ATTACHMENT B

Waste Discharge Requirements and Water Quality Certification for the South Bay Salt Pond Restoration Project, Phase 2

Supplemental Tables

Table 4 South Bay Salt Pond Restoration Project Phase 2 Proposed Construction Activities

ITEM	ACTION	POND COMPLEX AND CLUSTER			
		ALVISO - ISLAND PONDS (A19 AND A20)	ALVISO - A8 PONDS (A8 AND A8S)	ALVISO - MOUNTAIN VIEW PONDS (A1 AND A2W)	RAVENSWOOD PONDS (R3, R4, R5, AND S5)
1	Lower Existing Levees	X		X	X
2	Widen Existing Breach	X			
3	Create New Breach(es) and Channel(s) Connecting to Adjacent Slough	X		X	X
4	Install Internal Ditch Blocks	X		X	X
5	Place in-situ Levee Material in Existing Borrow Ditch	X		X	X
6	Install Habitat Transition Zone(s) and Establish Vegetation		X	X	X
7	Raise and Improve Existing Levee			X	X
8	Raise Existing Structures on Levees			X	X
9	Add New Public Access, Signage and Trails			X	X
10	Improve Existing Public Access and Trails			X	X
11	Raise PG&E Tower Foundations			X	
12	Replace Existing PG&E Boardwalks			X	
13	Construct New PG&E Boardwalks			X	
14	Construct Habitat Islands Inside Ponds			X	
15	Construct Bridges and Armoring at Breach(es)			X	
16	Pile Driving For Permanent Piles			X	X
17	Install New Water Control Structures				X
18	Remove Existing Water Control Structures			X	X
19	Cap or Close Existing Siphon			X	

ITEM	ACTION	POND COMPLEX AND CLUSTER			
		ALVISO - ISLAND PONDS (A19 AND A20)	ALVISO - A8 PONDS (A8 AND A8S)	ALVISO - MOUNTAIN VIEW PONDS (A1 AND A2W)	RAVENSWOOD PONDS (R3, R4, R5, AND S5)
20	Fill Internal Canal				X
21	Remove Internal Levee(s)				X
22	Convert Internal Levee into Habitat Island				X
23	Excavate Internal Pilot Channel				X
24	Install Fencing			X	X
25	Install Gate			X	X
26	Construction Access from Existing Levee	X	X	X	X
27	Use Amphibious Construction Vehicles and Mats	X		X	X
28	Construction Access from Barge	X		X	
29	Stockpile Clean Fill in Project Area		X	X	X
30	Conventional Construction Equipment	X	X	X	X
31	Install and Dewater Cofferdams			X	X
32	Implement Effective BMPs for Soil Stabilization, Sediment, Tracking, Dust and Non-stormwater Discharge Control Measures	X	X	X	X
33	Pond Dewatering				X
34	Temporary mats and gravel in Pond(s) for Equipment Access			X	X
35	Clear and Grub Debris and Vegetation from Construction Area Before Work	X	X	X	X
36	Conduct Work Within Appropriate Work Windows for Sensitive Species as Feasible	X	X	X	X
37	Maintain and Repair Existing Levees	X	X	X	X

ITEM	ACTION	POND COMPLEX AND CLUSTER			
		ALVISO - ISLAND PONDS (A19 AND A20)	ALVISO - A8 PONDS (A8 AND A8S)	ALVISO - MOUNTAIN VIEW PONDS (A1 AND A2W)	RAVENSWOOD PONDS (R3, R4, R5, AND S5)
38	Maintain and Operate Water Control Structures		X	X	X
39	Manage Water Levels in Select Ponds for Bird Habitat				X
40	Implement Effective Containment Plans and Avoidance and Minimization Measures for Hazardous Spills	X	X	X	X
41	Provide Worker Environmental Awareness Training before Construction for all Construction Personnel Working on Site	X	X	X	X
42	Implement Appropriate Avoidance and Minimization Measures for Listed and Sensitive Species During Construction	X	X	X	X
43	Manage Vegetation for Invasive Plant Species	X	X	X	X
44	Concrete Delivery			X	X

Table 5 Island Ponds Phase 2 Action Cut and Fill Volumes Below HTL/MHHW

MAP ID	FEATURE	CUT VOLUMES (CY)	FILL VOLUMES (CY)
1	Pond A19 Northwest Levee Lowering	1,000	0
2	Pond A19 North Levee Lowering (Middle)	450	0
3	Pond A19 Northeast Levee Lowering	520	0
4	Pond A19 Southwest Levee Lowering	280	0
5	Pond A19 Southeast Levee Lowering	380	0
6	Pond A19 Southwest Levee Removal	467	0
7	Pond A19 Northwest Levee Removal	1,067	0
8	Pond A20 Northeast Levee Removal	467	0
9	Pond A20 Southeast Levee Removal	967	0
10	Pond A19 Northwest Breach and channel	800	0
11	Pond A19 Northeast Breach and channel	230	0
12	Pond A19 South Breach Widening	560	0
13	Pond A19 - Northwest Breach – Ditch block 1	0	1,800
14	Pond A19 - Northwest Breach – Ditch block 2	0	1,900
15	Pond A19 - Northeast Breach – Ditch block 1	0	1,500
16	Pond A19 - Northeast Breach – Ditch block 2	0	1,400
17	Pond A19 - South Breach Widening – Ditch block 1	0	2,200
18	Pond A19 - South Breach Widening – Ditch block 2	0	2,200
19	Other Placed Levee Material	0	14,500
Totals		**7,188**	**25,500**
Island Ponds Subtotals by Action Type			
1 to 5	Levee Lowering Subtotal	2,630	0
6 to 9	Levee Removal Subtotal	2,968	0
10 to 12	Breach and Breach Widening Subtotal	1,590	0
13 to 18	Ditchblock Subtotal	0	11,000
19	Other Placed Levee Material	0	14,500

