Monitoring and Adaptive Management Plan (MAMP) for the proposed Sears Point Unit of the Napa-Sonoma Marshes Wildlife Area.

MONITORING

This document details the monitoring plan for construction and habitat evolution at the proposed Sears Point Unit (Sears Point) of the Napa-Sonoma Marshes Wildlife Area. The monitoring plan includes both biotic and abiotic parameters that will be monitored, performance standards, habitat targets, protocols, and sampling frequencies for the entire unit. This plan also identifies potential adaptive management triggers. The monitoring methods, schedule, and reporting system are also described in the Sears Point Monitoring and Reporting Plan Table (Table 1), which summarizes parameters to be monitored, performance objectives, protocols, and monitoring frequency. The Discharger for the Sears Point Project is currently the Sonoma Land Trust.

1.0 Background

A monitoring plan was developed in 2006 to track the progress of the Napa Plant Site project with input from the Water Board staff and the Bay Area Monitoring Review Team (MRT), which met on May 15, 2006 to discuss monitoring of the Napa Plant Site project. Because Sears Point is located adjacent to the Napa Sonoma Marshes and is a similar tidal restoration project we suggest not requiring the same long term monitoring because funding is not available. However, will use a similar monitoring approach as developed for the Napa Sonoma Marshes and approved by the Water Board and the MRT, with changes, as appropriate, to adapt the plan for the Sears Point site. In addition, we have reviewed and incorporated adaptive elements of the South Bay Salt Pond monitoring plan where feasible (e.g., see Table 2, Adaptive Management Strategy).

1.1 Monitoring Components and Performance Objectives

Over a 5-year period, chemical, physical, and biological project components will be monitored for the restoration project to determine if the short-term goal of 30 acres of predominantly native tidal marsh develops. Thereafter, the Project will be assessed to determine if the long-term goal of approximately 940 acres of predominantly native tidal marsh develops. That assessment can be quick, inexpensive, and based on best professional judgment of the Discharger, volunteers, or paid consultants; or, the assessment can be quantitative. The site can be assessed by free web-based aerial or satellite photography; paid web-based aerial or satellite photography; walking or boating around the site perimeter; putting a transect through the restored area, or any other reasonable method to determine if the long-term goal is met. In addition, the Technical Advisory Committee (TAC) will determine whether aerial or satellite photos should continue for a specified period, as defined by the TAC, until both the short and long-term goals target habitats are achieved, or whether the Project has successfully provided adequate wetland habitat benefits to justify discontinuing monitoring.

1.2 Chronology

Project construction will be completed when tidal action has been restored. After construction but before the levee breaches, baseline data will be collected for later comparison to immediately post-breach data. After construction has been completed the Sonoma Land Trust will submit a

construction completion report (with as-built drawings) to the Water Board. Upon approval of these reports (or after 45 days from submission), the monitoring period will commence.

2.0 Monitoring Methods and Schedule

This section presents monitoring protocols for water quality, biota, and geomorphic evolution. The monitoring schedule is also discussed and summarized in Table 1.

2.1 Water Quality

General Water Quality Parameters: Water quality monitoring is specifically associated with project construction to assess the effects of breaching on the receiving water quality; the receiving waters for the Sears Point Project are Tolay Creek, San Pablo Bay, and the Petaluma River. General water quality parameters to be monitored include salinity, temperature, pH, dissolved oxygen (DO), and turbidity. Water quality parameters will be monitored either by a deployed continuous monitoring station device (e.g. Sonde) or *in situ* by collecting a grab sample and using a multi-parameter probe and flow cell (e.g., YSI 6820 or equivalent). Monitoring stations will be associated with Breaches 1 and 2 (Figure C-1). In addition there will be a monitoring station within the newly flooded area. The sampling station locations will assess interior water quality, site effluent and receiving water quality, and provide the means for estimation of the attenuation of any water quality conditions related to levee breaches that may exist (e.g., low DO concentrations).

For grab sampling water quality data will be collected at one foot below the surface during an ebbing tide and will be collected at the following frequency:

- within 3 days prior to breaching of the levees;
- within 3 days after breaching of the levees;
- weekly for the first month after breaching; and
- monthly until water quality performance objectives have been met for two consecutive months, or the Discharger shows that beneficial uses of water are not being adversely impacted by the Project.

If a continuous monitoring station is deployed, data collection will occur at a higher frequency and at a fixed position in the water column. Water quality monitoring data will be evaluated for trends and compared to the performance objectives established for each parameter.

