6.0 BIOLOGICAL RESOURCES - REGULATORY SETTING

This section describes the federal and state policies and laws relevant to biological resources in the project area.

6.0.1 Regulatory Environment and Policies

6.0.1.1 Federal Endangered Species Act (ESA)

The ESA protects listed wildlife species from harm or “take.” The term “take” is broadly defined as to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.” An activity is defined as a “take” even if it is unintentional or accidental. Project-related impacts to federally-listed, proposed, and candidate species or their habitats are considered “significant” under CEQA guidelines.

USFWS (with jurisdiction over plants, wildlife, and resident fish) and NOAA Fisheries (formerly NMFS; with jurisdiction over anadromous fish and marine fish and mammals) oversee ESA. The purpose of consultation with USFWS and NOAA Fisheries is to ensure that the federal agencies’ actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat for listed species.

ESA does not give plants legal protection on nonfederal lands unless a state law or regulation is being violated. ESA does prohibit malicious damage or destruction of threatened or endangered plant in any area under federal jurisdiction, and the removal, cutting, digging up, or damaging or destroying of any such species in any other area in knowing violation of any state law or regulation, or in the course of any violation of a state criminal trespass law.

The Corps of Engineers has requested informal Section 7 consultation for the proposed project. Information has been supplied to USFWS and NOAA Fisheries, as appropriate and informal consultation is ongoing. Based on this information and consultations, USFWS and NOAA Fisheries will prepare Biological Opinions on the proposed project.

6.0.1.2 Clean Water Act - Section 404

Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (Corps) is responsible for regulating the discharge of fill material into waters of the United States. Section 404 regulates any discharge activity below the ordinary high-water level—the water level equal to the mean annual flood level—of a stream channel. Examples of such discharge activities include placement of fill material, placement or alteration of structures that have the intended effect of functioning as fill, or any discharge activity that would affect wetlands or the surface-water conveyance or capacity of a channel.

“Waters of the United States” and their lateral limits are defined in 33 CFR (Code of Federal Regulations) Part 328.3 (a) and include tidal waters, streams that are tributary to navigable waters, and their adjacent wetlands. “Wetlands” are defined for regulatory purposes, at 33 CFR 328.3 and 40 CFR 230.3, as areas “inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Wetlands that are not adjacent to waters of the United States are termed “isolated wetlands” and are subject to Corps jurisdiction under certain circumstances.

In general, a Corps permit must be obtained before placing fill in wetlands or other waters of the U.S. The type of permit depends on the amount of acreage and the purpose of the proposed fill and is subject to discretion from the Corps. Corps authorizations are usually granted under either a nationwide permit or an individual permit. To qualify for a nationwide permit, a project must meet certain conditions and have no more than a minimal adverse effect on the aquatic ecosystem. The Corps typically interprets this condition to mean that impacts are minor and there will be no net loss of either wetland acreage or wetland habitat value, and this process usually results in the need to provide mitigation for project-related fill of any tidal water, creek, or wetland.

An individual permit is usually required where a nationwide permit is not applicable. The consideration of an individual permit includes, but is not limited to, factors such as significant acreage of wetlands or waters of the U.S., areas of high biological or unique value, or length of watercourse affected. Individual permits require review of the project by the public, an alternatives analysis that demonstrates that wetland impacts have been avoided or minimized to the extent possible, and appropriate compensatory mitigation for unavoidable impacts.

Pursuant to Section 401 of the Clean Water Act, projects that apply for a Corps permit for discharge of dredged or fill material into wetlands or other waters of the U.S./State, must obtain water quality certification from the RWQCB. This certification ensures that the project will uphold State water quality standards. Alternatively, the RWQCB may elect to notify an applicant that the State may issue Waste Discharge Charge Requirements in lieu of a Section 401 certification for a project.

A federal ruling issued in 2001 may affect whether wetlands are considered jurisdictional by the Corps (January 9, 2001, Solid Waste Agency of Northern Cook County [SWANCC] ruling [*SWANCC* v. *United States Army Corps of Engineers* (121 S.Ct. 675,2001)]). Guidance on non-navigable, isolated and intrastate waters was published on January 19, 2001, by counsel for USEPA and the Corps in response to the SWANCC ruling. The guidance essentially resulted in the determination that non-navigable, isolated waters may not be regulated by the Corps.

For the proposed project, the Corps has agreed to the assumption all areas below the mean higher high water (MHHW) level are jurisdictional wetlands and are subject to Section 404 requirements. This assumption is highly conservative, as many of the areas designated as jurisdictional wetlands for the project do not contain vegetation.

Preliminary consultation with the Corps indicates that the agency is most likely to issue a Nationwide Permit for the proposed project. Nationwide permits are general permits that cover activities such as minor dredging, construction of temporary structures (e.g., cofferdams) and fill activities. Nationwide permits have a set of general conditions that must be met for the permits to apply to a project, as well as specific conditions that apply to each nationwide permit.

For the proposed project, the following conditions would need to be met as part of the Section 404 permitting process:

- Procurement of Section 401 water quality certification from the San Francisco Bay RWQCB (discussed above)
- Compliance with ESA, involving consultation with USFWS and NOAA Fisheries (discussed above)

- Compliance with the requirements of Section 106 of the National Historic Preservation Act (NHPA)

6.0.1.3 Other Statutes, Codes, and Policies Affording Species Protection

Migratory Bird Treaty Act—The federal Migratory Bird Treaty Act (16 U.S.C., Sec. 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs.

Bald and Golden Eagle Protection Act—The federal Bald and Golden Eagle Protection Act prohibits persons within the United States (or places subject to U.S. jurisdiction) from "possessing, selling, purchasing, offering to sell, transporting, exporting or importing any bald eagle or any golden eagle, alive or dead, or any part, nest, or egg thereof."

Executive Order 11990—Protection of Wetlands—Executive Order 11990 (issued in 1977) is an overall wetland policy for all agencies managing federal lands, sponsoring federal projects, or providing federal funds to state and local projects. It requires federal agencies to follow procedures for avoidance, mitigation, and preservation, with public input, before proposing new construction in wetlands. Compliance with Section 404 permit requirements may constitute compliance with the requirements of Executive Order 11990.

6.0.1.4 California Endangered Species Act

California implemented the California Endangered Species Act (CESA) in 1984. CESA is similar to the federal ESA both in process and substance; it is intended to provide protection to threatened and endangered species in California. CESA does not supersede the federal ESA, but operates in conjunction with it. Species may be listed as threatened or endangered under both acts (in which case the provisions of both State and federal laws would apply) or under only one act.

CESA prohibits the take of any plant or animal listed or proposed as threatened, endangered, or rare (applies only to plants). Habitat destruction is not included in the state's definition of take. Section 2090 of CESA requires state agencies to comply with endangered species protection and recovery and to promote conservation of these species. CDFG administers the act and authorizes take through Section 2081 agreements, except for species designated as "fully protected". (According to CESA, species designated as "fully protected," such as the salt harvest mouse, cannot be impacted and are not subject to Section 2081 take agreements.

6.0.1.5 California Native Plant Protection Act (CNPPA)

Regarding plant species, CESA defers to the CNPPA of 1977,which prohibits importing rare and endangered plants into California, taking rare and endangered plants, and selling rare and endangered plants. CEQA can provide protection for plants listed as rare under the CNNPA that would not otherwise be protected under CESA.

6.0.1.6 Other State Statutes, Codes, and Policies Affording Species Protection

California State Wetlands Conservation Policy—The Governor of California issued an executive order on August 23, 1993, that created a California State Wetlands Conservation Policy. This policy is being implemented by an interagency task force that is jointly headed by the State Resources Agency and the California Environmental Protection Agency (Cal/EPA). The policy has three goals:

- to ensure no overall net loss and a long-term net gain in wetlands acreage and values in a manner that fosters creativity, stewardship, and respect for private property;
- to reduce the procedural complexity of state and federal wetlands conservation program administration; and
- to encourage partnerships that make restoration, landowner incentives, and cooperative planning the primary focus of wetlands conservation.

"Waters of the State"—Water Code Section 13260 requires "any person discharging waste, or proposing to discharge waste, in any region that could affect the waters of the state to file a report of discharge (an application for waste discharge requirements [WDRs])." "Waters of the state" is defined in the Porter-Cologne Water Quality Control Act as "any surface water or groundwater, including saline waters, within the boundaries of the state" (Water Code Section 13050[e]). The SWANCC ruling described above has no bearing on the Porter-Cologne definition. Although all waters of the United States that are within the borders of California are also waters of the state, the converse is not true (i.e., in California, waters of the United States represent a subset of waters of the state). Thus, California retains authority to regulate discharges of waste into any waters of the state, regardless of whether the Corps has concurrent jurisdiction under Section 404. The Regional Water Quality Control Boards (RWQCBs) are responsible for imposing WDRs for fill material placed into waters of the state.

As noted above, for the proposed ISP, all areas under the MHHW level within the project area are considered jurisdictional wetlands, subject to Section 404 requirements.

State Fish and Game Code = Fully Protected Species and Species of Special Concern—Under the State Fish and Game Code, the CDFG also has jurisdiction over species that are designated as "fully protected." These species are protected against direct impacts. The CDFG maintains informal lists of "species of special concern." These species are broadly defined as plants and wildlife that are of concern to the CDFG because of population declines and restricted distributions, and/or they are associated with habitats that are declining in California. Project-related impacts to species on the State lists of endangered or threatened species, "fully protected" species, and species of special concern are considered "significant" under *CEQA Guidelines* (discussed below).

State Fish and Game Code Section 1601 to 1503 – Streambed Alterations—The CDFG exerts jurisdiction over the bed, banks, and channels of watercourses according to the provisions of Section 1601 to 1603 of the Fish and Game Code. CDFG requires a Streambed Alteration Permit for the fill or removal of any material from any natural drainage. The jurisdiction of the CDFG extends to the top of bank and often includes the adjacent riparian vegetation.

State Fish and Game Code, Section 3503.5—Additionally, birds of prey (hawks, eagles, falcons, and owls) are protected in California under the State Fish and Game Code, Section 3503.5. Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Disturbance that causes nest abandonment and/or loss of reproductive effort is considered “taking” by the CDFG and would be considered a significant impact.

CEQA Guidelines, Section 15380—Although threatened and endangered species are protected by specific federal and State statutes, CEQA *Guidelines*, Section 15380(b) provides that a species not included on the federal or State lists of protected species may be considered rare or endangered if the species can be shown to meet certain specified criteria. These criteria have been modeled after the definitions in the federal ESA and the California Fish and Game Code. This section was included in the guidelines primarily to deal with situations in which a public lead agency is reviewing a project that may have a significant effect on a species that has not yet been listed by either the USFWS or CDFG. Thus, CEQA provides a lead agency with the ability to protect a species from a project's potential impacts until the respective government agencies have an opportunity to designate the species as protected, if warranted.

6.1 BIOLOGICAL RESOURCES – BENTHIC ORGANISMS

This section describes the benthic communities within the project area and the effects of project implementation on these communities, including the salinity changes to receiving waters caused by ISP discharges. This section also addresses impacts to the California Bay shrimp.

References specific to the project or to the region that were used to prepare this section included: *Evaluation of the Potential for Impacts on Bay Shrimp Associated with Circulation of Saline Pond Water during the Initial Stewardship Period* (Appendix G), and *Assessment of Impacts to Aquatic Life Associated with Circulation of Saline Pond Water during the Initial Stewardship Period* (Appendix B). In addition, data collected in 1994-96 as part of the Benthic Pilot Study of the San Francisco Estuary Regional Monitoring Program (RMP) were used (RMP 1997).

6.1.1 Affected Environment

Benthic organisms are bottom-dwellers living on and in the bottom sediments of the Bay and include animals, plants and bacteria. Benthic organisms are ecologically important as food resources for other benthic invertebrates, both scavengers and predators, fish, birds and mammals. Benthic invertebrates in their adult life stages often are differentiated by their habitat.

Epifauna are motile invertebrates that live on specific substrates. The muddy and sandy bottom in open water areas and major channels is important habitat for large invertebrates, including the California bay shrimp, Dungeness crab, and rock crab. Most epifauna invertebrates are herbivores or predators.

Infauna are invertebrates that burrow or bore through mud or clay sediments. Examples are polycheate and oligocheate worms, most bivalves, some gastropods, and some crustaceans. Some infaunal species filter plankton from the water as food, whereas others prey on other infauna. Most live within a few centimeters of the substrate surface. Worms and clams form their own community structure beneath the bottom sediments, connected to the water by tubes and tunnels. Sessile species are permanently or semi-permanently attached to their substrates and include tubeworms, oysters, mussels and barnacles.

In addition to serving as a major food source for higher order predators, benthic organisms affect the physical and chemical condition of water and sediments. Filter feeders pump large volumes of water through their bodies and extract food from it. As they filter water for food, they also remove sediments and organic matter, cleaning the water. Since many chemical contaminants often are present in sediments, benthic fauna often are exposed to and can be harmed by these pollutants. Infaunal deposit feeders plow through the sediments in search of food. Many benthic animals bind sediments together as fecal pellets that remain at the bottom. Predators, such as crabs, scurry across the bottom searching for food. These activities stir the sediments, increasing the rate of exchange of materials into the water column. This mixing also increases diffusion of oxygen into the sediments.

6.1.2 Regional Overview

A significant decrease in native benthic invertebrate fauna in San Francisco Bay has been documented over the last several decades (URS 2001). This decline has resulted primarily from habitat loss and the introduction of invasive non-native species that either compete with or feed on the native benthic invertebrates. It is estimated that 40%-100% of the benthic invertebrate fauna in any area of the Bay are non-native species (Carlton 1979, URS 2001). Asian clam, green crab (*Carcinus maenas*), and Chinese mitten crab (*Eriocheir sinensis*) are invasive non-native species of particular ecological concern that have become well established in the bay. Along the intertidal mudflats and beaches, a variety of mites, springtails, flies, and beetles scavenge among flotsam along beach and estuary margins. Tiger beetles, many carabid beetles, and various fly species are active predators on these scavenging insects. Tiger beetle is a common insect predator, particularly on mudflats, tidal channel edges, and salt pans.

Some crab species are amphibious, and scavenge or prey on other invertebrates on the mudflats, vegetated wetland margins, or rocky shoreline areas during low tides. Invertebrate fauna important to the commercial fishery include *Cancer* crabs (primarily the Dungeness crab and rock crabs) and caridean shrimp. *Cancer* crabs and caridean shrimp are estuarine species that typically do not occur in deep water. Rock crabs and caridean shrimp support substantial fisheries in San Francisco Bay. Dungeness crabs in the bay mature at nearly twice the rate of those in populations outside the bay, probably as a result of higher water temperatures. Early planktonic larval stages (zoea) typically are limited to the central bay, but later planktonic larval stages (megalops) are found throughout the bay.

Sloughs – The composition of the benthic invertebrate communities inhabiting the five tributaries (Coyote Creek, Artesian Slough, Guadalupe Slough, Old Alameda Creek, Alameda Flood Control Channel, Mount Eden Creek, and Alviso Slough) into which pond water will be circulated is not well characterized. No benthic data could be found for any of the five tributaries in the project area. However, a 1997 City of Palo Alto study (Cressey 1997) does provide data that are probably relevant to the five tributaries of concern. In the Cressey study, benthic communities in San Francisquito Creek and the discharge channel from the Palo Alto Wastewater Treatment Plant were sampled and the collected specimens identified. These two tributaries will not be receiving circulated pond water, but since they are geographically close to the tributaries in question and have similar morphologies, it is likely that they will also have similar benthic communities. The results of this study indicate that benthic communities in the tributaries of concern are likely to be fairly simple, with the most abundant taxa being four species of annelids (*Neanthes succinea*, *Eteoni lighti*, *Tubificidae spp*, and *Heteromastus filiformis*), three species of arthropods (*Nippoleucon hinumensis*, *Corophium alienense*, and *Grandidierella japonica*), and two species of molluscs (*Macoma balthica* and *Potamocurbula ameurensis*). Interestingly, all of these species, except for *P. ameurensis,* were found at all stations in San Francisquito Creek and in the discharge channel, with salinities ranging from 1 to 27 ppt.

San Francisco Bay Proper – The composition of the benthic invertebrate community inhabiting the mudflats of South San Francisco Bay has been described by Nichols and Thompson (1985a & 1985b). Based on data from 1974-83, it appears that the communities in the vicinity of the Alviso Complex and the Baumberg Complex are probably very similar, with three species being "the overwhelming numerical dominants" – these are *Gemma gemma* (a mollusc), *Ampelisca abdita* (an arthropod), and *Streblospio benedictii* (an annelid). In addition, according to Nichols and Thompson (1985b), "although much less abundant, the mollusks *Macoma balthica*, *Mya arenaria*, and *Illyanassa obsoleta* often represent the bulk of benthic invertebrate biomass."

A more recent dataset was collected in 1994-96 as part of the Benthic Pilot Study of the San Francisco Estuary Regional Monitoring Program (RMP 1997). Based on these data, for estuarine muddy sediments, the most common and abundant species are *Potamocorbula amurensis*, *Ampelisca abdita, Nippoleucon hinumensis*, *Corophium heteroceratum*, *Corophium alienense*, *Grandiderella japonica*, *Balanus improvisus*, *Tubificidae sp.*, *Neanthes succinea*, and *Streblospio benedicti* . These data indicate that the species composition in the bay sediments in the vicinity of the Alviso and Baumberg complexes has remained fairly consistent over time, with the exception of the marked increase in the abundance of a recent invading species, *Potamocorbula amurensis*.

6.1.1.1 California Bay Shrimp

Bay shrimp (*Crangon franciscorum*) is a common invertebrate species in South S.F. Bay and its tributaries. At present, bay shrimp support the only commercial fishery in the South Bay and the juveniles of this species probably live in all of the sloughs into which saline pond water would be circulated during the ISP. Reportedly, these juveniles have specific salinity requirements which are currently being met in South Bay sloughs and creeks.

Bay shrimp use all of the sloughs into which saline pond water will be circulated during the ISP as rearing habitat. The use is seasonal, with most shrimp being absent during the months of March and April, when adults migrate to the ocean to spawn. Starting in May, juveniles migrate to the sloughs from the ocean and apparently seek out slough segments based on prevailing salinity profiles. As the shrimp grow and mature, they are found in those segments of the sloughs that contain higher salinity waters (i.e., closer to the bay). In January and February, when the shrimp are mostly adults, they leave the sloughs and begin their annual migration to their ocean spawning grounds.

In the South Bay and its tributaries, the salinity preference of bay shrimp is apparently associated with the age and, correspondingly, the size of the individuals. Juvenile bay shrimp (defined as individuals between 11 and 25 mm total length) are found in South Bay sloughs from May (when they first arrive from the ocean) through August (after which they are considered adults). CDFG data indicate that the juveniles are found in waters of between 3 and 19 ppt salinity, but seem to prefer a salinity range of 10 and 15 ppt (Baxter et al. 1999).

As the bay shrimp get older and larger, they are found in higher salinity waters (Baxter et al 1999, Kinnetic Labs 1987). In the months of September through February, the average size of the adult bay shrimp in the potential circulation areas consistently increases from 30 mm to almost 50 mm. In the main channel of the South Bay, bay shrimp in this size range are commonly found in waters with average salinities of between 17 and 27 ppt (depending upon year), and at maximum salinities as high as 32 ppt. In the sloughs, from September through December, the adult shrimp are found in waters of between 4 and 27 ppt, but seem to prefer a range of between 10-20 ppt.

6.1.3 Criteria for Determining Significance of Effects

Criteria based on the CEQA Guidelines and NEPA implementing guidelines were used to determine the significance of impacts to benthic organisms. Under NEPA, analysis of significance requires consideration of both the context and intensity of an impact. Consideration of context means the significance of an action must be analyzed within the appropriate ecological and temporal scale and intensity refers to the severity of the impact.

Potential impacts of the project on benthic organisms were characterized qualitatively and quantitatively by evaluating both the intensity and context of direct, indirect, temporary, and permanent impacts. Direct impacts may include, for example, construction activities or removal of habitat within the construction footprint. Indirect impacts include the loss or gain of a primary food source through a change in pond salinities. Temporary impacts have a short duration, and benthic populations would be expected to recover within a few months after implementation. An example would be habitat changes during the initial release of brines from the ponds. A permanent impact would involve the long-term alteration of habitat quality because the project would result in a change in habitat type. An example would be the permanent removal of a levee section, resulting in the conversion of diked salt pond to tidal marsh.

The project would have a significant impact on benthic populations if it would:

- Have the potential to substantially reduce habitat, cause a population to drop below self-sustaining levels, or threaten to eliminate a community
- Conflict with the provisions of an approved local, regional or State policy or ordinance protecting biological resources
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or State Habitat Conservation Plan

The term "substantial" (applied to populations, habitat, or range), has not been quantitatively defined in CEQA or NEPA. What is considered substantial varies with each species and with the particular circumstances pertinent to a particular geographic area. Water salinity is the primary determinant of the significance of impacts to benthic organisms. Therefore, for the purposes of this analysis, significance thresholds for benthic organisms are based on short- and long-term impacts to the salinity of receiving waters under the Initial Release Period and Continuous Circulation Period of the ISP.

6.1.4 Impacts and Mitigation Measures

This section addresses impacts to benthic populations within the project area. The section also presents proposed mitigation for impacts that are significant or potentially significant.