Table 6 A8 Ponds Phase 2 Action Cut and Fill Volumes Below HTL/MHHW

MAP ID	FEATURE	CUT VOLUMES (CY)	FILL VOLUMES (CY)
20	Western habitat transition zone	0	91,500
21	Eastern habitat transition zone	0	82,500
Totals		**0**	**174,000**

Table 7 Mountain View Ponds Phase 2 Action Cut and Fill Volumes Below HTL/MHHW

MAP ID	FEATURE	CUT VOLUMES (CY)	FILL VOLUMES (CY)
22	Pond A1 Northwest Breach	990	0
23	Pond A1 Southeast Breach	660	0
24	Pond A2W Northwest Breach	660	0
25	Pond A2W Southwest Breach	880	0
26	Pond A2W Northeast Breach	330	0
27	Pond A2W Southeast Breach	1,650	0
28	Pond A1 Shear Key Excavation	3,100	0
29	Coast Casey Forebay Levee Improvement	0	12,050
30	Pond A1 West Levee Improvement	0	40,320
31	10 Habitat Islands	0	40,600
32	Bridge piles, abutments	0	100
33	Pond A1 Habitat Transition Zone	0	73,480
34	Pond A2W Habitat Transition Zone	0	77,120
Totals		**8,270**	**243,670**
Mountain View Ponds Subtotals by Action Type			
22 to 27	*Levee Breaches*	*5,170*	*0*
29 to 30	*Levee Improvements*	*3,100*	*52,370*
31	*Habitat Islands*	*0*	*40,600*
32	*Structures*	*0*	*100*
33 to 34	*Habitat Transition Zones*	*0*	*150,600*

Table 8 Ravenswood Ponds Phase 2 Action Cut and Fill Volumes Below HTL/MHHW

Map ID	Feature	Cut Volumes (cy)	Fill Volumes (cy)
35	Pond S5 Internal Levee Removal	1,000	0
36	Pond R5/S5 North internal levee removal	3,900	0
37	Ponds R5/S5 South Internal Levee Removal	2,800	0
38	Pond R4 Northwest Levee lowering	0	0
39	Pond R4 Northeast Breach	10,600	0
40	Pond R4 Pilot Channel	16,000	0
41	Pond R3 Water Control Channel	1,000	0
42	All American Canal and R5/S5 levee improvement	0	46,090
43	All-American Canal habitat transition zone	0	69,460
44	Bedwell Bayfront Park habitat transition zone	0	47,240
45	Ditch Block west of R4 Breach	0	1,000
46	Water Control Structures	0	400
Totals		**35,300**	**164,190**
Ravenswood Ponds Subtotals by Action Type			
35 to 37	*Levee Removal*	*7,700*	*0*
38	*Levee Lowering*	*0*	*0*
39	*Levee Breaches*	*10,600*	*0*
40 TO 41	*Channel Cuts*	*17,000*	*0*
42	*Levee Improvements*	*0*	*46,090*
43 to 44	*Habitat Transition Zones*	*0*	*116,700*
45	*Ditch Blocks*	*0*	*1,000*
46	*Water Control Structures*	*0*	*400*

Attachment B (ii): Table B-8 -- Adaptive Management Program Summary Table

CATEGORY/ PO	RESTORATION TARGET	MONITORING PARAMETER (METHOD)	SPATIAL SCALE FOR MONITORING RESULTS	EXPECTED TIME FRAME FOR DECISION-MAKING	MANAGEMENT TRIGGER	APPLIED STUDIES	POTENTIAL MANAGEMENT ACTION
Sediment Dynamics Project Objective 1 (Preserve existing estuarine habitat areas)	No significant decrease in South Bay intertidal and subtidal habitats (south of San Bruno shoal), including restored pond mudflat, intertidal mudflat, subtidal shallow and subtidal channel areas.	▪ Area of restored mudflat. ▪ Area of outboard mudflat. ▪ Area of subtidal shallows and channel. Methods: Bathymetry and LiDAR surveys will be performed periodically, initially every 3–5 years and then less frequently if data suggest slower rates of changes over time.	▪ Change in tidal mudflat and subtidal shallows expected to vary at the pond complex scales. Areas will be estimated and reported on the pond complex scale. ▪ Changes in South Bay need to be placed within system-wide (San Francisco Estuary) context to assess influence of external factors.	▪ Change in tidal mudflat & subtidal shallow: 10–20 years, assuming significant tidal habitat restoration continues beyond Phase 1. ▪ Subtidal channel change: 0–5 years.	▪ Outboard mudflat decreases greater than the range of natural variability + observational variability/error.	▪ Will sediment movement into restored tidal areas significantly reduce habitat area and/or ecological functioning (such as plankton, benthic, fish or bird diversity or abundance) in the South Bay? ▪ Development of a 2- and 3-D South Bay tidal habitats evolution model.	▪ Convene study session to review and interpret findings to assess if observed changes are due to restoration actions or system-wide changes in the sediment budget (*e.g.*, effects of sea level rise). ▪ Study biological effects of loss of mudflat, subtidal shallows, and/or subtidal channel habitat. ▪ Adjust restoration phasing and design to reduce net loss of tidal mudflats. Potential actions include remove bayfront levees to increase wind fetch and sustain tidal mudflat, phase breaching to match demand and supply, and/or breach only high-elevation ponds to limit sediment demand ▪ Reconsider movement up staircase
Sediment Dynamics Project Objective 1 (Rate of accretion indicates trajectory toward vegetated marsh)	Accretion rate of the restored ponds is sufficient to reach vegetation colonization elevations.	▪ Areas of inboard mudflat and pioneer marsh inside ponds ▪ Sedimentation rate inside breached ponds. Methods: Transects or SET in breached ponds, annually at first and then less frequently as rates of accretion slow. LiDAR surveys (see above).	▪ Pond scale	▪ 2–10 years depending on initial pond elevation	▪ Projections based on the rate of inboard mudflat accretion suggest vegetation colonization elevations are not likely to be achieved within the planning time frame.	▪ Will sediment accretion in restored tidal areas be adequate to create and to support emergent tidal marsh ecosystems within the 50-yr projected time frame?	▪ Convene study session to review findings to assess if observed changes are due to restoration actions and whether colonization is compromised. ▪ Study biological effects of slower tidal flat evolution. ▪ Adjust phasing and design to increase inboard mudflat accretion. Potential management actions include adding wave breaks or adding fill. ▪ Reconsider movement up staircase

