2018 Self-Monitoring Report
Baumberg Complex - Hayward, California
Eden Landing Ecological Reserve

Order Number: R2-2008-0078

Prepared for:

California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, California 94612

Prepared by:

John Krause, Environmental Scientist
California Department of Fish and Wildlife
Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534

March 2019

Table of Contents

Introduction

This annual self-monitoring report (SMR) for Final Order R2-2008-0078 (Final Order) summarizes the pond operations, management and monitoring conducted by the California Department of Fish and Wildlife (CDFW) from May through October 2018 at the Eden Landing Ecological Reserve (ELER) in Hayward, California. For this 2018 SMR, CDFW followed the format revised in our 2017 report which removed outdated information. We maintained these SMR revisions in compliance with the Final Order.

Monitoring is conducted for pond operations as required by the Regional Water Quality Control Board (RWQCB) Final Order. 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. Phase One of the South Bay Salt Ponds Restoration Project (SBSPRP) was completed in 2016. Data for pond management was collected according to the Self-Monitoring Program outlined in the Final Order. The initial "B" for the Baumberg Complex ponds has been changed to "E" for Eden Landing, in accordance with the nomenclature used for the SBSPRP. The U.S. Fish and Wildlife Service (USFWS) separately submit reports for the Alviso and Ravenswood Complexes.

ELER pond systems operated by CDFW in 2018 are described in the attached Operations Plans, updated for 2019. Current management reflects implementation of the adaptive management plan for the SBSPRP) in Ponds E10, E12, E13 and E14 (reconfigured and managed ponds), including multi-season and multi-species modified pond operations in System E6A (Ponds E8, E6B and E6A).

CDFW staff collected pond operations data in accordance with the Final Order requirements. Water quality monitoring was performed in 2018 using pond grab samples; continuous monitoring devices are not required for Dissolved Oxygen, pH, temperature and salinity. Receiving water monitoring was not conducted. Observed water levels and salinity from grab samples had values within ranges specified in the Operations Plans and Final Order Water Quality Objectives (WQOs) and adequately protected receiving waters. Pond operations and management activities were conducted to meet objectives described in the Final Order and CDFW's Operations Plans for each system.

The ponds are generally being operated as "muted tidal" systems with intake and discharge at the same location, with continuous circulation. Pond operations are fully described in the updated 2019 Operations Plans. Water enters ponds directly from San Francisco Bay (Bay) or sloughs on high tides via Water Control Structures (WCSs), with flow to one or more ponds, then discharges at low tide. The ponds discharge at tide stages lower than pond water elevations, typically averaging 3.5-feet (NGVD). Discharge is presumed to occur for approximately 13 to16 hours per day (based on predicted tides and spring or neap tide cycle variation). Pond intake is presumed to occur at elevations of approximately 1.5 feet or more above pond water levels due to required head (pressure) for in-flow based on data and observations from previous years.

The Final Order established maximum salinity levels below 44 parts per thousand (ppt) for discharge from the ponds. In 2018, operation of all systems was monitored and

discharge was generally below 44ppt, except brief periods as noted below. Other water quality parameters were not regularly sampled. Ponds were not significantly affected by major construction actions and were operated as open water or seasonal (dry) habitat. No adverse conditions were observed in ponds or receiving waters. Water quality monitoring activities were conducted as described in subsequent sections of this report.

This SMR includes summary information of pond operations and management. Pond operations were similar to previous years. Reconfigured System E12 ponds were operated with less intensive pond management, as discussed later. More typical (less intensive) pond management occurred in other pond systems (E11, E6A, E2/E2C).

Low dissolved oxygen (DO) levels at the point of discharge have previously been observed to fall below a 10^{th} percentile value of 3.3 mg/L (calculated on a calendar weekly basis). Low DO conditions may be expected during extended periods of high air and water temperature and appear to represent natural DO variations in sloughs or lagoon systems. It has been documented that DO levels below the Basin Plan standard of 5.0 mg/L are observed in sloughs not affected by any pond discharge and are within the natural range of variation of the South San Francisco Bay. A summary of grab sample data and discharge events are included in this report. Full data sets were provided to RWQCB staff. Additional analysis and interpretation of monitoring data is not expected to be completed nor submitted for 2018.

2018 Annual Summary

Water year 2017 was California's second-wettest year of record as measured by statewide runoff, ending a historic five-year drought (2011-2016). Water year 2018 (October 1, 2017, to September 30, 2018) marked a return to dry conditions statewide, with nearly all the state experiencing below-average precipitation, but drought conditions did not resume in the San Francisco (SF) Bay Area. Significant rainfall was observed in March 2018.

The effect of the March 2018 rainfall resulted in a prolonged period of low salinity in SF Bay. High episodic rainfall generally affected pond operations positively. Salinity values were moderate during the summer months. The effects of high rainfall are apparent in terms of more direct input of freshwater into ponds and SF Bay resulting in sustained lower salinity conditions. Salinity was observed to be below 20ppt for an extended period in March 2018 in the bay and in sloughs. Higher sustained intake and discharge operations helped maintain low salinity during the summer operation period. In-pond salinity averages in summer 2018 were typical of dry years, and a few "spikes" were observed during July, August and September, particularly during neap tide periods.

In 2018, continuous circulation in the ponds occurred during the summer monitoring season as described in Operations Plans. Pond operations included intake to, and discharge from, Pond E10, E12, E14, E8X, E6A, E6B, E2C and E2. Pond management and water quality monitoring in 2018 was conducted using grab samples.
The Pond E13Mixing Basin WCS (five 36-inch culverts w/gates) has been fully operational since 2015. In 2018, the fourth full year of consistent operation of gates was successful in Ponds E12 and E13. These ponds have year-round open water in a series of

pond "cells" which provide a salinity gradient in shallow water, primarily for shorebird habitat. In 2018, limited operations and maintenance (O&M) activities were completed at ELER. O&M included minor work on public access features, such as the year-round Bay Trail spur and seasonal loop on Mt. Eden Creek. The 10,000 Gallon Per Minute (GPM) intake pump at Pond E12 did not operate except periodic preventative maintenance.

The 2018 monitoring results indicate that while reconfigured Ponds E12 and E13 were intensively managed, water quality was maintained but not significantly improved overall. It appears that use of a mixing basin for discharge helps meet water quality objectives, but still may not always meet Basin Plan objectives. Construction of mixing basins in ponds managed for low salinity do not appear necessary. We will continue evaluate pond operations within an adaptive management framework for future activities.

In 2018, operation of the WCSs (mostly single 48-inch culverts with combination gates) were normal year-round. No problems were encountered in 2018. Typical, seasonal operations continued for Ponds E6A, E6B and E8. System E6A ponds (E8, E6B, E6A) were managed for multi-season, multi-species objectives. As currently operated, System 6A ponds sustain decreased intake and increased discharge volumes via Old Alameda Creek (Pond E6A) and North Creek (Pond E6B and E8). In winter, the System is operated primarily for waterfowl foraging and roosting, specifically for diving ducks, though dabbling ducks are supported. System 6A ponds are managed in summer for western snowy plover (WSP), black-necked stilt and American avocet breeding, with drawn down water levels and subsequent exposure and drying of much of the pond bottoms. Spring and fall season conditions supported shorebird foraging and roosting during migration periods. During 2018, this system provided suitable habitat conditions.

For the 2018 monitoring season, periodic (weekly) collection of pond water data was sufficient to inform pond management (summer and winter). Pond management and operations are discussed in greater detail in the Operations Plans and briefly here.

Water quality monitoring at the ELER ponds conformed to the Final Order. Salinity, water levels and waterbird use were the primary basis for determining pond management activities for the 2018 season. Typical pond operations and monitoring of salinity and water levels indicated that the ponds were operating within parameters that met biological and water quality objectives. No abnormal conditions, such as fish kills, were observed.

Ponds were operated for multi-season, multi-species objectives, as briefly described below. Temporary suspension of discharge was seldom implemented in 2018. Weekly discharge timing BMP's addressed most periods of elevated salinity seen at discharges.

The ELER site location is shown on Figure 1; sampling and water control structure (WCS) locations are shown on Figure 2.