Mercury: The mercury objective in the Water Quality Control Plan for the San Francisco Bay is based on fish tissue mercury concentrations. Fish tissue can be used to determine if mercury levels are elevated at the Project, or sediment/water can be used. At the request of the Discharger, a final mercury monitoring plan will not be required until mercury biosentinel data is analyzed from adjacent tidal marsh restoration sites. The Project will be prepared to monitor methyl mercury.

2.2 Biota

This section discusses biological monitoring, including avian monitoring, fish as used for biosentinel mercury monitoring, small mammals, and vegetation. Some components in Table 1 have been placed under Level 1 and are required; others are placed under Level 2 and will be carried out only if funding is available. Due to the limited biological value the existing conditions provide, and the immediate increase in biological value after breaching, biological monitoring, as described below, will only be conducted as funding allows.

Birds

Avian surveys will be conducted up to four times a year in years 1-3 (focused on migratory and winter periods). Surveys will occur during migratory periods and in conjunction with winter waterfowl surveys conducted by the United States Fish and Wildlife Service.

Data could be compared to United States Geological Survey (USGS) bird surveys conducted at the Napa Sonoma Marshes project site between April 2003 and March 2006, estuary-wide shorebird surveys coordinated by Point Reyes Bird Observatory, and/or the winter waterfowl surveys conducted by the United States Fish and Wildlife Service (USFWS), depending on availability and applicability to Sears Point. Data analysis will include an evaluation of species composition, abundance and trends in bird use relative to San Pablo Bay and the larger San Francisco Estuary. The Discharger will coordinate with the Napa Solano Audubon Society to add a Christmas Bird Count Station at the Sears Point Site.

Small mammals

Tidal marsh habitats can support populations of special-status small mammals, including salt marsh harvest mouse (*Reithrodontomys raviventris*) (SMHM) and Suisun ornate shrew (*Sorex ornatus sinuosus*). If at least 30 acres of contiguous suitable habitat (tidal marsh with at least 75% cover) are present adjacent to known source populations, surveys will begin in year 3 following construction, or as soon thereafter as suitable habitat is present, and will continue once every year until year 5 of the monitoring plan. Survey will be done in coordination with regional programs.

Vegetation

Vegetation colonization in wetland areas will be monitored using free or purchased web-based aerial or satellite photography supported by ground-truthing. If funding is available, aerial images will be interpreted with a Geographic Information System (GIS) to estimate percent cover in the wetland areas for the first 5 years. Ground-truthing will be performed to verify vegetation signatures on the aerial photos, and to make qualitative assessments habitat composition.

A minimum of 30 acres of habitat suitable for colonization by native marsh vegetation is expected along the interior edge of the site, specifically along the perimeter levee (after lowering) and along the interior slope of the new levee constructed. Vegetation colonization in these two areas is expected to be fairly rapid, beginning within one year of project completion, and achieving substantial native tidal marsh vegetation cover within 3 to 5 years. The remainder of the site is expected to take up to 30 years to reach 75% cover of native tidal marsh vegetation. The vegetation assessment will include recording the dominant pioneer species colonizing the marsh plain.

The Discharger will follow an invasive plant management program to prevent and control non-native invasive plant species, including those listed under Tier I (and to a lesser extent Tier II) of the Water Board's "Invasive Non-Native Plant Species to Avoid in Wetland Projects in the San Francisco Bay Region"[1], that threaten sensitive native tidal marsh communities. (Other updated appropriate lists of highly invasive plant species to keep out of tidal marsh restoration sites in the Region, can be substituted for the Water Board's list.) The Discharger will review this list and determine which species will be feasible to keep off the wetland restoration site, and which will not. No invasive cordgrass species (e.g., *S. alterniflora, S. densiflora*) should be tolerated, and *Lepidium latifolium* (perennial pepperweed) is also a high priority species for control or

[1] (www.waterboards.ca.gov/sanfranciscobay/certs.htm under "Fact Sheet for Wetland Projects, Appendix I).

eradication on Discharger lands. The Discharger will coordinate with the Invasive Spartina Project to control invasive *Spartina* species in San Pablo Bay.

2.3 Geomorphic Evolution

Protocols developed by the San Francisco Estuary Institute for habitat mapping using aerial and satellite photos will be reviewed and followed if feasible[2]. Alternatively, some form of habitat mapping including vegetation types and channel evolution will be conducted using aerial or satellite photos or other sources such as Google Maps, if those provide sufficient detail to assess the development of habitats including channels.