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Sediment Dynamics Project Objective 1 (Maintenance or increase of current vegetated marsh is essential to key species)	▪ No long-term net loss of vegetated tidal marsh throughout the South Bay.	Total area of tidal salt marsh Methods: Bathymetry and LiDAR surveys and/or Iconos satellite data and/or aerial photography and ground truthing	Pond Complex and South Bay	10 to 20 years	▪ Observed net loss of tidal salt marsh (area of outboard fringe marsh losses > greater area of tidal marsh in restored ponds) than the range of natural variability + observational variability/error.	▪ Will sediment accretion in restored tidal areas be adequate to create and to support net increase in emergent tidal marsh habitat within the 50-yr projected time frame? ▪ Development of a 2- and 3-D South Bay tidal habitats evolution model	▪ Convene study session to review findings to assess if observed changes are due to restoration actions. ▪ If tidal marsh area is not meeting projections, assess biological significance of long-term loss of tidal marsh. ▪ Adjust phasing and design to accelerate marsh development. Potential management actions include filling to colonization elevations, adding wave breaks and/or preserving bayfront levees ▪ Adjust phasing and design to reduce erosion of existing marsh. For example, phase tidal restoration to match sediment demand and supply.
Flood Protection Project Objective 2	▪ No increase in tidal or fluvial flood risk at any project phase and improve tidal and fluvial flood protection in the South Bay in specific areas	▪ Survey slough channel cross-sections (scour) in the vicinity of breaches; ▪ Survey marshplain accretion in the ponds; initially frequently, then less often ▪ Measure water surface elevations inside the ponds and in the sloughs in the vicinity of breaches; initially annually, then less frequently ▪ Collect high water mark elevations in the vicinity of breaches and upstream, following large flood events ▪ Inspect for levee erosion initially monthly, then annually, and after major rainfall and/or tidal events ▪ Monitor relative sea level rise (sea level rise and land subsidence) every few years ▪ Water levels and cross-sections upstream in flood-prone channels	Slough (drainage) scale	▪ Slough channel cross-sections, marshplain accretion, and water levels: rapid initial response (within approximately five years) followed by slower changes over decades. ▪ Flood high waters: approximately every ten years (depends on timing of large events) ▪ Levee erosion: same timeframe as channel cross-section and marshplain accretion responses above, or as dictated by rainfall, tidal, and other events. ▪ Relative sea level rise: approximately ten years or longer	▪ Flood modeling predicts a current or future increase in flood risk (*e.g.*, decrease in levee freeboard). ▪ Significant levee erosion observed ▪ Elevated water surface elevations projected by modeling effort and/or observed in the field ▪ Field data collection and/or observation indicates that flood risk is greater than that predicted by models (*e.g.*, water surface elevation is higher)	Will restoration activities always result in a net decrease in flood hazard?	▪ Adjust phasing and design to provide fluvial flood protection. For example, set back or lower additional levees to increase flood conveyance or dredge channels. ▪ Adjust phasing and design to protect levees. For example, adjust levee maintenance or implement levee improvements (*e.g.* widen shoulder, raise, armor, set back levee)

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Water Quality Project Objective 4	▪ Water quality parameters in ponds will meet RWQCB standards ▪ South Bay water quality will not decline from baseline levels ▪ DO levels meet Basin Plan Water Quality Objectives	▪ Water quality parameters (DO, pH, suspended sediment and turbidity, trace contaminants other than mercury, etc.) set by RWCQB in ponds and Bay (methods as per Takekawa, et al. 2005). ▪ Sediment oxygen demand ▪ Continue as is under regulatory requirements for managed ponds. ▪ Relate to RMP for conventional pollutants (Use RMP infrastructure for Far South Bay main water mass.) ▪ Relate to RMP for trace contaminants (Use RMP process for determining frequency and methods for Far South Bay main water mass. Also use RMP process for determining need for and frequency of tidal habitat special studies.)	Ponds, receiving waters, and entire South Bay	Ongoing	▪ Annual data review to determine variation from past trends ▪ Review of RMP results indicate abnormal conditions ▪ Other indication of abnormal conditions such as fish kills ▪ Increases in chlorophyll-a to levels indicating eutrophic conditions ▪ Increases in sediment oxygen demand to levels indicating risk of low DO ▪ Low dissolved oxygen in ponds or receiving waters	▪ What is the effect of a) pond management, including increased pond flows and associated managed pond effects, and b) increased tidal prism from tidal marsh restoration on water quality, phytoplankton and fish diversity and abundance, and food web dynamics in South Bay? ▪ Can residence time be altered to prevent low dissolved oxygen? ▪ Is it possible to re-aerate water prior to discharging to the Bay? ▪ What effect would progress all the way to 90/10 (Alternative C) have on the BOD loading to the Bay?	▪ Applied studies to find causes of water quality problems in ponds (need salinity, temperature, wind speed, solar radiation, sediment oxygen demand, and net primary production) ▪ Applied studies of Bay-wide conditions ▪ Applied studies of WQ effects on pond/Bay species (plankton, shrimp, fish, birds) ▪ Active management such as baffles, aerators, etc. ▪ Decrease number of ponds monitored as conversion away from managed ponds to full tidal occurs. Focus on managed ponds with compliance issues. ▪ Review all available data. ▪ Reduce pond residence times. ▪ Accelerate conversion from managed ponds to tidal habitat. ▪ Eliminate managed pond discharges by converting to seasonal wetlands. ▪ Decrease pond residence time ▪ Introduce re-aeration mechanisms at discharge points ▪ Reconsider movement up staircase
Mercury Project Objective 4	▪ Levels of Hg in sentinel species do not show significant increases over baseline conditions ▪ Levels of Hg in sentinel species are not higher in target restoration habitats than in existing habitats	Hg levels in sediment, water column and sentinel species (methods as per Collins, et al. 2005)	Ponds and pond complexes	1–3 years depending on specific data and overall geographic scope	▪ One or more sentinel species show higher levels of Hg in target habitats than existing habitats ▪ One or more sentinel species show higher than ambient levels of Hg in Pond A8 or Alviso Slough.	▪ Will tidal marsh restoration and associated channel scour increase methylmercury (MeHg) levels in marsh and bay-associated sentinel species? ▪ Will pond management increase MeHg levels in ponds and pond-associated sentinel species?	▪ Applied study of sources of Hg and causes of increases ▪ Applied study of sediment capping methods (if relevant) ▪ Applied study of methylation processes (*e.g.*, photo-degradation, microbial methylation) ▪ Adjust phasing and design; for example, undertake preventative dredging or prevent draining of interstitial spaces or pore water. ▪ Reconsider opening more Alviso ponds to tidal action.

