in April 2004 and provide a comparison to post-release data. USGS conducted invertebrate sampling in Guadalupe and Alviso Slough in April 2004 following identical protocols to those used in July and August. Samples were collected at 3 upstream, 3 midstream, and 3 downstream sites, locations that are comparable to the summer sampling locations.

Benthic macroinvertebrates were sampled from the boat using a standard Eckman grab sampler (15.2 cm x 15.2 cm x 15.2 cm). Samples were collected by lowering the dredge into the water slowly, holding it level on the substrate, and releasing the “jaws.” Soft substrates consistently produced samples that filled the dredge, whereas on harder substrates only a portion of the dredge was filled (the dredge cannot as deeply penetrate a hard surface). Sampling locations with vegetative debris on the substrate produced samples with high concentrations of vegetation. Grab samples were washed in the field using a 0.5mm mesh sieve and preserved in 70% ethanol and rose bengal dye.

Samples were sorted and invertebrates enumerated using dissecting microscopes and appropriate taxonomic keys (Usinger 1956, Merritt and Cummins 1996, Pennak 1989, Smith and Johnson 1996). Identifications were confirmed, when necessary, by comparison to confirmed identification voucher specimens at the USGS Davis Field Station, Davis, CA. Sorted samples and associated sample debris were stored at USGS San Francisco Bay Estuary Field Station, Vallejo, CA.

We used the Shannon-Weiner index (Krebs 1999) to assess invertebrate taxa diversity for each sampling event. On all four dates, samples were taken with approximately equal frequency along a gradient from the mouth to the upstream portion of the slough. We computed means from repeated invertebrate measurements for each slough and examined differences in *Capitella* sp., *Streblospio* sp., total abundance, and diversity between sample dates with analysis of variance tests (ANOVA; SAS Institute, 1990). Abundance values were log-transformed prior to analysis. We similarly tested for differences in dissolved oxygen, salinity, temperature, and pH measured at the time of summer sample collection. We tested for equal variances using Levene's test and then used the multiple variance mixed procedure (SAS Institute, 1990) if data violated the equal variance assumption. Significant ANOVA results ($\alpha = 0.05$) were investigated with the Tukey-Kramer procedure (SAS Institute, 1990) to make multiple comparisons among pairs of means (Sokal and Rohlf 1995).

Differences in taxa composition may exist when overall abundance and diversity indices are similar, and these differences may be ecologically important. To examine differences in taxa composition among sample dates, we used CANOCO 4 (ter Braak and Smilauer 1998) to perform detrended correspondence analysis (DCA) with downweighting of rare species. DCA is an indirect gradient analysis technique that reveals gradients in taxa composition independent of measured environmental variables. Although water quality was measured at the time of sample collection, point sampling may not account for the extent of variability in those parameters that could have affected the benthic community. The DCA axes are measured in units of constant beta diversity; therefore, it is useful for examining data for potential environmental patterns, regardless of whether the gradient displayed represents a measured environmental variable (Gauch 1982).

Results

Collected data were compiled according to sample date and location within each slough (upstream, midstream near discharge point, and mouth; tables 1 and 2).

Guadalupe Slough (Pond A3W receiving water)

Water quality parameters differed among summer sampling dates, with the first sample date most different from the other two (Fig. 1). Dissolved oxygen differed among sampling dates ($F_{2,18}$ = 11.69, P = 0.0006), and the 29 July (first) sample differed from the second (2 August) and third (16 August) samples (Tukey-Kramer, P = 0.0027), which did not differ from each other (P = 0.9827). Salinity differed among sampling dates ($F_{2,18}$ = 3.57, P = 0.0494), with the first sample different from the second (Tukey-Kramer, P = 0.0434), but not the third (P = 0.6752). This was also true for temperature, which differed ($F_{2,19}$ = 21.13, P < 0.0001) between the second sample and the first and third (Tukey-Kramer, P < 0.0001), which did not differ from each other (P = 0.4511). pH differed ($F_{2,19}$ = 6.14, P = 0.0088), with the first sample different from the second (Tukey-Kramer, P = 0.0067), but not the third (P = 0.1106).

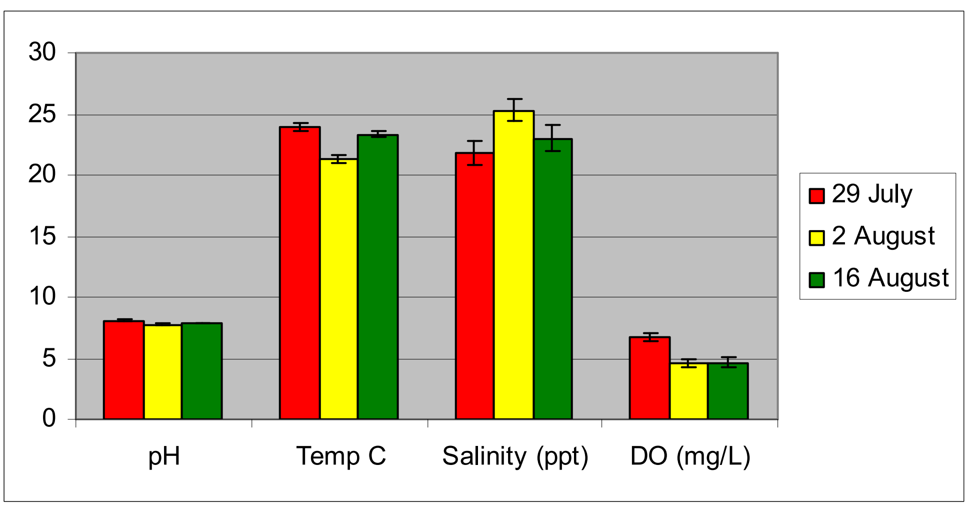


Figure 1. Comparison of pH, temperature, salinity, and dissolved oxygen among three summer 2004 sampling dates when benthic invertebrates were collected in Pond A3W receiving waters, Guadalupe Slough, Alviso, CA.

Taxa diversity did not differ among the four sample dates (Fig. 2), including the April 2004 pre-release sample ($F_{3,27} = 0.93$, P = 0.4378). Total abundance did not differ ($F_{3,27} = 2.23$, P = 0.1078), and neither did abundance of *Capitella* sp. ($F_{3,22} = 3.01$, P = 0.0520), although *Capitella* sp. was not present in any samples in April (Fig.2, Table 1). Abundance of *Streblospio* sp. differed among sample dates ($F_{3,28} = 4.74$, P = 0.0085), with the April (pre-release) sample different from all summer samples (Tukey-Kramer, P = 0.0310). *Streblospio* sp. was found at Guadalupe Slough only during April and only in the midstream and mouth samples (Table 1).