2.3.1 Tidal Channel Evolution

Evolution of tidal channels will be evaluated using readily available aerial imagery. To the extent feasible depending on available imagery, the aerial images will be captured in the first year following the levee breach during a low tide to increase visibility of channel network development and again in five years during a low tide to increase visibility of channel network development. Aerial images will be interpreted with GIS to calculate: 1) overall channel density in the drainage basin associated with each breach; 2) channel width at each breach and at locations along the alignment of the restored historic channels. Density will be calculated as square feet of channel per square feet of marsh plain.

2.3.2 Sedimentation

If it can be safely measured at the Project, sedimentation in restored tidal areas will be monitored using sedimentation plates, pins, erosion tables or LiDAR; if more feasible, sediment deposition can be measured by mapping vegetation. If sedimentation plates are used, each plate will be constructed of a square sheet of non-corrosive material. Sedimentation plates will be set flush with the marsh surface prior to restoration of tidal action. A rod will be placed through the center to anchor the plate and facilitate relocation for sampling purposes. Sediment accumulation on the plates will be measured in years 1 and 5. A total of 6 plates will be placed on the site before tidal action is restored, but only 3 of those need to be measured regularly; the remaining 3 will be kept in reserve for measuring, in case the predicted deposition fails to produce elevations at which vegetation develops. Initial elevations will be recorded for all plates.

2.4 Functional or Conditional Assessment

A functional or conditional assessment (e.g. California Rapid Assessment Method (CRAM)) will be conducted on a subset of the passive enhanced seasonal wetland features preserved north of the SMART rail line, and the preserved vernal pool. A baseline assessment will be conducted in year 1 and again in years 3 and 5. This will provide information on the status and trends of those features.

3.0 Reports

As-built plans will be submitted to the Corps, BCDC, and the Water Board within 90 days of the completion of construction. The plans will note changes from the final bid set of plans and will be accompanied by notes from the construction manager and monitor.

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[2] In addition to protocols for tidal marsh vegetation mapping from aerial and satellite imagery, this site also has protocols for monitoring tidal marsh plants and animals, as well as sedimentation rates. (see www.wrmp.org/documents.html; under “Protocols”.

Reports will be submitted for Years 1, 3, and 5, within 90 days after the end of each respective year describing the data collected pursuant to the approved restoration plan. All reports will evaluate and discuss biotic and abiotic elements of the monitoring program. The monitoring report will include the Corps, BCDC, and Water Board permit numbers, a list of the names of the persons who conducted the monitoring and prepared the report, a brief description of the restoration project, dates monitoring was conducted, photographs and figures identifying monitoring station locations and photo points. Monitoring reports will include details of any adaptive management actions that have been implemented in the preceding year, if applicable. Monitoring reports will be submitted to the Water Board.

4.0 Notification of Completion

The Discharger will notify the Water Board at the end of the 5-year monitoring period, or when the performance objectives have been met. A site visit to confirm completion status will be scheduled. The short-term goal of 30 acres of native tidal marsh may be met in the first 5 years, and the hypothesized target of approximately 940 acres with 75% cover of native tidal marsh plant species may not occur for 30 years or longer. After the first 5 years, a Final Report can be submitted.

Following the short-term 5-year monitoring period, the Discharger will use best professional judgment or quantitative assessment to assess habitat development every 5 years until the final target is met. If performance criteria are not met, the Discharger will make recommendations to the TAC to either continue waiting for tidal marsh, or revise the target habitat. The TAC may also need to revise habitat goals and associated project assessments to reflect changes occurring throughout the Estuary (e.g., declining sediment inputs, excessive erosion, sea level rise, evolution of surrounding tidelands, invasive species) that could limit the ability of the Project to evolve as originally predicted. The determination of whether to implement additional measures to meet existing goals, or to revise habitat goals to reflect regional changes in the estuary will be made in consultation with the restoration community at a forum such as the Napa Sonoma Marshes Restoration Group or the San Francisco Bay Joint Venture which includes scientists, practitioners, and regulators including BCDC and the Water Board that are directly involved in tidal marsh restoration and monitoring.