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Algal composition and abundance	▪ Nuisance and invasive species of algae are not released from the Project Area to the Bay. ▪ Algal blooms do not cause low DO within managed ponds	Algal species – visual observations of macrophytes and plankton tows Chlorophyll-a Sediment oxygen demand (SOD)	Ponds (visual), Bay (plankton tows) Ponds	Annually Annually	▪ Nuisance macrophytes are observed ▪ Harmful exotic species of phytoplankton are characterized in Bay	▪ Does pond configuration affect algal composition and abundance? ▪ Do harmful exotic species of algae persist in the Bay?	▪ Alter pond configuration ▪ Introduce artificial shading ▪ Stop progression towards Alternative C
Tidal Marsh Habitat Establishment Project Objective 1A	▪ Tidal marsh vegetation/habitat mosaic (including vegetation acreage and density, species composition, acreage of mudflat, channels, marsh ponds and transition area) is on a trajectory toward a reference marsh and/or other successful marsh restoration sites in South San Francisco Bay.	▪ Tidal marsh habitat acreage (*e.g.*, vegetation, mudflat, channel, pan, transition zones, etc.; collected via remote imagery with limited ground-truthing) as a percent of the total restoration area; plant species composition, including abundance of non-natives such as non-native *Spartina* spp. (qualitative assessments for invasive species will occur annually, quadrant or transect sampling once marsh has 20% vegetation cover); habitat trajectory toward a reference marsh and other restoration sites ▪ Tidal marsh habitat quality rated as high, medium, or low based on usefulness to clapper rail and salt marsh harvest mouse, determined every 2-3 years using aerial photos and ground-truthing ▪ Habitat mapping will take place every 5 years, beginning 5 years after the restored area has reached vegetation colonization elevation. Once 40% native vegetation cover has been achieved, species composition will be collected (in years corresponding to the habitat mapping) in a variety of zones (low marsh, high marsh, upland transition) within each restored marsh. (It would be beneficial to	Entire South Bay	Establishment depends on initial pond elevation, vegetation colonization anticipated to be detectable within 5 years (or less) of reaching appropriate elevations, while habitat development trajectory anticipated to be detectable within 15 years (and possibly less) of the onset of vegetation colonization	▪ Vegetation deviates significantly (30–50%) from projected trajectory after colonization elevations are achieved. ▪ Channel and marsh pond formation does not occur as predicted. ▪ Non-native *Spartina* present on the site.		▪ Review sediment dynamics ▪ Study causes of slow vegetation establishment and channel development (ex: gypsum) ▪ Active revegetation ▪ Increased non-native invasive species control ▪ If invasive species cannot be controlled, study biotic response to non-native vegetation ▪ Continue to re-evaluate what is meant by "control" of invasive species and adjust monitoring and management triggers based on the latest scientific consensus ▪ Adjust phasing and design ▪ Reconsider movement up staircase