For all pond systems:

Grab samples were collected at pond-to-pond, intake and/or discharge locations to monitor pond conditions and meet habitat management and water quality objectives.

Salinity, water level and circulation patterns such as flow direction at a culvert location, as well as bird guild/species and abundance were monitored throughout the pond systems. We observed conditions which indicated good water quality, particularly for salinity. During summer operations, water levels in the ponds are maintained throughout the season primarily by adjusting discharge gates, rather than intake gates, with consideration of neap tide cycles, weather conditions, habitat objectives and species use.

In 2018, pond management for continuous circulation was typical for summer operations. A summary of discharge events is shown on Table 1.

System E2C:

Pond E2C was operated in 2018 as described in the Operations Plan, similar to previous years. A continuous monitoring device for water quality was not utilized or required. Monitoring included grab samples collected on an approximately weekly basis for salinity and for water levels recorded from staff gauges installed in ponds at a WCS. Waterbird use was recorded to inform operations and meet habitat objectives. Discharge was at or below 25% of capacity; therefore, no receiving water monitoring was required, as noted in the Final Order. System E2C operations were normal and regular flow occurs between E2C and Cargill Pond 3C and periodically between E2C and E5C.

System E2:

Pond E2 was operated in 2018 as described in the Operations Plan, similar to previous years. Discharge directly to the Bay from Pond E2 was generally maintained at 25% of capacity of two, 48-inch gates for much of the summer. A continuous monitoring device was not utilized or required. Monitoring included grab samples collected on an approximately weekly basis to monitor salinity, and water levels recorded from staff gauges. Waterbird use was recorded to inform operations and meet habitat objectives. There is limited flow from E1 to E7 to E6, and to E5 from E4 to maintain water in the eastern ponds. Managed "batch" ponds (E6, E5) allow salinity to increase to approximately 120-parts per thousand (ppt), maintaining water levels by providing "make up" water (lost to evaporation) from adjacent ponds (E7 or E4). Batch ponds are recirculated in winter to maintain low salinity in the spring and summer monitoring season. E6C was managed as a seasonal pond and allowed to mostly dry. System E2 discharge operations during the winter successfully recirculated higher salinity conditions in "batch" and seasonal ponds (E5, E6 and E6C).

System E10:

The E10 intake/discharge WCS and a pond-to-pond WCS (E10 to E11) were replaced in 2017. The E10 WCS has a 48-inch culvert and combination gates on each side, whereas previously there was a 3-pipe, 48-inch WCS at E10 and an original two gate (36-inch) wooden WCS between E10 and E11 was replaced with a 36-inch culvert and combination gates on each side. Typical operations were conducted in 2018 in System E10 ponds. Pond E10 is operated as a continuous circulation, low salinity pond, and pond E11 is operated as a seasonal pond. Pond E10 has intake from and discharge into the Bay at the mouth of Mount Eden Creek (MEC). E11 has intake and discharge from MEC and

periodic flow from Pond E10. Continuous monitoring devices (Datasondes) were not used in ponds or receiving waters.

System E6A:

In 2018, operations were conducted similar to previous years in System E6A ponds (E8, E6B, E6A) In summer, System E6A management targeted western snowy plover (WSP) nesting. In the winter, System 6A was managed with deeper water levels to provide foraging and roosting habitat for diving ducks. Continuous circulation intake/discharge operations were conducted, whereby low salinity conditions were maintained throughout the year in most of the borrow ditch and ponded areas throughout the system. Pond operations successfully provided target conditions for multi-season, multi-species management, including WSP nesting, and maintained low salinity conditions in the ponds subsequently benefiting overwintering waterfowl and migratory shorebirds.

System E9:

Ponds E9, E8A and E8X in System E9 were restored to full tidal action in 2011 as part of Phase One of the SBSPRP. Managed ponds E12, E13 and E14 previously linked to E9 and E8X are in System E12, below.

System E12:

Reconfigured ponds E12 and E13 were fully operational for the fourth year in 2018 and are managed routinely as designed. Ponds E12 and E13 were reconfigured as a "salinity experiment" providing a series of shallow, open water cells of progressively increasing salinity with similar water levels. Significant use of the cells by small and medium shorebirds is regularly observed as part of on-going monitoring and surveys. WSP continued to use System E12 ponds, including dry bottom areas of E14, and dry berms, levees and islands in the reconfigured Ponds E12 and E13. Pond operations in E12, E13 and E14 maintained low salinity discharge (<44 ppt). Moderate to high salinity conditions (80 to 120ppt) targeted within respective cells were observed in summer.

In 2018, intake/discharge operations and monitoring were conducted in System E12 ponds. Pond E8X was operated as a forebay for intake and discharge operations in pond E14. Ponds E14 and E8X were generally operated as shallow, muted tidal basins and periodically allowed pond-to-pond flow during brief periods from Pond E12 to meet water quality objectives for continuous circulation. Pond E14 was operated similarly to other seasonal ponds in ELER, with limited intake from tidal areas as needed under continuous circulation to support sufficient dry areas for WSP nesting. Ponds E12 and E13 discharged primarily to Mt. Eden Creek via the "mixing basin" area within E13. Periodically, E14 received low-volume flow from E13 to maintain more constant water surface elevations in E14. This system provided good habitat conditions for shorebirds, particularly WSP, as well as waterfowl throughout 2018.

Table 1: Summary of Intake/Discharge Activities

Complete data and field notes for pond operations/conditions and management activities provided electronically to RWQCB and are otherwise available upon request.

NOTE: Table 1 salinity values obtained from a hand-held refractometer (Parts Per Thousand, or ppt). In previous reports, Baumberg aka Eden Landing. Staff gauge readings are specific to each pond (or pond system), and vary between NGVD 29, NAVD 88 or relative to pond bottom.

Pond	Location	Date	Salinity (ppt)	Staff	Activity and notes
E2C	E2c-14	4/25/18	27	3.25	Discharge 1x48" at 25%, 2x48" Intakes 100%; begin summer operations.
E2C	E2c-14	5/4/18	36	below	1x48" Disch. 25% cont**.** Neap tide
E2C	E2c-14	6/12/18	36	3.0	1x48" Disch. 25% cont.
E2C	E2c-14	7/6/17	26	2.9	1x48" Disch. 25% cont, neap tides
E2C	**E2c-14**	**7/19/18**	**54**	**below**	**Reduced 1x48" Disch. To 5%, Salinity Mgmt.**
E2C	**E2c-14**	**7/24/18**	40	**3.35**	**Increased 1x48" Disch. To 10%**.
E2C	**E2c-14**	**7/31/18**	**40**	**3.35**	**Increased 1x48" Disch. To 15%**
E2C	**E2c-14**	**8/17/18**	**41**	**3.60**	**Increased 1x48" Disch. To 25%**.
E2C	**E2c-14**	**8/24/18**	**44**	**below**	**Reduced 1x48" Disch. To 15%**.
E2C	E2c-14	9/5/18	41	3.0	1x48" Disch. 15% cont.
E2C	**E2c-14**	**9/11/18**	**37**	**3.55**	**Increased 1x48" Disch. to 20%**.
E2C	**E2c-14**	**9/14/18**	**47**	**3.30**	**Reduced 1x48" Disch. To 5%.**
E2C	**E2c-14**	**9/18/18**	**45**	**3.25**	**1x48" Disch. 5% cont.**
E2C	**E2c-14**	**9/25/18**	**38**	**3.4**	**Increased 1x48" Disch. To 10%.**
E2C	**E2c-14**	**10/5/18**	**39**	**3.70**	**Increased 1x48" Disch. To 20%.**
E2	E2-10	4/25/18	28	3.00	2x48" Discharge 25%, 2x48" Intake 100% cont. Begin Summer Ops
E2	E2-10	5/4/18	33	3.20	2x48" Disch. 25%; 2x48" Intake 100% cont
E2	E2-10	5/24/18	37	3.05	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	6/12/18	32	3.15	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	7/18/18	42	3.40	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	7/24/18	**45**	3.40	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	7/31/18	**45**	3.30	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	8/17/18	**46**	3.45	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	8/24/18	42	3.45	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	9/5/18	**45**	3.25	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	9/11/18	42	3.45	2x48" Disch. 25%, 2x48" Intake 100% cont.
E2	**E2-10**	**9/14/18**	**47**	**3.50**	**Reduced to 1x48" Disch. 25%** (Salinity Mgmt), 2x48" Intake 100%.
E2	E2-10	9/18/18	49	3.45	1x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	9/25/18	40	3.40	1x48" Disch. 25%, 2x48" Intake 100% cont.
E2	E2-10	10/5/18	39	3.55	1x48" Disch. 25%, 2x48" Intake 100% cont.
E10	E11-1	4/20/18	30	5.90	New staff gauge NAVD. 1x48" Disch. 10%, Intake 100% cont.