The project will have the potential to impact benthic populations through impacts to water quality, substrate, continuity, and habitat area and type. In general, the following types of project impacts are considered in this section:

- Impacts to benthic populations related to increased salinity
- Impacts to benthic populations related to other water quality changes
- Impacts to benthic populations related to introduction of non-native opportunistic organisms

The No Action/No Project Alternative would not include pond discharges to the receiving waters, but may result in potential impacts to benthic populations from salinity and water quality changes in receiving waters following uncontrolled breaches pond levees. In addition, all invertebrate populations within the ponds would be greatly affected.

Alternative 1 (Seasonal Ponds) would have a minimum of potential impacts to benthic populations in the receiving waters, although substantial impacts would occur to populations within the ponds themselves. The alternative would not include pond discharges and would include levee maintenance comparable to existing conditions.

Alternatives 2 and 3 would include a combination of continuous circulation systems, seasonal ponds, and batch ponds. Pond discharges may include temporary salinity and water quality impacts in limited areas near the discharge locations. Pond management techniques and water quality monitoring, as proposed, would reduce these impacts to less than significant.

Alternatives 2 and 3 include the option to breach the Island Ponds, which would be expected to provide access to habitat for a variety of benthic species. Increasing habitat access by levee breaching and re-establishing tidal exchange with the South Bay is identified as a beneficial impact of the project on benthic communities under all three alternatives.

Implementation of the project will potentially cause the following changes in environmental conditions relevant to the benthic community:

- Increases in salinity
- Increases in heavy metal exposure
- Changes in availability of oxygen
- Changes in water temperature

Additionally, the project may have indirect impacts to benthic communities by allowing non-native opportunistic species to become established. The types of anticipated project impacts are discussed generally first and then in relationship to each of the proposed project alternatives below. Additional information on the effects of the project on water salinity, heavy metals, dissolved oxygen (DO), and temperature is provided in Chapter 4, Water Quality.

6.1.4.1 Overview of Impacts to Benthic Organisms Related to Increases in Salinity

When salinities increase above the normal range experienced at a site in an estuarine system, resident aquatic organisms can be adversely impacted (Hopkins 1973). The adverse impacts could range from altered physiological functions (e.g., metabolism, reproduction, growth) to acute lethality. Both ends of this spectrum could result in altered community structure and/or function.

Aquatic organisms that occur in the South Bay and associated creeks and soughs are estuarine species that are currently subject to daily and seasonal changes in salinity levels. Estuarine species must be able to tolerate environmental changes (e.g., benthic species) or must be able to move to more optimal conditions (e.g., planktonic species). Because of the dynamic nature of their surrounding environment, estuarine benthic species must be able to react to fresh water and saltwater. Most estuarine species are capable of surviving a wide salinity range.

Mobile organisms exposed to conditions less than optimal may move to areas with more suitable salinity. Sessile or benthic organisms or passive swimmers are not able to move away from unsuitable conditions, and so they are much more tolerant of variable conditions. Sessile or benthic organisms, such as clams, typically will close their shells or burrow into the mud until conditions improve, or until they acclimate to the new conditions. The sessile and benthic communities in the project area are adapted to periods of high salinity, particularly during the summer months.

It is not possible to determine a valid single threshold salinity value that would protect all the potentially exposed organisms. The variety of resident species, lack of scientific data on individual salinity tolerances at all life stages for most of the South Bay fauna makes such a task extremely difficult. Additionally, 51% of the benthic species that occur in South Bay are introduced; this adds additional uncertainties as these introduced species are opportunistic and may have wider tolerances than the literature indicates for surrogate species. Little if any data is available on the tolerance of the interstitial fauna or those micro-benthic organisms living at the water-substrate interface. We do know that wide changes in biological communities occur in the bay during drought conditions and extended times of higher salinity during the continuous circulation period could result in similar water quality conditions.

Based upon the literature reviewed there are two potential salinity threshold ranges:

1. The upper tolerance range that if exceeded causes the organism to die (acute level).
2. A salinity range that does not cause death but adversely affects metabolism, reproduction, larval survival, and other physiological functions. This chronic level could lead to the eventual decrease in the population vitality and possibly the collapse of the population if conditions were maintained over a long period of time.

Within these possible threshold range guidelines, a discussion of salinity threshold ranges can be attempted. Under normal salinity conditions in the summer, levels reach 28-30 ppt. During drought conditions in South Bay, salinities are rarely over 35 ppt. (Table 1). Even at this level, large changes in the biota are seen during long term drought conditions. Two multi-year studies have shown that, in addition to within-year periodicity, major restructuring of the benthic community can occur as a result of anomalous (usually climate-related) perturbations of the benthic habitat (salinity-temperature-dissolved oxygen concentrations). For example, during wet years, freshwater-intolerant species (*Mya arenaria, Corophium acherusicum, Ampilisca abdita* and *Streblospio benedicti*) disappear from the upper part of the estuary (Carquinez Strait) and from shallow areas of the bay. During a two-year drought these same species colonized the extreme upper end of the estuary (Suisun Bay) in large numbers (Nichols &Thompson, 1985). During the 1976-77 drought the effects of increased salinity levels greatly reduced phytoplankton blooms in San Francisco Bay. Organisms living in an estuarine system are usually tolerant of some variation in salinity, but typically have a preferred range. Large salinity changes over a wide area could adversely alter the distributions of organisms in the San Francisco Bay (Davis, 1982).

Table 6-1
Salinity Levels During Drought Conditions-Three South Bay Sloughs

	Newark	Mowry	Faber Tract
Month	Salinity high (ppt)	Salinity High (ppt)	Salinity High (ppt)
August	33	28	31
September	33	29	31
October	34	32	32
November	35	35	31

Data collected in 1977 over a single tidal cycle (Smith, 1978)

Data from the San Jose/Santa Clara WPCP (2002) studies in the Coyote Creek and Alviso Slough areas provide information on recent salinity levels. The area of study is influenced by the discharge of fresh water from the waste treatment plant that discharges into Artesian Slough. Based upon results from continuously recording stations, surface water salinities decreased during falling and low tides and increased on rising and high tides. These results indicate that the creek system is stratified in that fresh water, from all local sources, flows out across the more saline bay water during the falling and low tides. Conversely, during rising or high tides, fresh water flows are impounded upstream or are mixed with more saline tidal waters. The results that are presented in Table 6-2 were selected to show the higher range of salinities measured during the incoming tidal cycle in the summer months from selected stations.

Table 6-2
Maximum Salinity from South Bay (San Jose/Santa Clara WPCP Study)

Date	Coyote Creek (fixed)	Date	Coyote Creek (floating)	Date/time	Alviso Slough
6/3/00	22.9	7/2/01	20.75	9/1/99-16:30	23.92
7/2/00	18.4	7/5/01	20.83	9/1/99- 17:00	24.47
7/31/00	19.4	7/20/01	21.59	9/1/99- 17:50	24.46

1. Coyote Creek near RR Bridge
2. Fixed = recording by fixed instrument
3. Floating = recording by floating instrument
4. Alviso Slough data taken on a single date.

These salinity levels are below those taken by USGS at stations in Coyote Creek during 2002. These differences could reflect station location (further away from freshwater inflow), seasonal differences and methods of measurement. Salinity levels measured by USGS during the same 2002 cruise at stations outside the direct influence from the waste discharge (Coyote Hills, Ravenswood Point) reached 30 ppt in August, September and October. These levels most likely reflect the salinity of the more open water and perhaps sloughs in South Bay that are not influenced by the fresh water coming from treatment plants.

At salinity levels to 34 ppt, the response of the South Bay biota might resemble that seen during a long-term drought period. At salinity levels to 36 or 38 ppt, conditions are likely to exceed the acute levels for many species. For example, sea urchin embryos showed developmental problems at 36.5 ppt and did not survive salinity above 38.5 ppt (SCCWRP, 1993). While there are no echinoderms in the South Bay fauna, the sea urchin embryo bioassay test is used for testing sewage discharges under NPDES permits within the bay. In this range other species, which do occur in South Bay, reach their upper tolerance range (e.g., *Mytilus galloprovincalis* at 38 ppt (Mars, 1950). There are other species where the upper tolerance was between 40 and 45 ppt (Pierce, 1970).

Table 6-3 summarizes the types of potential benthic species effects which may occur with increased salinities. The ambient and drought classes represent minimal effects. Stages 1 through 4 represent increasing salinity classes and increasing potential species effects. These classes and estimated salinity ranges are approximate and species impacts can be affected by local salinity conditions and species aclimatization to local conditions.

Table 6-3
Summary of Potential Salinity Response Characteristics (Summer Conditions)

Class	Salinity Range (ppt)	Potential Response
Ambient	<33	Benthic species population may vary depending upon species salinity preferences.
Drought	33-35	Chronic exposure: benthic community changes to salinity tolerant species similar to drought years, effects quickly reversed with normal salinity regime. Acute exposure: less of a shift is species composition. In either case, impacts less than significant
Salinity ranges above those encountered in South Bay		
Stage 1	36-38	Chronic exposure: benthic community may lose most sensitive species, impacts considered potentially significant. Acute exposure: less impact on community, impacts considered less than significant.
Stage 2	39-41	Chronic exposure: benthic community may lose larger number of species, impacts considered significant. Acute exposure: less impact on community, impacts considered potentially significant.
Stage 3	41-45	Chronic exposure: community may be limited to most salinity tolerant species, impacts considered significant. Acute exposure: less impact on community but still lose of large number of species, impacts considered significant.
Stage 4	>45	For both chronic and acute exposures, community would be severely reduced. In either case, impacts considered significant.
NOTE: Response criteria based on scant scientific data for local species and therefore must be considered speculative.		

These levels are based on some species that do not occur in the bay, and there is limited data on the salinity tolerances of the native opportunistic species that may be responsive to higher salinity levels. In addition, it is not known whether an artificial drought salinity condition due to the initial release during normally less saline periods of the spring may affect reproductive cycles of any of the bay biota.

At increased salinity levels above the 30 ppt level, the likelihood that more species will be adversely affected would increase with increasing salinity. At salinities above the 40 ppt range the impacts would be widespread. These response levels are based on the assumption that the salinity discharge concentrations would be immediate (no period of acclimation for the fauna). The response levels indicated in Table 6-3 are based mostly on adult forms exposed to ambient temperature levels.

Conversely, benthic surveys within the salt ponds (Lonzarich, 1989) also provide valuable insights as to the sensitivities of benthic invertebrate species inhabiting the receiving waters. Lonzarich found one annelid species (*Polydora ligni*) and four crustacean species (*Artemia salina, Balanus sp., Copepoda sp., and Corophium sp*.) which could tolerate salinities from 22 to 84 ppt. Several other species were not found in the highest salinity ponds, but were observed in ponds that seasonally reached 40 ppt. These included three mollusk species (*Gemma gemma*, *Ilyanassa obsoletus*, and *Tryonia imitator*), two annelid species (*Neries succinea* and *Tubificoides sp*.), and 6 crustacean species (*Anisogammarus confervicolus*, *Crangon spp*., *Hemigrapsus oregonensis*, *Ostracoda sp*., *Palaemon macrodactylus*, and *Sphaeroma quoyana*). Comparison of these Lonzarich results with the invertebrate species expected to be found in the waters into which the salt ponds will be circulated indicates that several members of the benthic invertebrate community-at-risk can tolerate significantly elevated salinities. Two of the crustacean species common to the discharge areas (*Balanus sp*. And *Corophium sp*.) were observed to tolerate salinities as high as 84 ppt. In addition, one common annelid species (*Tubificoides sp*.) and two common mollusk species (*Gemma gemma* and *Ilyanassa obsoletus*) were observed to tolerate salinities as high as 40 ppt.

In addition, two salt pond releases have occurred in Napa at ponds 2a and 3. These ponds were uncontrolled breaches with extended periods of releases at 50 and over 60 ppt into South Slough. Because the breaches were not planned, there has been limited monitoring data available for these discharges. However, limit observational data has not identified extensive losses of benthic invertebrates or other common species.

During the ISP (Alternatives 2 and 3), the salinity of the discharges from the Alviso Unit, Baumberg Unit, and West Bay Unit ponds will generally be greater than the salinity of the receiving waters. The greatest differences in salinity between discharge and receiving water will occur during the Initial Release Period, when the highest salinity waters (estimated to be up to 135 ppt) will be pushed out of the ponds. There will be variation between discharge points, but, in general, the discharge of the higher salinity waters will last for between 1 and 2 months, with the salinity of the discharge decreasing over time. After this Initial Release Period, bay water will be continuously circulated through the ponds so that pond salinities are maintained at levels suitable for future restoration. During the Continuous Circulation Period, the discharge salinities may be as high as 44 ppt. However, under most scenarios, the actual discharge salinities during this Continuous Circulation Period will be considerably less than 44 ppt.

The significance of impacts to each of the receiving waters in the project area was determined by examining the percentage of receiving waters predicted to fall into several salinity classes, or stages, during the IRP. Each stage represents a salinity range that is expected to correspond with a different benthic response. Predictions of benthic responses to different levels of salinity were based on an extensive review of the available literature as described above. The salinity ranges in these stages are intended as a qualitative tool to categorize possible impacts to aquatic communities. It is not known how each species or aquatic community may respond to a particular salinity range; only that the potential for impacts would increase with higher stages. In addition, the potential for impacts would increase with longer durations of exposure (e.g., the same elevated salinity range experienced for 2 hours would be expected to produce a significantly smaller effect than if the exposure were for 24 hours).

The intensity of the impact is characterized by the duration of the exposure and the stages, or salinity range, of the impact.

- For a chronic exposure, a water body that would receive a Stage 1 impact (some acreage of that water body would have salinities in the Stage 1, or 36 to 38 ppt range) would be considered to have a potentially significant impact. A water body that would receive Stage 2 to 4 impacts (salinities greater than 39 ppt) would be considered to have a significant impact. Impacts to water bodies that are predicted to have salinities of 35 ppt or less (Ambient or Drought Conditions) would be considered to be not significant or less than significant. In terms of intensity, any Stage 1 impact (between 36 to 38 ppt) would be potentially significant.
- For an acute exposure, a water body that would receive a Stage 1 impact (some acreage of that water body would have salinities in the Stage 1, or 36 to 38 ppt range) would be considered to have a no significant impact. A water body that would receive Stage 2 (salinities in the 39-41 ppt range) would be considered to have a potentially significant impact. A water body that would receive Stage 3 to 4 impacts (salinities greater than 41 ppt) would be considered to have a significant impact. Impacts to water bodies that are predicted to have salinities of 38 ppt or less (Ambient, Drought, or Stage 1 Conditions) would be considered to be not significant or less than significant. In terms of intensity any Stage 2 impact (between 39 to 41 ppt) would be potentially significant.

6.1.4.2 Overview of Impacts to Benthic Organisms Related to Increases in Heavy Metal Exposure

Based upon the evaluation of the potential discharge levels of nickel and mercury during initial release under the maximum salinity scenarios, the levels of nickel and mercury in the discharge would likely be above the water quality objectives (WQOs) for the South Bay. WQOs are regulatory thresholds that are based upon long-term response criteria (i.e., bioassay data, behavioral response) with appropriate safety factors to assure adequate protection for sensitive species not tested (see Chapter 4, Water Quality). Thus, these criteria cannot be used to predict effects, but rather to indicate a level of additional risk should they be exceeded.

The higher levels of nickel and mercury are associated with increased salinity discharged from the ponds. Salinity by itself does not seem to increase the toxicity of metals (Klapow et al. 1979) and in the case of chromium; increased salinity levels may actually reduce the toxicity (Sprague, 1985). However, if increased salinity levels stress the existing biota, particularly where salinity levels approach biotic tolerance levels, concentrations of metal may have cumulative adverse effects. If the discharge of the project ponds were to coincide with the infaunal invertebrate reproductive stages or recently settled larvae in the sloughs, impacts could occur. Fish and epibenthic species would most likely move out of the areas with toxic levels of metals, and would therefore not be exposed.

Even low levels of metals can be very toxic to aquatic organisms at early developmental stages. There are also other pathways by which metals in the South Bay could contribute to chronic effects in benthic and other aquatic organisms. In 1994, a spring phytoplankton bloom in South San Francisco Bay caused substantial reductions in concentrations of dissolved cadmium, nickel, and zinc (Luoma, et al. 1998). The phytoplankton bloom reduced the nickel levels by 75%. Luoma et al. (1998) estimated that about 60% of the dissolved cadmium, nickel, and zinc from South Bay treatment plants are cycled through the phytoplankton. Part of this dissolved metals load is then moved into the food chain and can be taken up by plankton-feeding fish and invertebrates out of the water column or collected by infauna at the water-substrate interface.

We know that South Bay organisms do bioaccumulate metals as shown by studies of the clam *Macoma baltica* from the mudflats in Palo Alto (Primo et al. 2001). Data for nickel and mercury were evaluated from 1994-2001 and it was noted that nickel and mercury levels decreased during this time, with tissues concentrations of 6 μg/g for nickel and 0.35 μg/g for mercury Kinnetic Lab (1983) noted that South Bay shrimp averaged 35% higher in Mercury when compared to reference samples taken from North Bay. The levels that exceed the criteria are artifacts of the solar evaporation process and the potential discharge concentrations may not be above other historic or current sources in San Francisco Bay. What role the possible discharge of nickel and mercury from the ponds would play in this bioaccumulation cycle is unclear, but the potential for impacts should not be ruled out.

Exposure of benthic organisms in early developmental stages to mercury poses the biggest potential pathway for impacts from the pond discharges. If the discharges are initiated in April (as proposed under Alternative 2), some species may still be undergoing early developmental stages in some of the sloughs. Discharges later in the summer (as proposed for some ponds under Alternative 3) would be less likely to cause cumulative metal effects because most eggs and larvae have already hatched and settled.

6.1.4.3 Overview of Impacts to Benthic Organisms Related to Changes in Available Oxygen

The distribution of oxygen differs from parameters such as salinity and temperature in that it is biologically active: it is closely associated with changes in carbon and plant-nutrient concentrations (Conomos et al, 1979). Dissolved oxygen (DO) is influenced by a variety of important processes:

- Exchange of oxygen across the water surface through atmospheric invasion (gain) and out-gassing (loss)
- Photosynthesis
- Respiration by plants and animals, decomposition of organic matter by bacteria and chemical oxidation
- Advection and diffusion

It is important to remember that DO levels also interact with salinity and temperature. The amounts of oxygen or carbon dioxide present in water are proportional to the partial pressures exerted by these two gases. The solubility of oxygen and carbon dioxide and consequently the absolute amount held in solution decrease with increasing salinity (Kinne, 1964).

Hansen (2003e) presented a detailed report on estimates of the composition (percentages of bay water, upstream slough water, and each type of discharged pond water) that would be found in selected slough and bay segment under existing (no circulation) and IRP conditions. Analytical tests were conducted to determine biological oxygen demand (BOD) on each of the mixtures to estimate their oxygen demand. Predictions were presented on whether any observed changes in oxygen demand would result in adverse conditions to aquatic life. Based upon this data, the author determined that the discharge from the ponds would not affect the DO in the receiving water. See Section 4.3.1.3 for additional discussion of this study.

Studies in Mowry Slough, Newark Slough and Faber Tract Marsh (Smith, 1978) indicated that the DO could reach levels of 3.5 ppm during time of tidal change. The data also indicated that vertical stratification of DO occurred in Newark Slough during August of 1977. It was evident that there was a separate DO and salinity regime occurring in each of the three marsh areas studied. As part of the study, benthal demand analysis (oxygen uptake), which is a measure of the oxygen uptake by biological communities and chemicals in the substrate, was conducted. Based on laboratory results, the chemical and biological demand could at times reduce the DO levels to below 1 ppm within the interstitial waters below the water-substrate interface. While the preliminary information strongly indicates that DO will not be a problem during the discharge from the ponds, it is conceivable that if high density water remains in contact with the water-substrate interface, DO levels could be depressed for a longer time than normally encountered during a tide cycle. If temperatures are elevated along with increased salinity levels the DO could become depressed.

6.1.4.4 Overview of Impacts to Benthic Organisms Related to Changes in Temperature

Similar to their responses to changes in salinity, benthic organisms respond to changes in water temperature through a number of physiological, behavioral, and ecological mechanisms that affect survival, growth, migration, and reproduction. In addition, temperature can influence how well benthic fauna tolerate changes in salinity, and their possible responses to combined changes in salinity and temperature range widely.

In San Francisco Bay, water temperature varies more widely than salinity. Bay temperatures are influenced by several factors, including local weather conditions and local discharge of waste heat, as well as by rivers and the ocean (Conomos, 1979). In the summer, salinity levels in the South Bay match that of the ocean, but water temperatures increase by 4-5°C as a result of solar heating in shallow water. This warming is enhanced by the long residence time of water in the South Bay, and is especially evident during dry summers, when a warm-water lens forms and is maintained at the water surface despite vertical mixing (Conomos, 1979).

Available data indicate that only during the summer months is the temperature of discharged pond water likely to impact benthic fauna in receiving waters. In the months of March and May, pond temperatures were similar to those of potential receiving waters. In the summer months of June and July, pond temperatures were a maximum of 4.6°C higher than temperatures of receiving waters, although at most locations temperatures were similar to receiving waters. Temperature data for receiving waters are not available for the months of August and September. However, pond temperatures did not increase further in August and September, suggesting that significant differences in temperature between pond water and receiving waters may not occur during these months.