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		have increased frequency of monitoring in the early Project phases.)					
Vector Control Project Objective 5	▪ The need for mosquito control does not exceed NEPA/CEQA baseline as determined by the Vector Control agencies	▪ Presence/absence of mosquitoes in former salt ponds ▪ Number of acres of breeding mosquitoes ▪ Number of larvae/dip in potential breeding habitat ▪ Number of acres within the Project Area treated for mosquitoes ▪ Costs/level of effort (*e.g.*, hours spent in treatment, amount of material applied, helicopter cost, etc.) to control mosquitoes	Focal areas that may support mosquito sources throughout the South Bay	Ongoing	▪ Detection of breeding mosquitoes in a former salt pond ▪ Detectable increase in monitoring parameters (relative to NEPA/CEQA baseline), particularly in areas with human activity/exposure ▪ Detection of mosquitoes that are known disease vectors and/or are of particular concern (*i.e.*, *Aedes squamiger*, *A. dorsalis*) in the Project Area		▪ Adjust design to enhance drainage or tidal flushing, control vegetation in ponded areas, and/or facilitate access (for control) to marsh ponds ▪ Increase level of vector control (preferably only as an interim measure while design issues are addressed to reduce mosquito breeding habitat) ▪ Study relationships of fish abundance and community composition and mosquito larval abundance in marsh features (*e.g.*, ponds and pannes) and managed ponds ▪ Ensure management actions are consistent with Refuge mosquito management policies
Clapper Rails Project Objective 1A	▪ Meet recovery plan criteria for clapper rail habitat within the SBSP Restoration Project Area	Clapper rail tidal salt marsh habitat acreage, quality (see Tidal Marsh Habitat Establishment above)	Entire South Bay	Likely decades for high-quality tidal marsh development (10-year targets)	See triggers for *Sediment Dynamics*, *Vegetation Establishment* above	▪ How do clapper rails and/or other key tidal marsh species respond to variations in tidal marsh habitat quality and what are the habitat factors contributing to that response?	▪ See *Vegetation Establishment* above ▪ Reconsider movement up staircase
	▪ Meet recovery plan criteria for clapper rail numbers (0.25 birds/ac over 10-year period) within the SBSP Restoration Project Area	Winter numbers, censused during high-tide airboat surveys, and breeding-season numbers, censused at representative locations	Entire South Bay	Monitoring not expected to show substantial results until 5–10 years after cordgrass establishment in 300 acres or more (10-year targets)	▪ Numbers drop below 0.20 birds/ac in any given year for Project Area as a whole ▪ Rate of increase in clapper rail numbers deviates significantly from projection		▪ See *Vegetation Establishment* above ▪ Applied studies of habitat parameters, contaminant levels, and predation pressure related to rail densities and productivity (and implement related management actions as appropriate) ▪ Reconsider movement up staircase
Salt Marsh Harvest Mice Project Objective 1A	▪ Meet recovery plan criteria for salt marsh harvest mouse habitat within the SBSP Restoration Project Area	Salt marsh harvest mouse tidal salt marsh habitat acreage, quality (see Tidal Marsh Habitat Establishment above)	Entire South Bay	Likely decades for high-quality tidal marsh development (10-year targets)	See triggers for *Sediment Dynamics*, *Vegetation Establishment* above	▪ How do salt marsh harvest mice and/or other key tidal marsh species respond to variations in tidal marsh habitat quality and what are the habitat factors contributing to that response?	▪ See *Vegetation Establishment* above ▪ Adjust phasing and design; for example, add or enhance upland transition habitat within and between restored marshes ▪ Reconsider movement up staircase

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CATEGORY/ PO	RESTORATION TARGET	MONITORING PARAMETER (METHOD)	SPATIAL SCALE FOR MONITORING RESULTS	EXPECTED TIME FRAME FOR DECISION-MAKING	MANAGEMENT TRIGGER	APPLIED STUDIES	POTENTIAL MANAGEMENT ACTION
	▪ 75% of viable habitat areas within each large marsh complex with a capture efficiency level of 5.0 or better in five consecutive years	Capture efficiency (targeting multiple areas with a CE of at least 5.0)	Entire South Bay	Monitoring not expected to begin for 5–10 years after pickleweed establishment in 300 acres or more	Rate of increase deviates significantly from projection		▪ See *Vegetation Establishment* above ▪ Adjust phasing and design; for example, add or enhance upland transition habitat within and between restored marshes ▪ Reconsider movement up staircase
Migratory Shorebirds Project Objective 1B	▪ Maintain numbers of migratory shorebirds at pre-ISP baseline numbers, if known, or as close to that baseline as can be determined.	▪ Use previously collected data (USGS, PRBO, SFBBO) on foraging shorebird densities, as well as modeled densities, to set targets for densities of foraging shorebirds for each restored/managed habitat type (*e.g.*, reconfigured ponds and restored mudflats) by season. Targets would be based on densities (by habitat type and/or geographic area) necessary to maintain pre-ISP numbers. Conduct limited surveys in a sample of habitats/locations within the SBSP Restoration Project Area to estimate foraging densities. ▪ Use existing data from Flyway Project surveys and data from initial few years of window surveys to determine the percentage of small migratory shorebirds that occur in the South Bay compared to the entire Bay. Monitor abundance in fall, winter, and spring via high-tide, baywide "window" surveys (in which multiple observers census a number of locations in a brief [*e.g.*, 3-day] period) conducted throughout San Francisco Bay. SBSP Restoration Project would provide for the coordination of these surveys.	▪ Monitoring stations in a sample of habitats/locations within the SBSP Restoration Project Area (for collection of data on shorebird densities in various habitats) and throughout the Bay Area (for collection of data on the percentage of small migratory shorebirds that occur in the South Bay compared to the entire Bay)	▪ Changes in shorebird foraging densities are expected to be immediate upon changes in management (*e.g.*, reconfiguration and management of a pond for optimal foraging depths, or conversion of a salt pond bottom to intertidal mudflat upon breaching of levees), although any changes in densities within a given habitat type will be slower. ▪ May take years or decades for the percentage of S.F. Bay birds using the South Bay to change in response to SBSP Restoration Project.	▪ Three consecutive years in which observed densities of foraging shorebirds for selected habitat types are below targets. ▪ Three consecutive years in which the percentage of S.F. Bay small migratory shorebirds that use the South Bay is below the baseline (as determined using window survey data).	▪ Will the habitat value and carrying capacity of South Bay for nesting and foraging migratory and resident birds be maintained or improved relative to current conditions? ▪ Will ponds reconfigured and managed to provide target water and salinity levels significantly increase the prey base for, and pond use by waterfowl, shorebirds and phalaropes/grebes compared to existing ponds not managed in this manner? ▪ To what extent will the creation of large isolated islands in reconfigured ponds maintain numbers (and reproductive success) of terns and other nesting birds in the South Bay, while increasing densities of foraging birds over the long term compared to ponds not managed in this manner? (including studies of mudflats and managed ponds invertebrate productivity, time-energy budgets for foraging birds, relative importance of and prey use in ponds with different salinities) ▪ Will intramarsh pond and panne habitats in restoring tidal marshes provide habitat for significant numbers of foraging and roosting shorebirds and waterfowl?	▪ Analyze all available monitoring data for South Bay, Bay Area, and entire Pacific Flyway to determine whether declines are likely the result of SBSP Restoration Project, or the result of external factors. Coordinate with other Pacific Flyway studies; develop the larger structure for a centralized flyway monitoring network. ▪ Conduct Bay-wide survey to determine whether Project has displaced birds to other areas ▪ If declines are likely the result of SBSP Restoration Project: - Adjust design, for example reconfigure more ponds for use by foraging shorebirds - Adjust management, for example, manage more ponds for optimal water levels and salinities for foraging shorebirds ▪ Reconsider movement up staircase