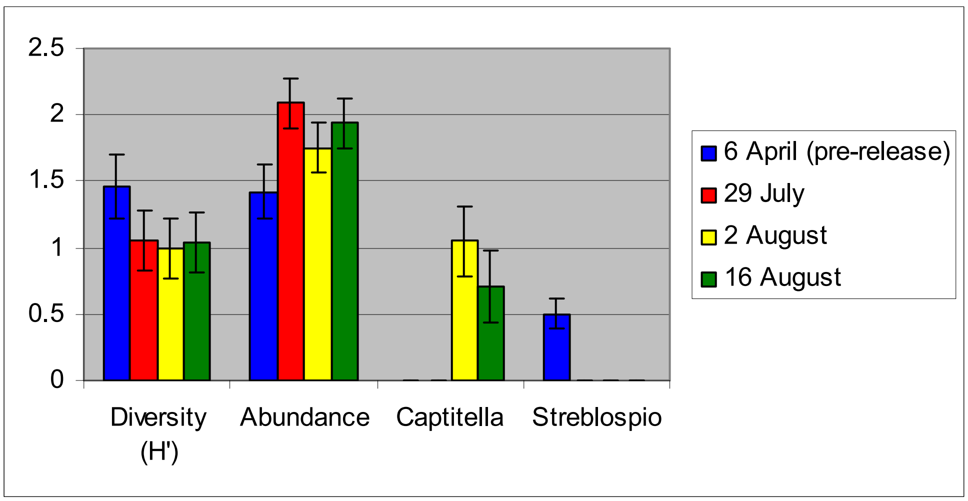


Figure 2. Comparison of taxa diverity, mean (log-transformed) total abundance, *Capitella* sp. abundance, and *Streblospio* sp. abundance among three summer 2004 sampling dates in Pond A3W receiving waters, Guadalupe Slough, Alviso, CA.

DCA Axis 1 had an eigenvalue of 0.531 and explained 27.2% of the explainable variance, and DCA Axis 2 had an eigenvalue of 0.235; together, they explain 39.3% of the explainable variance (Fig. 3). The length of DCA Axis 1 was 3.586 and represents constant beta diversity, indicating that a gradient exists relative to taxa composition. It is the perpendicular distance of a sample point relative to an axis that determines its position along that gradient; samples from 2 August and 6 April had the least variability in taxa composition within samples relative to DCA Axis 1, and the 16 August sample had the most. The samples from 6 April were most dissimilar in taxa composition and fall farthest along the gradient; this gradient could be related to seasonal changes or other environmental differences between April and late July-August. These 6 April samples were also those with the least variability in taxa composition relative to DCA Axis 2, which was a 3.065-unit axis with high variability and little differentiation among all July and August samples, but the April samples did not differ from the summer samples relative to DCA Axis 2.

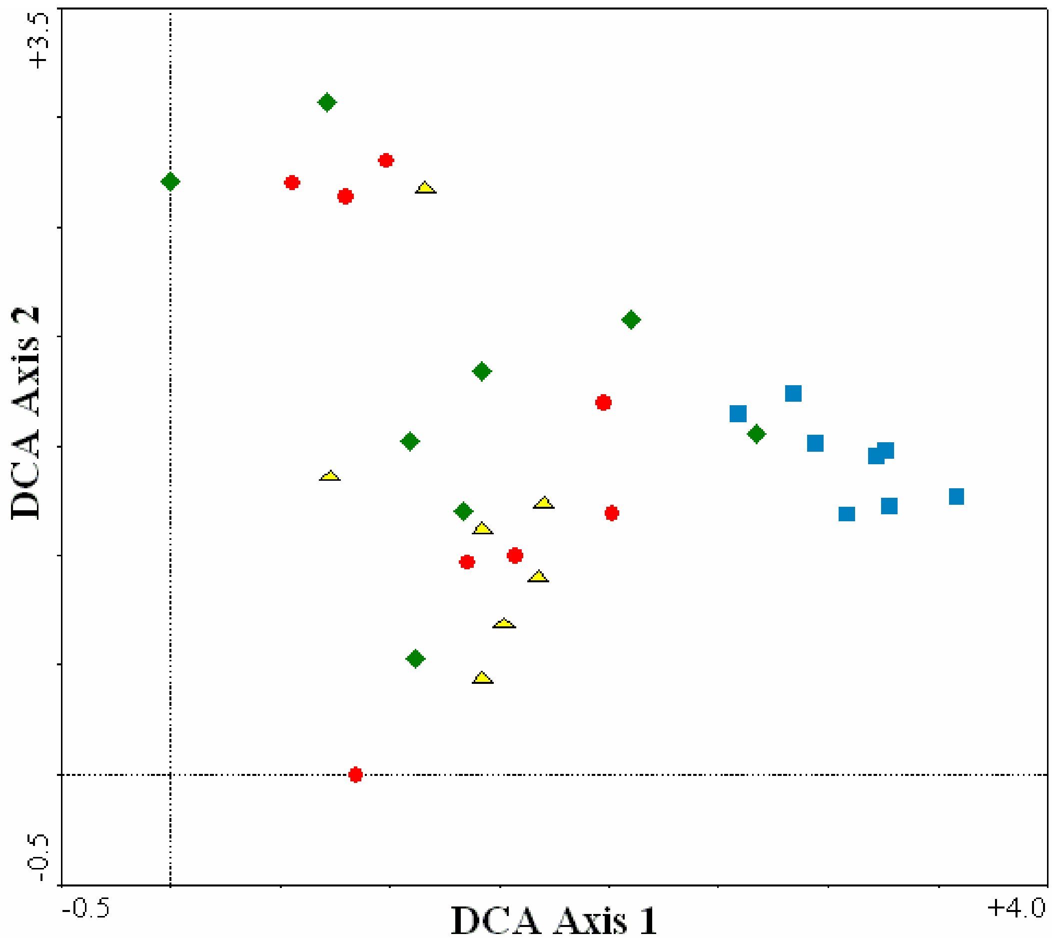


Figure 3. Results of DCA analysis showing 2004 Pond A3W receiving water Guadalupe Slough benthic invertebrate samples in ordination space. Blue squares = 6 April, red circles = 29 July, yellow triangles = 2 August, and green diamonds = 16 August.