6.1.4.5 Resilience of Benthic Communities and Impacts Related to Non-native Opportunistic Species

Over a 10-year period (1974-83), Nichols and Thompson (1985) studied benthic invertebrate communities in South San Francisco Bay mudflats. These communities are probably very similar to those found in many of the bay and slough segments which will receive salt pond discharges during the ISP. Nichols and Thompson report that these communities are very persistent over time because many of the member species can respond quickly to major changes in salinity and other perturbations. During these perturbations, local populations of some of the resident species may greatly diminish in numbers or even disappear. However, when favorable conditions return, these species often become re-established within a matter of months. According to Nichols and Thompson, the key to this rapid recovery are the "opportunistic life history strategies (rapid maturity, brooding of young, multiple generations each year, ease of local dispersal of both juveniles and adults) that permit continued colonization of the mudflat surface or rapid re-colonization after disturbances".

A second study by Hopkins (1987), reported similar findings for four intertidal sites in San Francisco Bay. Two of these sites, near Palo Alto and near Hayward, are in the general area of the proposed Alviso and Baumberg Complex discharges and would be expected to have similar benthic invertebrate community structure. Over a two year period, the benthic invertebrate community structure varied considerably at each of these sites due to changes in salinity resulting from changing rainfall patterns. The fall of 1982 to the spring of 1983 was an unusually wet period and many of the species that are commonly found in the study areas were lost from the benthic communities. However, during the following year, rainfall was back to normal and many of the "lost" species were re-established.

Other corroborating information on the ability of estuarine species to rapidly become re-established can be found in the literature on the colonization of constructed salt wetlands. This process is clearly a worst-case example because, when initially constructed, the ecosystem in these wetlands is starting from scratch. Not only are there no estuarine animals or plants present, but the physical habitat is still being modified. In a paper by Levins et al. (1996), it is reported that one month after the creation of a salt marsh, there is early colonization of benthic invertebrates and after six months, the macrofaunal densities and species richness of sediments resemble those of natural marshes. Similarly, Simenstad and Thom (1996) report that in created wetlands, fishes immediately occupied the intertidal habitat, with the number of species present during the first year being fairly equivalent to later years.

Other information which demonstrates the ability of natural benthic invertebrate communities to recover from major perturbations includes the accidental spill of metam sodium, a toxic soil sterilant, into the Upper Sacramento River at the Cantara Loop in July 1991. According to a Department of Water Resources report (DWR 1997), immediately after this accident, the benthic invertebrate community was totally eliminated for a 26-mile stretch downstream of the Cantara Loop. However, within 30 days, colonization of the entire impacted area was significantly underway and within 4 months, the diversity found at the impacted sites was similar to that found at the upstream control area. Within one year, most metrics of benthic community health indicated recovery at the downstream sites.

It is important to take into consideration the presence of non-native opportunistic species and their potential impact on post-project recruitment time, succession and benthic community structure. Over 50% of the species now present in the receiving waters are introduced and are most likely very opportunistic. These species can become established after disturbance and hinder the re-establishment of functioning benthic communities.

An example of community disruption is presented by the invasion of San Francisco Bay by the Asian clam *Potamocorbula amurensis*. During years of normal or high river inflow, the resident community in the North Bay consisted of a few brackish or freshwater species (Nichols et al. 1990). During prolonged periods of low river inflow, the number of species doubled as estuarine species (e.g. *Mya arenaria*) migrated up the estuary. In June 1987, at the beginning of the longest dry period in recent decades, large numbers (>12,000 per m^2) of juvenile *P. amurensis* were discovered at the Suisun Bay site (Nichols et al. 1990). By mid-summer 1988, the new clam predominated (>95%) in both total number of individuals and biomass, and the expected dry-period estuarine species did not become re-established.

A second example of community disruption by the introduction of non-native species can be found in the South Bay where *Macoma balthica,* a native species of clam, is abundant only when, during its periods of larval settlement, *Ampelisca abdita* (non-native species) is very low in abundance or absent. This finding suggests that *Macoma* abundance is controlled locally by the presence of a large population of *A. abdita.*

6.1.4.6 No-Project/No Action

Under the No Action alternative the ponds would dry through the evaporation process in summer and then fill seasonally with rainwater in winter. No action would be conducted by the agencies, including levee maintenance, and some levees would likely fail during this period.

> *BENTHIC IMPACT-1* If levee failure occurs, existing benthic communities located near the breach will be impacted.

The No-Project/No Action Alternative would result in both direct and indirect impacts to the benthic community along the outboard of pond levees and adjacent sloughs and creeks in the event of a levee failure. In addition, benthic communities within the ponds would be severely impacted by the lack of sustained water levels in the ponds. Levee failure would result in the release of pond contents, and may expose benthic communities to high salinity water. Levee failure would restore tidal action and may cause localized scouring and/or deposition of the bottom substrate which would remove and/or smother benthic communities. Once conditions have stabilized, the restored tidal action would decrease pond water salinity within the pond area and create conditions appropriate for the re-establishment and colonization of estuarine benthic communities (a potential beneficial impact).

Significance: Potentially Significant

6.1.4.7 Alternative 1 – Seasonal Ponds.

In Alternative 1, the ponds would dry through the evaporation process in summer and then fill seasonally with rainwater in winter. The only action taken by the agencies would be to maintain the levees at their current standard of maintenance (i.e., salt pond maintenance, not for flood control).

Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds. Thus, under this alternative, Benthic Impact-1 would not apply.

Under this alternative, most of the existing open water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The existing intake structures for each pond complex would be closed. Intake ponds would no longer be present, so the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

Alternative 1 would have minimal impacts to receiving waters, but existing, in-pond habitat value would decline as a result of changing the existing open-water ponds to seasonal ponds. In addition, this alternative would not meet project objectives of maintaining existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species or maintaining ponds in a restorable condition to facilitate future long-term restoration.

6.1.4.8 Alternative 2- Simultaneous March/April Discharge

Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds. Thus, under this alternative, Benthic Impact-1 would not apply.

In Alternative 2, the contents of most of the Alviso and Baumberg Ponds would be released simultaneously in March and April. The ponds would then be managed as a mix of continuous circulation ponds, seasonal ponds and batch ponds, though management of some ponds could be altered through adaptive management during the continuous circulation period. Higher salinity ponds in Alviso and in the West Bay would be discharged in March and April in a later year when salinities in the ponds have been reduced to appropriate levels. The Island Ponds (A-19, 20, and 21) would be breached and open to tidal waters.

> *BENTHIC IMPACT-2:* The project would cause a reduction in aquatic habitat suitability because of deterioration of water quality

Initial release of the existing pond contents as part of project operations would result in the discharge of moderately to highly saline water that could lead to a deterioration of water quality and a reduction in aquatic habitat. There are no quantitative standards established for salinity discharges, but the San Francisco Bay RWQCB has a narrative standard that states that the allowable increase in salinity cannot adversely affect beneficial uses such as aquatic habitat. The specific water quality effects are described in Chapter 4, “Water Quality.”

Additionally, bay shrimp use the sloughs into which saline pond water will be circulated during the ISP as rearing habitat. The use is seasonal, with most shrimp being absent during the months of March and April. This two-month period encompasses the time when the adults leave the South Bay to spawn in the ocean. In May, the young-of-the-year return to the sloughs to grow and mature until February when their annual migration to the ocean once again begins. In order to minimize any potential impacts to bay shrimp, this window of low abundance (March and April) would be an ideal time to initiate the circulation of saline water from the ponds. The discharged pond water will have the highest salinities at the beginning of the ISP and an opportunity to eliminate those more saline waters when the majority of the shrimp are absent would be advantageous.

Under Alternative 2, the initial release from the ponds is scheduled to begin in March/April when ambient salinities are low, and to coincide with the time of the year when the densities of bay shrimp are at their lowest in the receiving waters and, therefore, to minimize potential impacts. If initial pond salinities are at their proposed maximum levels, temporary local decreases in preferred shrimp habitat are predicted for a few months following the commencement of initial discharge. The major change will be a shift of the most preferred salinities (for bay shrimp) to locations further upstream in the sloughs in question.

Under proposed maximum salinities and the Alternative 2 discharge scenario, there is no predicted reduction in the amount of adult preferred habitat area in any of the four sloughs studied. In addition, for two of the sloughs (the Alameda Flood Control Channel and Guadalupe Slough) there is no predicted reduction in the amount of juvenile preferred habitat either. On the other hand, for Alviso Slough and Coyote Creek, discharges under these conditions are predicted to reduce the amount of preferred juvenile habitat, but the lost area will still retain some value to the juvenile shrimp.

In summary, this evaluation indicates that, with regard to bay shrimp habitat, the major change that the circulation of saline pond water will produce during the ISP is a shift of the preferred salinities to locations further upstream in the sloughs in question. If the discharges are at proposed maximum salinities (with the initial release beginning in either April or July), there is a predicted decrease in juvenile preferred habitat in Alviso Slough and Guadalupe Slough during the Initial Release Period, but adult preferred habitat is not expected to be affected. After the initial release from the ponds has been completed, it is anticipated that juvenile and adult shrimp habitat in the sloughs will not be significantly impacted by the planned continuous circulation of relatively low salinity pond water.

Refer to Chapter 4 (Water Quality) for a complete discussion of impacts to water quality affecting habitat values for aquatic organisms. Since significance thresholds for salinity impacts to water quality are based on impacts to benthic organisms, potentially significant and significant salinity impacts to water quality are, by definition, also potentially significant and significant impacts to benthic organisms. In Chapter 4, short-term and long-term salinity impacts to water quality are addressed separately for each of the receiving water bodies. Other constituents could also affect the receiving waters and be toxic to aquatic organisms, degrading habitat and affecting populations. Water quality impacts from other constituents are also discussed in detail in Chapter 4.

As discussed in Chapter 4 (see Section 4.3), the following significant short-term water quality impacts may affect benthic organisms:

- Short-term impacts to aquatic habitat are anticipated from elevated salinities in the following receiving water bodies:
- Alameda Flood Control Channel (Baumberg Complex)— See Water Quality (Salinity) Impact-7 for a complete discussion.
- Old Alameda Creek (Baumberg Complex)— See Water Quality [Salinity] Impact-8 for a complete discussion.

- Under some circumstances, total mercury in discharged water and receiving water will exceed total mercury WQOs and may have short-term impacts on water quality—See Water Quality (Metals) Impact-3 for a complete discussion.
- Increased algal activity in ponds leads may lead to decreased dissolved oxygen in receiving waters—See Water Quality (DO) Impact-1 for a complete discussion.
- Discharge of pond water at temperatures more than 5 degrees Fahrenheit above the temperature of the receiving water may adversely affect water quality and biota in adjacent waterways—See Water Quality (Temperature) Impact-2 for a complete discussion.

Significance: Short-term impact—Significant

Long-term impact—Less than Significant

Implementation of mitigation measures proposed in Chapter 4 (Water Quality), in combination with Benthic Mitigation Measure-1 below, would reduce this impact to less-than-significant level. Relevant mitigation measures in Chapter 4 are as follows (see Section 4.3 for details):

- WQ-Salinity Mitigation Measure 1A
- WQ- Salinity Mitigation Measure 1B
- WQ-Metals Mitigation Measure 1A
- WQ- Metals Mitigation Measure 1B
- WQ-DO Mitigation Measure 1A
- WQ- DO Mitigation Measure 1B
- WQ-Temperature Mitigation Measure 1A
- WQ- Temperature Mitigation Measure 1B
- WQ-pH Mitigation Measure 1A
- WQ- pH Mitigation Measure 1B

Benthic Mitigation Measure-1: Assess and maintain salinity and other water quality parameters at levels protective of aquatic resources.

The data developed through WQ-Salinity Mitigation Measure 1A will be assessed relative to the salinity and other water quality requirements of benthic communities. If the assessment of water quality, based on analysis of monitoring data, indicates a potential measurable effect on population abundance, measures could be implemented to minimize the water quality effects. The measures may include change in discharge magnitude, timing, and duration. The data would support real time operations that could minimize effects to all life stages.

Post Mitigation Significance: Less Than Significant

6.1.4.9 Alternative 3 Phased Initial Discharge

In Alternative 3, many of the lower salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

In general, impacts to benthic organisms under Alternative 3 are essentially the same as those for Alternative 2. The potential impacts from mercury bioaccumulation by early life stages of benthic organisms may be less under Alternative 3 than under Alternative 2. Most eggs and larvae have already hatched and settled by July. During the initial release period, Alternative 3 does have a greater short-term impact on juvenile Bay Shrimp habitat. Mitigation proposed for Alternative 3 is identical to mitigation proposed for Alternative 2 and would reduce all identified impacts to a less than significant level. A list of impacts and proposed mitigation for Alternative 3 is provided below.

> *BENTHIC IMPACT-2:* The project would cause a reduction in aquatic habitat suitability because of deterioration of water quality

As discussed in Chapter 4 (see Section 4.3.1.3), the following significant short-term water quality impacts may affect benthic organisms under Alternative 3:

- Short-term impacts to aquatic habitat are anticipated from elevated salinities in the following receiving water bodies:
- Guadalupe Slough (Alviso Complex)— See Water Quality (Salinity) Impact-6 for a complete discussion.
- Old Alameda Creek (Baumberg Complex)— See Water Quality [Salinity] Impact-8 for a complete discussion.
- Old Alameda Creek (Baumberg Complex)— See Water Quality [Salinity] Impact-8 for a complete discussion.
- Under some circumstances, total mercury in discharged water and receiving water will exceed total mercury WQOs and may have short-term impacts on water quality—See Water Quality (Metals) Impact-3 for a complete discussion.
- Increased algal activity in ponds leads may lead to decreased dissolved oxygen in receiving waters—See Water Quality (DO) Impact-1 for a complete discussion.
- Discharge of pond water at temperatures more than 5 degrees Fahrenheit above the temperature of the receiving water may adversely affect water quality and biota in adjacent waterways—See Water Quality (Temperature) Impact-2 for a complete discussion.

Significance: Short-term impact—Significant
Long-term impact—Less than Significant

Implementation of mitigation measures proposed in Chapter 4 (Water Quality), in combination with Benthic Mitigation Measure-1 below, would reduce this impact to less-than-significant level. Relevant mitigation measures in Chapter 4 are as follows (see Section 4.3 for details):

- WQ-Salinity Mitigation Measure 1A
- WQ- Salinity Mitigation Measure 1B
- WQ-Metals Mitigation Measure 1A
- WQ- Metals Mitigation Measure 1B
- WQ-DO Mitigation Measure 1A
- WQ- DO Mitigation Measure 1B
- WQ-Temperature Mitigation Measure 1A
- WQ- Temperature Mitigation Measure 1B
- WQ-pH Mitigation Measure 1A

- WQ- pH Mitigation Measure 1B

  Benthic Mitigation Measure-1: Assess and maintain salinity and other water quality parameters at levels protective of aquatic resources.

The data developed through WQ-Salinity Mitigation Measure 1A will be assessed relative to the salinity and other water quality requirements of benthic communities. If the assessment of water quality, based on analysis of monitoring data, indicates a potential measurable effect on population abundance, measures could be implemented to minimize the water quality effects. The measures may include change in discharge magnitude, timing, and duration. The data would support real time operations that could minimize effects to all life stages.

Post Mitigation Significance: Less Than Significant

6.2 BIOLOGICAL RESOURCES – VEGETATION AND WETLANDS

This section describes the biological communities known to occur within the salt ponds, levees, sloughs and creeks, and along the Bay shoreline within the project area and the effect that project implementation may have on these communities. The section also addresses impacts to special status plant species within the project area. Finally, the section addresses potential concerns of the project pertaining to invasive plant species.

Site-specific plant surveys were conducted only for those areas that will be directly impacted by the project (i.e., inlet and outlet locations). However, additional information specific to the project area or to the region was available from a number of sources, including reports prepared for the Goals Project 2000, the Spartina Control Program, Cargill operations and maintenance permits, the Eden Landing Ecological Reserve, San Francisco International Airport's proposed runway reconfiguration program, and the Napa River Salt Marsh Restoration Project. Additional information was available from databases, including the California Native Plant Society's Electronic Inventory of Rare and Endangered Vascular Plants of California, and CDFG's California Natural Diversity Database (CNDDB). These sources are cited below and full references are provided in Chapter 15.

6.2.1 Affected Environment

Regional Vegetation Characteristics

The San Francisco Bay Estuary supports the largest and most ecologically important expanses of tidal marshes and mudflats in the contiguous western United States. These vegetation communities are characterized for the project region below.

Tidal Marsh

Tidal marsh can be found along the Bay shoreline from MSL to extreme high water line. Tidal marsh is categorized by elevation as belonging to the low marsh zone, middle marsh zone, or high marsh zone. The low marsh zone occurs from mean sea level to mean high water (MHW). The middle marsh zone occurs from approximately MHW to mean higher high water (MHHW). The high marsh zone occurs near and above MHHW, up to the extreme high water line.

In the San Francisco Bay, native Pacific cordgrass generally dominates the low marsh zone, and along tidal creek banks and the edges of tidal mudflats. The middle marsh zone makes up an extensive portion of the San Francisco Bay. Younger marshes in this zone are characterized by vegetation dominated by pickleweed (*Salicornia virginica*) with some areas containing saltgrass (*Distichlis spicata*), salt marsh dodder (*Cuscuta salina*), alkali heath (*Frankenia salina*) and spearscale or fat hen (*Atriplex triangularis*). The high marsh zone commonly includes natives such as gumplant *(Grindelia stricta*) (often dominant in the zone), salt marsh dodder, pickleweed, alkali heath, sea lavender (*Limonium californicum*) and spearscale. Common non-native species in the high marsh zone include perennial pepperweed (*Lepidium latifolium*), bassia (*Bassia hyssopifolia*), saltwort (*Salsola soda*), wild beet (*Beta vulgaris*), annual iceplant (*Mesembryanthemum nodiflorum*), iceplant (*Corpobrotus edulis*), Australian saltbush (*Atriplex semibaccata*), ripgut brome (*Bromus diandrus*), sicklegrass (*Parapholis incurva*) and rabbit's-foot grass (*Polypogon monspeliensis*) (Goals Project, 1999).

The low marsh and middle marsh zones are increasingly being impacted by several invasive species of cordgrass, including an Atlantic species of invasive cordgrass (*Spartina alterniflora,* or smooth cordgrass). (See discussion of this and other invasive species in Section 6.2.5, below.)

Within each of the elevation zones in the Bay, tidal marsh communities can be categorized as salt marsh or brackish marsh, according to their salinities and the type of plant assemblages present. According to a long-term study that monitored tidal and soil characteristics affecting marsh vegetation, interstitial soil salinity is the greatest factor controlling marsh vegetation (H.T. Harvey and Associates, 2002). Salt marsh in the Bay is defined as having a water column salinity range from 20 to 32 ppt. Water in the soil pores (interstitial salinity) was found to have salinities ranging from 35-42 ppt in the South Bay salt marshes (H.T. Harvey and Associates, 2002). Dominant plant species include Pacific cordgrass in the low marsh, and common pickleweed and other halophytes at higher elevations. Brackish marsh occurs where freshwater inputs reduce salinity from15-20 ppt, and is dominated by alkali bulrush, cattails and California bulrush (H.T. Harvey and Associates, 2002; Goals Project, 2000). At salinity ranges between those defined as salt marsh or brackish marsh, species from both these habitats co-occur.

Tidal Mudflats

Below the low marsh zone are tidal flats, which occur from below MLLW to MLW and are defined as having less than 10% vascular plant cover other than eelgrass (Goals Project 2000). They include large areas of mudflats, expanses of barren mud that are uncovered during low tides and are habitat to diatoms, invertebrates, and a variety of algae. When exposed, mudflats are considered the most crucial habitat for shorebird populations that feed heavily upon them. During inundation periods (twice daily at high tides), mudflats are feeding areas for fish.

According to one account, prior to filling and diking in San Francisco Bay, tidal mudflats were ubiquitous and as wide as two miles. In the South Bay, each day as the tide went out, almost 50,000 acres of tidal flats emerged along margins of bays and larger tidal creeks and sloughs (Goals Project, 2000). Currently, the South Bay supports approximately 30,000 acres of tidal mudflat (San Francisco Bay Conservation and Development Commission, 1994). In areas where salt ponds have been constructed, mudflats are located outboard of the salt pond levees.

6.2.2 Vegetation Characteristics in the Project Area

Salt ponds in the project area are largely unvegetated. Because the South Bay Salt Ponds receive no tidal influence, they do not support tidal marshlands. In addition, due to elevated salinities and prolonged inundation, the ponds support few vascular plants. As discussed below, vascular plants are present only along the edges of the pond levees.

Vegetation varies across the project site depending on the characteristics of the habitat adjacent to the pond levees. Tidal marsh vegetation and associated mudflats are located on the levee toes and fringe marsh adjacent to the Bay. As freshwater streams approach the Bay, plant associations change as salinity levels increase from freshwater to brackish to saltwater. This is especially prevalent along channels within the Alviso Complex. The marshes located farther up the creeks and sloughs have vegetation that is increasingly dominated by brackish marsh species.

Vegetation within Salt Ponds—Most salt pond complexes in the South Bay were built on tidal marsh. Salt ponds were constructed using bay mud for the levees around the ponds. Active salt ponds are inundated year-round and do not support tidal marsh. In addition, vascular plants are limited to the edges of the pond levees (see descriptions of plant cover at proposed water control sites in Tables 6-5, 6-6 and 6-7 below). However, the ponds do support a distinctive group of halophilic (salt-loving) biota made up of microalgae, photosynthetic bacteria and invertebrates. Vascular plants only exist along the edges of the pond levees. With presence varying by salinity, the dominant organism in these hypersaline ponds is the single-celled green algae (Dunaliella salina), halobacteria and purple sulfur-reducing bacteria. Ponds that serve as intake areas with salt concentrations closer to sea levels, contain marine algae, such as sea-lettuce (Ulva), Enteromorpha ssp., Cladophora ssp., and sometimes Fusus ssp. and Codium ssp. in firmer substrate. These areas also include marine diatoms, dinoflagellates and cryptomonads (Goals Project, 1999).