5.0 Contingency Measures

Corrective actions, if necessary, will be suggested in monitoring reports for performance objectives that are not being met. The responsible parties for implementing and monitoring required contingency measures are the following people and their respective agencies:

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6.0 Maintenance

The proposed project design minimizes operations and maintenance requirements since it is a tidal restoration project. Tidal habitats should be self-sustaining and, once levees are breached,

will evolve to a dynamic equilibrium state without intervention, if no unforeseen problems arise. The project would require operation and/or maintenance of the following:

- new flood control levee – weed control, mowing, visual inspection
- Public access features
- Invasive plant control and native plant restoration of the marsh-upland ecotone

The pump station outfalls and the new levee will be inspected for erosion, settlement, excessive burrowing animal activity, and/or presence of deep-rooted woody plants. Routine mowing and maintenance should forestall these problems. Trash receptacles would also require regular maintenance.

7.0 Adaptive Management

The ability to react to changing circumstances is the basis for adaptive management. The adaptive management premise is to address issues as they arise; developing solutions based on contemporary circumstances and available resources. Issues that may require adaptive management include mosquito abatement, invasive species, erosion, flooding, and others. The Discharger will develop solutions to management needs as they arise. The Discharger has developed a set of restoration targets and triggers for potential management action (Table 2). An evaluation of tidal marsh evolution relative to stated projects targets and triggers will be presented in the monitoring reports.

Table 1. Sears Point Monitoring and Reporting Plan: a summary of the initial 5-Year monitoring program parameters, performance standards, targets, protocols, and frequencies. The 5-year monitoring period will begin after construction is completed but before levees are breached. At 5 year intervals after the first 30 acres of tidal marsh emerges, the Project will be assessed using best professional judgment or quantitative analysis, until the final goal of over 700 acres is met or changed. In addition to the monitoring elements below, the use of best management practices and site monitoring to ensure that pollutants are not discharged to the Bay or Tolay Creek or the Petaluma River will also be conducted during construction periods. Parameters are considered to be required Level 1 features, unless a pound sign (#) denotes Level 2 which should be carried out only if funding is available.

Parameter	**Performance Standard**	**Target***	**Protocol**	**Frequency**
Field Photo Monitoring	None, purpose is documentation of tidal marsh evolution	Establishment of native tidal marsh plant communities	Establish photo monitoring points for ground images	• Within 1 yr pre-construction • Post-construction yrs 1, 3, 5; Field photos can be used with best professional judgment to determine when long-term target tidal marsh is met.
Aerial or Satellite Photo Monitoring #	Purpose is documentation of tidal marsh evolution and will only be conducted as funding allows	Establishment of native tidal marsh plant communities	Obtain aerial images from sources explained in SFEI's** vegetation mapping protocol for aerial/satellite photos, or readily-available public source such as Google Maps®	Years 1, 3, and 5; continue thereafter as funding allows. Free aerial or satellite photos can be used with best professional judgment to determine when long-term target tidal marsh met .
Dissolved oxygen (DO)	Outflow of water from the site will not decrease DO concentrations in the receiving waters during any tide cycle to a concentration lower than 5.0 mg/L (Basin Plan water quality objective downstream of Carquinez Bridge) or below the ambient concentration if the ambient concentration is less than 5.0 mg/L. The median DO concentration for any two consecutive months shall not be less than 80 percent of the DO content at saturation.	Maintain water quality in Tolay Creek, Petaluma River, and San Pablo Bay	Water quality parameters will be monitored either by a deployed continuous monitoring station device (e.g. Sonde) or in situ by collecting a grab sample and using a multi-parameter probe and flow cell (e.g., YSI 6820 or equivalent) at monitoring stations associated with the breach 1 and 2 locations and an ambient in San Pablo Bay as shown in Figure 1.	• Within 3 days prior to breaching the levees • Within 3 days after breaching the levees • Weekly for the first month after breaching • Until water quality performance objectives have been met for two consecutive months or the Discharger shows that beneficial uses are not being adversely impacted. (The latter requires EO approval.)