Alviso Slough (Pond A7 receiving water)

Some differences were detected in water quality between sample dates (Fig. 4). There was no difference detected in dissolved oxygen ($F_{2,16}$ = 0.40, P = 0.6739) or salinity ($F_{2,17}$ = 1.33, P = 0.2907) in Alviso Slough among summer sampling dates. There was a difference in temperature ($F_{2,16}$ = 17.77, P < 0.0001), and the 29 July (first) sample differed from the second (9 August) and third (23 August) samples (Tukey-Kramer, P = 0.0063), which did not differ from each other (P = 0.0532). pH differed ($F_{2,17}$ = 6.73, P = 0.0070), with the third sample different from the first and second (Tukey-Kramer, P = 0.0310).

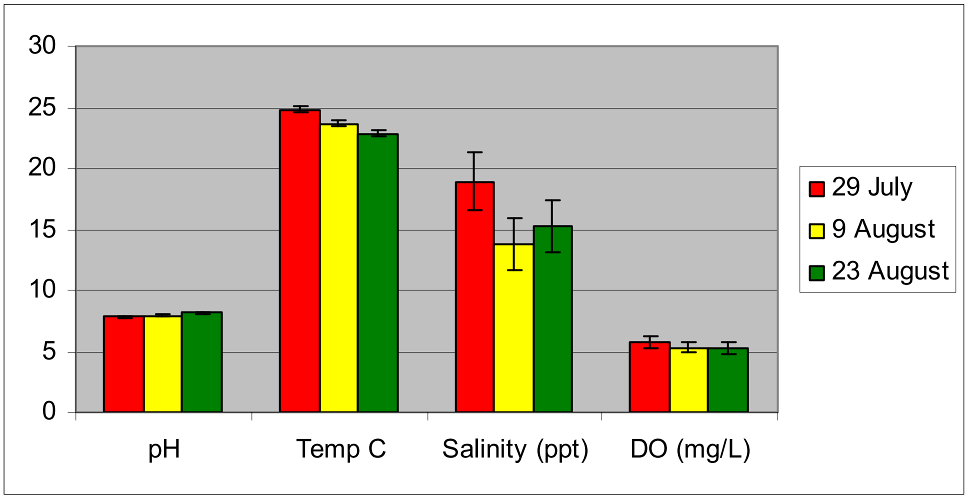


Figure 4. Comparison of pH, temperature, salinity, and dissolved oxygen among three summer 2004 sampling dates when benthic invertebrates were collected in Pond A7 receiving waters, Alviso Slough, Alviso, CA.

Taxa diversity did not differ among the four sample dates, including the April 2004 pre-release sample ($F_{3,24}$ = 2.35, P = 0.0979). Total abundance did not differ ($F_{3,24}$ = 0.16, P = 0.9235), and neither did abundance of *Capitella* sp. ($F_{3,25}$ = 1.87, P = 0.1597), although only 1 individual *Capitella* sp. was present in all April samples (Fig. 5, Table 2). Abundance of *Streblospio* sp. differed among sample dates ($F_{3,25}$ = 3.56, P = 0.0286), with the April (pre-release) sample different from the two latest summer samples (Tukey-Kramer, P = 0.0493, but not the first (P = 0.5466). *Streblospio* sp. was found at Alviso Slough during April, but after April, most individuals were detected in the upstream 29 July sample (Table 2).

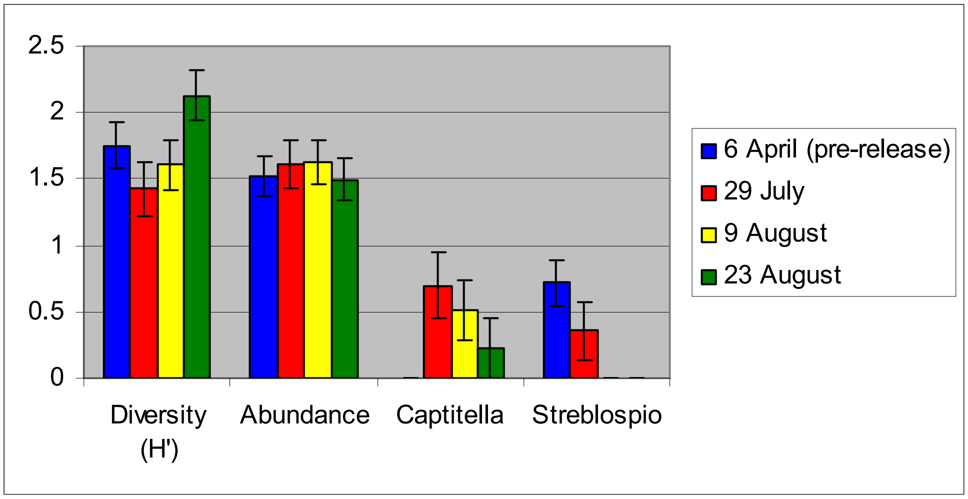


Figure 5. Comparison of taxa diverity, mean (log-transformed) total abundance, *Capitella* sp. abundance, and *Streblospio* sp. abundance among three summer 2004 sampling dates in Pond A7 receiving waters, Alviso Slough, Alviso, CA.

DCA Axis 1 had an eigenvalue of 0.433 and explained 19.5% of the explainable variance, and DCA Axis 2 had an eigenvalue of 0.267; together, they explain 31.5% of the explainable variance (Fig. 6). The length of DCA Axis 1 was 2.241 and represents constant beta diversity, indicating that a gradient exists relative to taxa composition, but the first DCA Axis is not as important for defining taxa composition in Alviso Slough as it was in Guadalupe Slough. It is the perpendicular distance of a sample point relative to an axis that determines its position along that gradient; samples from 29 July had the least variability in taxa composition within samples relative to DCA Axis 1, and the 7 April sample had the most. The samples from 7 April were most dissimilar in taxa composition and fall farthest along the gradient, but were not as distinct in Alviso Slough as in Guadalupe Slough; this could indicate that environmental changes across time were less pronounced in Alviso Slough. The 29 July samples were also those with the least variability in taxa composition relative to DCA Axis 2, which was a 2.922-unit axis with high variability and little differentiation among all samples, including those from April.