Colors in salt ponds range from pale green to deep coral pink and indicate the salinity of the ponds. In low-to mid-salinity ponds (50-110 parts per thousand [ppt]), green algae proliferate, lending the water a green cast. The typical salinity of sea water is 32 ppt. As the salinity increases, *Dunaliella* out-competes the other microorganisms in the pond, and the color shifts to an even lighter shade of green. In mid-to high-salinity ponds (200-250 ppt), high salt concentrations actually cause the *Dunaliella* to produce a red pigment. Brine shrimp in mid-salinity ponds contribute an orange cast to the water. Halophilic bacteria such as *Stichococcus* and purple sulfur-reducing bacteria also contribute red and reddish purple tints to high-salinity brine (Goals Project, 1999).

Vegetation on Levees—Levees around salt ponds and dredge lock ponds support both native and weedy species. Plant communities are often dominated by ruderal species adapted to disturbed upland habitat. In some areas sufficient water is present to support patches of native marsh species. Levee vegetation varies at the toe according to whether it is located on: 1) along tidal waters, 2) along non-tidal ponds, 3) along creeks and sloughs.

Levees above the extreme high tide zone support alkali heath, salt grass, perennial pepperweed, and coyote brush. Perennial pepperweed is a common dominant species on many levee crowns and disturbed sites and can form monotypic stands on recently disturbed sites, displacing native marsh vegetation. While it can establish through seed, it spreads primarily by subsurface rhizomes, which sprout and form new plants when broken by tilling or excavation (Wetland Research Associates, 2000).

Vegetation along Sloughs and Creeks—As freshwater streams approach the Bay, plant associations change as salinity levels increase from freshwater to brackish to saltwater. This is especially prevalent along channels within the Alviso Complex. In general, the upper reaches of creeks and sloughs support predominantly alkali bulrush and/or peppergrass. Lower reaches support single species stands, or mixed stands of pickleweed and cordgrass, depending on water depth. Pacific cordgrass occurs primarily in areas of persistent high salinity; alkali bulrush occurs in brackish water conditions; and California tule (Scirpus californicus) in freshwater conditions. Their distribution and abundance are related to their tolerance to water salinity and other factors, including tidal regime, disturbance, substrate type, marsh age, erosion and accretion (sedimentation) patterns.

Vegetation in and adjacent to streams and sloughs around the South Bay salt ponds were mapped by Jones & Stokes for San Francisco International Airport to assess the potential of complexes for habitat mitigation in conjunction with a proposed runway reconfiguration program (Jones & Stokes, 2001). Dominant communities of some of the major creeks and sloughs in the initial plan area for the airport project appear below in Table 6-4:

Table 6-4
Acreage of Slough and Creek Habitats

	Acres of Habitat			
	Mudflat	**Salt Marsh**	**Brackish/ Freshwater**	**Open Water**
Alviso Slough	58	57	118	83
Coyote Creek	293	116	306	258
Guadalupe Slough	37	60	156	122
Mt. View Slough	9	30	x	8
Mud Slough	x	29	112	38
Ravenswood Slough	57	8	x	17

6.2.3 Vegetation at the Proposed Impact Sites

In March through June of 2002, vegetation surveys were conducted where the addition of new or replacement of existing water control structures is proposed. The surveys did not included proposed locations of levee breaches on the Island Ponds. This section describes the survey methods and results, and provides a description of the existing vegetation.

Survey Methods—At each proposed structure location, surveyors measured the percentage of the area of impact that is vegetated. Plant species that cover at least 20 percent of the area of impact were noted. Species that comprise less than 20 percent cover were lumped together as "Other Halophytes."

Survey Results— Tables 6-5, 6-6, and 6-7 identify the vegetation found at each location. Survey locations noted in the table correspond to locations noted on Figures 6-1, 6-2, and 6-3.

The most prevalent species across all project sites are pickleweed, pepperweed, and hare barley. Species that are common, but present at lower densities, include gum plant, bulrush, rip-gut brome, and species categorized as "other halophytes" (see note to Table 6-5). Although these species occur less frequently, they are occasionally co-dominant.

There are few differences between the complexes in the amount or composition of vegetation at proposed structure locations, although levee tops in the West Bay Complex tend to be more densely vegetated. However, the survey results indicate that there is a great deal of variation in percent cover of vegetation, and also in the dominant species present between surveyed locations within a single complex. For example, in the Baumberg 2C system, despite the proximity and similarity in conditions at replacement gate locations 2C-4 and 2C-5, the outboard levee slope of 2C-4 contains 30% hare barley cover, while the outboard levee slope of 2C-5 contains 100% pickleweed and other halophytes cover.

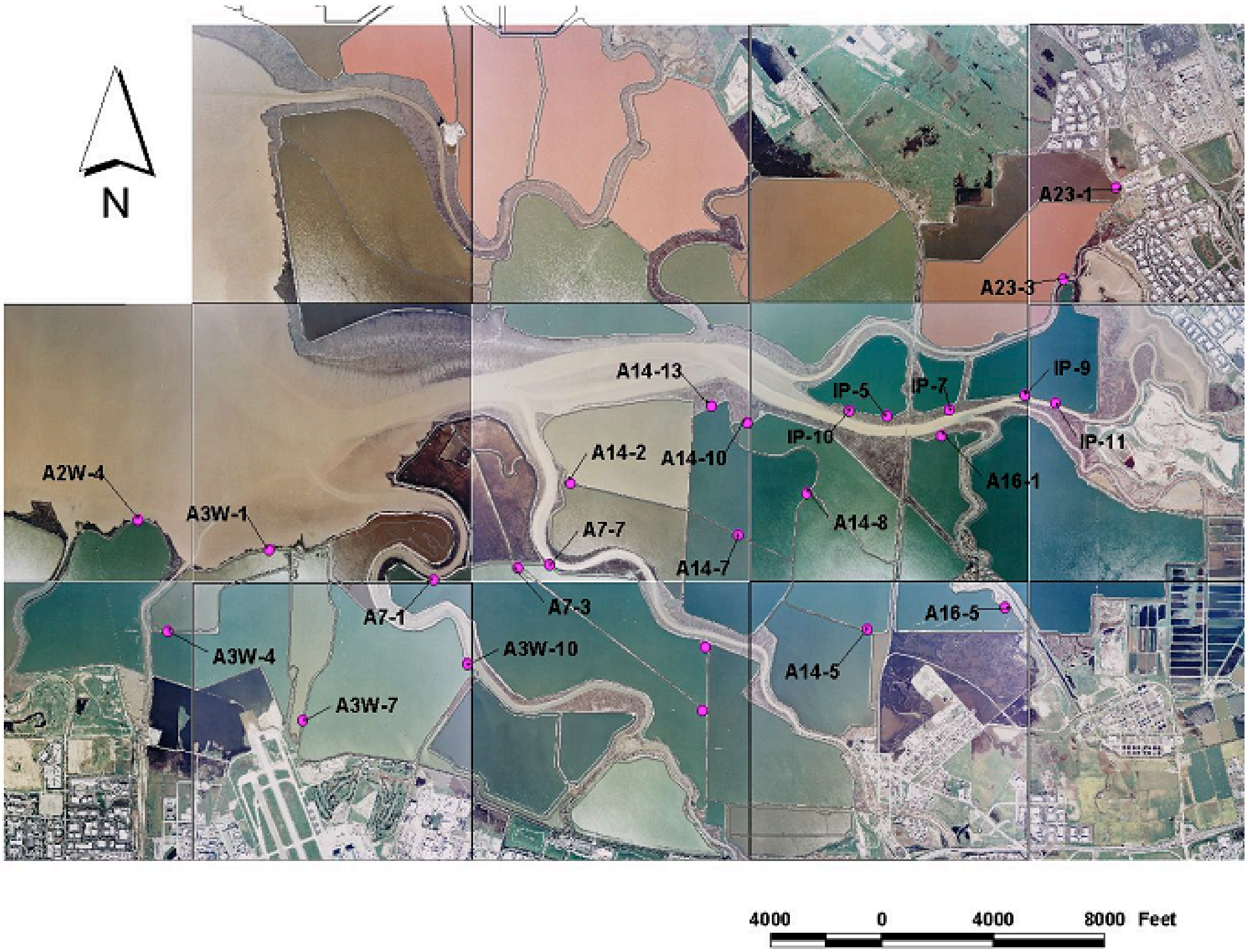


Figure 6-1
Alviso Complex Structure and Breach Locations For Alternatives 2 and 3.

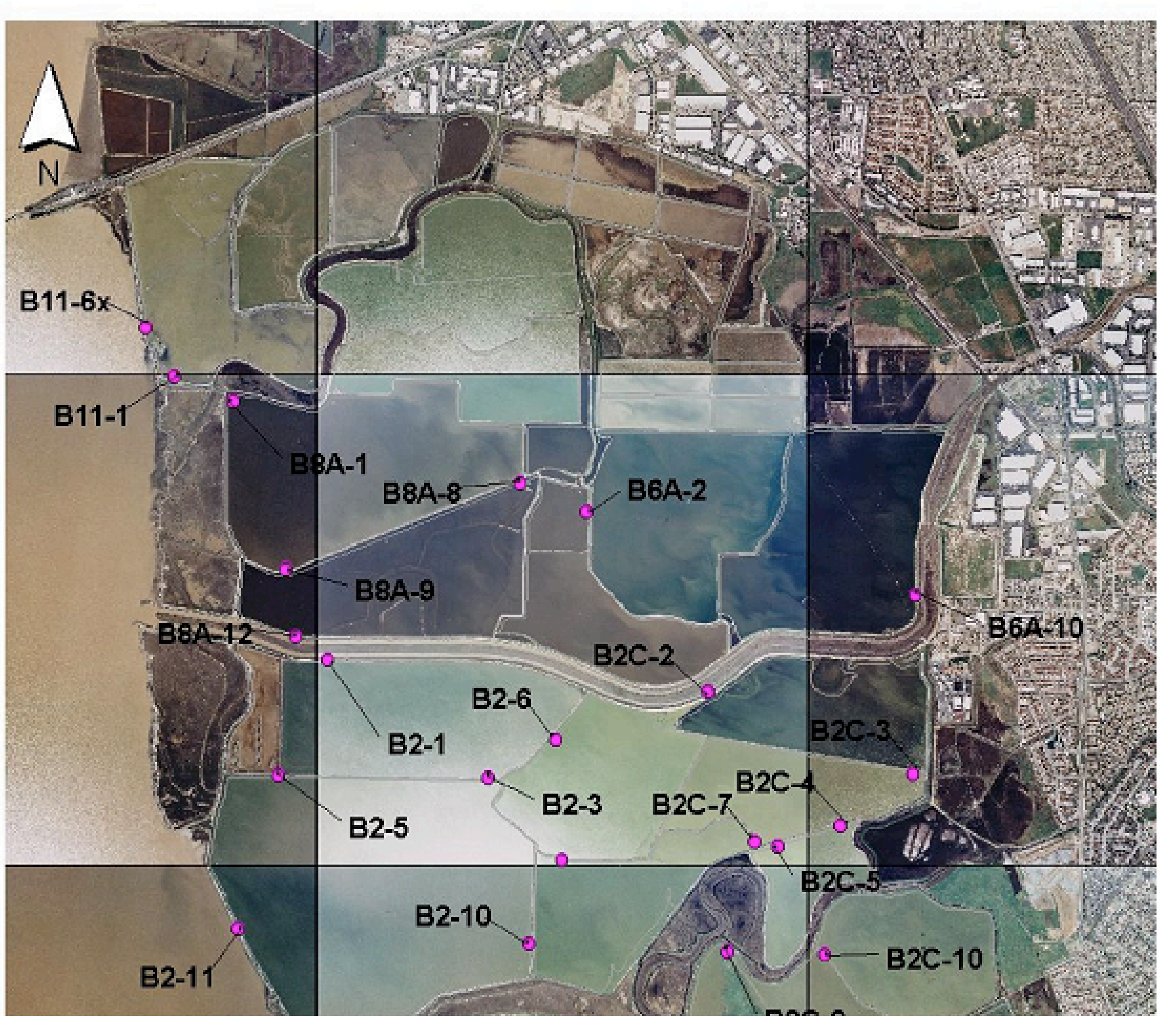


Figure 6-2.
Baumberg Complex Structure Locations for Alternatives 2 and 3.

Figure 6-3
West Bay Complex Structure Locations for Alternatives 2 and 3

Table 6-5
Vegetation at Proposed Alviso Complex Water Control Structures

Structure	Vegetation (total% cover; species with at least 20% cover)		
	Inboard Side	**Levee Top**	**Outboard Side**
A2W-4	36% total cover; hare barley, other halophytes	2% total cover	no vegetation
A3W-1	80% total cover; pickleweed, cordgrass, rip-gut brome, other halophytes	5% total cover	20% total cover
A3W-4	90% total cover; pickleweed	5% total cover	100% total cover; pickleweed, alkali heath,
A3W-7	15% total cover	no vegetation	10% total cover
A3W-10	100% total cover; rip-gut brome, pickleweed	50% total cover; rip-gut brome	100% total cover; pickleweed
A7-1	75%; Pickleweed, other halophytes	no vegetation	no vegetation
A7-2	no vegetation	no vegetation	no vegetation
A7-3	no vegetation	no vegetation	no vegetation
A7-6	no vegetation	no vegetation	10% total cover; other halophytes
A7-7	2% total cover	82%; pickleweed, other halophytes	50%; pepperweed
A14-12	no vegetation	no vegetation	80% total cover; pickleweed, other halophytes
A14-13	1% total cover	no vegetation	99% total cover; pepperweed
A14-10	100% total cover; pepperweed, pickleweed	no vegetation	no vegetation
A16-1	100% total cover; pepperweed, pickleweed	no vegetation	10% total cover; other halophytes
A16-5	1% total cover	2% total cover	100% total cover; *Scirpus sp.*

Structure	Vegetation (total% cover; species with at least 20% cover)		
	Inboard Side	**Levee Top**	**Outboard Side**
A23-1	95% total cover; rip-gut brome	no vegetation	5% total cover
A23-3	95% total cover; pepperweed, pickleweed	90% total cover; pickleweed	3% total cover

Notes:

inboard = inlet side of the levee, or the side from which water will flow

outboard = outlet side of the levee, or the side into which water will flow

"other halophytes" category includes the following species with less than 10% cover: marsh coyote brush (*Baccharis pilularis*), brass buttons (*Cortula coronopifolia*), pickleweek (*Salicornia sp.*), gum plant (*Grinelia stricta*), and alkali health (*Frankenia salina*).

Table 6-6
Vegetation at Proposed Baumberg Complex Water Control Structures

Structure	Vegetation (total% cover; species with at least 20% cover)		
	Inboard Side	Levee Top	Outboard Side
B2-1	90% total cover; pickleweed, hare barley	no vegetation	100% total cover; pickleweed, other halophytes
B2-4	no vegetation	no vegetation	10% total cover; pickleweed
B2-5	no vegetation	no vegetation	8% total cover
B2-6	10% total cover	30% total cover; hare barley	30% total cover; pickleweed
B2-11	10% total cover	90% total cover; pickleweed	no vegetation
B2-12	no vegetation	20% total cover; pickleweed	no vegetation
B2C-2	100% total cover; pickleweed, hare barley, other halophytes	no vegetation	100% total cover; hare barley, rip-gut brome, other halophytes
B2C-4	60% total cover; hare barley, picklweed	5% total cover	30% total cover; hare barley
B2C-5	1% total cover	no vegetation	100% total cover; pickleweed, other halophytes
B2C-14	100%; pickleweed, hare barley	no vegetation	100% total cover; pickleweed, *Scirpus sp*.
B6A-10	100% total cover; pickleweed, pepperweed, gum plant	40% total cover; Hare barley	100% total cover; *Scirpus sp.*
B8A-1	70% total cover; hare barley	5% total cover	100% total cover; pickleweed, gum plant, hare barley
B8A-12	100% total cover; pickleweed, gum plant	no vegetation	90% total cover; hare barley, other halophytes
B11-1	16% total cover	no vegetation	no vegetation

Table 6-7
Vegetation at Proposed West Bay Complex Water Control Structures

Structure	Vegetation (total% cover; species with at least 20% cover)		
	Inboard Side	**Levee Top**	**Outboard Side**
WB-1a	no vegetation	100% total cover; gum plant	100% total cover; cordgrass, alkali heath
WB-4	100% total cover; pickleweed	100% total cover;gum plant, alkali heath	no vegetation
WB-2	100% total cover; pickleweed	100% total cover; alkali heath, pickleweed	no vegetation
WB-13	<5% total cover	20% total cover; jaumea	100% total cover; pickleweed, cordgrass, alkali heath
WB-11	100% total cover; pickleweed, *Avena sp.*, cordgrass	no vegetation	100% total cover; *Avena sp.*
WB-6	100% total cover; pickleweed	no vegetation	no vegetation

In general, levee slopes are more densely vegetated than levee tops. When vegetation is present on levee tops, halophytes tend to dominate, although hare barley is prevalent at some locations. Vegetation characteristics also vary between the inboard and outboard sides of a levee at a single water control structure location. Vegetation characteristics on levee slopes located along tidal sloughs or Bay shoreline (levees that receive tidal influence), such as the outboard levees at A16-5 or B2C-2, also vary significantly compared to vegetation characteristics on levee slopes along non-tidal salt ponds.

6.2.4 Special-Status Plant Species and Sensitive Communities

Special-Status Plant Species—Special-status plants are defined as species that are legally protected under the California and federal ESAs or other regulations (see Section 6.0, above), or species considered sufficiently rare by the scientific community to qualify for such listing. Special-status plants are species in the following categories:

- Plants listed or proposed for listing as threatened or endangered under the federal ESA (50 CFR 17.12 [listed plants], and various notices in the *Federal Register* [proposed species])
- Plants that are candidates for possible future listing as threatened or endangered under the federal ESA (62 *Federal Register* [FR 182:49397-49411, September 19, 1997)
- Plants listed or proposed for listing by the State of California as threatened or endangered under the California ESA (14 CCR 670.5)
- Plants listed under the California Native Plant Protection Act (California Fish and Game Code sec. 1900 *et seq.*)

- Plants that meet the definition of rare or endangered under CEQA (State CEQA Guidelines sec. 15380), including those considered by the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California"

Species of Concern— Species of concern is an informal term used by some, but not all USFWS offices. Species of concern are sensitive species that have not been listed, proposed for listing, or placed in candidate status. Species of concern receive no legal protection, and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species. Potential project-related effects on species of concern, however, are disclosed as part of this document.

California Native Plant Society Listings—CNPS tracks plant species considered rare in California and assigns them to one of five lists in an effort to categorize their degree of rarity. Project-related effects on plant species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380) should be disclosed in EIRs and EISs. CDFG recognizes that plants on CNPS Lists 1A, 1B, and 2 would qualify for listing under Sections 2062 and 2067 of CESA and recommends they be addressed in EIRs. Some of the plants on CNPS Lists 3 and 4 may also qualify for listing under Sections 2062 and 2067 of CESA, and project-related effects should be described in EIRs and EISs. In addition, CDFG recommends, and local governments may require, protection and disclosure of impacts on plants that are regionally significant, such as locally rare species or disjunct populations of more common plants.

Special-Status Plant Species in the Project Area—There are two special status plant species that historically may have occurred in the project area. Point Reyes bird's beak (*Cordylanthus maritimus* ssp. *palustris*; federal species of concern, CNPS 1B) and California seablite (*Suaeda californica*, federally endangered, CNPS 1B). These species may be extremely rare in South Bay salt marshes and CNDDB records (CNDDB, 1993) indicate that known populations are most likely destroyed. Point Reyes bird's beak grows in tidal salt marsh and had been reported from Alviso and Palo Alto marshes (CDFG Natural Diversity Data Base 1993). California seablite was historically reported from one location in salt flats at the Palo Alto Yacht Harbor. This species occurs in salt marsh and upper littoral habitats. There are no recorded occurrences of either species at the project sites.

Sensitive Communities—Sensitive communities are those described as Significant Natural Areas (SNAs) by CDFG. These are communities that are known or believed to be of high priority for inventory in the CNDDB because of their rarity or level of threat (CDFG, 2001), or they are communities that are protected or regulated by federal, state, or local laws and regulations.

Sensitive Communities in the Project Area—In the project area, sensitive communities include tidal marshes, which are described for the San Francisco Bay region in Section 6.2.2, above.

6.2.5 Invasive Plant Species

Many non-native species of plants and animals have been introduced to the San Francisco Bay Estuary, and some now threaten fundamental changes in the structure, function, and value of the estuary's tidal lands. Within the last 30 years, the San Francisco Estuary has become host to a number of invasive cordgrasses from the Atlantic coast (*Spartina* *alterniflora* and *S. patens*), Chile (*S. densiflora*), and Europe (*S. anglica*). One of these species, *S. alterniflora*, has crossed with the native Pacific cordgrass (*S. foliosa)*, producing a hybrid that is highly fertile, adaptive, and robust. Though valuable in their native settings, these introduced cordgrasses are highly aggressive in this new environment, and frequently become the dominant plant species in areas they invade.