Pond	Location	Date	Salinity (ppt)	Staff	Activity and notes
E10	E11-1	5/22/18	32	5.90	1x48" Disch. 10%, Intake 100% cont.
E10	E11-1	6/26/18	40	6.00	1x48" Disch. 10%, Intake 100% cont.
E10	**E11-1**	**7/11/18**	**34**	**5.95**	**Increased 1x48" Discharge to 50%**, max circulation to reduce algal mats. 1x48" Intake 100% cont.
E10	E11-1	7/17/18	36	5.70	1x48" Discharge 50%, 1x48" Intake 100% cont.
E10	E11-1	8/3/18	38	5.00	1x48" Discharge 50%, 1x48" Intake 100% cont.
E10	E11-1	9/6/18	42	5.20	1x48" Discharge 50%, 1x48" Intake 100% cont.
E10	E11-1	9/25/17	38	5.40	1x48" Discharge 50%, 1x48" Intake 100% cont.
E10	E11-1	10/12/18	39	5.55	1x48" Discharge 50%, 1x48" Intake 100% cont.
E8X	E8X- Tidal Discharge	4/18/18	25	5.2	1x48" Intake 100% 1x48" Disch. 10%. Summer Ops.
E8X	E8X- Tidal Discharge	6/12/18	30	5.8	1x48" Intake 100% 1x48" Disch. 10% cont.
E8X	E8X- Tidal Discharge	8/1/18	37	5.2	1x48" Intake 100% 1x48" Disch. 10%. cont.
E8X	E8X- Tidal Discharge	9/14/18	42	5.15	1x48" Intake 100% 1x48" Disch. 10% cont.
E14	E14-E9 new WCS	4/23/18	30	*5.0	1x48" Discharge 25%, 1x48" Intake 15% cont. E14->E9 Summer Ops
E14	**E14-E9 new WCS**	**5/24/18**	**29**	***5.5**	1x48" Discharge 15% cont. **Reduced 1x48" Intake to 5%** (min WSE flux, SNPL nests).
E14	**E14-E9 new WCS**	**11/9/18**	**35**	***5.55**	**Increased 1x48" Intake to 50%**, 1x48" Discharge 25% cont. Trans. to Fall Ops.
E12	**E12-1**	**6/11/18**	**32**	***6.65**	**Opened 2x48" DISCH 25%**, Max Circ. Algal Mat recirc. 2x48" Intakes 100% cont. E12-RES-6.65-(32ppt)-1x18" gate 10%, 1x18" gate 5%->E12-Lo-6.45-(35ppt)-[1x48" DC gate Closed -/-(E12-DC-6.4')] ->E12-Med-6.2-(55ppt)->E12Hi-5.85 (93ppt)-[>E12-DC-5.75]->E13MB- 5.5-(30ppt). Weirs Set at 5.0' NAVD. 2x36" Discharge Open 100%, 2x36" Intake 100%, (Summer Ops, Spring Tides) (Reconfig. Ops w/MB Intake/Disch).
E12	**E12-E8X**	**6/12/18**	**32**	***5.45**	**Closed 2x48" DISCH**, Max WSE. Algal Mats OK. 2x48" Intakes 100% cont. E12-RES-5.45-(32ppt)-1x18" gate 10%, 1x18" gate 5% cont->E12-Lo-6.45-(35ppt)-[1x48" DC gate Closed -/-(E12-DC-6.4')]->E12-

Pond	Location	Date	Salinity (ppt)	Staff	Activity and notes
					Med-6.2-(55ppt)->E12Hi-5.85 (93ppt)->[E12-DC-5.75]->E13MB- 5.5-(30ppt). Weirs Set at 5.0' NAVD. 2x36" Discharge Open 100%, 2x36" Intake 100%, (Summer Ops, Spring Tides) (Reconfig. Ops w/MB Intake/Disch).
E13	**E12-E13 Mixing Basin**	**4/23/18**	**25**	**6.0**	Discharging. **Opened 1x36" gate 25%** + 3x36" Intake 100% Open 2x36" Discharge Open 100% Cont. (T'sition to Summer Ops). Weirs set at 5.0' NAVD. (New staff 5.6' , 0.0 Wood Staff). 5.4' = E13-E14 =5.2'). (Reconfig. Ops w/MB Intake/Disch).
E13	E12-E13 Mixing Basin	5/17/18	28	5.85	Discharging. 1x36" gate 25% + 3x36" Intake 100% Open cont, 2x36" Discharge Open 100% Cont.
E13	**E12-E13 Mixing Basin**	**5/22/18**	**29**	**5.6**	Discharging. **Closed 1x36" gate (fr.25%)** 3x36" Intake 100% Open cont, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	6/1/18	30	5.5	Discharging. 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	7/17/18	41	5.75	Discharging. 2x36" 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	8/1/18	37	5.5	Discharging. 2x36" 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	8/17/18	**67**	5.5	2x36" 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	8/21/18	41	5.6	Discharging. 2x36" 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	9/14/18	41	5.7	Discharging. 2x36" 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	9/18/18	50	5.25	Discharging. 2x36" 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	10/12/18	44	5.8	Discharging. 2x36" 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.
E13	E12-E13 Mixing Basin	10/29/18	41	5.5	Discharging. 2x36" 3x36" Intake 100% Open, 2x36" Discharge Open 100% Cont.

Pond	Location	Date	Salinity (ppt)	Staff	Activity and notes
6B	E6A-2	4/25/18	26	2.2	Intaking. 1x48" Disch. 50%, 1x48" 1x48" Intake 25% cont. Transition to Spring/SNPL Ops (Low WSE).
6B	**E6A-2**	**7/11/18**	**33**	**2.15**	**Reduced 1x48" Intake to 10%**, 1x48" Disch. 50% cont. Spring/SNPL Ops.
6B	**E6A-2**	**8/1/18**	**35**	**1.0**	Discharging. **Increased 1x48" Intake to 15%**, 1x48" Disch. 50%, WSE mgmt. for SNPL nest Ops.
6B	**E6A-2**	**8/17/18**	**43**	**0.5**	Discharging. **Reduced 1x48" Disch. to 25% Increased 1x48" Intake to 50%**, WSE mgmt. (SNPL brood forage/nest Ops).
6B	E6A-2	9/11/18	42	2.3	Intaking. 1x48" Disch. 25%, 1x48" Intake 50% cont, T'sition to Fall Migrant Ops
6B	**E6A-2**	**10/11/18**	**38**	**2.6**	1x48" Disch. 50%, **Reduce 1x48" Intake to 10%**, Cont. T'sition to Fall Migrant Ops
			(Below)	(values)	(Salinity & Staff at E6A-3)
6A	E6A-10	4/25/18	(18)	(2.2)	(Note: Salinity & Staff at E6A-3). 1x48" Intake 25%), 1x48" Disch. 75%. Begin T'sition to Summer/SNPL-E6B Ops.
6A	E6A-10 (E6A-3)	5/22/17	(12)	(2.25)	1x48" Intake 25%, 1x48" Disch. 75% cont. Summer ops. (Salinity/Staff at E6A-3; 1x48" gate 5%, E6A->E6B).
6A	**E6A-10 (E6A-3)**	**7/18/18**	**(34)**	**(1.9)**	**Reduced 1x48" Intake to 15%**, 1x48" Disch. 75% cont. (Salinity/Staff at E6A-3; 1x48" gate 5%, E6A->E6B).
6A	E6A-10 (E6A-3)	9/11/18	(44)	(2.1)	1x48" Intake 15%, 1x48" Disch. 75% cont. (Salinity/Staff at E6A-3; 1x48" gate 5%, E6A->E6B).
6A	E6A-10 (E6A-3)	9/18/18	(42)	(2.0)	1x48" Intake 15%, 1x48" Disch. 75% cont. (Salinity/Staff at E6A-3; 1x48" gate 5%, E6A->E6B). Increase WSE, T'sition to Fall Migrant Ops.
6A	E6A-10 (E6A-3)	10/11/18	(33)	(2.3)	1x48" Intake 15%, 1x48" Disch. 75% cont. (Salinity/Staff at E6A-3; 1x48" gate 5%, E6A->E6B). Increase WSE, Cont. Fall Migrant Ops.
8	E6A-1	4/25/18	26	*5.3	NAVD Staff at B6A-1a. 1x48" Disch. 10%, 1x48" Intake 50% cont. T'sition to Summer/SNPL Ops.
8	E6A-1	5/15/18	26	5.35	NAVD Staff at B6A-1a. 1x48" Disch. 10%, 1x48" Intake 50% cont. Summer/SNPL Ops.
8	E6A-1	6/12/18	30	5.3	NAVD Staff at B6A-1a. 1x48" Disch. 10%, 1x48" Intake 50% cont. Summer/SNPL Ops.