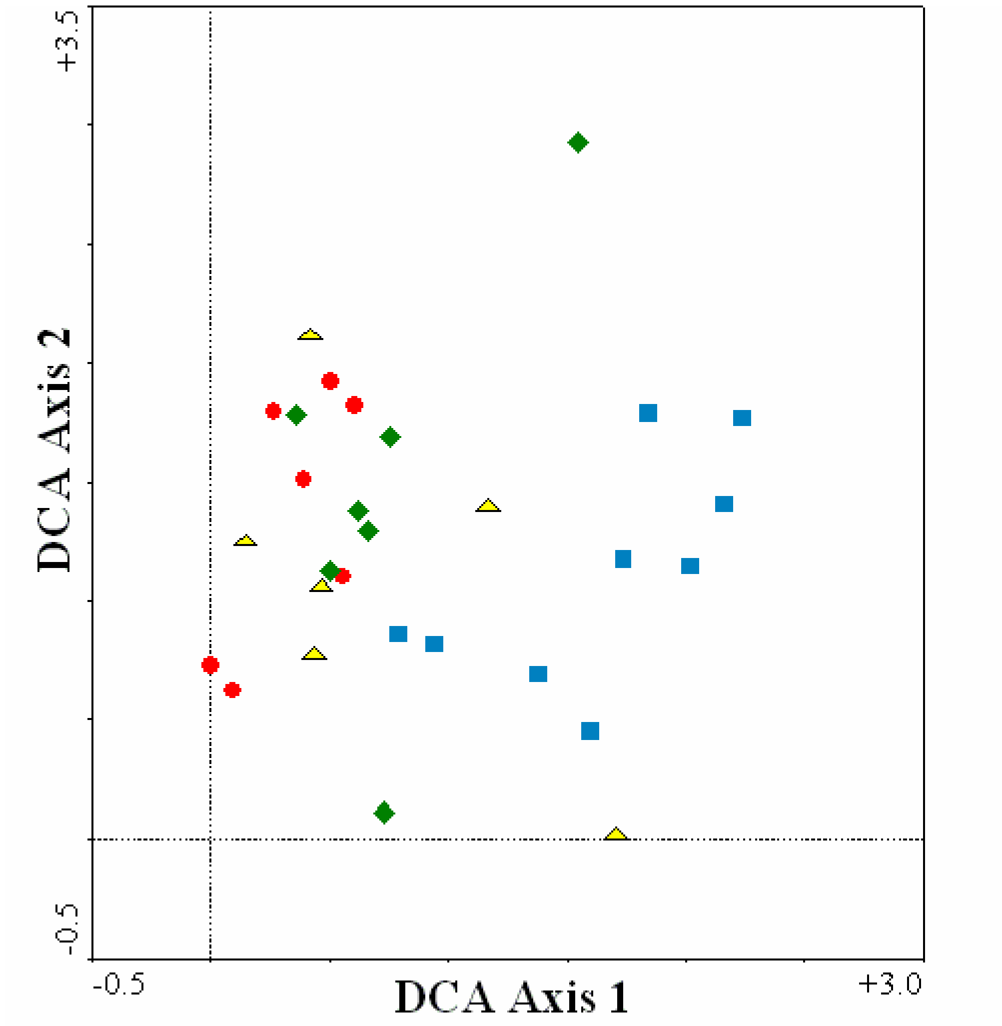


Figure 6. Results of DCA analysis showing 2004 Pond A7 receiving water Alviso Slough benthic invertebrate samples in ordination space. Blue squares = 7 April, red circles = 29 July, yellow triangles = 9 August, and green diamonds = 23 August.

Discussion

Ecological monitoring of benthic invertebrates can be a useful tool for detecting the impacts of water quality changes over time (Summers et al. 1991, Christman and Dauer 2003), as they can provide consistent responses to environmental stressors (Weisberg et al. 1997). Benthic samples were taken on three occasions following late July 2004 salt pond discharges into Guadalupe Slough and Alviso Slough, CA, to assess the effects of these discharges on the benthic community within the receiving waters. Additional samples collected in April 2004 are representative of pre-discharge conditions.

Comparisons were made between all four sampling events to assess community changes over time, and to relate them to water quality changes in the slough.

In addition to taxa diversity and total abundance, two indicator taxa were chosen for abundance comparison among sampling dates. *Capitella* sp. and *Streblospio* sp. are both recognized as taxa that are tolerant of stressful environmental conditions, which may include low dissolved oxygen and contaminants (Thompson and Lowe 2004, Thompson and Shouse 2004, Gaston et al. 1998). Higher relative abundances of these taxa could be indicative of degraded conditions. Although neither slough showed differences in *Capitella* sp. across the four sampling dates, including the pre-release (April) date, high sample variability and low sample size may make differences difficult to detect. *Capitella* sp. was not found in April. In Guadalupe Slough, *Capitella* sp. was found in the highest number in the second summer sample and slightly lower in the third sample. In Alviso Slough, *Capitella* sp. was found in the highest number in the first summer sample and each subsequent sample contained fewer individuals, although high sample variability made these differences insignificant. These results suggest that more data could show an increase in *Capitella* sp. immediately after pond release, followed by a decline. However, the water quality implications are contradicted because *Streblospio* sp. was present in pre-discharge samples but only rarely in post-discharge samples. In Guadalupe Slough, the April sample differed from all summer samples (which contained no *Streblospio* sp.), whereas in Alviso Slough, the April sample and the first summer sample were not different, while the later summer samples contained few *Streblospio* sp. Although there are too few data to draw conclusions, this may be a seasonal effect (*Streblospio* sp. was present during spring and declined through summer).

Although abundance and diversity comparisons showed no differences among sample dates, DCA revealed a shift in taxa composition between April samples and summer samples in both sloughs, especially Guadalupe Slough. In Guadalupe Slough, the three summer samples were similar relative to the ecological gradient represented by DCA Axis 1, whereas the April sample was distinct. April samples contained few or no *Capitella* sp., *Potamacorbula* sp., or *Heteromastus* sp., although these genera were abundant in summer samples. In contrast, April samples contained Nematoda, which was not represented in summer samples. In Alviso Slough, trends were similar but Tubificoides was present in April samples and not in summer samples, while Cumacea was more abundant in April samples than in summer samples. Differences in taxa composition may be useful for evaluating water quality changes if evaluated carefully with respect to known environmental tolerances of individual taxa. Because over three months passed between the pre-discharge sample and the post-discharge samples, many of the differences in taxa composition may be attributable to seasonal shifts rather than effects of the discharge. Such shifts in invertebrate taxa have been noted to occur seasonally in Alviso salt ponds (Miles et al. 2004).