Cordgrasses are hydrophytic plants that thrive on mean salinities of 27 ppt and on tidal fluctuations in water levels. In the San Francisco Bay, native Pacific cordgrass generally dominates the low marsh zone, and along tidal creek banks and the edges of tidal mudflats. The low marsh and middle marsh zones are increasingly being impacted by the introduced species of cordgrass.

Researchers in 1992 (Callaway and Josselyn 1992) predicted that, left unabated, *S. alterniflora* would become a dominant salt marsh plant species in the South Bay, changing important ecosystem functions such as sedimentation dynamics and detrital production. At that time, *S. alterniflora* was found in seven locations in the South and Central Bay, including locations in the three counties (Alameda, San Mateo, and Santa Clara) in which the presently proposed project is located. At three of the seven locations, *S. alterniflora* was described as "abundant." The San Francisco Bay Area Wetlands Ecosystem Goals Project (Goals Project 1999) identified *S. alterniflora* and its hybrids as a serious threat to future restoration of bayland habitats, and called for an immediate, systematic, and coordinated program of control. In 2000, monitoring by the San Francisco Estuary Invasive *Spartina* Project found that non-native *Spartina* species had spread to dominate nearly 500 acres of tidal marsh (97% of that being S. alterniflora and its hybrids) interspersed throughout 5,000 acres of the Bay, predominantly in the South and Central Bay (Coastal Conservancy and USFWS, 2003). Once established in the San Francisco Bay Esturary, invasive cordgrasses could rapidly spread to other estuaries along the California coast through seed dispersal on the tides.

Possible long-term impacts of the *Spartina* invasion include local or total extinction of native *Spartina foliosa* (by genetic assimilation and/or displacement), changes in available detritus, decreased benthic algal production, increased wrack deposition and disturbance of upper marsh, changes in habitats for native wetland animals, changes in benthic invertebrate populations, loss of critical shorebird and wading bird foraging areas (Callaway and Josselyn, 1992; Coastal Conservancy and USFWS, 2003), regional loss of small tidal sloughs and choking of channels, alteration of estuarine beaches, and grave impacts to populations of state and federally listed endangered species (Coastal Conservancy and USFWS, 2003).

In 1999, the State Coastal Conservancy and USFWS initiated the Invasive *Spartina* Project, a region-wide program to control non-native *Spartina* in the San Francisco Estuary.

The USFWS Biological Opinion for the Initial Stewardship Project (see Biological Opinion attached following response to EPA comments in Chapter 13) does not specifically discuss impacts from *Spartina* eradication to California clapper rail. The FEIS for the *San Francisco Estuary Invasive Spartina Program: Spartina Control Program* (California Coastal Conservancy 2003) does find that some project impacts on clapper rails associated with *Spartina* eradication cannot be reduced to less than significant levels; measures are outlined to reduce project impacts as much as possible. CDFG and USFWS will work closely with the

Invasive *Spartina* Project on eradication within the project area and will implement impact reduction measures outlined in the *Spartina* Control Program's Biological Opinion.

In addition to the invasive species of cordgrasses, other invasive species that have been noted in the middle marsh zone in the project area include brass buttons (*Cotula coronopifolia*) and Mediterranean saltwort (*Salsola soda*).

6.2.6 Assessment of Impacts

6.2.6.1 Criteria for Determining Significance of Effects

Potential impacts of the project on vegetation resources were characterized qualitatively by evaluating direct, indirect, temporary, and permanent impacts. Direct impacts include the direct removal of vegetation within the footprints of ground-disturbing actions at proposed water control structure locations and levee breaches. An indirect impact results from changes to habitat that are incidental to project implementation. An example would be the establishment of a non-native invasive weed species that out-competes native vegetation as a result of ground disturbance during project implementation.

Temporary impacts have a short duration, and the vegetation would be expected to recover within a few years after implementation. An example would be the removal of vegetation to add or replace an inlet structure, where the vegetation soon re-colonizes the repair site. A permanent impact would involve the long-term alteration of habitat quality and vegetation, because the project would result in the removal or change in the vegetation type. An example would be the permanent removal of a levee section that currently supports vegetation. A change in the hydrology of a pond, such as the conversion of a system pond to a seasonal pond, could also cause a permanent impact on the pond's vegetation characteristics.

Criteria based on NEPA and CEQA Guidelines were used to determine the significance of vegetation impacts. The following general criteria were considered in determining whether a vegetation impact would be considered significant:

- Federal or state legal protection of the resource or species
- Federal or state agency regulations and policies
- Documented resource scarcity and sensitivity both locally and regionally
- Local and regional distribution and extent of biological resources

The project would have a significant impact on botanical resources if it would result in:

- substantial reduction in local population size attributable to direct mortality or habitat loss, lowered reproductive success, or habitat fragmentation of plant species that are
- listed as endangered, threatened, or proposed for listing under CESA or ESA;
- listed as rare under CNPPA; or
- qualified as rare or endangered under CEQA; or
- the removal or alteration of substantial portions of a sensitive vegetation community, any vegetation community of particular public or regulatory concern, or other natural vegetation community, such that the viability of the community is threatened in the project area or vicinity.

6.2.6.2 Impacts and Mitigation Measures

For the most part, vegetation impacts are anticipated to be minor. Existing conditions in the project area are not conducive to tidal marsh plants and most of the project ponds are largely unvegetated. Ground disturbance within the footprints of proposed water control structures will cause direct impacts to vegetation, including some tidal marsh plants. The total area of disturbance is estimated at 2.91 acres of jurisdictional wetlands and 1.99 acres of areas with a greater than 25% cover of pickleweed. By complex, this breaks down as follows:

- Alviso Complex: 1.56 acres of jurisdictional wetlands and 0.81 acres of pickleweed (areas having greater than 25% pickleweed)
- Baumberg Complex: 1.03 acres of jurisdictional wetlands and 0.51 acres of pickleweed (areas having greater than 25% pickleweed)
- West Bay Complex: 0.32 acres of jurisdictional wetlands and 0.67 acres of pickleweed (areas having greater than 25% pickleweed)

By lowering pond salinities and opening up some of the ponds to tidal influence, on the other hand, the project is expected to produce conditions which are more conducive to plant growth, including tidal marsh. Breaching of the three Island Ponds (Alviso Ponds A19, A20, and A21) would open a total of approximately 475 acres of ponds to tidal influence, with significant benefits for wetlands vegetation. Restoration of wetlands habitat is one of the long-term goals for the project area and one of the major goals of the ISP. Overall, then, the project is expected to have a beneficial impact on vegetation, including wetlands.

The project does have the potential to create conditions favorable to the spread of invasive species of cordgrass *(Spartina spp.).* As discussed in Section 6.2.1.5, above, a major effort is currently underway to control the spread of these cordgrasses. An objective of the ISP is to assure that interim construction and management practices do not impede *Spartina* control efforts. CDFG and USFWS have committed to working closely with the Invasive *Spartina* Project to assure that non-native *Spartina*, and particularly, *S. alterniflora* and its hybrids, are adequately controlled near salt pond restoration sites prior to opening sites to tidal flow. Proposed mitigation would reduce all potentially significant project impacts to less than significant.

6.2.7 No-Project/No Action Alternative

VEGETATION IMPACT-1: If levee failure occurs, existing vegetation, possibly including rare plant species, would be impacted.

The No-Project/No Action Alternative would result in both direct and indirect impacts on vegetation along the pond levees and adjacent sloughs and creeks in the event of a levee failure and during emergency repairs.

Levee failure (more likely under this alternative since levees and other infrastructure would not be maintained) and related repair activities would remove vegetation in the failed section and in adjacent areas used for construction-related repair actions (direct impact). Vegetation types that may be affected include lower, middle, and upper tidal marsh on levee slopes bordering tidal areas. Other common vegetation types on the levee structures, including tidal and non-tidal levee slopes, may also be affected. Although there are no reports of populations of special-status plants within or adjacent to the project areas, since the levees have not been completely surveyed, the possibility remains that rare plant species may be present that could also be impacted by levee failure and repair activities.

Slough channel scouring and erosion due to levee failure may indirectly affect tidal marsh vegetation that occurs in outboard levee habitats. In addition, if levee failure occurs, highly saline water would be released into adjacent sloughs and creeks. Such a release would have negative indirect effects on vegetation alongside receiving waters. Other indirect impacts resulting from levee failure could include decreased pond water salinity and a dramatic increase in tidal influence in the ponds, creating conditions more conducive to vegetation, including establishment of wetland communities (a potential beneficial impact).

For most vegetation, these impacts would be temporary, as vegetation would re-establish in these affected areas. It is less clear that rare plants, if any exist, in the project area would re-establish following such an impact. Since the presence of rare plants cannot be ruled out without a thorough survey of all potentially affected areas, this impact must be considered potentially significant.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

> *VEGETATION IMPACT-2*: Disturbance of existing vegetation could promote the spread of invasive cordgrasses.

Disturbance of existing vegetation due to levee failure and related repair activities would create conditions more favorable to the establishment of invasive cordgrass species and hybrids. The spread of invasive cordgrass species is a permanent impact that will have long-term effects on existing plant communities. The Baumberg Complex currently contains fairly dense, contiguous stands of a variety of invasive cordgrass species, including *S. alterniflora* and its hybrids. These hybrids are also present near the Alviso and West Bay complexes. Levee failure may result in successful establishment of these hybrids in areas that are not currently impacted.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

6.2.7.1 Alternative 1 (Seasonal Ponds)

Levee failure is considered less probable under this alternative compared to the No Project/No Action alternative. Direct and indirect vegetation impacts that could be caused by levee failure and related repair activities, as discussed for the No Action/No Project Alternative (Vegetation Impacts -1-2) , are not likely under Alternative 1. In addition impacts to vegetation caused by breaching the Island Ponds under Alternatives 2 and 3 would not apply to Alternative 1.

6.2.7.2 Alternative 2 (Simultaneous March/April Discharge)

This alternative would result in beneficial impacts overall. Direct impacts to vegetation at proposed water control structure locations are considered less than significant. Disturbance of existing vegetation as a result of breaching the Island Ponds (Alviso Ponds A19, A20, and A21) could promote the spread of invasive cordgrasses, which is a potentially significant impact. However, proposed mitigation would reduce this impact to less than significant.

> *VEGETATION BENEFICIAL IMPACT-1:* Breaching of the Island Ponds (Ponds A19, A20, and A21) would allow the establishment of transitional salt marsh and brackish marsh communities.

Alternative 2 includes the proposal to breach the Island Ponds (Alviso Ponds A19, A20, and A21). Once the Island Ponds are breached, pond water depth and salinity no longer would be managed, but would be driven solely by tidal effects. Ponds would take on water during high tides, and would drain during low tides. Ponds are expected to be inundated for 6 to 10 hours a day, and salinities would decrease from a range of 79 to 304 to a July average of 8 to 19 ppt. Mean depth would be slightly lower than currently existing, but with significant, daily tidal fluctuations.

Breaching of the Island Ponds, which are currently mostly unvegetated, would result in a beneficial impact on a total of approximately 475 acres. Under this alternative, the conversion to lower salinity tidal ponds would provide conditions favorable for the establishment of transitional salt marsh and brackish marsh species, including California bulrush and alkali bulrush. Although pickleweed may remain on levee slopes at the upper edge of the tidal marsh, it will be excluded by tidal flooding from lower elevations in the ponds.

Significance: Beneficial impact.

> *VEGETATION IMPACT-2:* Disturbance of existing vegetation could promote the spread of invasive cordgrasses.

Under Alternative 2, breaching of the Island ponds would convert these high salinity, non-tidal ponds to low salinity tidal ponds. These changes would create conditions more favorable to the establishment of invasive cordgrass species and their hybrids. Currently, there are several small, localized clusters of *S. alterniflora* hybrids in the area of the Island Ponds. If the existing populations are not removed, the introduction of favorable conditions for their expansion could be a significant impact. The Water District's efforts to control *S. alterniflora* and its hybrids are a mitigation element of the District's multi-year Stream Maintenance Program. Under this program, the District will treat up to 10 acres of control *S. alterniflora* and hybrids throughout Santa Clara County and Coyote Slough over a five-year period, starting in 2004. Prioritization of sites targeted for control efforts is currently underway and will center of the most heavily infested areas first. At this point, it is unclear how the patches located in the vicinity of the Island Ponds will be prioritized, as the most heavily infested areas within Santa Clara County are near Palo Alto and Mountain View. In any case, control efforts will occur in the fall of each year, in order to avoid impacts to the endangered California clapper rail.

Significance: Potentially significant.

> *VEGETATION MITIGATION MEASURE-1:* USFWS will coordinate with the Santa Clara Valley District to ensure that existing clusters of S. alterniflora in the vicinity of the Island Ponds are removed prior to breaching the ponds.

Post-mitigation Significance: Less than significant

> *VEGETATION IMPACT-3:* Installation or replacement of water control structures would remove or disturb existing areas of vegetation.

The installation or replacement of water control structures under Alternative 2 will result in direct, permanent impacts on vegetation in the area of ground disturbance, excavation and other construction activities. This option would remove areas of vegetation for the placement of new structures, or would disturb vegetation around existing structures proposed for replacement. The total area of disturbance is estimated at 2.91 acres of jurisdictional wetlands and 1.99 acres of areas with a greater than 25% cover of pickleweed. By complex, this breaks down as follows:

- Alviso Complex: 1.56 acres of jurisdictional wetlands and 0.81 acres of pickleweed (areas having greater than 25% pickleweed)
- Baumberg Complex: 1.03 acres of jurisdictional wetlands and 0.51 acres of pickleweed (areas having greater than 25% pickleweed)
- West Bay Complex: 0.32 acres of jurisdictional wetlands and 0.67 acres of pickleweed (areas having greater than 25% pickleweed)

There are no reports of populations of special-status plants within or adjacent to the project areas, and survey of the proposed water control structure sites did not identify special-status plants in these specific locations. Disturbance and/or loss of common plant communities at these locations would not jeopardize their existence. Therefore, this impact is considered less than significant.

Significance: Less than significant.

VEGETATION IMPACT-4: Installation or replacement of water control structures would cause changes in pond parameters, which would have permanent indirect impacts on vegetation in the project area.

The installation or replacement of water control structures will result in changes to several pond parameters, including salinity, water depth, amount of tidal influence, and connectivity to adjacent ponds. These changes will have permanent indirect impacts on vegetation in the project areas. Since these ponds are largely unvegetated, the overall effect of the project will be beneficial. Salinities in most of the ponds would be lowered. This, together with increasing tidal influence in the ponds, would promote plant growth. Changes in pond parameters may cause disturbances to common plant communities and shifts in some plant communities, but would not jeopardize the existence of these communities. In addition, there are no reports of populations of special-status plants within or adjacent to the project areas. Therefore, this impact is considered less than significant.

Significance: Less than significant.

Management of individual ponds as seasonal ponds and as high salinity batch ponds, or seasonal differences in pond management (e.g., management of ponds as winter system ponds and summer seasonal ponds) will cause indirect vegetation impacts, most of which are minor (less than significant).

VEGETATION IMPACT-6: Seasonal wetting and drying cycles in ponds managed as seasonal ponds will create saline soil conditions that will inhibit vegetation growth within the ponds and at the pond margins.

Adaptive Management under Alternative 2 includes the option to manage Alviso ponds A3N, A8, A22 and A23, and Baumberg ponds 12 and 13 as seasonal ponds. Under this option, ponds would be hydrologically isolated from adjacent ponds, and water and salinity levels would no longer be controlled. Water depth in the winter would be influenced by ground water depth and by rainfall, and in the summer, ponds are expected to dry completely. This option would have an indirect impact on vegetation.

Field observations made at CDFG's Eden Landing Ecological Reserve, where salt production had ceased in 1972, provides an indication of what may occur at the seasonal ponds within the Baumberg Complex. At the reserve, vegetation cover is generally limited to ponds with salinity levels lower than 30 ppt. Vegetated areas had a mean salinity of 22 ppt compared to non-vegetated areas with mean salinity of 65 ppt. At the reserve, the lower salinity ponds had characteristics of a San Francisco Bay salt marsh, with transitional pickleweed and saltgrass. In these ponds, there was a gradual succession from pickleweed stands to mixed stands of pickleweed and ruderal (disturbed)/hydrophytic (salt-loving) grassland associations. Higher salinity muds were colonized on a seasonal basis by annual pickleweed (*Salicornia europa*). A correlation was also observed between percent vegetative cover greater than 50 percent and salinity less than 50 ppt (Resource Management International, Inc., 1999).

Seasonal wetting and drying cycles within the proposed Baumberg Complex seasonal ponds will convert these ponds into largely unvegetated salt pannes. The saline soil surface will likely prevent establishment of most plants within the ponds. A shift from system or batch to seasonal is expected not to affect existing levee vegetation, but increased soil salinity levels will result in the loss of some vegetation currently at the pond edge. However, these ponds are currently largely unvegetated. The loss of common plant communities at these locations would not jeopardize their existence. In addition, there are no reports of populations of special-status plants within or adjacent to these ponds. Therefore, this impact is considered less than significant.

Significance: Less than significant.

> *VEGETATION IMPACT-7: Increase in pond water salinity in ponds managed as high salinity batch ponds will result in loss of vegetation along the shoreline.*

Adaptive Management under Alternative 2 includes the option to manage Alviso ponds A12, A13 and A15 as high salinity batch ponds. Under this change, pond water salinity would increase significantly to levels ranging from 120 to 150 ppt. Pond water depth would not be altered. This increase in salinity is expected to result in the loss of pickleweed habitat and other vegetation present near the shoreline. According to a long-term monitoring study conducted by H.T. Harvey and Associates (2002), maximum interstitial salinity for pickleweed is 70 ppt. These changes are not expected to affect vegetation growing higher up on inboard levee slopes. The loss of common plant communities at these locations would not result in the substantial loss of these habitat types, and is not expected to jeopardize their existence. In addition, there are no reports of populations of special-status plants within or adjacent to these ponds. Therefore, this indirect impact is considered less than significant.

Significance: Less than significant.

> *VEGETATION IMPACT-8:* Differences in seasonal management of ponds would cause a decrease in average pond depth and decreased fluctuations in salinity in some of the ponds, which could result in indirect impacts to vegetation, including elevation and type shifts of plant communities.

Adaptive Management under Alternative 2 includes the option to manage a number of ponds in the Baumberg Complex differently on a seasonal basis. Under this option, Baumberg Ponds 4, 7, 8, 6B, 6A, 14 and 11 would continue to be managed as system ponds in the winter, but would be seasonal in the summer. Under this alternative, mean salinity levels in Ponds 4, 7 and 11 would not change, although average pond depth would decrease.

No significant changes in vegetation are expected, although it is likely that an elevation shift will occur, with plants growing further down on the levee slope. Ponds 8, 6B, 6A and 14 will experience decreased fluctuation in salinity concentrations from the current range of 35 to 296 ppt to less than 40 ppt. Stabilization of salinity will permit establishment and long-term persistence of salt marsh dominant species, including pickleweed. The elevation shift of plant communities at these ponds would not result in the substantial loss of habitat, and salt marsh plant cover may increase with stabilization of salinity levels at these ponds. Therefore, this impact is considered less than significant and would likely be beneficial.

Significance: Less than significant; probably beneficial.

> *VEGETATION IMPACT-9:* Muted tidal influence in the summertime in Baumberg Ponds 8A and 8X would cause some changes in vegetation and would create conditions favorable to the establishment of invasive cordgrass.

Adaptive Management under Alternative 2 includes the option to manage Baumberg Ponds 8A and 8X as system ponds in winter and as seasonal ponds in the summer. Unlike the other ponds that could receive differential seasonal management (discussed directly above, Vegetation Impact-8), Ponds 8A and 8X would also receive muted tidal influence in the summer. Pond 8A would be tidally influenced by an adjacent borrow ditch, and Pond 8X would be influenced by a culvert that extends from an adjacent ditch. Under this option, salinity levels are expected to decrease from a range of 69 to 265 to less than 40 ppt. Because pond salinity will be managed in the winter, soil surface salinity during the summer is not expected to reach levels similar to ponds managed as seasonal year-around. Despite the decrease in salinity, the establishment of salt marsh vegetation would be inhibited by long-duration ponding in the winter. Therefore, this proposed adaptive management measure would not have an effect (beneficial or negative) on most plant communities.

However, the proposed changes, including decreases in salinity and increases in tidal fluctuations would create conditions more favorable to the establishment of invasive cordgrass species and their hybrids. The project site currently contains fairly dense, contiguous stands of invasive *S. alterniflora* hybrids. During project implementation, invasive cordgrass could be spread through either the opening of newly disturbed habitat, or the movement, by construction equipment, of propagules from the existing stands of *S. alterniflora* into previously inaccessible sites.

Significance: Potentially significant.

> *VEGETATION MITIGATION MEASURE-2A:* All equipment shall be cleaned prior to movement from an infested site.

> *VEGETATION MITIGATION MEASURE-2B:* Conduct post-implementation monitoring for new, establishing populations of cordgrass.

> *VEGETATION MITIGATION MEASURE-2C:* Gain control of new, establishing populations using protocols suggested by the San Francisco Estuary Invasive Spartina Project.

Post-mitigation Significance: Less than significant

6.2.8. Pond Management Alternative 3 (Phased Initial Release)

The only difference between Pond Management Alternatives 2 and 3 is in the timing of initial release of pond waters. As described in Chapter 2, under Pond Management Alternative 2, water control structures would be installed in the Spring and initial discharge of the existing pond contents would begin in July.

Impacts and mitigation measures under Pond Management Alternative 3 would be the same as those under Pond Management Alternative 2 (Section 6.2.3.3, above). The timing of initial discharge would not change the anticipated impacts.