Pond	Location	Date	Salinity (ppt)	Staff	Activity and notes
8	**E6A-1**	**6/19/18**	**30**	**5.35**	NAVD Staff at B6A-1a. **Increased 1x48" Disch. to 50%, Reduced 1x48" Intake to 25%**. Summer/SNPL Ops.
8	**E6A-1**	**7/25/18**	**32**	**4.9**	NAVD Staff at B6A-1a. **Reduced 1x48" Intake to 15%**, 1x48" Disch. 75%, cont. Summer/SNPL Ops.
8	**E6A-1**	**8/17/18**	**40**	**5.0**	NAVD Staff at B6A-1a. **Increased 1x48" Intake to 50%, Reduced 1x48" Disch. to 25%**. Summer/SNPL Ops.
8	E6A-1	9/11/18	39	5.3	NAVD Staff at B6A-1a. 1x48" Intake 50%, 1x48" Disch. 25% cont. End SNPL Ops.
8	E6A-1	10/11/18	38	5.6	NAVD Staff at B6A-1a. 1x48" Intake 50%, 1x48" Disch. 25% cont. Fall Migrant Ops.

Water Quality Monitoring Requirements

Water quality monitoring was conducted at locations shown in Figure 2 for Table 2:

Table 2 Continuous Circulation Period Discharge Limits
All pond waters discharging to the Bay or Sloughs shall meet the following limits:

Parameter	Instantaneous Maximum	Instantaneous Minimum	Units
Salinity	44	n/a	Ppt
Dissolved Oxygen[1]	n/a	5.0	Mg/L
pH[2]	8.5	6.5	

[1] = Basin Plan objective; pond discharges must be ≥ DO receiving waters. DO Trigger: when using a continuous data recorder, if the DO 10th Percentile value is < 3.3 mg/L, on a calendar weekly basis, values shall be reported to RWQCB and BMP's implemented as needed.
[2] = The Discharger may determine pH compliance at the discharge or in the receiving water.

Water Quality Monitoring Methodology

Pond Discharge Monitoring/Sampling:
In 2018 continuous data were not collected. As previously approved by RWQCB, such data were not required in Pond Systems E2, E2C, E6A/B/8, E8X and E14 in the Final Order. Pond management targeted waterbird habitat objectives and operational changes were made on a weekly, monthly and seasonal basis, based on salinity grab samples, water level monitoring and waterbird use. Pond management conformed to Operations Plans. Pond management is summarized in Table 1: Summary of Discharge Activities.

Discharge Time-Period and Volume Estimates:
Estimates of discharge volume provide context for pond management but are not easily calculated. RWQCB previously modified ASMR requirements such that volume estimates are not required. Discharge time-period information is a proxy for discharge volume, interpreted from previous monitoring data, observations and predicted tides, as noted below. We assume discharge occurs when tide stage is below pond water elevation,

estimated at approximately 13-16 hours daily. This may over-estimate actual discharge time (and volume) because it disregards effects of head (pressure) that may alter discharge flows from culverts with tide gates. Based on observed data, intake requires tide stages that are approximately 1 ½ feet higher than pond water elevations.

Receiving Water Sampling:

Receiving water was not monitored in 2018 as previously approved by RWQCB. Ponds E2 and E10 discharge to the Bay, while limited discharge occurs into sloughs via Ponds E2C, E6A, E6B, E8, E8X, E14 and the mixing basin for reconfigured Ponds E12/E13.

Sampling requirements under the Final Order were originally modified by RWQCB in 2008. Receiving water sampling was required only when adverse conditions are observed, concurrent with Pond E2C discharge volumes greater than 25% of capacity of the 2x48" water control structure. As previously approved by RWQCB, discharges are maintained at greater than 25% capacity in order to maintain nesting habitat for WSP in ponds E8X, E6B, E6B, E8 and E14, as well as in reconfigured ponds E12 & E13. Table 3 below describes the water quality monitoring requirements for discharge from this complex at greater than 25% capacity during the period May through October.

In the 2017 ASMR, CDFW requested that type "A" monitoring only be required for all ponds, and approved as a revision to the Final Order.

Table 3 –Water Quality Monitoring for Eden Landing Ponds

Sampling Station:	D.O.	pH	Temp	Salinity	Sample Function
E2-10	A	A	A	A	Discharge
E2C-1 (E2C-14)	A	A	A	A	Discharge
E6A-10	A	A	A	A	Discharge
E6A-2	A	A	A	A	Discharge
E6A-1	A	A	A	A	Discharge
E8X-Tidal	A	A	A	A	Discharge
E12-E13	A	A	A	A	Discharge
E14-E9	A	A	A	A	Discharge

LEGEND FOR TABLE 3

A = Between May and October the Discharger shall collect weekly grab samples of pond water and report standard observations (Section D of the SMP). The Discharger shall alternate the time it collects grab samples, as practicable. Grab samples and standard observations inform pond operations and management.

Calibration and Maintenance:

The refractometer instrument used for salinity sampling as part of the Self-Monitoring Program was calibrated by using pure water to reset the instrument to zero.

Pond Management Sampling:

CDFW regularly conducted sampling in 2018 in all ponds in each system. This data was used to inform pond management and adjust discharge operations. Data include pond

water elevation (staff gages), salinity (hand-held refractometer), wildlife use (observations), meteorological/tidal conditions and physical pond conditions.