Management Implications

The results of the 2004 benthic invertebrate sampling did not detect impacts from the Alviso Salt Pond discharges. Some trends were observed during sampling; however, the results of the sampling could have been more definitive if more data was obtained and the pre-release samples were taken closer to the post-release samples. It is possible that the results were confounded by the difference in the sampling seasons rather than the difference in the water quality coming from the ponds. To improve on the 2004 benthic invertebrate sampling, in 2005 we have included pre-release samples taken just 7 days before the first release from the Phase 2 ponds. The results from the 2005 sampling should provide us with a more appropriate comparison between pre-release and post-release benthic populations.

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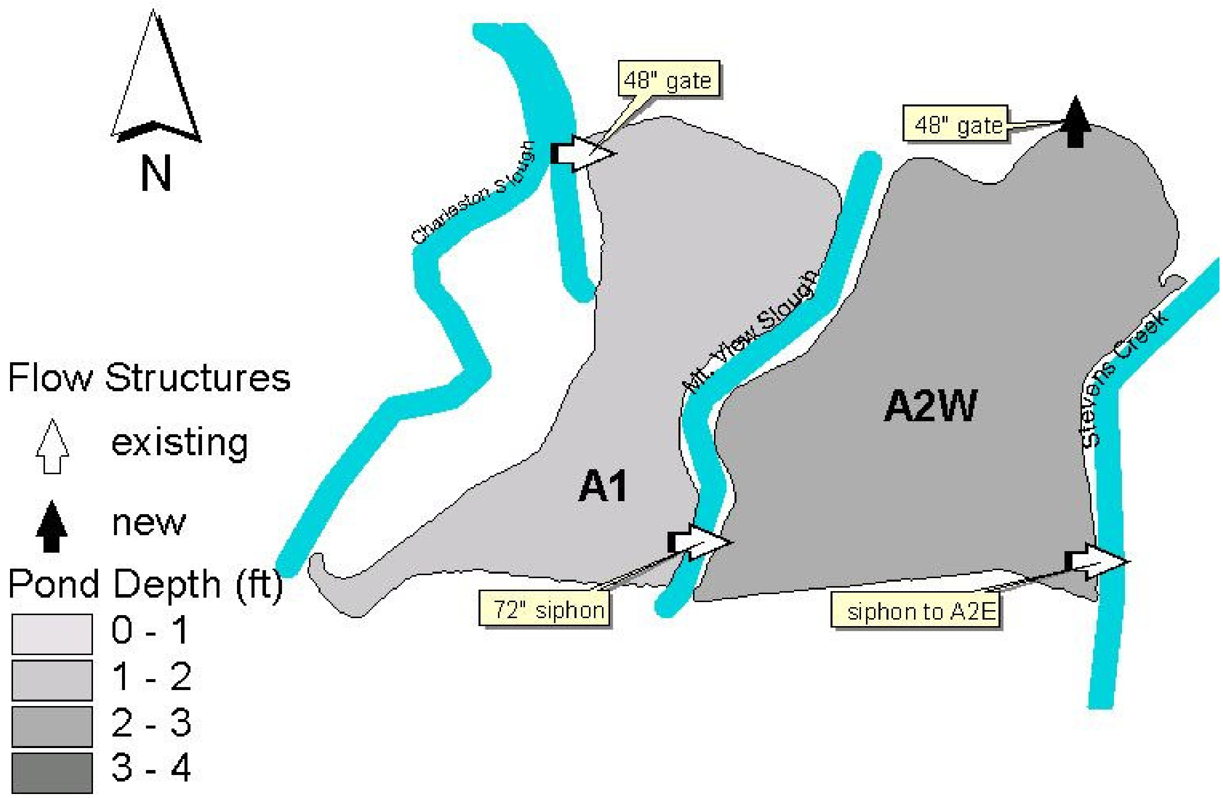
Operation Plan – Alviso System A2W (May 2005)



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, mercury methylation, 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 A1from lower Charleston Slough
- Existing 72" siphon under Mountain View Slough between A1 and A2W
- Existing staff gage (no datum) at A1, plus a new NGVD gauge to be installed in 2005
- New 48" gate outlet structure with 24' weir box at A2W to the Bay
- New NGVD gage 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 4.5 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 and limit wind wave erosion.

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 2004.

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 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 A1 inlet further. If increased flows are not possible, fully open both the A1 and A2W gates to allow the ponds to become 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 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.

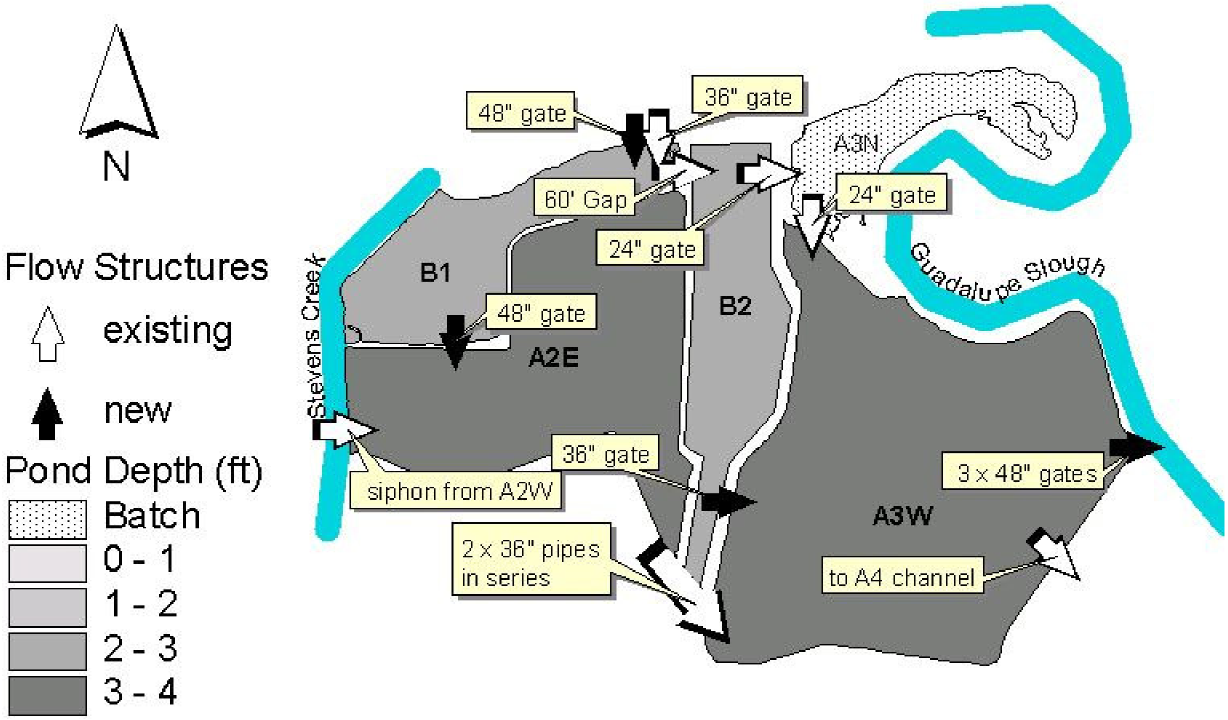
Mobilization of Inorganics and / or the Methylation of Mercury Control