6.3 BIOLOGICAL RESOURCES – BIRDS AND OTHER WILDLIFE

This section describes the wildlife known to occur within the salt ponds, levees, sloughs and channels, and along the Bay shoreline within the project area, including special status species. It also assesses the effects that project implementation may have on wildlife, including special status species, and proposes mitigation measures.

Site-specific wildlife surveys were not conducted for this document. However, numerous previous and ongoing studies of wildlife of the project area (or the South Bay region) were available from a number of sources. These included several reports prepared for the Goals Project (1999 and 2000); numerous reports and data provided by San Francisco Bay Bird Observatory (SFBBO), Point Reyes Bird Observatory, U.S. Geological Survey (USGS), USFWS, and CDFG; and prior studies prepared to assess the impacts of Cargill's maintenance operations. Additional information was available from the CDFG's California Natural Diversity Database (CNDDB). These sources are cited below, and full references are provided in Chapter 14.

6.3.1 Affected Environment

This section describes the various habitat types that are currently present within the project area, with a focus on attributes of those habitats that are attractive to wildlife. Refer to Section 6.1.1 for a detailed description of vegetation communities on the site.

Habitat types within the project area generally fall into one of four categories: open water, tidal mudflat, tidal marsh, barren levees, and non-native grassland/ruderal vegetation. Open water is by far the most extensive habitat type and the primary attractant for the hundreds of thousands of waterbirds that occur on the salt ponds each year (see detailed discussion below). Salinity and water depth, which vary from pond to pond (Table 2-1), as well as location within the salt pond system (i.e., intake pond vs. system pond), are the primary attributes of salt ponds that determine waterbird species composition and abundance.

For this section of the EIR/EIS, salinity categories are defined as low (<60 ppt), medium (60-180 ppt), and high (>180 ppt). These categories were based on those of the Goals Project bird focus teams, which based their classification on observations of birds rather than of plants and invertebrates (Goals Project 1999). Note that these are different than the salinity categories defined in Chapter 2, including Table 2-1. Although Table 2-1 defines batch ponds as "high salinity," they actually fall within the medium-salinity category used by the Goals Project and in the Biology section of this document. To avoid confusion, when referring to ISP management options, the term "high salinity batch pond" will continue to be used.

Most (but not all) of the salt ponds in the South Bay are located within the ISP project area or within the Newark pond complexes, which are located between the Baumberg and Alviso salt pond complexes and are still owned by Cargill. Using the categories defined in the paragraph above, the project area includes about 7,159 acres of low-salinity salt ponds, 4,386 acres of medium-salinity ponds, and 1,316 acres of high salinity ponds. The Newark complexes include about 2,300 acres of low-salinity ponds, 3,100 acres of medium-salinity ponds, and 1,600 acres of high salinity ponds (Kirk Wheeler, personal communication). Figures 6-4 through 6-9 illustrate the configuration of the salt ponds in the project area, along with their existing and proposed salinities and hydrologic conditions.

Tidal marsh and tidal mudflats are present within the project area, along the numerous sloughs and channels within the salt pond complexes, as well as along the bay shoreline outboard of several bayside ponds. Tidal marsh vegetation often occurs on the sideslopes of salt pond levees that are exposed to tidal waters. Tidal marsh areas provide potential habitat for special-status species such as California clapper rail and salt marsh harvest mouse. Tidal mudflats provide important foraging habitat for shorebirds, when uncovered by low tides, and for waterfowl and other waterbirds, when inundated by high tides. In addition, non-tidal mudflats occur within the salt pond dredge locks and within the salt ponds themselves, when water levels are lowered (i.e., when drained due to management operations). Much of the upland (non-wetland) habitat in the project area consists of the upper portions of levees, above the water line, and much of this habitat is essentially barren, with little or no vegetation. These barren levees provide roosting and/or nesting habitat for many species of shorebirds and other waterbirds. In some areas, the upper portions of levees are covered with non-native grassland/ruderal vegetation. This habitat is used by a limited number of mammalian and landbird species (see Paragraphs, "Other Wildlife" below).

Waterbirds

Many studies over the past 30 years have documented the habitat value of South Bay salt ponds to waterbirds (e.g., shorebirds, waterfowl, wading birds, grebes, cormorants, pelicans, terns, and gulls). Salt ponds provide important habitat for many species of migratory shorebirds and waterfowl during the non-breeding season (Goals Project 1999). Salt ponds also provide year-round foraging habitat for a number of resident species, such as American avocet, black-necked stilt, and western snowy plover (Harvey et al. 1992, Goals Project 1999). These and other species, including California gull, western gull, Forster's tern, and Caspian tern, nest on partially-dry salt ponds, levees, and salt pond islets and islands (Harvey et al. 1992). In all, more than 40 species of waterbirds are common on salt ponds of varying salinities.

Lower-salinity ponds (including most intake ponds) provide habitat for several species of euryhaline fish (fish tolerant of wide salinity fluctuations; Lonzarich 1989). These fish, in turn attract piscivorous (fish-eating) bird species, such as American white pelican, double-crested cormorant, Forster's tern and great egret. Medium- and high-salinity ponds support higher densities of microalgae, photosynthetic bacteria, brine shrimp (*Artemia franciscana*), brine flies (*Ephydra* spp.), and water boatmen (*Trichocorixa reticulata*), which provide an abundant food source for waterbirds (Anderson 1970). Highest densities of these prey species occur in salinities of 60-200 ppt (Larsson 2000, Maffei 2000a, b).

Water depth is another factor influencing the abundance and distribution of waterbirds using the ponds. Most shorebirds forage in water depths less than 1.5 inches (Isola et al. 2000), while dabbling ducks and diving ducks prefer water depths from 4-12 inches and greater than 12 inches, respectively (Page 2001). However, since water depth is extremely variable both spatially (within the same pond) and temporally (throughout different seasons), it is difficult to predict which species will occur in any given pond at any given time (Warnock, 2003 pers. comm.).

Salt ponds also support several special-status waterbird species. Western snowy plovers (*Charadrius alexandrinus nivosus*; a federally threatened species) nest on salt pond levees and dikes. The federally- and state endangered California clapper rail (*Rallus longirostris* *obsoletus*) also occurs in the tidal marshes adjacent to the salt ponds. These and other special-status species are discussed in more detail in Section 6.3.1.4.

Shorebirds. San Francisco Bay salt ponds support large numbers of wintering and migratory shorebirds, with single-day counts during peak spring migration reaching as high as 200,000 shorebirds in a single salt evaporation pond (Stenzel and Page 1988). Indeed, the San Francisco-San Pablo Bay estuary and associated wetlands have been designated as a site of hemispheric importance by the Western Hemisphere Shorebird Reserve Network (Harrington and Perry 1995). In addition, the Don Edwards National Wildlife Refuge (the Refuge) has recently been designated as a Globally Important Bird Area (IBA) (American Bird Conservancy 2003).

Salt ponds and associated levees are important high-tide roosting areas for species that forage in the Bay's tidal mudflats, such as western and least sandpiper, dunlin, dowitchers, marbled godwit, willet, and long-billed curlew (Stenzel et al. 2002). Some shorebird species only use salt ponds for roosting, while others (e.g., western sandpiper, least sandpiper, dunlin, American avocet, willet, and greater yellowlegs) will also use salt ponds as supplemental high tide foraging habitat (Harvey et al. 1988, Stenzel et al. 2002). Still other species (e.g., black-necked stilt, Wilson's phalarope, and red-necked phalarope) in San Francisco Bay feed and roost almost exclusively in salt ponds (Harvey et al. 1988). Salt pond levees and dikes also provide nesting habitat for various shorebirds, including American avocet, black-necked stilt, and the federally-threatened western snowy plover.

In their recent study on waterbird use of South Bay salt ponds (from October 1999-February 2000 and September 2000-February 2001), Warnock et al. (2002) found a relationship between tidal height and the abundance and species richness of shorebirds using salt ponds. Their data revealed higher numbers of shorebirds in the salt ponds during high tides and lower numbers during low tides, when most shorebirds move to adjacent tidal flats to forage. This pattern, however, does not apply to all shorebird species. According to Warnock, et al. (2002), large numbers of American avocets and black-necked stilts remain in the ponds throughout the tidal cycle (although substantial numbers of avocets, and some of the stilts, also move to tidal flats or tidal marshes during low tides). The two phalarope species do not leave the salt ponds during low tides, as noted above.

Using linear models and controlling for pond, year, month, tide, and pond area, Warnock et al. (2002) also found the highest numbers of waterbirds (including, but not limited to, shorebirds) at 140 ppt salinity, with the highest species diversity at 126 ppt. Although Wilson's phalaropes, red-necked phalaropes, and black-necked stilts reportedly prefer higher salinity ponds (Swarth et al. 1982, Harvey et al. 1988), Harvey et al. (1992) stated that most shorebirds show no salinity preference. They suggested that the presence of shallow water and isolated islands and dikes is generally the most important criteria in pond selection by shorebirds.

However, a recent study by Stralberg et al. (*in prep.*) showed that densities of small shorebird species such as western sandpiper, least sandpiper, and dunlin were highest in ponds with salinities greater than 120 ppt (medium-salinity ponds; see Figure 3 in Appendix J). In the same study, more than 75 percent of feeding detections of these three species (as well as several others) were at salinities greater than 60 ppt (breaking point for low to medium salinity; Table 1 in Appendix J). (Note: The study was conducted from October 1999-April

2001. Birds were counted in 11 low-salinity ponds, 1 low/medium-salinity pond, and 9 medium- or high-salinity ponds.)

Therefore, medium-salinity salt ponds may provide important high-tide feeding areas for shorebirds that traditionally feed in tidal mudflats, particularly when their energy demands are increased (Stenzel et al. 2002). Although further research is needed on what shorebirds gain energetically from salt ponds as compared to tidal marshes and mudflats, preliminary studies (Warnock et al. 2002, Stralberg et al. *in prep.*) suggest that salt ponds, particularly those with medium salinities, are indeed an important component of shorebird foraging habitat in the South Bay.

Although Warnock et al. (2002) did not include water depth in their predictive models of habitat attributes affecting waterbird distribution within salt ponds, other studies have shown that shorebirds (other than phalaropes) generally do not feed in water at depths much greater than about 10-15 cm (4-6 inches), and most prefer water depths under about 4 cm (1.5 inches) (Isola et al. 2000).

Waterfowl. The San Francisco Estuary is an important wintering and migrational stopover area for many species of waterfowl (Accurso 1992, Harvey et al. 1992). Winter surveys conducted from 1987-1990 showed that South Bay salt ponds supported 27 percent or 76,000 of the Estuary's total waterfowl population, including 67 percent of San Francisco Bay's overwintering ruddy ducks and 50 percent of the buffleheads (Accurso 1992). Large numbers of dabbling ducks were also documented in salt ponds during the winter, including 89 percent of all northern shovelers in the San Francisco Bay (Accurso 1992). This finding was recently corroborated by Warnock et al. (2002), who found dabbling ducks to be the second-most abundant waterbird group (after shorebirds) counted in South Bay salt ponds during the winter. A related study by Stralberg et al. (*in prep.*) found northern shovelers to be the third most abundant waterbird species in the salt ponds, behind dunlin and western sandpiper (Table 2 in Appendix K). In addition to being important wintering habitat for waterfowl, San Francisco Bay salt ponds also provide valuable nesting habitat. At least six species of waterfowl nest within South Bay salt ponds, albeit in small numbers: Canada goose, mallard, gadwall, northern pintail, cinnamon teal, and ruddy duck.

Waterfowl use of South Bay salt ponds is at least partially associated with pond salinity. Accurso (1992) found that waterfowl, especially plant-eating dabbling ducks, were concentrated in lower-salinity (20-63 ppt) ponds, with few waterfowl present in ponds above 154 ppt. The majority of waterfowl (both plant-eating and invertebrate-eating) were observed in ponds with salinities between 35-64 ppt. This indirect relationship is likely a result of prey (*i.e.*, salt-tolerant aquatic plants and invertebrates) availability and abundance, which is directly influenced by pond salinity.

Other Waterbirds. The South Bay salt ponds provide foraging and nesting habitat for several other waterbird species in addition to shorebirds and waterfowl. Low-salinity ponds, particularly intake ponds, contain populations of salt-tolerant fish that attract fish-eating birds such as American white pelican, brown pelican, double-crested cormorant, snowy egret, black-crowned night heron, Forster's tern, and Caspian tern. Eared grebes, which primarily feed on brine shrimp, water boatmen and brine fly larvae, occur nearly exclusively on the medium- to high-salinity ponds that support these prey species (Anderson 1970, Swarth et al.

1982). They occur primarily from late August to April or early May, when individuals may number up to several thousand per pond.

Salt pond levees, dikes, and islands within salt ponds provide nesting habitat for California gull, western gull, Forster's tern, and Caspian tern. These dry areas in an otherwise vast pond complex are well-isolated from adjacent uplands and thus provide substantial protection from predators (Cogswell 2000b). California gulls were first documented nesting at the Knapp Property (Pond A6) near Alviso in 1980, and have since expanded to five "satellite" colonies in the South Bay (Ryan 2000b). This South Bay breeding population represents the only nesting colony of California gulls west of the Sierra Nevada/Cascade mountains (Harvey et al. 1992). Nesting colonies of all the above species, with the exception of western gull (i.e., California gull, Forster's tern, and Caspian tern), are considered California Species of Special Concern.

Six species of herons and egrets breed in the South Bay: great blue heron, great egret, snowy egret, black-crowned night heron, little blue heron, and cattle egret. Potential nesting habitat for these species in the vicinity of salt ponds includes trees and large shrubs such as coyote brush (*Baccharis pilularis*). Historically, the largest breeding colony (which included several species of herons) was at Mallard Slough, between Ponds A16 and A18 (WRA 1994), but apparently it is now abandoned (M. Rogers, pers. comm.).

Other Wildlife

Salt ponds generally provide marginal habitat for other wildlife species besides waterbirds. Landbirds, including several raptor species (e.g., red-tailed hawk), use pond levees for foraging and roosting. Common bird species that occur within the project area include: barn swallow, cliff swallow, black phoebe, common raven, American crow, mourning dove, Brewer's blackbird, red-winged blackbird, western meadowlark, savannah sparrow, and house finch. Special-status raptor species that occur within the study area are addressed in Section 6.3.1.4.

The number of mammal species using salt ponds is limited by low prey availability and lack of vegetative cover. Two special-status mammal species, salt marsh harvest mouse (*Reithrodontomys raviventris*) and salt marsh wandering shrew (*Sorex vagrans halicoetes*), occur (or may occur) in tidal salt marshes within and adjacent to the project area and are discussed in Section 6.3.1.4. Two introduced non-native mammal species, Norway rat (*Rattus norvegicus*) and red fox (*Vulpes vulpes*), forage along the salt pond levees and within the salt marsh and are known predators of several nesting bird species (e.g., California clapper rail, black rail, and California least tern). Other common mammal species that may occur along the pond levees include long-tailed weasel (*Mustela frenata*) Virginia opossum (*Didelphis virgiana*), racoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), feral house cat (*Felis catus*), Townsend's vole (*Microtus townsendii*), and black-tailed jackrabbit (*Lepus californicus*).

Amphibians probably do not occur within the salt ponds or in the adjacent sloughs and channels, due to high salinity. Western fence lizards (*Sceloporus occidentalis*) and souther alligator lizard (*Elgaria multicarniata*) occur on salt pond dikes and outfall structures (Eric Lichtwardt, LSA Associates, Cheryl Strong, SFBBO, pers. obs.), but are probably the only reptilian species to occur within the project area.

6.3.2 Special-Status Wildlife Species

Special-status wildlife species are animals that are legally protected under the state and federal endangered species acts or other laws and regulations (see Section 6.0, Regulatory Setting), and species that are considered rare by the scientific community. Special-status species are defined as follows:

- Animals that are listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (50 CFR 17.12 for plants; 50 CFR 17.11 for animals; various notices in the Federal Register [FR] for proposed species);
- Animals that are listed as rare, threatened, or endangered under the California Endangered Species Act (Fish and Game Code 1992 Sections 2050 et seq.; 14 CCR Sections 670.1 et seq.);
- Animals that are candidates (i.e., former Category 1 candidates) for possible future listing as threatened or endangered under the federal Endangered Species Act (61 FR 7595, February 28, 1996);
- Animals that are "fully protected" in California (Fish and Game Code, Sections 3511, 4700, 5050, and 5515);
- Animals that meet the definition of rare or endangered species under the CEQA Guidelines Section 15380, which includes species that are not protected under the state or federal endangered species acts;
- Animals that are designated as "Species of Special Concern" by CDFG; and
- Animals that are designated as "Special Animals" by CDFG, a general term that refers to all of the taxa the California Natural Diversity Data Base (CNDDB) is interested in tracking, regardless of their legal or protection status.

Database Search

The project area is contained within portions of the San Leandro, Newark, Mountain View, and Redwood Point USGS 7.5-minute quadrangle maps. A search of the CNDDB revealed records of 17 special-status terrestrial vertebrates (amphibians, birds, and mammals) that have been observed within these quads. Other potentially occurring species were identified based on personal field observations and consultations with other biologists familiar with the study area. These species are discussed below.

Species Not Likely to Occur (or Nest) in Project Area. Several of the special-status amphibian and bird species that are known (or likely) to occur in the vicinity of the project are not expected to occur in the actual project area, due to lack of suitable habitat. The California tiger salamander *(Ambystoma californiense)* and California red-legged frog *(Rana aurora draytonii)* are both amphibians. They breed in various types of freshwater environments where predatory fish are absent. These two species do not occur in salt- or brackish-water environments and are not expected to occur within the project area, due to the lack of suitable habitat.

Several bird species that are designated as species of special concern are considered special-status species only at their nesting sites. Some of the species in this category may occur within the project area during the non-breeding season (e.g., as migrants or winter residents) but are not known or expected to nest within the project area, due to the lack of suitable nesting habitat. These species include: common loon *(Gavia immer)*, American white pelican *(Pelecanus erythrorhynchos)*, canvasback *(Aythya valisineria)*, Barrow's goldeneye (*Bucephala islandica*), white-tailed kite *(Elanus leucurus)*, Cooper's hawk *(Accipiter cooperii)*, sharp-shinned hawk *(Accipiter striatus)*, osprey *(Pandion haliaetus)*, American peregrine falcon *(Falco peregrinus anatum)*, long-billed curlew *(Numenius americanus)*, and bank swallow *(Riparia riparia)* These species are not discussed any further because the proposed project (and alternatives) would not cause impacts to their nesting sites.

Species Known or Likely to Occur in Project Area. Special-status species that have been documented to occur within the project area or have a reasonable potential to occur there are listed in Table 6-8. This table notes the common and scientific names for each of the species, their legal protection status, their habitat in the project area, and their potential for occurrence within the project area. More detailed information on each of the species is provided in the text below. Records for most of these species were found in the CNDDB search.

California Brown Pelican. The California brown pelican (*Pelecanus occidentalis californicus*) is a state- and federally-listed endangered species and a California fully protected species. This species breeds at scattered localities along the western coast of Mexico, in the Gulf of California, along the Pacific Coast of Baja California north to the Channel Islands of southern California, and at the Salton Sea (Shields 2002). After breeding, thousands of individuals disperse north from their nesting grounds to spend the summer and fall along the central California coast and in San Francisco Estuary (Ainley 2000).

TABLE 6-8
SPECIAL-STATUS WILDLIFE SPECIES KNOWN TO OCCUR OR POTENTIALLY OCCURRING WITHIN THE SOUTH BAY SALT POND PROJECT AREA

Species	Status* (Federal/State/CDFG)	Habitat within Project Area	Potential for Occurrence in the Project Area
California brown pelican *(Pelecanus occidentalis californicus)*	FE/SE/CFP	Open water for foraging, isolated levees for roosting.	High. This species does not breed in the Bay Area. It occurs regularly, but in low numbers, in the South Bay during summer and fall.
Great egret *(Ardea alba)*	–/–/SA(rookery)	Rookeries located in trees and shrubs. Forages on shorelines, marshes, sloughs, and other wetland habitats. Sometimes forages in upland habitats.	Medium (nesting). A rookery was located along Mallard Slough, just south of the Alviso complex but this site has been abandoned. However, a potential new site may be located along Guadalupe Slough.
Great blue heron *(Ardea herodias)*	–/–/SA(rookery)	Rookeries located in trees. Forages on shorelines, marshes, sloughs, and other wetland habitats. Sometimes forages in upland habitat.	High (nesting). A few snowy egrets nest at a formerly large rookery located along Mallard Slough, just south of the Alviso complex.
Snowy egret *(Egretta thula)*	–/–/SA(rookery)	Rookeries located in trees, shrubs, and sometimes in tules. Forages on shorelines, marshes, sloughs, and other wetland habitat.	High (nesting). Rookery is located along Mallard Slough, just south of the Alviso complex.
Black-crowned night heron (*Nycticorax nycticorax*)	–/–/SA(rookery)	Rookeries located in trees and shrubs. Forages on shorelines, marshes, sloughs, and other wetland habitats	Low (nesting). A former rookery was located along Mallard Slough, just south of the Alviso complex.
Northern harrier *(Circus cyaneus)*	–/–/CSC(nesting)	High salt marsh, grasslands, and ruderal habitats for nesting and foraging.	High (nesting). This species is expected to nest within the project area.