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CATEGORY/ PO	RESTORATION TARGET	MONITORING PARAMETER (METHOD)	SPATIAL SCALE FOR MONITORING RESULTS	EXPECTED TIME FRAME FOR DECISION-MAKING	MANAGEMENT TRIGGER	APPLIED STUDIES	POTENTIAL MANAGEMENT ACTION
Breeding Avocets, Stilts, and Terns Project Objective 1B	▪ Maintain numbers and breeding success of breeding avocets, stilts, and terns using the South Bay at pre-ISP baseline numbers, if known, or as close to that baseline as can be determined.	▪ Monitor total numbers of nesting Forster's and Caspian terns in the South Bay via comprehensive breeding-season surveys (per methods currently employed by SFBBO). Baseline has been established through past/ongoing monitoring conducted by SFBBO. ▪ Sample selected areas within the South Bay during the breeding season to determine the numbers of stilt/avocet nests in those areas. ▪ Estimate reproductive success by sampling a subset of breeding locations/colonies.	▪ Local (pond-level) scale for management actions, such as island creation, at specific ponds ▪ Entire South Bay for estimates of numbers (with estimates of breeding success in a few representative areas)	▪ Immediate response (increase) expected due to Phase 1 actions ▪ Longer-term trends monitored annually	▪ Decline in numbers (in the South Bay as a whole) or reproductive success of breeding stilts, avocets, and Forster's and Caspian terns below baseline for two consecutive years	▪ Will the habitat value and carrying capacity of South Bay for nesting and foraging migratory and resident birds be maintained or improved relative to current conditions? ▪ To what extent will the creation of large isolated islands in reconfigured ponds maintain numbers (and reproductive success) of terns and other nesting birds in the South Bay, while increasing densities of foraging birds over the long term compared to ponds not managed in this manner? (including predation and predator control studies, vegetation management approaches and Hg uptake in eggs, and related toxicity studies) ▪ Will California gulls, ravens, and crows adversely affect (through predation and encroachment on nesting areas) nesting birds in managed ponds?	▪ Analyze all available monitoring data for South Bay, Bay Area, and entire Pacific Flyway to determine whether declines are likely the result of SBSP Restoration Project, or the result of external factors (taking into account the downward trends in abundance of Forster's terns over last few decades, which are unrelated to salt pond conversion). ▪ If declines are likely the result of SBSP Restoration Project: - Undertake applied studies of habitat parameters, contaminant levels, prey availability and type, juxtaposition of nesting and brood rearing/foraging areas, predation pressure, and disturbance to determine appropriate design/management adjustments - Conduct Bay-wide survey to determine whether SBSP Restoration Project has simply displaced birds to other Bay-area locations. - Adjust design to construct more, or more optimal, nesting islands - Adjust design to reduce Hg uptake - Adjust management. For example, manage more ponds for optimal water levels and salinities for breeding and foraging stilts and avocets, manage more ponds for optimal water depths and salinities for foraging terns and/or control predation, vegetation, human disturbance. ▪ Reconsider movement up staircase

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Diving Ducks Project Objective 1C	▪ Maintain numbers of diving ducks using the South Bay at pre-ISP baseline numbers	Use mid-winter waterfowl survey data to monitor winter numbers of diving ducks in the South Bay. Baseline has been set by previous mid-winter surveys and Accurso's studies.	Entire South Bay	Local changes in abundance are expected to be immediate upon changes in management (*e.g.*, reconfiguration and management of a pond, or conversion of a salt pond bottom to intertidal mudflat upon breaching of levees). Larger-scale changes in abundance will likely be slower (on the order of years to decades).	Decline in South Bay numbers below baseline conditions for two consecutive years	▪ Will sediment movement into restored tidal areas significantly reduce habitat area and/or ecological functioning (such as plankton, benthic, fish or bird diversity or abundance in the South Bay? ▪ Will the habitat value and carrying capacity of South Bay for nesting and foraging migratory and resident birds be maintained or improved relative to current conditions? ▪ Will intramarsh pond and panne habitats in restoring tidal marshes provide habitat for significant numbers of foraging and roosting shorebirds and waterfowl over the long term?	▪ Analyze all available monitoring data for South Bay, Bay Area, and entire Pacific Flyway to determine whether declines are likely the result of SBSP Restoration Project, or the result of external factors ▪ If declines are likely the result of SBSP Restoration Project: - Undertake applied studies of habitat use and effects of human disturbance to determine appropriate design/management adjustments - Adjust design to increase the restoration of shallow subtidal habitat - Adjust management. For example, manage more ponds for optimal water depths and salinities for foraging diving ducks and/or control human disturbance ▪ Reconsider movement up staircase
Salt Pond Associated Migratory Birds (Wilson's and Red-necked Phalaropes, Eared Grebes, Bonaparte's Gulls) Project Objective 1B	▪ Maintain these species' use of SBSP Restoration Project Area ▪ Minimize declines in the South Bay relative to pre-ISP baseline	Focused surveys would be conducted targeting seasonal peaks (*i.e.*, late summer/early fall for phalaropes, fall and winter for Eared Grebes and Bonaparte's gulls) and geographic concentrations (*e.g.*, high-salinity ponds and other areas known to support large proportions of South Bay numbers of these species) to determine the numbers of these species using the South Bay.	Entire South Bay (as determined by surveys in areas where these species are concentrated)	Local changes in abundance are expected to be immediate upon changes in management (*e.g.*, reconfiguration and management of a pond, or conversion of a salt pond bottom to intertidal mudflat upon breaching of levees). Larger-scale changes in abundance will likely be slower (on the order of years to decades).	Three consecutive years in which numbers are more than 25% below the NEPA/CEQA baseline, or any single year in which numbers are more than 50% below NEPA/CEQA baseline	▪ Will the habitat value and carrying capacity of South Bay for nesting and foraging migratory and resident birds be maintained or improved relative to current conditions? ▪ Will ponds reconfigured and managed to provide target water and salinity levels significantly increase the prey base for, and pond use by waterfowl, shorebirds and phalaropes/grebes compared to existing ponds not managed in this manner?	▪ Analyze all available monitoring data for South Bay, Bay Area, and entire Pacific Flyway to determine whether declines are likely the result of SBSP Restoration Project, or the result of external factors (taking into account declines that have already occurred due to ISP). ▪ If declines are likely the result of SBSP Restoration Project: - Adjust management to have more ponds with optimal water levels and salinities for foraging pond-associated birds ▪ Reconsider movement up staircase