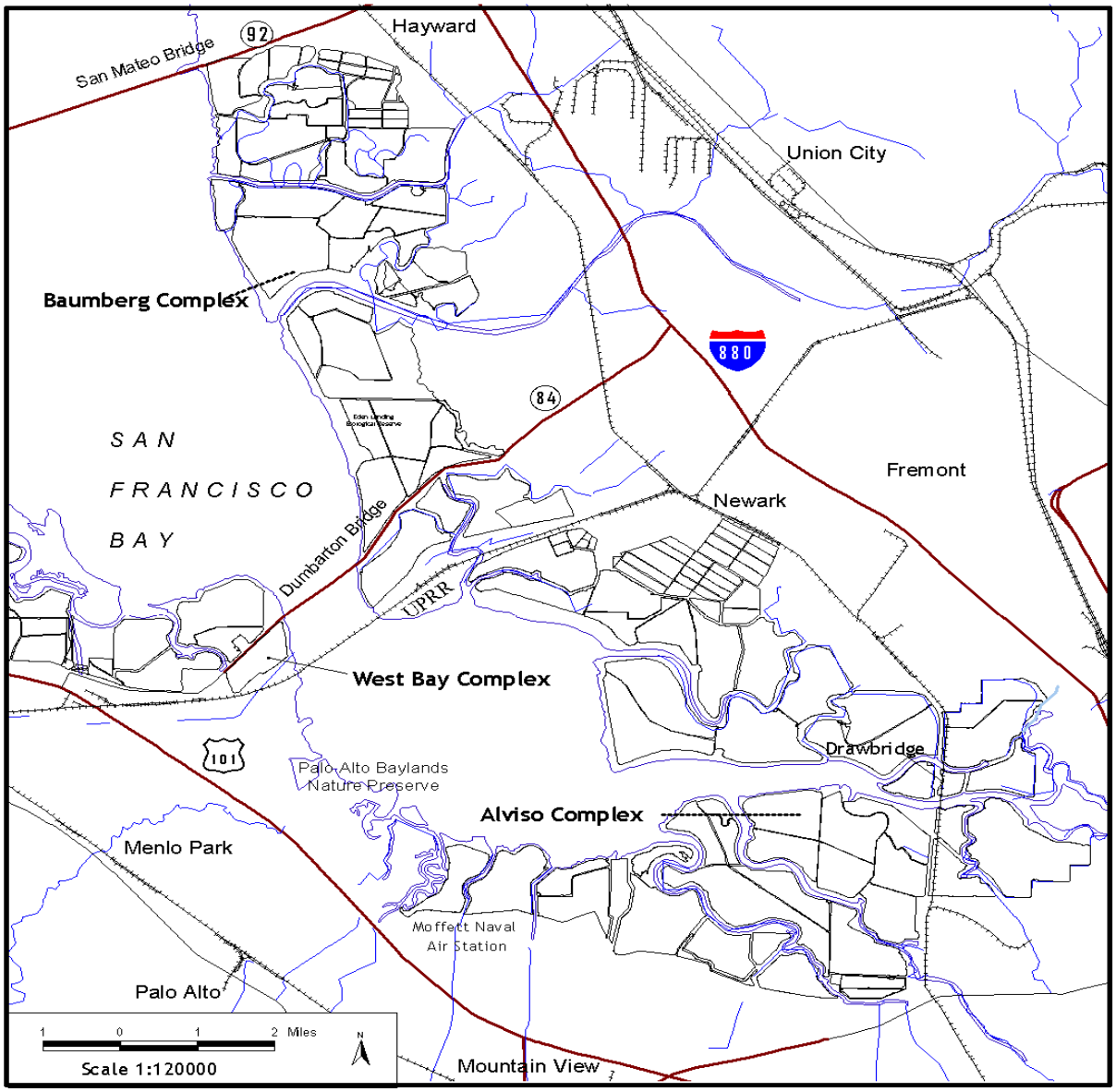

Figure 1. Vicinity Map of the Eden Landing Ecological Reserve (Baumberg Complex)

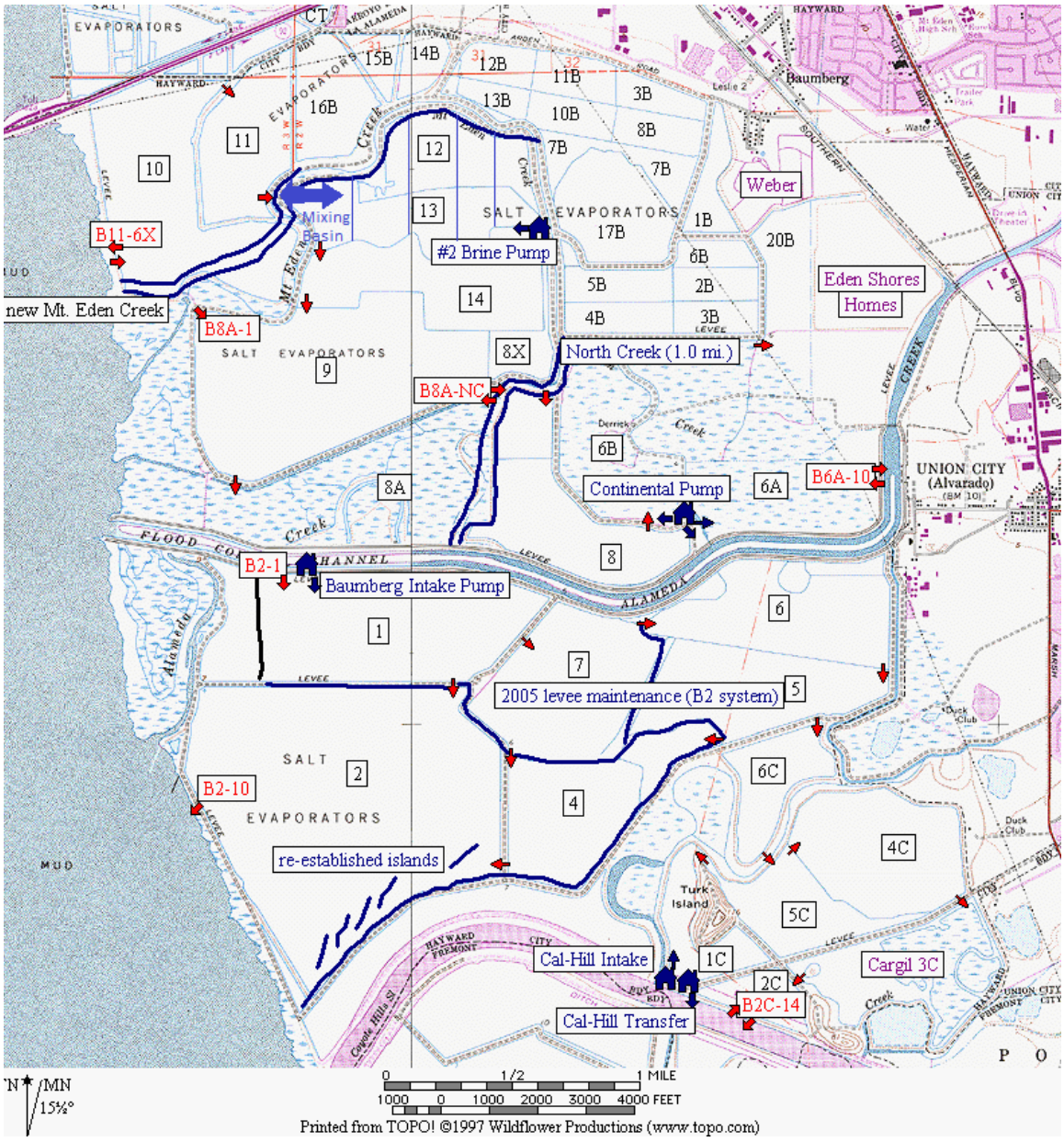

Figure 2. Eden Landing Ecological Reserve (Baumberg Complex) Ponds: Discharge and Intake Locations

Green text boxes note Intake and Discharge Locations, Red text boxes note other key pond operation and monitoring locations. ("B" nomenclature from water control structure names for ISP is replaced by "E" in most documents and field notes. SBSP Restoration Project naming convention uses "E" on ponds, WCS)

Water Quality Monitoring Results

Discharge and Receiving Waters

Results from the monitoring of pond waters at discharge locations are summarized below. During the 2018 water quality monitoring period, salinity was generally low and appeared to follow the typical patterns and ranges as previously observed in previous years. In 2018 pH, temperature and DO were not monitored directly, as previously approved by RWQCB in the Final Order. It is assumed that those parameters continued the typical patterns and ranges as in previous years, based on visual observed conditions. Pond discharges do not occur continuously. Pond discharge data review should consider the variation in tide stage and cycles, and pond operations which may affect discharge.

Salinity data from 2018 were generally consistent with data collected during previous years in Systems E10, E12/E13, E8X-E14, E6A, E2, E2C, and E10. Except for high rainfall in March, 2018, it was a dry year. Salinity was similar to comparative calendar dates during the 2011-2016 drought. In 2018, pond operations sustained continuous circulation with higher discharge settings, high intake and good circulation.