pH	Outflow of water from the site will not cause changes greater than 0.5 units of pH in the receiving waters during any tide cycle. The pH shall not be depressed below 6.5 nor raised above 8.5, or below ambient pH if the ambient pH is less than 6.5, or above the ambient pH if the ambient pH is greater than 8.5	Maintain water quality in Tolay Creek, Petaluma River, and San Pablo Bay	Same protocol as for dissolved oxygen	See dissolved oxygen
Temperature	Outflow of water from the site will not increase temperature by more than 5°F (2.8°C) in the receiving waters during any tide cycle in the wet season, and 10°F in the dry season	Maintain water quality in Tolay Creek, Petaluma River, and San Pablo Bay	Same protocol as for dissolved oxygen	See dissolved oxygen
Turbidity	Outflow of water from the site will not increase turbidity in the receiving waters during any tide cycle by more than 5 NTU if the ambient turbidity is less than 50 NTU, or by more than 10% if the ambient turbidity is greater than 50 NTU (or as close to these targets as practicable given the likelihood of turbidity immediately post-breach and following heavy rainfall events)	Maintain water quality in Tolay Creek, Petaluma River, and San Pablo Bay	Same protocol as for dissolved oxygen	See dissolved oxygen
Methyl mercury#	Mercury concentrations in biota tissue samples over time are less than concentrations in samples collected from comparable habitats in the San Pablo Bay watershed. Otherwise results from Napa Plant site will serve as a surrogate.	Maintain water quality in Tolay Creek, Petaluma River and San Pablo Bay	Protocol acceptable to RWQCB, e.g. regional biosentinel fish tissue monitoring such as the one developed by UC Davis	1 location, annually or biennially (once every other year) if required by the Water Board after biosentinel data from adjacent projects is analyzed; must be coordinated with other biosentinel fish monitoring in the region (e.g., Napa Marsh, Napa Plant Site, or Cullinan Ranch) to result in meaningful data
Birds#	None, purpose is documentation of tidal marsh evolution and will only be conducted as funding allows	Bird use will increase, particularly among diving and dabbling ducks over the shorter term; and among shorebirds, songbirds, and rails over the longer term	Area bird surveys using WRMP wetland bird protocols, regional shorebird surveys (PRBO), winter waterfowl surveys (USFWS).	For shorebirds and waterfowl: Years 1-3: up to four times a year, if funding allows

Vegetation	30 acres of habitat at marsh plain elevation within 3-5 years	Short-term: minimum of 30 acres of native tidal marsh plant community cover Long-term: 700+ acres of predominantly native tidal marsh within 20-30 years	On-going observations (as part of routine site maintenance and control) to detect non-native invasive species; to the extent feasible control highly invasive species on the RWQCB's Tier 1 list of species to keep out of wetland sites, or other updated list. ***; Aerial photography or Google Maps® images and GIS to define extent of vegetation communities and total percent cover; ground-truth to identify dominant species, and define communities. Long-term goal can be assessed with free web-based aerial or satellite photos, walking or boating around the Project; a transect through the restoration site; or other means of determining if the site has evolved into tidal marsh. Assessments can be made with best professional judgment or analytically.	Annual observations of colonizing species Ground observations in conjunction with aerial imagery analysis once 20% plant cover is attained Every 5 years until long-term project goal is met or changed.
Salt Marsh Harvest Mice and the ornate shrew#	None, purpose is documentation of tidal marsh evolution and will only be conducted as funding allows	Site will support and provide habitat for small mammals, including salt marsh harvest mice	Monitor or document the presence or absence of federally listed salt marsh harvest mouse at the project site in accordance with the established USFWS protocols and recovery plan. Salt marsh harvest mouse surveys will be completed in years 4 and 5 if suitable habitat is present.	As determined by USFWS, see also Table 2.
Tidal channel evolution	None, purpose is documentation of tidal marsh evolution	Density and size of tidal channels will increase throughout the duration of the monitoring period	Aerial photograph; SFEI's recommended protocol**; or free web-based Google Maps® image interpreted with GIS to calculate overall channel density in the drainage basin associated with each breach (sq. ft. channel per sq. ft. of marsh plain). Top width of each breach measured in GIS from aerial images	Years 1 and 5

Sedimentation #	None, purpose is documentation of tidal marsh evolution	The site will fill in with enough sediment within 30 years to support native tidal marsh vegetation through most of the site; some deeper areas may persist longer as open water	Deposition resulting in marsh plain accretion to the MHW elevation will be mapped as vegetation germinates and colonizes the site. Sediment plates, pins, erosion tables LiDAR, or sediment deposition maps of vegetation will be used to monitor deposition. If sediment plates or pins are used, 6 monitoring locations will be established in appropriate areas throughout the site, and the 3 in the lowest areas will be measured	Years 1 and 5 (if it can be measured safely)

*No penalties for failure to achieve the targets in this column are expected since that would discourage important restoration projects. However, failure to achieve targets should prompt the Discharger to investigate the causes for failure, recommend management measures to protect beneficial uses, and report those recommendations to the resource agencies and the public.