Species	Status* (Federal/State/CDFG)	Habitat within Project Area	Potential for Occurrence in the Project Area
Merlin *(Falco columbarius)*	–/–/CSC (wintering)	Open areas, shorelines, mudflats, perches on poles, buildings and isolated trees.	High. This species occurs regularly during migration in the Bay Area. Small numbers are expected to winter in the South Bay.
American peregrine falcon *(Falco peregrinus anatrum)*	–/SE/CFP (nesting)	Open areas, shorelines, mudflats, perches on poles, buildings and isolated trees. Nests in the Bay Area on buildings, bridges, and high cliffs.	High. This species is expected to occur primarily during migration and is not likely to nest in the project area. Nearby breeders may forage within the project area.
California clapper rail *(Rallus longirostris obsoletus)*	FE/SE/CFP	Tidal salt marsh	High. This species is known to be present within the project area.
California black rail *(Laterallus jamaicensis)*	–/ST/CFP	Tidal salt marsh	Moderate. This species is known to winter within the project area but is not known to nest in the South Bay.
Western snowy plover *(Charadrius alexandrinus nivosus)*	FT/–/CSC	Dry salt evaporators and salt pans for nesting. Forages along shorelines, including brine ponds.	High. This species nests within the project area.
California gull *(Lars californicus)*	–/–/CSC (nesting)	Isolated islands, levees and dry ponds (nesting).	High. A large colony of California gulls currently nests within the project area.
Black skimmer *(Rynchops niger)*	–/–/CSC (nesting)	Isolated islands or levees (nesting).	High. This species is known to nest within the project area.
California least tern *(Sterna antillarum)*	FE/SE/CFP	Isolated barren islands, and levees (nesting). Forages for fish over open waters and along sloughs.	Moderate. This species does not nest in the project area, but is known to occur occasionally during migration or post-breeding dispersal.
Caspian tern *(Sterna caspia)*	–/–/SA(nesting)	Isolated barren islands, levees, and sandbars (nesting). Forages for fish over open fresh and/or salt water.	High. This large tern is known to nest within the project area.

Species	Status* (Federal/State/CDFG)	Habitat within Project Area	Potential for Occurrence in the Project Area
Forster's tern *(Sterna forsteri)*	–/–/SA(nesting)	Isolated barren islands, levees, and sandbars (nesting). Forages for fish over open fresh and/or salt water.	High. The Forster's tern is known to nest within the project area.
Burrowing owl *(Athene cunicularia)*	–/–/CSC	Tops and upper slopes of levees, ground squirrel burrows.	High to moderate. These owls are known to be present within the project area but numbers may vary from year to year.
Short-eared owl *(Asio flammeus)*	–/–/CSC (nesting)	Grasslands, ruderal habitats, and marshes for nesting and foraging.	Low (nesting). There is little available information on the breeding status of this owl in the South Bay region. May occur as a breeding species during years of high vole abundance.
Loggerhead shrike (*Lanius ludovicianus*)	–/–/CSC	Open grasslands and woodlands with scattered shrubs, fence posts, utility lines, or other perches. Nests in dense shrubs and lower branches of trees.	High. This species has been observed in the project area. Although shrikes have not been documented nesting within the project area, suitable nesting habitat (coyote brush) is present along channels and sloughs.
Salt marsh common yellowthroat *(Geothlypis trichas sinuosa)*	–/–/CSC	Brackish and salt marshes and adjacent ruderal vegetation.	High. This species nests within the project area.
Tricolored blackbird *(Agelaius tricolor)*	–/–/CSC	Typically nests in extensive freshwater marshes and occasionally in other dense, non-forested vegetation. Forages on the ground in open habitats.	Low (nesting). No freshwater marsh is located within the project area, and other potential nesting habitats are rare or absent.
Alameda song sparrow *(Melospiza melodia pusillula)*	–/–/CSC	Tidal salt marsh (nesting and foraging).	High. Known to nest in the project area.
Salt marsh wandering shrew *(Sorex vagrans halicoetes)*	–/–/CSC	Tidal salt marsh.	Moderate to high. This small mammal is known to be present in the South Bay area and suitable habitat is present within the project area.

Species	Status* (Federal/State/CDFG)	Habitat within Project Area	Potential for Occurrence in the Project Area
Salt marsh harvest mouse *(Reithrodontomys raviventris)*	–/–/CSC	Densely vegetated tidal and non-tidal salt marsh and adjacent grassland/herbaceous vegetation.	High. The salt marsh harvest mouse is known to be present in the South Bay area and suitable habitat is present within the project area.
Harbor seal *(Phoca vitulina)*	MMPA/–/–	Open water of bays and inner coastal waters. Uses isolated beaches, islands, or ledges for haul-out and pupping sites.	High. Within the project area, harbor seals are expected to use isolated beaches along the bay for pupping and as haul-out sites.

*** Status**

Federally Protected Species

FE Federal Endangered

FT Federal Threatened

MMPA Fully protected under the Marine Mammal Protection Act

State-Protected Species

SE State Endangered

ST State Threatened

FP Fully Protected

Informal Lists

CSC California Species of Special Concern

SA "Special animal" listed by the California Natural Diversity Data Base

– No status

Brown pelicans forage by sighting prey (i.e., schooling fish) from the air and plunge-diving from heights as great as 65 feet (Shields 2002). In the San Francisco Bay Estuary, important prey items include northern anchovies *(Engraulis mordax)* and other small schooling species. When the water is too shallow or turbid for plunge-diving, they will occasionally forage while swimming on the water surface using surface-seizing to catch small fish. This type of surface-feeding behavior has been observed in South Bay salt ponds (Cogswell 2000b).

The brown pelican is found primarily in the deeper portions of the Bay and also some salt ponds (Ainley 2000). Within the project area, pelicans forage over low-salinity, deepwater ponds and roost on man-made structures and occasionally on salt pond levees (WRA 1994). A wildlife survey of salt evaporator ponds A4, A5, and A8, in the Alviso Complex, found brown pelicans to be rare visitors to the project area, with most individuals being seen near slough channels (Ryan 2000a).

Herons and Egrets. The black-crowned night heron *(Nycticorax nycticorax),* snowy egret *(Egretta thula)*, great egret *(Ardea alba)*, and great blue heron *(Ardea herodias)* are all considered state species of special concern at rookery sites. These heron species use a variety of wetland and upland habitats around the San Francisco Estuary and can be observed foraging along sloughs, channels, shorelines, and on mudflats. In addition, great egrets and great blue herons can be seen foraging for frogs, snakes, and small mammals in moist grasslands around the Bay Area.

Herons nest in colonies (i.e., rookeries) that often contain multiple species. All four of the species noted above formerly nested at a historical heron rookery at Mallard Slough, between Pond A16 and A18 (WRA 1994). This rookery, however, is apparently now abandoned (M. Rogers, pers. comm.).

Northern Harrier. The northern harrier (*Circus cyaneus*) is a state species of special concern at its nesting sites. This raptor is a species of open habitats, including grasslands, ranchlands, marshes, and fields. Northern harriers typically forage low over these habitats, searching for small mammals, birds, reptiles, and frogs (MacWhirter and Bildstein 1996). They generally nest on the ground in open country, with the nest located in tall, dense grasses or other vegetation.

The northern harrier is present throughout the year and nests in suitable habitat around the South Bay (CNDDB 2003). Upper marsh and ruderal vegetation on levees within the project area provide potential nesting habitat. The northern harrier is probably present as a breeding species within the project area. Three pairs exhibiting courtship behavior were observed within the Alviso Complex during spring 2003 (E. Lichtwardt, pers. obs.).

Merlin. The merlin (*Falco columbarius*) is a state species of special concern. These small falcons do not breed in California, but occur as uncommon migrants and winter visitors. Merlins frequent open habitats such as grasslands, shorelines, marshes, and baylands. They often perch on isolated trees or structures such as telephone poles.

The merlin occurs annually as a migrant and winter visitor in areas around the South Bay and forages over salt ponds and adjacent habitats (Cogswell 2000b). The probability of this species occurring within the project area during the fall, winter, and spring is considered high, but the numbers of individuals present at any given time would be relatively low, as is typical of many raptor species.

California Clapper Rail. The California clapper rail (*Rallus longirostris obsoletus*) is a state- and federally-listed endangered species. This secretive bird prefers tidal salt marshes dominated by pickleweed and cordgrass (*Spartina* spp.) with adjacent areas of high marsh cover, e.g. pickleweed, gumplant (*Grindelia* spp.), saltgrass (*Distichlis spicata*), alkali heath (*Frankenia salina*), and fleshy jaumea (*Jaumea carnosa*) (Albertson and Evens 2000). Clapper rails also occupy tidal brackish marshes dominated by bulrush. This subspecies of the clapper rail is now restricted to the tidal marshlands around the San Francisco, San Pablo, and Suisun Bays.

A California clapper rail survey in the early 1970s estimated a total population of between 4,000 and 6,000 birds (Gill 1979). By the early 1990s, the population had declined drastically to 300 to 500 birds (Takekawa 1992). Habitat loss has contributed to this decline, but the major reason appears to be the introduction and spread of the red fox *(Vulpes vulpes)* to the baylands ecosystem. Predator control programs implemented in the San Francisco Bay National Wildlife Refuge (the Refuge) and adjacent areas have reduced the numbers of red fox and other predators and resulted in a rebound of the clapper rail population. The San Francisco Bay Estuary population has most recently been estimated to be 1,040-1,264 individuals (Albertson and Evens 2000).

There are numerous records of the California clapper rail in South Bay salt marshes (Albertson and Evens 2000, CNDDB 2003), but this species is much less common today than historically. This species is known to be present within the project area in many areas where suitable habitat is present (e.g., tidal marshes along sloughs and along the Bay shoreline).

California Black Rail. The California black rail (*Laterallus jamaicensis coturniculus*) is a state-listed threatened and California fully protected species. Around the San Francisco Bay Estuary, these rails inhabit tidal salt marsh dominated by pickleweed, but they also occupy brackish marshes dominated by bulrush. California black rails prefer tidal marshes but apparently will use higher marshlands during “wet” years (Trulio and Evens 2000). In the South Bay marshes, there are a number of records of this highly secretive species during the non-breeding season, and there is an old breeding record from Alviso but none elsewhere (Trulio and Evens 2000). Based on these records, there is at least a moderate potential for this species to occur within the project area during the non-breeding season, but it is not known to breed in the South Bay.

Western Snowy Plover. The Pacific coast population of the western snowy plover (*Charadrius alexandrinus nivosus*) is listed as federally threatened, and the snowy plover is also a California species of special concern. Snowy plovers occur in a narrow coastal zone along the Pacific and Gulf coasts of the United States and Mexico and in a disjunct area in the arid interior of the western U.S. and Mexico (Page et al. 1995). They nest on barren sandy beaches, levees and flats of salt evaporation ponds, dry lakebeds, and river sand bars. They forage on mudflats, salt flats, and along shorelines. The Pacific coast population has declined due to human impacts on beaches, coastal dunes and salt flats.

One of the largest breeding populations of snowy plovers on the Pacific Coast occurs in the South Bay, mainly east of Guadalupe Slough (WRA 1994, Page et al. 2000). Nesting habitat within the salt pond complex is confined to levees or dried pond bottoms. Snowy plvers appear to be quite opportunistic in finding newly dried or drying ponds and nest sites may change annually (C.Strong, SFBBO Comment Letter). Some historic nesting locations within the Alviso complex include levees and salt flats south of Pond A8, along the levee between Ponds A5 and A7, and at Pond A22 (WRA 1994). Historic nesting locations within the Baumberg complex include ponds 14B-17B, at two sites along the levee forming the southern edge of Pond 2, just west of Pond 1C, and at the northeastern portion of Pond 4C (WRA 1994). The most recent nesting locations from the 2003 season include: Ponds SF2 and 2 in the West Bay complex (chicks were also observed in Ponds 3, 4, and 5); Ponds A22 and A23 in the Alviso complex; and Ponds 6A, 6B, and 12 in the Baumberg complex (J. Albertson, pers. comm.). Preferred snowy plover foraging sites within the salt ponds include dried ponds with borrow ditches around the perimeter and shallow pond edges where brine flies and shrimp collect (C. Wilcox, pers. comm.). These borrow ditches retain water when the rest of the pond has dried out and are a source of brine flies for foraging snowy plover chicks.

California Gull. The California gull (*Larus californicus*) is a California species of special concern at its nesting sites. This gull nests in colonies at inland lakes in western North America but recently (1980) a breeding colony was established at Pond A6 in the Alviso complex (Shuford and Ryan 2000). From this initial colony (12 pairs) the population has grown, and currently the breeding population in the South Bay is around 10,000 individuals (Ryan 2000b). The primary nesting sites within the project area are in the Alviso complex, at Ponds A1, B2, A6, A9/A10 levee, and on the Mowry M1/M2 levee (Ryan 2000b).

The California gull winters along the Pacific Coast, primarily from central California to southern Mexico, and in the Central Valley. California gulls are abundant around the San Francisco Estuary during the winter.

Double Crested Cormorant. The double-crested cormorant *(Phalacrocorax auritus)*, is a California species of special concern at its nesting sites. This is the only species of cormorant associated within inland bodies of fresh, brackish, and saline water. In the early part of the 20th century, almost all of the double-crested cormorants that occurred in the San Francisco Bay likely nested on the offshore Farallon Islands. Since the late 1970's, they began to nest in small numbers around the Bay, especially on power transmission towers and bridges. The primary nesting sites within the project area are in the Alviso complex, at Ponds A9/A10 levee. The double-crested cormorant is most prevalent in and around the San Francisco Estuary during the winter.

Black Skimmer. The black skimmer (*Rynchops niger*) is a California species of special concern at its nesting sites. This unusual water bird has dramatically expanded its breeding range in California since it was first found nesting in the state in the early 1970's (Collins and Garrett 1996). This species was first discovered nesting in the San Francisco Estuary in 1994 (Layne et al. 1996). Skimmers have nested on Ponds A1, A8 (new site in 2003), and A16 of the Alviso complex, and Pond 1 of the West Bay complex (C. Strong, pers. comm.). Currently black skimmers nest in small numbers within the project area but may not be present at the same nesting sites from year to year (M. Rogers, pers. com.).

Black skimmers forage over open water, often at night, for small fish. Presumably they use the low salinity ponds for foraging, as well as the adjacent Bay and sloughs.

Forster's and Caspian Terns. The Forster's tern *(Sterna forsteri)* and the Caspian tern *(S. caspia)* nest on levees and dredge spoil islands within the project area. Both of these species are designated by the CNDDB as Special Animals at their nesting sites. Both Forster's and Caspian terns occur widely in North America (AOU 1998) and forage over saltwater and freshwater habitats. Within the project area, Forster's terns nest in the Baumberg complex at Ponds 1, 4, 6, 7, 9, 10, 11, and 12, and the Alviso complex at Ponds A1, A7, A8, A16, and B2 (Ryan 2000c and C. Strong pers. Comm.).

Caspian terns nest within the Baumberg Complex at Pond B10 and the Alviso Complex at Pond A7 (Ryan 2000d and C. Strong pers. Comm.)

California Least Tern. The California least tern (*Sterna antillarum browni*) is a state- and federally-listed endangered and California fully protected species. During the breeding season, the California least tern occurs along the west coast of North America from central California south to northwestern Mexico. This subspecies winters in coastal marine areas off Mexico and Central America. Least terns nest in colonies on barren or sparsely vegetated areas, including sand flats, low dunes, beaches, levees, river bars, sandy islands, and shell islands (Thompson et al. 1997). They forage for fish over shallow to deep waters.

In the San Francisco Bay area the largest nesting colony of least terns is at the former Alameda Naval Air Station. Small numbers also nest (some years) at the Oakland Airport and the Pittsburg Power Plant (Feeney 2000). Although least terns do not currently nest in South Bay salt ponds, they have been documented to use several ponds as post-breeding foraging habitat in late summer and early fall. Specific ponds where they have been seen (at various times) include: Baumberg Ponds 10, 11, 12, 9, 1, 2, 4, and 7; and Alviso Ponds A1, B1, A2E, B2, A3W, A3N, A9, A11, and A14 (Wilcox 2003). In addition, the CNDDB identifies Charleston Slough (just west of Alviso Pond A1) as a potential post-breeding foraging area for this species (CNDDB 2003).

Burrowing Owl. The burrowing owl (*Athene cunicularia*) is a California species of special concern. These small owls are widely distributed in western North America, Florida, and portions of Mexico, the Caribbean, and South America. Burrowing owls typically require open, dry habitats with populations of burrowing mammals such as the California ground squirrel. Burrowing owls nest in ground squirrel burrows and artificial cavities such as riprap and culverts, and feed on insects and small mammals.

This species has declined greatly throughout many areas of central and coastal California, including the Bay Area, and is now rare or extirpated in many counties. The decline has resulted, at least in part, from a loss of suitable habitat, through development of open grasslands and fields (Center for Biological Diversity 2003). These owls are known to occur on levees around salt ponds and in fields in the South Bay (Trulio 2000, CNDDB 2003) but the current status of burrowing owl populations within the study area is unknown. Small nesting colonies of burrowing owls occur in areas adjacent to the Alviso complex (e.g., Sunnyvale Baylands Park, Moffett Field, and Alviso [Center for Biological Diversity 2003]).

Short-eared Owl. The short-eared owl (*Asio flammeus*) is a California species of special concern that occurs in grasslands, meadows, and saline and freshwater emergent wetlands. Short-eared owls nest on the ground in dense, tall herbaceous vegetation, in upland or wetland areas without standing water. Their numbers have declined over most of their range in recent decades due to destruction and fragmentation of grassland and wetland habitats, and grazing (Remsen 1978).

The current breeding status of this species in the South Bay is not well known. Short-eared owls have not been known to nest in the South Bay salt ponds since the early 1970's (Cogswell, pers. comm. *in* WRA 1994). The last known nesting record in the South Bay was in 1977 at Bair Island, approximately 3 miles north of the West Bay complex (Remsen 1978 *in* CNNDB 2003). However, suitable nesting habitat is still present, and short-eared owls are still occasionally sighted in the South Bay (WRA 1994).

Loggerhead Shrike. The loggerhead shrike (*Lanius ludovicianus*) is a California species of special concern. This species occurs in open habitats (e.g., grasslands, deserts, oak savannahs) with scattered shrubs, trees, fenceposts, utility lines, or other perches. Dense-foliaged shrubs or trees are required for nesting. Shrikes feed on large insects, small mammals, reptiles, and amphibians, which they frequently impale on thorns or barbed wire after capturing.

Loggerhead shrikes have not been documented nesting within the project area (CNDDB 2003). However, they have been observed there (Stralberg et al. *in prep*., C. Strong, pers. comm.) and could potentially nest in coyote brush, which occurs along sloughs and channels adjacent to the salt ponds.

Salt Marsh Common Yellowthroat. The salt marsh common yellowthroat (*Geothlypis trichas sinuosa*) is a California species of special concern. The common yellowthroat is a widely-distributed warbler in North America, occurring in wetlands, moist thickets, and grasslands (Dunn and Garrett 1997). The salt marsh common yellowthroat is a subspecies restricted to riparian habitat, brackish marsh, freshwater marsh, tidal salt marsh, and adjacent grassland and ruderal vegetation along the margins of San Francisco Bay. Large areas of former habitat of this subspecies have been lost around the Bay due to development and flood control projects.

There are a number of records of this species from the project vicinity (CNDDB 2003). Within the project area, the salt marsh common yellowthroat is expected to be present along channels and sloughs that support suitable habitat (e.g., brackish marsh dominated by bulrush [*Scirpus* sp.] and cattail [*Typha* sp.]).

Tricolored Blackbird. The tricolored blackbird (*Agelaius tricolor*) is a California species of special concern at its nesting sites. This blackbird is largely endemic to the lowlands of California (Beedy and Hamilton 1999). Tricolored blackbirds are highly colonial, often forming large nesting aggregations in extensive freshwater marshes, but they also nest in moist thickets, grain fields, and willows. The CNDDB (2003) contains a 1986 record of a nesting colony in North Marsh, located on the northeast edge of the Coyote Hills Regional Park, just south of the Baumberg complex. However, the tricolored blackbird is not expected to nest within the project area due to the lack of suitable nesting habitat.

Alameda Song Sparrow. The Alameda song sparrow (*Melospiza melodia pusillula*) is a California species of special concern. This subspecies of the widely distributed song sparrow is restricted to the salt marshes and adjacent uplands around the San Francisco Bay (Cogswell 2000a). Alameda song sparrows occur primarily in tidal salt marshes, but may also nest or forage in other shoreline habitats such as seasonal wetlands, intertidal mudflats, and adjacent uplands (e.g., on dikes and levees) (Cogswell 2000a). They are expected to be present throughout the project area where suitable habitat occurs.

Salt Marsh Wandering Shrew. The salt marsh wandering shrew (SMWS) (*Sorex vagrans halicoetes*) is a California species of special concern. This shrew is known only from tidal salt marsh habitats around the San Francisco Bay (Shellhammer 2000a, Williams 1986). The salt marsh wandering shrew is a subspecies of the vagrant shrew, which ranges from southern British Columbia south to northern California and east to western Utah and Idaho (Kays and Wilson 2002); an isolated population is present in central Mexico.

The salt marsh wandering shrew occurs in areas supporting wet, medium-high salt marsh (6-8 feet above mean sea level), dominated by pickleweed, with large amounts of cover (e.g., driftwood), and an abundance of small invertebrates (Shellhammer 2000a, Willams 1986). Salt marsh wandering shrews have not been found within the project area (Shellhammer 2000a, WRA 1994). However, potential habitat is present within the project area, and there are recent records both to the north and the south (Shellhammer 2000a, CNDDB 2003). This small mammal is potentially present in salt marsh habitats along sloughs and channels within the project area.