System E6A was successfully managed as a modified seasonal pond system, with salinity and water levels managed for WSP nesting habitat and migratory shorebird foraging in spring through fall, with deeper, low salinity open water habitat in the winter. Modified seasonal operations are typified by large areas of dry, exposed pond bottom, with some shallowly inundated areas, and deeper water levels in circulation primarily within borrow ditches. Overall conditions allowed for continuous circulation discharge below 44 ppt.

Reconfigured Ponds E12 & E13 were successfully managed as open water ponds with increasing salinity and nearly constant water levels. This provides shallow, open water for migratory shorebird foraging and roosting habitat across both ponds, with islands as nesting habitat and deeper water levels in borrow ditches. Overall pond conditions within this system allowed for continuous circulation discharge operations below 44 ppt.

Water temperature is generally consistent across wet and dry years. As determined from previous years' data analysis, dissolved oxygen data is difficult to interpret with respect to actions related to management. It is assumed that DO is more related to (in-situ) pond conditions and (external) weather trends. Similarly, pH is also variable and difficult to interpret regarding the effects of management activities. Therefore, pH, temperature and DO are not regularly monitored at ELER.

The 2018 pond water monitoring results (grab samples) and field observations are large files and are not included in this SMR. Rather, this data is provided in electronic format. Pond systems consistently provided good habitat conditions for numerous waterbird species, including migratory shorebirds and waterfowl, resident piscivores and waders.

Table 1 lists the observed (grab sample) values for salinity at the discharge location on dates that changes were made to pond operations. Refer to the electronic pond management and field observations files for more data and other monitoring locations.

Salinity

Pond salinities in 2018 were higher than 2017 but within normal ranges of prior similar water years with below average rainfall conditions (2011-2016 drought conditions). For 2018, pond operations and management sustained high volume discharges. Salinities were generally maintained below 44 ppt, except as noted. Normal salinity values were typically observed during daily tidal flux and pond operations. Refer to Table 1 for observed salinity values, water levels and pond management activities. Refer to detailed pond management electronic data files for overall pond conditions.

All system ponds were observed to maintain low salinity discharge conditions in 2018. Eden Landing continues to operate chiefly the low-salinity ponds, with some medium-salinity ponds, as discussed below. Reconfigured ponds E12 and E13 include a series of cells in each pond, with progressively higher salinities than the intake waters, and a mixing basin to maintain salinity below 44ppt with intake from and discharge to the Bay via Mt. Eden Creek. Differences in mean salinity between low salinity ponds and Bay waters are more apparent during neap tide periods and warm weather periods. Higher salinity is observed during drought years. Review of data collected to date indicates that pond management and operations effectively maintain low salinity discharge in all pond systems, thereby meeting standards. Higher salinity pond water is sufficiently mixed at the discharge location to adequately protect receiving water quality objectives. Pond Systems in Eden Landing include some seasonal ("dry") or managed "batch" ponds.

E2C:

System E2C is operated as a muted tidal pond with intake and discharge at the same location. Salinity varied depending on weather and duration of intake periods from spring and neap tide cycles. During 2018, System E2C was managed with typical operations, as described below. In winter through early spring 2018, salinity values ranged from 11-32ppt (0-28ppt in 2017, 0-44ppt in 2016, 30-33ppt in 2015, 30 to 35ppt in 2014, 20 to 36ppt in 2013, and 23 to 28ppt in 2012). Grab samples obtained during routine pond operations in April, 2018 showed salinity values ranging from 27-32 ppt.

Grab sample values during the monitoring season from May to October 2018 showed pond salinities from 26-44 ppt (18-41 ppt in 2017; 25-50 ppt in 2016; 33-52 ppt in 2015; 34-48 ppt in 2014; 29-49 ppt in 2013, 30-47 ppt in 2012), with few exceptions noted below. Observed E2C salinity was below 44 ppt in the 2018 monitoring season, except as observed on three days (7/19/19, 54 ppt, 9/14/19, 47 ppt, 9/18/19, 45ppt). Elevated salinity values are typically only observed during brief neap tide periods that result from circulation of higher salinity water to a discharge location. Sufficient tidal mixing normally shows salinity below 44ppt. Best Management Practices (BMPs) for pond operations were limited in 2018 to brief periods of discharge volume reduction.

In the summer of 2018, Pond E2C infrequently mixed with Pond E5C (and E4C and E1C). Sustained near 25%, discharge gate settings maximized circulation at Pond E2C. The system was operated under dry winter conditions (lower rainfall) and mostly maintained low salinity conditions below 44ppt). Average salinity over the May to

October monitoring season was 39 ppt (27 ppt in 2017; 37 ppt in 2016; 40 ppt in 2015; 41 ppt in 2014; 46ppt in 2013; and 38 ppt in 2012).

E2:
System E2 is operated as continuous circulation system, rather than a muted tidal system. However, System E2 is augmented by muted tidal intake at the E2-10 discharge location to the Bay. The system was operated as low salinity, continuous circulation ponds for the season, with muted tidal intake/discharge directly on the Bay, and primary inflow from E1. Discharge was maintained with two gates approximately 25% open except as noted.

Observed salinity at the E2-10 discharge at the end of April, 2018 was approximately 29 ppt (18 ppt in 2017, 31 ppt in 2016, 35 ppt in 2015, 38 ppt in 2014, 40 ppt in 2013, 37 ppt in 2012) and ranged from 28 to 49 ppt during the May-October operational season (18 to 40 ppt in 2017, 26 to 44 ppt in 2016, 37 to 53 ppt in 2015, 35 to 55 ppt in 2014, 39 to 50 ppt in 2013, 29 to 46 ppt in 2012). Salinity for the majority of the 2018 season based on grab samples averaged 40 ppt (28 ppt in 2017, 38 ppt in 2016, 46 ppt in 2015, 46 ppt in 2014, 40 ppt in 2013, 40 ppt in 2012) and was below 44 ppt throughout the season. In January 2018, the E2-10 WCS discharge gates (two) were set at approximately 25% each and was sustained at that setting until Fall. This operation helped maintain appropriate salinity values in 2018, which were generally at or below 44 ppt, with a few exceptions (7/24/18, 7/29/18 and 9/5/18 = 45 ppt, 8/17/18 = 46 ppt, 9/14/18, 47 ppt, 9/18/18 49 ppt). Greater intake and discharge volumes near the WCS appears to be warranted in dry years to maintain lower salinity, while in wet years helps maintain appropriate water levels. In 2018, no adverse effects were observed. Temporary suspension of discharge (a BMP) was not implemented in 2018.

E10:
The E10 WCS was replaced in 2017, and normal summer operations occurred in 2018. Discharge maintained appropriate water levels (discharge gate 5-25% open).

System E10 was operated in 2018 as shallow open water for the summer, with intake and discharge at the same location (muted tidal operations) at the mouth of MEC. Pond E11 is operated as a seasonal pond and allowed to draw down and be mostly dry during the summer. E10 salinity in the May-October 2018 monitoring season averaged 37 ppt (31 ppt in 2017, 32 ppt in 2016, 35 ppt in 2015, 40 ppt in 2014; 36 ppt in 2013) and ranged from 30-42 ppt (23-37 ppt in 2017, 30-35 ppt in 2016, 32-40 ppt in 2015, 38-43 ppt in 2014; 31-43 ppt in 2013; 27-39 ppt in 2012). Before the monitoring season, salinity in E10 was approximately 30 ppt in April 2018 (7 ppt in 2017, 25 ppt in 2016, 32 ppt in 2015, 33 ppt in 2014, 31 ppt in 2013; 29ppt in 2012). Observed salinity did not exceed 44 ppt in 2018 (0 days in 2017, 0 days in 2016, 2015, 2014, 2013 and 2012) and the system maintained typical (low) salinity conditions throughout the season.

E9:
System E9 ponds, including E9, E8A and E8X, were restored to full tidal action in 2011. Seasonal ponds previously operated via pond E9, and are now managed via pond E8X. with intake from and discharge to North Creek and Mt. Eden Creek.