**San Francisco Estuary Institute: http://www.wrmp.org/documents.html; under Protocols, "Tidal Marsh Vegetation Mapping"

***http://www.waterboards.ca.gov/sanfranciscobay/certs.htm under “Fact Sheet for Wetland Projects” (Appendix 1).

Table 2. Sears Point Restoration: Adaptive Management Strategy.

Category	Project Purpose	Restoration Target	Expected Timeframe	Monitoring Parameters and Methods	Management Threshold for Action	Potential Management Action
Sediment Deposition#	Sediment accreting at rates along a trajectory sufficient to support tidal marsh plant colonization	Project elevations capable of supporting tidal marsh vegetation over 75% of the project area (approx. 715 ac)	30 years	Sedimentation rates, total accumulation, vegetation maps to show sediment deposition, or bathymetry using sedimentation plates, pins, erosion tables or LiDAR; assessments at year 1 and 5, and 5-yr intervals thereafter if funding allows #	Projections based on data gathered in the first 5 years suggest elevations required for vegetation colonization are not likely to be achieved	Re-evaluate projections/timelines and likelihood of achieving tidal marsh elevation and associated habitat development relative to regional changes in sediment dynamics and sea level rise
Predominantly native Tidal Plant Community Development	• Restore habitat for the recovery of federally- and state-listed special status species • Provide habitat for a broad range of marsh-dependent birds, mammals, fish and other aquatic organisms, and migratory shorebirds and waterfowl	• Development of predominantly native tidal marsh plant communities (e.g., channel edge, low/middle/upper marsh, pan, marsh-upland ecotone): evolution of native plant composition and structure similar to successful tidal marsh restoration projects of the North Bay or reference tidal marsh sites once appropriate elevations have been achieved • Short-term: 30 acres of habitat at marsh plain elevation with 80% cover • Long-term: achieve 75% cover of native tidal marsh plant communities (approx. 715 ac)	• 3-5 years (30 acres) • 30 years: 75% cover of native tidal marsh plant communities	• Qualitative assessment of pioneering species and dominance prior to attaining 20% cover of tidal marsh plants • Acres of tidal marsh plant communities: aerial photo interpretation, ground-truthing, and GIS when vegetation cover is ≥ 20% (10-yr intervals as funding allows) • Ground surveys (annual or biennial) for high priority[4] invasive plant species (e.g., *Spartina alterniflora*, *Lepidium latifolium*); priority species and timeframe for monitoring will be adapted through time as conditions change	• Invasive plant colonization and spread by high priority invasive species • Lack of colonization by native halophytes once appropriate elevations have been reached	• Active revegetation from local plant sources • Increased invasive plant management

Salt Marsh Harvest Mice and ornate shrew	Restore habitat for the recovery of federally- and state-listed special status species	• SMHM colonizes new SMHM habitat from surrounding source populations (e.g., adjacent tidal marsh habitats) • Acres of high quality SMHM habitat increase through time (see 'Tidal Plant Community Development')	20-30 years (habitat acres increase relative to baseline)	• Acres and quality of SMHM habitat developed (See 'Tidal Marsh Plant Community Development' monitoring parameters and methods) • Assessment of SMHM habitat quality based on current literature • Small mammal surveys (Year 3, 4 and 5 post-construction	• See triggers for 'Tidal Marsh Plant Community Development' • Lack of colonization by SMHM when appropriate habitat is present	• Active revegetation • Increased invasive plant management • Study of adjacent source populations and potential barriers to movement
Water Quality	Water quality parameters in receiving waters meet RWQCB performance standards (e.g., DO).	• Maintain water quality in Tolay Creek, Petaluma River and Sand Pablo Bay • Water quality parameters in receiving waters meet RWQCB performance standards (e.g., DO).	< 1year	• Continuous sample/data collection using a multi-parameter probe at monitoring stations associated with breach 1 and 2 and one an ambient in San Pablo Bay • Minimum of 1 days prior to breaching, and 30 days after breaching, until RWQCB objectives have been met for two consecutive months	Water quality parameters in receiving waters do not meet RWQCB performance standards)	Consider active management (e.g., re-aeration mechanisms to improve DO)
Mercury#	Hg levels in sentinel species of the project area are less than or equal to what is found in existing habitats of San Pablo Bay	Mercury concentrations over time less than or equal to concentrations in samples collected from comparable habitats of San Pablo Bay		Bio-sentinel fish tissue monitoring	Sentinel species show higher than ambient levels of Hg in the project area relative to comparable habitats of San Pablo Bay	Work collaboratively with regulators and restoration community to determine next steps

Insert Figure C-1