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Western Snowy Plovers Project Objective 1A	▪ Contribute to the recovery of the western snowy plover by providing habitat to support 250 breeding birds within SBSP Restoration Project Area, and maintain a 5-year average productivity level as required by the Recovery Plan.	Snowy plover numbers and estimated nest success, determined through comprehensive, annual South Bay surveys and monitoring during the breeding season	Entire South Bay for estimates of numbers (with estimates of breeding success in a few representative areas)	Local changes in abundance are expected to be immediate upon changes in management (*e.g.*, reconfiguration and water level/prey management of ponds). Longer-term trends will be monitored annually.	▪ Rate of population change declines substantially from projected trajectory toward target ▪ South Bay population declines in any given year below 2006 baseline	Will shallowly flooded ponds or ponds constructed with islands or furrows provide breeding habitat to support sustainable densities of snowy plovers while providing foraging and roosting habitat for migratory shorebirds compared to existing ponds not managed in this manner? (including predation studies and predator control studies, vegetation management approaches, and Hg- related toxicity studies	▪ Analyze all available monitoring data for South Bay, Bay Area, and entire Pacific Flyway to determine whether declines are likely the result of SBSP Restoration Project, or the result of external factors (taking into account the downward trends in abundance of plovers over last few decades, which are unrelated to salt pond conversion). ▪ If declines are likely the result of SBSP Restoration Project: - Undertake applied studies of habitat parameters, contaminant levels, prey levels/type, juxtaposition of nesting and brood rearing/foraging areas, predation pressure, and disturbance to determine appropriate design/management adjustments - Adjust design to construct more, or more optimal, nesting habitat, create more open salt panne habitat, and/or to reduce Hg uptake - Adjust management of water levels and salinities in more ponds for optimal breeding and foraging habitat and/or control predation, vegetation, human disturbance ▪ Reconsider movement up staircase
California Least Terns	▪ Maintain numbers of post-breeding California least terns in the Project Area at multi-year average levels including natural variation in numbers; avoid negative effect of SBSP Restoration Project on Bay-area least tern breeding bird numbers (multi-year average	Counts of birds using the South Bay as a post-breeding foraging area (or breeding area, if that occurs) and breeding pairs at Bay-area nesting colonies	Post-breeding foraging sites and breeding colonies	Local changes in abundance may be immediate upon changes in management (*e.g.*, reconfiguration and management of a pond, or conversion of a salt pond bottom to intertidal mudflat upon breaching of levees). Larger-scale changes in abundance will likely be slower (on the order of years to decades).	Decline in total number of birds using the South Bay as a post-breeding foraging area or breeding pairs in the S.F. Bay Area below 2006 baseline levels, in any given year		▪ If numbers decline, first use available information to attempt to determine whether declines are resulting from SBSP Restoration Project or other factors (*e.g.*, the impact of South Bay California gulls on nesting colonies or changes in Bay fisheries). ▪ Conduct applied study of post-breeding habitat use and diet, especially in the South Bay. ▪ Implement management or adjust design (*e.g.*, if applied study finds

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	levels with natural variation)						more foraging occurs in ponds than Bay, manage more ponds for suitable least tern foraging conditions). ▪ Reconsider movement up staircase.
Steelhead Project Objective 1C	▪ Enhance numbers of salmonids and juvenile in rearing and foraging habitats relative to NEPA/CEQA baseline numbers	Counts of upstream-migrating salmonids to monitor spawning populations in South Bay streams	South Bay spawning streams	5–10 years likely for effects of restoration on salmonids to be detectable	Reduction in number of upstream-migrating salmonids	Will increased tidal habitat increase native fish and harbor seal survival, growth and reproduction? (including specific study of steelhead)	▪ If numbers decline, first use available information to attempt to determine whether declines are resulting from SBSP Restoration Project or other factors (*e.g.*, factors associated with spawning streams). ▪ Conduct applied study of constraints to population growth (ex: Hg, water quality, food chain). ▪ Conduct applied study of condition of salmonids seaward of restoration site (sample Chinook using minnow net upstream from, at, and downstream from restoration sites before and after restoration; determine whether fish are larger and healthier after than before restoration). ▪ If numbers decline, conduct diet studies on piscivorous birds (to determine whether increased bird predation is responsible). ▪ Implement management or adjust design (*e.g.*, restore more tidal habitat adjacent to spawning streams). ▪ Reconsider movement up staircase.
Estuarine Fish Project Objective 1C	• Enhance numbers of native adult and juvenile fish in foraging and rearing habitats relative to NEPA/CEQA baseline numbers	▪ Presence/abundance of surfperch in restored marshes (as measured in permanent monitoring locations with pilings installed to facilitate monitoring) ▪ Presence/ absence of native flatfish, such as starry flounder, in restored un-vegetated shallow water areas	Monitoring results will reflect conditions at monitoring stations scattered throughout the SBSP Restoration Project Area, in tidal habitat, ponds, and sloughs	Varies by trigger – ▪ fish are expected to move into newly restored areas almost immediately but assemblages will change as habitat matures ▪ surfperch not expected to use restored marshes until vegetation is established ▪ negative impacts may be immediate if poor water quality from a pond	▪ Detection of a fish die-off ▪ Absence of detections of surfperch using restored tidal marsh ▪ Increase in percent of individuals sampled in restored marshes that are non-native ▪ Detectable reduction in water quality (as determined by monitoring described under "Water Quality" Key	Will increased tidal habitat increase native fish abundance and will restored habitat support healthy populations? (including specific study of native estuarine fish)	▪ Use available information to attempt to determine whether declines are resulting from SBSP Restoration Project or other factors (*e.g.*, factors associated with spawning streams). ▪ Applied study of constraints to population growth (ex: Hg, water quality, food chain) ▪ If fish populations decline, conduct diet studies on piscivorous birds (to determine