E12:
Major construction activities completed in 2015 reconfigured Ponds E12 and E13 as part of Phase One of the SBSPRP. System E12 was operated as shallow, open water in 2018 with intake and discharge via MEC. These ponds are managed with nearly constant water levels across three cells in each pond which provide progressively increasing salinities (not maintained in winter), terminating in a mixing basin to ensure low salinity discharge. Pond E8X may be operated as a forebay for Ponds E12 and E13 and a mixing basin for pond E14. Only one brief discharge was implemented from Pond E12 on June 10, 2018, to mobilize algal mats and maintain water quality. Discharge gates were closed on 6/12/18, resuming normal (intake only) operations. Brief E12 discharges are intermittently used to recirculate stagnant water and "reset" water quality parameters by increased circulation. System E12 met expected salinity targets in pond cells during the summer discharge monitoring season. Ponds E12 and E13 provided seasonal nesting, foraging and fledging habitat for WSP, primarily on graveled levees, berms and islands.

E13:
Grab sample salinity in E13 Mixing Basin was low on most occasions in 2018, similar to 2017 conditions. E13 Mixing Basin salinity during the May-October 2018 monitoring season averaged 37 ppt (28 ppt in 2017, 41 ppt in 2016, 40 ppt in 2015) and ranged from 25-67 ppt (20-40 ppt in 2017, 32-53 ppt in 2016, 32-50 ppt in 2015). Prior to the start of the 2018 monitoring season, salinity in the E13 Mixing Basin was approximately 25 ppt (16 ppt in 2017, 32 ppt in 2016, 34 ppt in 2015). In 2018, grab sample salinity exceeded 44 ppt on two days (8/17/18, 67ppt; 9/18/18, 50 ppt) (0 days in 2017, 8 days in 2016, 2 days in Sept. 2015). WSE fluctuate as a result of reduced intake and discharge operations implemented to protect WSP nests on dry pond bottom areas during neap tide periods.

E14:
Pond E14 was operated as a seasonal pond in 2018 and allowed to draw down and mostly dry during the summer, with shallow water circulation in the borrow ditches via Pond E8X and E9 tidal areas. The mostly dry pond bottom provided nesting, roosting and foraging habitat for the federally threatened species, western snowy plover (WSP), as well as other resident waterbirds. Over 100 WSP nests were monitored in 2018. Pond E14 provided very good habitat conditions for WSP nesting and fledging habitat, as well as foraging and roosting habitat for other shorebirds in 2018.

Weekly observed salinities were not above 44 ppt in 2018, similar to 2017. During the 2011-2016 drought higher salinity was noted in May, June and September 2015 (48-62 ppt) and in July 2014 (80 ppt). Intake to and discharge from E14 occurs from pond E8X, a de-facto mixing basin for E14 when higher salinity conditions occur in E14. Limited inflow from the Pond E13 Mixing Basin and regular outflow via Pond E8X occurred throughout most of the year. Supplemental intake/discharge operations for E14 via former pond E9 occurs also as the de-facto receiving water for E14 at Mt. Eden Creek.

In April, 2018, salinity in E14 at the E9 discharge location was approximately 30 ppt (12 ppt in 2017, 15ppt in 2016, 60 ppt in 2015). Low salinity values reflect high rainfall observed in March. Intake was allowed from E9 in 2018 with discharge regularly allowed

to maintain adequate dry nesting areas and shallow foraging habitat for WSP. E14 salinity at the E9 discharge was only periodically monitored during 2018 because salinity was observed to be consistently well below 44 ppt at the E13-E14 WCS where water was sufficiently deep. At the E14-E8X location, salinity ranged from 27-41 ppt and averaged 35 ppt (ranged 16-35 ppt and averaged 28 ppt in 2017. E9-E14 salinity ranged 23-42 ppt in 2016, 35-62 ppt in 2015, 28-43 ppt in 2014; and average salinity at E9-E14 was 34 ppt in 2016, 45 ppt in 2015, 42 ppt in 2014).

E8X:

Prior to May, salinity in E8X at the discharge location was approximately 25 ppt in 2018 (13 ppt in 2017, 25 ppt in 2016, 33 ppt in 2015, 32 ppt in 2014; 34 in 2013; 30 ppt in 2012). E8X salinity during the 2018 monitoring season ranged from 30-41 ppt (13-35 ppt in 2017, 25-35 ppt in 2016, 33-45 ppt in 2015; 36-44 ppt in 2014; 32-38 ppt in 2013; 30-42 ppt in 2012) and averaged 33 ppt (27 ppt in 2017, 35 ppt in 2016; 39 ppt in 2015; 41 in 2014; 36 ppt in 2013; 35 ppt in 2012). Weekly observed salinities were not above 44 ppt in 2018 (0 days in 2017, 0 days in 2016, 2015; in 2014 salinity was above 44 ppt on two dates; observed salinity did not exceed 42ppt in 2013 or 2012). Active salinity management was limited, as Pond E8X had typical low salinity conditions throughout the 2018 season. Pond E8X provided good habitat conditions for numerous waterbirds, including piscivores and wading birds in 2018.

E6A:

In 2018, System E6A continued operations as a modified seasonal pond system, with continuous circulation via muted tidal intake and discharge at the same locations. Ponds E8, E6B and E6A are managed with a multi-season, multi-species management objective, providing deep water in winter for waterfowl roosting and foraging, and shallow water to partly dry pond bottoms in summer for shorebird foraging, roosting and nesting. Under modified seasonal operations, salinity is generally low in the borrow ditches that act as water conveyance with continuous circulation and discharge, while some interior areas of the ponds are a mosaic of dry bottom and shallow water areas which have moderate salinity conditions. Salinity is generally below 44 ppt near the discharges and is less varied because the pond is operated at a low water surface elevation with ample mixing.

Grab samples from System E6A routine pond operations prior to May 2018 showed salinity values in pond E6A ranging from 18-21 ppt (6-21 ppt in 2017, 15-18 ppt in 2016, 21-25 ppt in 2015; 24-38 ppt in 2014; 19-24 ppt in 2013; 24-26 ppt in 2012). In pond E6B, salinity ranged 25-30 ppt (6-25 ppt in 2017, 20-29 ppt in 2016; 25 to 29 ppt in 2015; 26-34 ppt in 2014; 24-32 ppt in 2013; 26-30 ppt in 2012). In pond E8, salinity ranged 25-28 ppt (3-33 ppt in 2017; 15-27 ppt in 2016; 26-32 ppt in 2015; 30-37 ppt in 2014; 24-36 ppt in 2013; 28-38 ppt in 2012). System E6A ponds maintained continuous circulation and discharge salinity was below 44 ppt in 2018 (below 44 ppt in 2017 and 2016; above 44 ppt at E6A-10 in August, 2015, 47 ppt).

Salinity in 2018 in pond E6A at the discharge was not regularly monitored (similar to 2017), as values at a WCS nearby were used and observed ranging from 20-41 ppt (18-21 ppt in 2017; 31-33 ppt in 2016; 29-47 ppt in 2015; 28-41 ppt in 2014; 28-44 ppt in 2013;

25-43 ppt in 2012). Average salinity at the E6A-10 discharge in pond E6A was 35 ppt in 2018 (23 ppt in 2017, 32 ppt in 2016; 36 ppt in 2015; 41 ppt in 2014; 36 ppt in 2013; 32ppt in 2012).

In 2018, observed pond E6B salinity at the E6B-2 discharge was not above 44 ppt (0 days in 2017, 0 days in 2016, 1 day in July 2015 (45ppt)). Observed salinity in E6B at the discharge ranged 26-43 ppt (7-35 ppt in 2017; 24-42 ppt in 2016; 32-45 ppt in 2015; 32-43 ppt in 2014; 32 to 43 ppt in 2013; 25-38 ppt in 2012). Average salinity at the discharge in pond E6B was 36 ppt (27 ppt in 2017; 35 ppt in 2016; 38 ppt in 2015; 39 ppt in 2014; 38 ppt in 2013; 37 ppt in 2012).