Water column samples for total and dissolved arsenic, chromium, nickel, copper, zinc, selenium, silver, cadmium, lead, and mercury will be collected annually in August or September. If levels are found to rise, further analysis of the cause and mitigation measures will be developed.
If summer water levels in Ponds A1 and A2W are found to increase methyl mercury levels, according to the Methyl mercury Study done by USGS, the FWS will notify the Regional Water Quality Board and consult to determine the best approach to addressing the issue.

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

Location	**Frequency**	**Parameters**
A2W(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Bay	Monthly (May –Oct)	DO, pH, Temp., Salinity
Discharge point	Annually (Aug or Sept)	Metals in water column

Operation Plan – Alviso System A3W (May 2005)



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, mercury methylation, 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 gages at all ponds and new NGVD gages 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, from A2E to A3W, 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 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

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.

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)
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 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)
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 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 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, fully open both the B1 and A3W gates to allow the ponds to become 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 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 gage), 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 gage).

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.

Weekly Monitoring Program

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

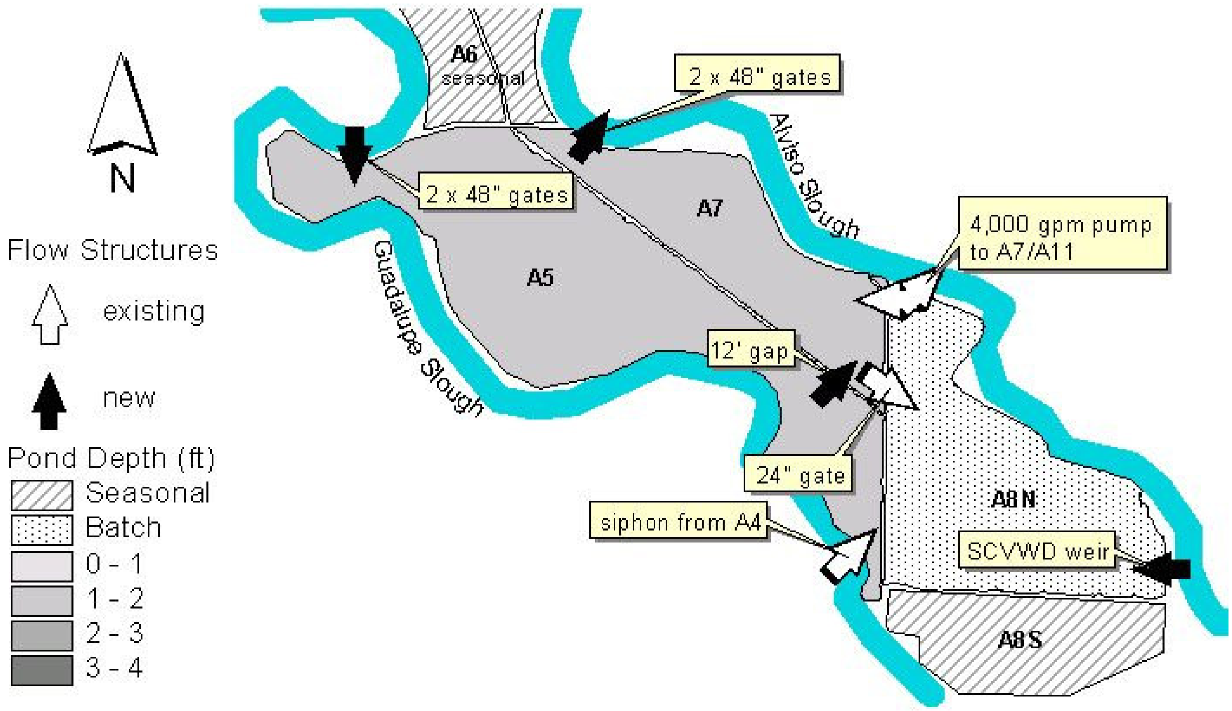
The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the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

Mobilization of Inorganics and / or the Methylation of Mercury Control

Water column samples for total and dissolved arsenic, chromium, nickel, copper, zinc, selenium, silver, cadmium, lead, and mercury shall be collected annually at the Discharge point in August or September. If levels are found to rise, further analysis of the cause and mitigation measures will be developed.
If summer water levels in the A3W system are found to increase methyl mercury levels, according to the Methyl mercury Study done by USGS, the FWS will notify the Regional Water Quality Board and consult to determine the best approach to addressing the issue.
Additional monitoring required by the RWQCB discharge permit includes the following:

Location	**Frequency**	**Parameters**
A3W(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Guadalupe.Sl.	Monthly (May –Oct)	DO, pH, Temp., Salinity
Discharge Point	Annually (Aug or Sept)	Metals in water column

Operation Plan – Alviso System A7 (May 2005)



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, mercury methylation, 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 4.5 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 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 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, fully open both the A5 and A7 gates to allow the ponds to become 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.