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		▪ Species richness and abundance of native fish species in a range of habitats including restored marshes and associated unvegetated shallow water areas, major and minor sloughs, and deep and shallow-water ponds ▪ Water quality parameters (see "Water Quality" Key Category)		discharge causes a die-off	Category) ▪ Deviation from expected trajectory of native fish use of restored marshes and associated unvegetated shallow water areas		whether increased bird predation is responsible). ▪ Consider possible effects of recreational angling pressure. ▪ Implement management or adjust design (*e.g.*, remove more levees to increase connectivity in restored ponds) based on study results ▪ Reconsider movement up staircase
Harbor Seals Project Objective 1C	▪ Maintain or enhance numbers of harbor seals using the South Bay	▪ Conduct periodic monitoring at known South Bay haul-out sites (*e.g.*, Mowry, Newark & Alviso Sloughs, and expand to include haul-out site in Corkscrew Slough) to determine trends in productivity and abundance, and changes in distribution. If incidental sightings at other areas are not adequate to determine if new haul-out sites are established, periodically survey other locations as well. Existing data include over 5 years of weekly survey data for Mowry and Newark sloughs, and 5 years of monthly survey data for Alviso Slough. ▪ Mercury parameters (see "Mercury" Key Category)	Focal areas (*i.e.*, known haul-out sites) throughout South Bay	Negative response to human disturbance from improved public access may be immediate; response to habitat restoration or increased mercury availability may be longer-term (a decade or more)	▪ Decline in overall South Bay numbers and pup production, if known, at haul-out sites below 2006 baseline levels for 2 consecutive years ▪ Reduction in frequency of use and pup production, if known, of Mowry Slough and adjacent haul-out/pupping areas	▪ Will increased tidal habitat increase native fish and harbor seal survival, growth and reproduction? ▪ Will increases in boating access significantly affect birds, harbor seals or other target species on short or long timescales?	▪ See management actions under "Mercury" and "Public Access" Key Categories ▪ Other potential management actions may include: - Restrict public access and/or improve public education near seal haul-out sites - Create seasonal closure in areas that might be appropriate for seal protection during pupping season, including buoys restricting access to sloughs to boats and land-based trails. - Enforce protective measures such as increased patrolling etc. ▪ If seal populations decline or pupping rates decline, conduct studies on seal health (pollutant exposure), potential disturbance changes, habitat/prey alternations (fish declines or fish community changes), or reduced access to sites due to steep gradient, tidal restrictions, or insufficient deep water
Public Access Project Objective 3	▪ High quality visitor experience is maintained ▪ Facilities are not degraded by over usage	▪ Visitor use surveys (numbers, activities, demographics, overall experience and peak use (surveys yearly) ▪ Staff observations ▪ Complaints or compliments registered with land managers ▪ Cost of maintaining	Within the Project Area.	Based on construction of facilities and public use (5+ years of usage)	▪ Survey results show dissatisfaction ▪ Overcrowding at staging areas ▪ Conflicts between users (recorded incidences) ▪ Maintenance costs exceed budget	▪ Will public access features provide the recreation and access experiences visitors and the public want over short or long timescales? (Study visitor traits and use patterns, visitor satisfaction with experience, public demand for other uses, facility degradation)	▪ Adjust design. For example, limit number of visitors to a given area, provide alternate use times for certain activities and/or reduce development of some uses, increase others, based on demand. ▪ Hold public meetings/workshops to inform the public of applied studies findings to determine how

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		facilities					best to meet public recreation desires given specific problems ▪ Hold charrette (group design process over 1-day)
Public Access Project Objective 1A, B, C	▪ Public use does not prevent reaching restoration targets as measured by significant impacts to target species.	Numbers, species richness and behavior of target species in public access areas	Within the Project Area, except as noted in restoration targets for shorebirds, diving ducks, breeding birds, California clapper rail, Western snowy plovers, and harbor seals.	Some parameters are immediate (*i.e.*, behavior); others may take 3 years or much more	▪ For species or guilds without specific population targets: statistically significant abundance, species richness or behavioral changes compared to control sites ▪ For species with population targets: reduction in abundance or density of breeding and/or non-breeding animals due to public access	▪ Will landside public access significantly affect birds or other target species on short or long timescales? (including studies of waterfowl, clapper rail and snowy plover responses to public access, and roosting bird response to public access) ▪ Will increases in boating access significantly affect birds, harbor seals or other target species on short or long timescales? (including studies of waterbird response to boaters)	▪ Adjust design. For example, provide edge condition to prevent visitors from moving off-trail (*e.g.*, fencing). change design to reduce wildlife disturbance based on study findings, or, in sensitive areas, restrict public access and redirect. ▪ Increase public access if species goals are met, but continue to monitor species' response ▪ Evaluate changes in population or density of species with population targets in light of restoration targets and other impacts on the species ▪ Design future phases to avoid significant impacts to species and optimize public access in areas of little or no species impact