In 2018, observed pond E8 salinity was not above 44 ppt at the discharge (0 days in 2017; 0 days in 2016; 2 days in May 2015 (57 ppt), September 2015 (47 ppt); 0 days in 2014; two days in August and September 2013). Observed salinity in 2018 in pond E8 at the discharge ranged 26-40 ppt (16-32 ppt in 2017; 33-40 ppt in 2016; 32-41 ppt in 2015; 35-39 ppt in 2014; 35 to 37 ppt in 2013; 30 to 44 ppt in 2012). Average salinity in 2018 at the discharge in pond E8 was 33 ppt (25 ppt in 2017; 37 ppt in 2016; 41 ppt in 2015; 38 ppt in 2014; 36 ppt in 2013; 37 ppt in 2012).

pH

For 2018, no Datasondes were utilized to collect instantaneous or continuous pH values.

Temperature

For 2018, no data were collected for instantaneous or continuous temperature values.

Dissolved Oxygen (DO)

Continuous monitoring of dissolved oxygen (DO) was not conducted in 2018, similar to previous years. Two years (2014-15) of continuous data were collected per the Final Order in reconfigured Ponds E12 and E13 as part of SBSPRP Phase One actions. In general, managed ponds appear to meet water quality objectives (WQO) of the Basin Plan, with periodic, short duration periods below those standards.

DO values are known to be highly variable, with a diurnal pattern observed in all years. Regular DO monitoring is no longer conducted as previously approved in revisions to the Final Order. Patterns or periods of low or sustained depressed DO in previous years indicate that achieving compliance with the Final Order continues to be problematic.

In 2018, it is assumed that there were periods of low DO conditions, as were previously observed in managed ponds, including reconfigured ponds E12 and E13. In 2018, large algal blooms were not persistent nor perceived as more prevalent than in previous years.

Effectiveness of Dissolved Oxygen Best Management Practices (BMPs) for Pond Management

It is recognized by RWQCB that a well-operated lagoon/pond system may not necessarily continuously meet an instantaneous DO limitation of 5.0 mg/L as specified in the Basin Plan and Final Order. It is also understood that a stringent interpretation of this limit is

not necessary to protect water quality, based on review of previous continuous monitoring data and other studies. These data and studies include site-specific standards and monitoring in the Everglades and Virginian Province (Cape Cod, MA to Cape Hatteras, NC), as well as San Francisco Bay studies and data collected by USGS in Newark Slough in 2005, 2006 and 2007. Monitoring programs have regularly recorded DO levels lower than 5.0 mg/l in estuaries under natural conditions, thus the phenomenon is not necessarily associated with pond discharges.

Operational strategies (BMPs) may be implemented as needed and described below and in the Pond Operations Plans. CDFW may use BMPs such as the temporary closure of discharge gates during periods when salinity values are at or above 44 ppt, when pond DO may be below 5.0 mg/L standard values. Based on previous years' data, it appears that ceasing discharge for prolonged periods may further degrade water quality. Reducing residence time of water in the ponds appears to improve overall DO levels; therefore, maintaining discharge, particularly at higher sustained volumes, provides for increased circulation and mixing. Muted tidal intake/discharge provides for the greatest circulation and mixing and is generally implemented in all ponds. It is presumed that DO levels in these ponds were similar to ambient conditions in sloughs and the Bay, notably during neap tides, when tidal ranges are more limited. Weekly discharge timing to set pond discharges at greater volumes may occur during spring tide periods to maximize intake, discharge and mixing.

Refer to Table 1 for a full summary of discharge events and gate settings in 2018.

Compliance Evaluation Summary

Data collected in 2018 were comparable to values from previous years. Monitoring indicates that reconfigured ponds E12 and E13 managed to include higher salinity cells, did not significantly improve water quality overall, as compared to typical pond management and water quality in other systems in ELER.

Maintaining dissolved oxygen levels in the ponds within water quality objectives and Final Order requirements is expected to continue to be the most notable management challenge for operation of the ponds. The BMPs developed and implemented as corrective actions as part of the Initial Stewardship Plan and subsequent SBSPRP Phase One actions have maintained, but not improved, water quality parameters including salinity and dissolved oxygen levels in the ponds. It appears that little immediate change within ponds occurs since high residence times are intrinsic to the nature of open-water managed ponds. Improved DO may be the result of a combination of factors, both biotic and abiotic, that are the driving DO dynamics. Based on the observations recorded during pond management and operations, CDFW will continue to determine which operations, management and monitoring activities adequately protect water quality and best achieve Final Order compliance.

Infrastructure improvements, such as major changes in pond management/operations, topography or geometry, do not appear viable as a means of improving compliance with water quality objectives. Intensively managed, reconfigured ponds implemented as part

of SBSPRP Phase One actions do not appear to provide the expected improvement in water quality. Pond management is expected to continue to be informed by on-going operations and any future applied studies implemented as part of SBSPRP Phase Two.

In 2018, discharge gates were generally set to allow high discharge volumes, similar to 2017, to decrease residence time and improve mixing. Lower volume discharges were implemented for short periods, though less than in the previous years during drought conditions. More continuous operational periods, rather than intermittent operations, appear to maintain water quality values with respect to salinity and other parameters.

Data Collection, Evaluation and Communication

In 2018, salinity grab samples and water depth were regularly recorded with general habitat quality and bird use observations. This monitoring continues to be sufficient to manage ponds in accordance with the Final Order. Continuous data recorders were not used in 2018. CDFW provided detailed operations and monitoring data to the RWQCB staff electronically, and data are summarized within this report. Pond management, operations and monitoring was conducted as often as possible by CDFW, given staff limitations. Only one CDFW biologist is available to conduct pond operations, management, monitoring, review, and interpretation of data. Despite on-going challenges, CDFW has successfully managed the pond systems to comply with regulatory standards and continues to provide high-quality waterbird habitat conditions on ELER.

Final Order requirements regarding communication of compliance to the RWQCB were completed electronically, including transmittal of all Excel data on pond management and operations. Continued communication between CDFW and RWQCB staff is useful for on-going pond management and Final Order revisions and compliance.

Summary and Requests for Revisions to SMP:

SBSPRP Phase One actions were completed in 2016 at ELER. Full tidal action was restored to 630-acres of former ponds E9, E8A and E8X in 2011 and establishment of salt marsh vegetation in ponds E9, E8A and E8X continues. Ponds E12 and E13 were reconfigured to create an intake reservoir, six cells (each in a series of three) and a mixing basin within 230 acres of shallow water foraging and roosting areas of increasing salinity with 6 constructed nesting islands. The first full year of operations occurred in 2015. ELER continues to support habitat for fish and wildlife, including special-status species, migratory waterfowl, shorebirds, and anadromous and resident fishes.

The SBSPRP Phase One actions provided recreational use and public access features. CDFW continues to conduct maintenance for the existing level of “de-facto” flood risk management.

CDFW will not collect continuous monitoring data in 2019.

Management and O & M activities conducted in 2018 adequately addressed the requirements in the Final Order. Pond management, operations and monitoring activities

in 2018 at all ELER pond systems continues to inform management, enhancement and restoration actions and has helped in the development of SBSPRP Phase Two restoration actions. Phase Two at ELER is the subject of the Final Environmental Impact Report expected to be completed in 2019.

CDFW appreciates the accepted revisions to the Final Order as noted in Table 3 "Water Quality Monitoring For Eden Landing Ponds" which was revised to require only type "A" monitoring activities for CDFW pond operations because discharge at greater than 25% of WCS capacity in pond E2C is not typically sustained.

However, sustained, higher-volume discharges and corresponding reduced residence time of pond water may improve overall water quality, particularly for DO; therefore, allowing discharges at greater than 25% of WCS capacity provides for increased circulation and mixing. This is particularly important in System E6A, which requires lower water surface elevations in order to maintain WSP nesting habitat. Maintaining low salinity in continuous circulation operations within borrow ditches is also important in order to meet the objective of providing for multi-season, multi-species management of the ponds, including winter operations for diving duck management. System E2 pond discharge may be regularly sustained above 25% because pond E2 discharges directly to the Bay (at E2-10).

Based on monitoring activities associated with the reconfigured Ponds E12 and E13, it appears that use of a mixing basin for discharge may improve water quality of the discharge of managed ponds, or at least improve compliance with water quality objectives. We will continue to collect regular grab samples as part of normal operations.

ATTACHMENT:

2019 Pond Operations Plans