Winter 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	1.8
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

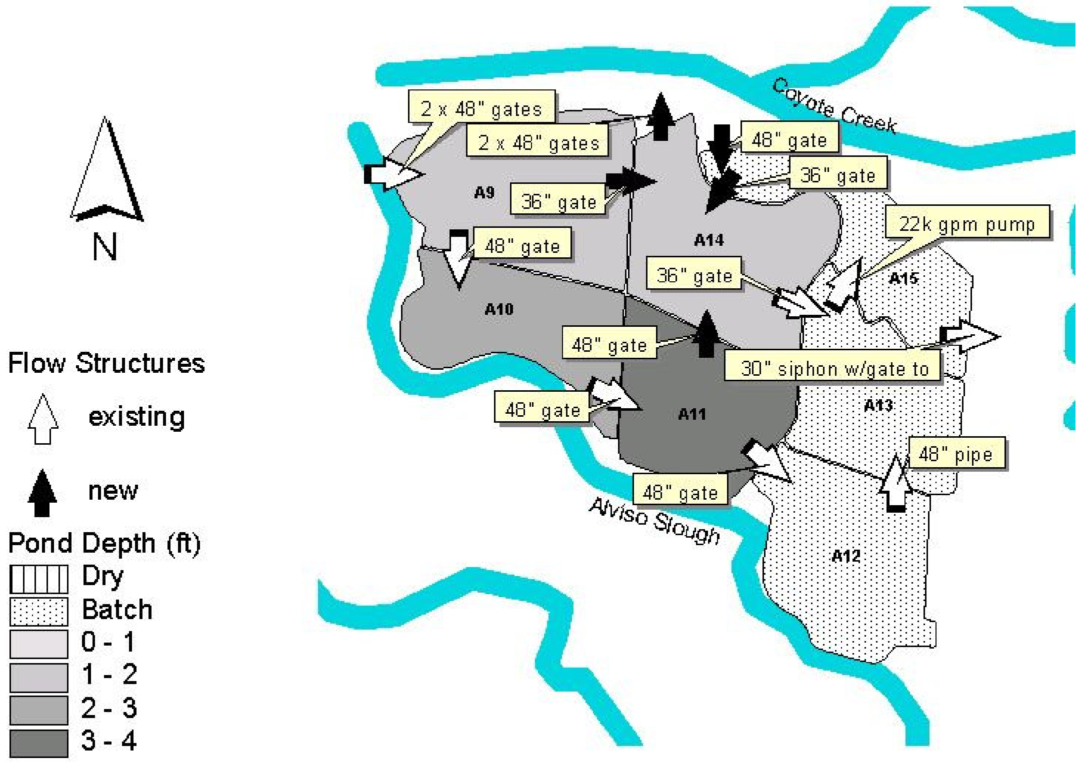
The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the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

Mobilization of Inorganics and / or the Methylation of Mercury Control

Water column samples for total and dissolved arsenic, chromium, nickel, copper, zinc, selenium, silver, cadmium, lead, and mercury shall be collected annually at Discharge point in August or September. If levels are found to rise, further analysis of the cause and mitigation measures will be developed.
If summer water levels in the Discharge point are found to increase methyl mercury levels, according to the Methyl mercury Study done by USGS, the FWS will notify the Regional Water Quality Board and consult to determine the best approach to addressing the issue.
Additional monitoring required by the RWQCB discharge permit includes the following:

Location	**Frequency**	**Parameters**
A7(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Alviso Slough	Monthly (May –Oct)	DO, pH, Temp., Salinity
Discharge point	Annually (Aug or Sept)	Metals in water column

Operation Plan – Alviso System A14 (May 2005)



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, mercury methylation, 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 4.0 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.

<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)
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 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 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, fully open both the A9 and A14 gates to allow the ponds to become 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 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

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

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.

<u>Weekly Monitoring Program</u>

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

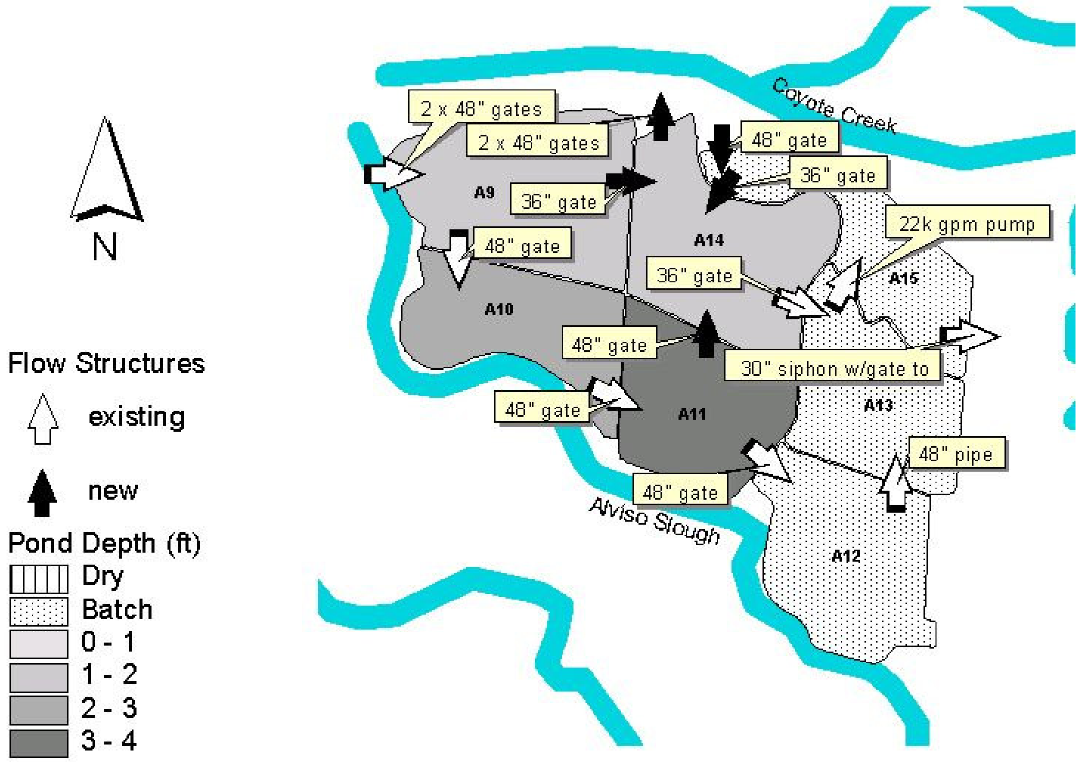
The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the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

Mobilization of Inorganics and / or the Methylation of Mercury Control

Water column samples for total and dissolved arsenic, chromium, nickel, copper, zinc, selenium, silver, cadmium, lead, and mercury shall be collected annually at the Discharge point in August or September. If levels are found to rise, further analysis of the cause and mitigation measures will be developed.
If summer water levels in the A14 system are found to increase methyl mercury levels, according to the Methyl mercury Study done by USGS, the FWS will notify the Regional Water Quality Board and consult to determine the best approach to addressing the issue. Additional monitoring required by the RWQCB discharge permit includes the following:

Location	**Frequency**	**Parameters**
A14(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Coyote Creek	Monthly (May –Oct)	DO, pH, Temp., Salinity
Discharge point	Annually (Aug or Sept)	Metals in water column

Operation Plan – Alviso System A14 (May 2005)



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, mercury methylation, 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 4.0 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.

<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)
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, fully open both the A9 and A14 gates to allow the ponds to become 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 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

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

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

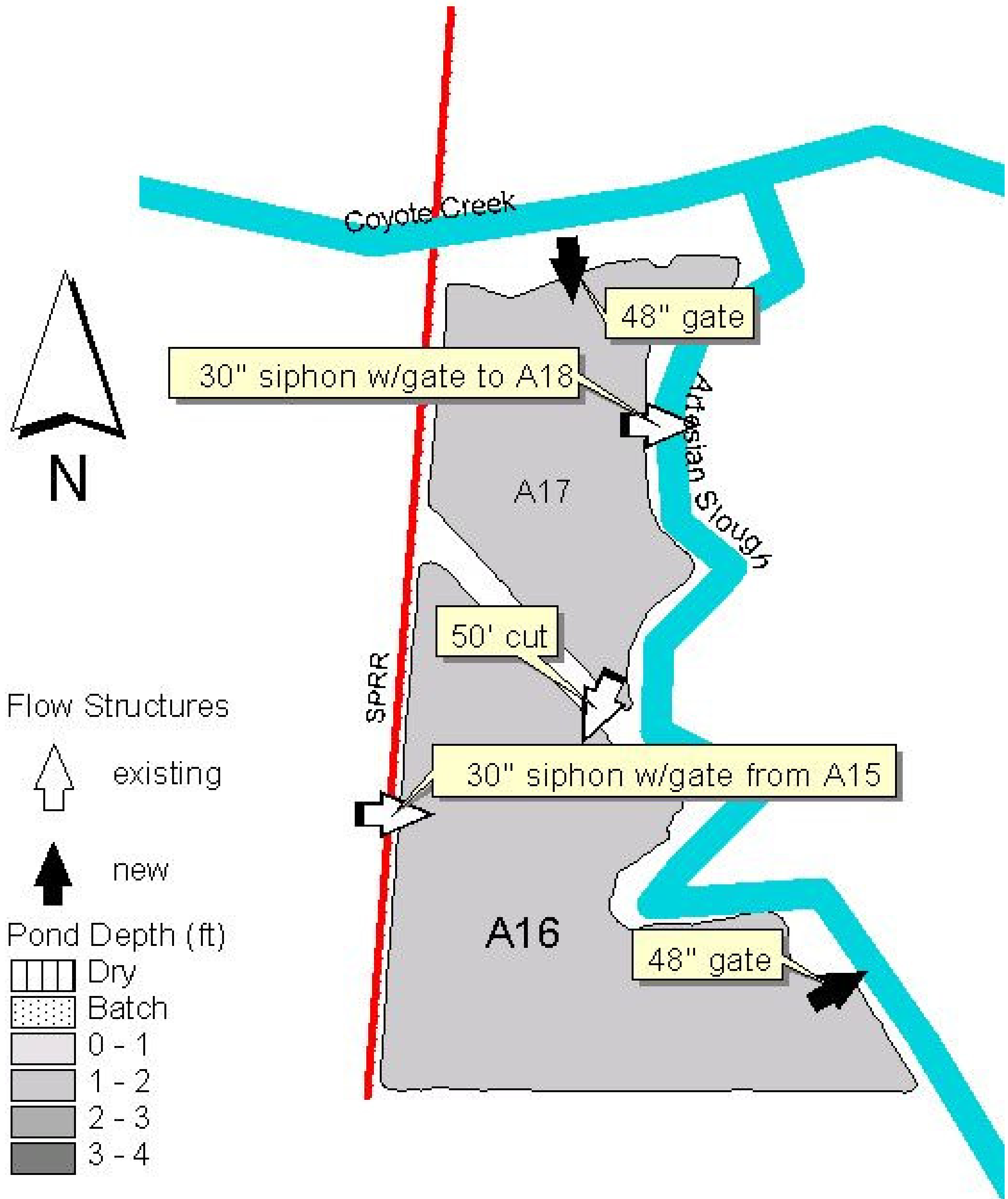
The weekly monitoring program will include visual pond observations to locate potential algae buildup or signs of avian botulism, as well as visual inspections of water control structures, siphons and levees. This program will also include supplementary DO monitoring when problems are identified in the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

Mobilization of Inorganics and / or the Methylation of Mercury Control

Water column samples for total and dissolved arsenic, chromium, nickel, copper, zinc, selenium, silver, cadmium, lead, and mercury shall be collected annually at the Discharge point in August or September. If levels are found to rise, further analysis of the cause and mitigation measures will be developed.
If summer water levels in the A14 system are found to increase methyl mercury levels, according to the Methyl mercury Study done by USGS, the FWS will notify the Regional Water Quality Board and consult to determine the best approach to addressing the issue. Additional monitoring required by the RWQCB discharge permit includes the following:

Location	**Frequency**	**Parameters**
A14(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Coyote Creek	Monthly (May –Oct)	DO, pH, Temp., Salinity
Discharge point	Annually (Aug or Sept)	Metals in water column

Operation Plan – Alviso System A16 (May 2005)



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 5.5 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.

Summer Pond Water Levels

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

Summer Gate Settings

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.

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)
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 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 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, fully open both the A17 and A16 gates to allow the ponds to become 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.

Mobilization of Inorganics and / or the Methylation of Mercury Control

Water column samples for total and dissolved arsenic, chromium, nickel, copper, zinc, selenium, silver, cadmium, lead, and mercury will be collected annually at the Discharge point in August or September. If levels are found to rise, further analysis of the cause and mitigation measures will be developed.
If summer water levels in Ponds A17 and A16 are found to increase methyl mercury levels, according to the Methyl mercury Study done by USGS, the FWS will notify the Regional Water Quality Board and consult to determine the best approach to addressing the issue.

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

Location	**Frequency**	**Parameters**
A16(discharge)	Continuous (May-Oct)	DO, pH, Temp., Salinity
Artesian Slough	Monthly (May –Oct)	DO, pH, Temp., Salinity
Discharge point	Annually (Aug or Sept)	Metals in water column