Salt Marsh Harvest Mouse. The salt marsh harvest mouse (SMHM) (*Reithrodontomys raviventris*) is a state- and federally-listed endangered species and California species of special concern. SMHM are found only in tidal marshes around San Francisco Bay, San Pablo Bay, and Suisun Bay (Shellhammer 2000b). These mice inhabit marshes dominated by pickleweed, but they also use upland areas adjacent to the salt marsh, particularly during high tides. For the purposes of this document, "primary SMHM habitat" is defined as all areas with dense herbaceous vegetation providing at least 80 percent plant cover, a dominance (at least 50 percent) of pickleweed (or other halophytes), and vegetation height that averages 8 inches or more. "Secondary SMHM habitat" is defined as all other areas with dense herbaceous vegetation providing at least 80 percent plant cover, provided that such areas are adjacent to (and within 150 feet from) primary SMHM habitat.

The SMHM is known to occur in the project area, within the mid-upper tidal salt marsh habitat along the Bay shoreline, sloughs, and channels, as well as in diked salt marshes adjacent to salt ponds (Shellhammer 2000b). Populations of SMHM have been found within areas of tidal and non-tidal salt marsh vegetation in and surrounding the Baumberg complex, but not in the ponds themselves which lack suitable vegetative cover (C. Wilcox, pers. comm.). They have also been found along Mowry Slough, Coyote Creek, and Alviso Slough; and at other localities within the Alviso complex (Shellhammer 2000b, CNDDB 2003). No harvest mice have been recorded at the West Bay complex, although suitable habitat is present (WRA 1994).

Harbor Seal. The harbor seal (*Phoca vitulina richardsi*) is fully protected by the Marine Mammal Protection Act and is a common non-migratory pinniped found along the entire mainland coast of California. Recorded numbers of seals in San Francisco Bay range from between 550 in the summer to 125 during the winter months (Harvey et al. 1992). This species forages opportunistically in shallow littoral water, feeding on fish, crustaceans, and cephalopods. Harbor seals usually occur singly, in mother/pup pairs, or in small groups (Zeiner et al. 1990). Courtship and mating occur in the water, but undisturbed haul-out sites are necessary for pupping. In California, harbor seals breed from March through June with peak pupping activity occurring in April and May (Zeiner et al. 1990).

Harbor seals require haul-out areas free from human disturbance with unrestricted access to water for resting and breeding. Of the approximate dozen known haul-out sites in the South Bay, four occur in close proximity to the project area: (1) Guadalupe Slough, near the northeast end of Alviso Pond A3N; (2) the mouth of the Alameda Flood Control Channel, offshore from the southwest corner of Baumberg Pond 2; (3) along Coyote Creek, across from the mouth of Alviso Slough and Pond A9; and (4) along Coyote Creek, at the south end of Alviso Pond A20 (E. Griggs, pers. comm., NOAA/CDFG-OSPR 1998).

6.3.3 Criteria for Determining Significance of Effects

Criteria based on the CEQA Guidelines and NEPA implementing guidelines were used to determine the significance of wildlife impacts. Under NEPA, analysis of significance requires considerations of both the context and intensity of an impact. Consideration of context means the significance of an action must be analyzed within the appropriate ecological scale and intensity refers to the severity of the impact.

Potential impacts of the project on wildlife were characterized qualitatively and quantitatively by evaluating both the intensity and context of direct, indirect, temporary, and permanent impacts. Direct impacts include direct disturbances, such as construction activities or removal of habitat within the construction footprint. Indirect impacts include habitat alterations that result in a change in abundance or breeding success of a species (or group of species), due to the loss or gain of a primary food source through a change in pond salinities, the conversion of salt ponds to seasonal ponds or tidal marsh, the flooding of islands used for nesting, an increase in avian botulism, increased exposure to contaminants, or some other factor. Temporary impacts have a short duration, and wildlife populations would be expected to recover within a few months after implementation. An example would be the noise disturbances from operation of construction equipment. A permanent impact would involve the long-term alteration of habitat quality because the project would result in a change in habitat type. An example would be the permanent removal of a levee section, resulting in the conversion of diked salt pond to tidal marsh.

The project would have a significant impact on wildlife if it would:

- Have the potential to substantially reduce the habitat of a wildlife species, cause a wildlife population to drop below self-sustaining levels, or threaten to eliminate an animal community
- Conflict with the provisions of an approved local, regional or State policy or ordinance protecting biological resources
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or State Habitat Conservation Plan

The following significance criteria apply specifically to special status species. The project would have a significant impact on wildlife if it would:

- Result in a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFG or USFWS, with habitat modifications specifically considered significant if they would:

- Result in the permanent loss of occupied special-status species habitat or the direct mortality of individuals of special-status species (not including a minor loss of occupied habitat for species that are not listed as threatened or endangered),
- Result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by CDFG or USFWS; or
- Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites for longer than two weeks.

The term "substantial" (applied to wildlife populations, habitat, or range, has not been quantitatively defined in CEQA or NEPA. What is considered substantial varies with each species and with the particular circumstances pertinent to a particular geographic area. For the purposes of this analysis, a "substantial" reduction in wildlife habitat is defined as:

- A greater than 30% decrease in the available acreage or quality of habitat for migrating or wintering waterfowl or shorebirds.

The project would have a beneficial impact if it would result in a substantial increase (a 30% or greater increase) in the quantity or quality of habitat for wintering waterfowl, migrant and wintering shorebirds, or special status species.

6.3.4 Impacts and Mitigation Measures

This section addresses impacts to wildlife within the project area, including impacts to special-status wildlife species. The section also presents proposed mitigation for impacts that are significant or potentially significant.

Temporary (short-term) impacts to individual species were assessed qualitatively, based on the likely sensitivity or susceptibility of the species to disruption as a result of activities that may be associated with construction (e.g., noise associated with equipment operation). Permanent impacts to wildlife were assessed by comparing the quantity and quality of habitats predicted to develop over time under the project alternatives with pre-project habitat conditions. Wildlife species that occur or have potential to occur at the project site were presumed to be indirectly affected if the quantity or quality of habitats with which they are typically associated would be affected.

Each of the project alternatives, including the No Project/No Action alternative and Alternative 1, would result in the following general types of impacts:

- Short-term and long-term changes to wildlife habitat, generating negative impacts for some wildlife species (including special status species and water birds in particular), and beneficial impacts for other species
- Impacts to nesting colonies of birds (including special status birds) due to increased predator access to and/or flooding of nesting habitat
- Impacts to birds (including special status birds) from increased exposure to sediments in pond bottoms

However, the intensity of these impacts and the specific species they would affect vary from alternative to alternative, as described in Section 6.3.3.1 through 6.3.3.5 below.

In addition, the Pond Management alternatives (Alternatives 1, 2, and 3) would create the following type of impact:

- Impacts to birds (including special status birds) from the creation of conditions suitable for avian botulism

The No Project/No Action and Alternative 1 would result in lower pond levels, but would not create many of the other conditions that can promote avian botulism (e.g., warm and shallow water, fluctuating water levels, high ambient temperatures, presence of vertebrate and invertebrate carcasses, poor water quality, and rotting vegetation). Therefore this impact does not apply to these two alternatives.

Under the Pond Management alternatives (Alternatives 2, and 3), impacts include those impacts related directly to proposed construction activities and to the Initial Discharge Phase of the project, as well as impacts are related to the Continuous Pond Circulation Phase of the project.

The impacts of Pond Management Alternatives 2, and 3 would be very similar. The changes in habitat conditions that would occur in each pond (i.e., changes in type of pond, salinity range, and average depth) are shown in Table 2-1. All of these changes would be implemented both for Alternatives 2 and 3, but the timing of the initial releases from the ponds would vary. Alternative 2 specifies an April initial release, while Alternative 3 specifies a phased initial release. Alternatives 2 and 3 include flexibility for pond management, by proposing a number of "possible alternative operations" for individual ponds (see Table 2-1). The proposed changes (including the possible alternative operations) are illustrated in Figures 6-4 through 6-9 [*LSA maps*]. The changes in habitat conditions would be implemented over a period of up to 8 years, depending on the particular pond and the alternative that is implemented (see Chapter 2).

Most of the impacts to wildlife that would result from implementing the pond management alternatives can be mitigated to less than significant. The exception is Wildlife Impact-1. Under both pond management alternatives, the changes in foraging habitat described under this impact would be significant and unavoidable, even with the proposed mitigation measures. The intensity of Wildife Impact-1 is identical under Alternatives 2 and 3. This impact would remain significant and unavoidable under Alternatives 2 and 3, even with the proposed mitigation.

6.3.5 No Project/No Action Alternative

In the near term, project area ponds would be allowed to dry down and would convert to seasonal ponds. Eventually, without maintenance, the pond levees would collapse and the project area ponds would convert to open-water lagoons and eventually to tidal marsh. In some of the ponds, tidal flats would be exposed at low tides, depending on the elevations of the pond bottoms. Natural processes (e.g., sedimentation and colonization by marsh plants) would eventually lead to the re-establishment of tidal marsh vegetation in the lagoons.

Impacts are different for individual species and for the two phases (i.e., initial conversion to seasonal ponds [near-term impacts] and eventual conversion to tidal marsh [long-term impacts]), as described below. As for all of the alternatives, this alternative would result in near- and short-term changes to wildlife habitat, which would have species-specific negative and beneficial impacts. In addition, this alternative would result in impacts to nesting birds from increased predator access (near-term) and flooding (long-term); and impacts from increased exposure to contaminants in pond sediments.

It is unknown how long the levees would hold up without maintenance. Failure of levees and concomitant wildlife impacts may not occur for years, but could occur within months. Once they do fail, the resulting impacts would be long-term.

> *WILDLIFE BENEFICIAL IMPACT-1:* An increase in the area of seasonal ponds would benefit western snowy plovers that could use these ponds for nesting and foraging (near-term).

One of the initial concerns about the ISP was how it would affect western snowy plovers that currently use some of the ponds for nesting and foraging. It was determined, however, that under the No Project/No Action Alternative and Alternative 1 , the area of seasonal ponds would increase from 715 to 12,900 acres and under the ISP (Alternatives 2 and 3) at least 2,827 acres. This would greatly increase the available habitat for snowy plovers, which nest and forage on pond bottoms that have dried out (at least partially) after the end of the rainy season. Furthermore, snowy plovers are quite opportunistic in their choice of nest sites and will move from year to year to wherever suitable habitat is available (Wilcox 2003). Therefore, implementation of the ISP (Alternatives 2 and 3) is expected to have a beneficial impact on western snowy plover.

Significance: Significant.

> *WILDLIFE IMPACT-1:* Changes in pond hydrology would result in wildlife habitat changes with positive impacts for some wildlife species and negative impacts for some wildlife species.

Beneficial impacts are discussed above.

> *WILDLIFE IMPACT-1A:* Conversion of project area ponds to seasonal ponds would result in a substantial loss of open water foraging habitat for waterbirds, including special status birds (near-term).

Waterbirds would still forage in the seasonal ponds that develop in the pond basins, but overall there would be a significant decrease in foraging habitat, especially for tidal flat specialists (e.g., western sandpiper, least sandpiper, dunlin) for which the ponds represent foraging habitat throughout the tidal cycle (Stenzel et al. 2002). Although the ponds would provide foraging habitat during the wet season (from approximately December-April), they would be dry the remainder of the year, during the breeding season and fall migration period. Therefore, waterbirds that currently forage within the ponds during these periods would have to travel farther distances and expend more energy to find suitable foraging sites during high tide periods.

Once abandoned, most of the ponds would likely remain highly saline due to salts that have built up in the substrate (Granholm 1989). Rooted vegetation would consequently be sparse or absent, except for limited pickleweed growth. Waterbird species that prefer lower-salinity ponds (e.g., plant-eating dabbling ducks and fish-eating species) would therefore be limited in their foraging opportunities even when water is present during the wet season. Moreover, as water depths decrease towards the end of the wet season, foraging habitat for dabbling ducks would decline, as well.

The loss of open water foraging habitat would impact the following special status species: California least tern, Forster's tern, Caspian tern, black skimmer, and California gull. The conversion to seasonal ponds would have a beneficial impact on western snowy plovers (see Wildlife Beneficial Impact-1, below).

> *WILDLIFE IMPACT-1B:* Eventually, conversion to open-water lagoons and tidal marsh would result in habitat impacts (both positive and negative) for various species, including special status species (long-term).

This habitat conversion would be detrimental to wildlife species that prefer seasonal ponds (e.g., snowy plover) and open-water habitats (e.g., waterfowl and terns), but would benefit tidal marsh species (e.g., salt marsh harvest mouse, salt marsh wandering shrew, California clapper rail, and Alameda song sparrow).

Significance: Significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

> *WILDLIFE IMPACT-2:* Changes in water levels in some ponds would result in impacts to nesting bird colonies from increased predator access and/or flooding, thereby substantially reducing the breeding habitat for certain waterbird species in the South Bay.

> *WILDLIFE IMPACT-2A*: Drying of project area ponds would result in "land-bridging" of existing nesting colonies on islands and isolated interior levees, exposing special status species and other birds to increased predation (near-term).

As a result of reduced water depths and seasonal dry-down in project area ponds, some isolated levees or islands could be temporally connected to mainland areas, thereby allowing increased access by mammalian predators. For example, decreased water levels in Pond 10 may land-bridge the existing islands at the southwest and west-northwest corners, which currently support nesting Caspian terns, Forster's terns, and American avocets (SFBBO, unpubl. data).

The following special-status species could be adversely affected by increased predator access to islands and isolated interior levees: western snowy plover, California gull, black skimmer, Caspian tern, and Forster's tern. These species nest and generally roost on the ground and are vulnerable to predators such as the red fox, raccoon, and Norway rat. Ideal nesting habitats are isolated from mainland areas by open water. Open water serves as a barrier to mammalian predators, greatly reducing their ability to gain access to sensitive nesting and/or roosting areas.

Note that California gulls currently nest in the Knapp property (Pond A6 near Alviso), which dries in the summer. In addition, snowy plovers primarily nest in dry pond bottoms and other areas which are currently accessible by terrestrial predators. Therefore, impacts to nesting colonies of these species already exist in the project areas.

> *WILDLIFE IMPACT-2B*: Eventually, conversion to tidal marsh would further increase predator access to islands (long-term).

WILDLIFE IMPACT-2C: Collapse of pond levees would result in the loss of nesting habitat on levees for special status species and other bird species (long-term).

Without regular maintenance, the levees are expected to erode and eventually collapse and thus be unsuitable to support nesting waterbirds. Salt pond levees and dry ponds and islands they protect currently support nesting populations of five special status species (Caspian tern, Forster's tern, western snowy plover, California gull, and black skimmer) and two additional bird species (American avocet and black-necked stilts).

Significance: Significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

WILDLIFE IMPACT-3: Lower average water levels in project ponds could increase the exposure of some foraging waterbirds to contaminated sediments on the bottoms of some ponds, potentially resulting in a substantial reduction in suitable foraging habitat for some species.

WILDLIFE IMPACT-3A: Drying of the project ponds would increase the exposure of western snowy plover (a special status species) as well as other foraging birds to contaminated sediments on the pond bottoms (near-term).

Several ponds that currently receive high waterbird use (e.g., Alviso Pond A9) also have been shown to contain levels of mercury in the pond sediments comparable to levels found in the adjacent tidal mudflats and slough channels. For tidal areas around Alviso Slough/Guadalupe River, these levels may be sufficient to cause impacts to avian species through bioaccumulation. Lower water levels in the adjacent ponds would increase the area available for exposure of certain avian species (i.e., probers) to these contaminants. Refer to Section 5.3.1 for more detailed information.

WILDLIFE IMPACT-3B: Eventually, conversion to open water lagoon and tidal marsh, would cause additional special-status wildlife species to be exposed to contaminated sediments (long-term).

Sensitive species that would be affected by this impact include California clapper rail, Alameda song sparrow, salt marsh wandering shrew and salt marsh harvest mouse. Within the project area, in areas where contaminated sediments are known to occur in the salt ponds, the surrounding tidal marshes also have contaminated sediments (C. Wilcox, pers. comm.). Thus, the tidal marsh species are already exposed to contaminants. With this impact, however, the acreage of contaminated tidal marsh would eventually be substantially increased. Refer to Chapter 5 and Wildlife Impact 0.2 for more information. Refer to Section 5.3.1 for more detailed information.

Significance: Significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

6.3.5.1 Alternative 1 (Seasonal Ponds)

Impacts under this alternative would initially be similar to those under the No Project/No Action Alternative, but since the levees would be maintained, long-term impacts would differ as noted below for each of the impacts discussed for the No Project/No Action Alternative in Section 6.3.3.1 above.

WILDLIFE IMPACT-1A (CHANGES IN WILDLIFE HABITAT): Since the levees would be maintained, there would be no conversion to tidal marsh, and hence no beneficial impacts on tidal marsh species, as expected under the No Project/No Action Alternative.

WILDLIFE IMPACT-2A (IMPACTS TO NESTING BIRD COLONIES): Since the levees would be maintained, there would be no loss of nesting habitat on levees. However, as ponds dry down, nesting colonies on islands, would be exposed to increased predation due to land-bridging. Since levees would be maintained, this would be a long-term ongoing impact, rather than a just a near-term impact as under the No Project/No Action Alternative. Since the seasonal ponds within the pond basins would persist indefinitely under this alternative, western snowy plovers would derive a long-term benefit from the creation of nesting habitat (rather than the short-term benefit anticipated under the No Project/No Action Alternative).

WILDLIFE IMPACT-3A (INCREASED EXPOSURE TO CONTAMINANTS IN POND SEDIMENTS): In some ponds, the potential impact on snowy plovers due to increased exposure to contaminated sediments would be long-term, rather than short-term as it is under the No Project/No Action Alternative). However, adverse impact on tidal marsh species due to increased exposure to contaminated sediments, anticipated under the No Project/No Action Alternative, would be eliminated under the Seasonal Pond Alternative.

6.3.5.2 Alternative 2 (Simultaneous March/April Initial Discharge)

Under the Pond Management alternatives (Alternatives 2, and 3), impacts include those impacts related directly to proposed construction activities and to the Initial Discharge Phase of the project, as well as impacts are related to the Continuous Pond Circulation Phase of the project.

In general, impacts during the Continuous Pond Circulation Phase of the project would include changes in wildlife habitat (Wildlife Beneficial Impacts-1 and -2, Wildlife Impact-1), impacts from disruption of nesting bird colonies (Wildlife Impact-2), and impacts from increased exposure to contaminated pond sediments (Wildlife Impact-3), all of which are also anticipated under the No Project/No Action and Alternative 1, although the intensity of impacts and specific species impacted vary for each of these alternatives. In addition, Alternative 2 would create conditions that could produce avian botulism (Wildlife Impact-4). Also, there would be a number of short- and long-term impacts to special status species as a result of construction activities proposed under Alternative 2 (Wildlife Impacts-5 through -9).

Public access and hunting activities will not increase substantially under Alternatives 1, 2, or 3, and thus, these activities will not result in a significant impact on wildlife species. Similarly, salt pond maintenance activities (primarily consisting of the maintenance of water control structures and levees) will be very similar to those previously conducted by Cargill, when the ponds were in salt production. These activities will be subject to the conditions of the existing maintenance permit, which is being transferred to the CDFG and USFWS. Those conditions include measures to mitigate impacts on biological resources. Thus, the maintenance activities will not result in significant biological impacts.

Most of the impacts to wildlife that would result from implementing Alternative 1, including the impacts related to construction activities can be mitigated to less than significant. The exception is Wildlife Impact-1. The changes in foraging habitat described under this impact would be significant and unavoidable, even with the proposed mitigation measures.

Impacts During the Alternative 2 Continuous Circulation Phase

> *WILDLIFE BENEFICIAL IMPACT-1:* An increase in the area of seasonal ponds would benefit western snowy plovers that could use these ponds for nesting and foraging.

Under Alternative 2, the area of seasonal ponds would increase from 715 to 3,233 acres. This would greatly increase the available habitat for snowy plovers, which nest and forage on pond bottoms that have dried out (at least partially) after the end of the rainy season. Snowy plovers are expected to utilize these new seasonal ponds, because they are opportunistic in their choice of nest sites and will move from year to year to wherever suitable habitat is available (Wilcox 2003).

Significance: Significant.

> *WILDLIFE BENEFICIAL IMPACT 2:* The increase in low-salinity ponds and intake ponds will result in an increase in high-quality foraging habitat for dabbling ducks and piscivorous (fish-eating) waterbirds.

Under the proposed ISP, the number of low-salinity ponds would increase from 22 to 44. In addition, the number of intake ponds, which have been noted to support higher numbers of waterbirds than other system ponds (M. Kolar, pers. comm.), will increase from four to 16. This habitat modification would be beneficial for fish-eating waterbirds (e.g., terns, herons, pelicans, and cormorants) and several species of dabbling ducks (e.g., northern shoveler, American wigeon, and mallard), which typically forage in larger numbers in lower-salinity and intake ponds.

Significance: Significant.

> *WILDLIFE IMPACT-1*: Changes in hydrology would result in changes in wildlife habitat with positive impacts for some wildlife species and negative impacts for some wildlife species.

Beneficial impacts are discussed above. Reduced salinity in many of the ponds may substantially reduce foraging habitat for waterbird species that occur primarily in medium-salinity (60-180 ppt) ponds. (Please see the Affected Environment [Section 6.3.1] for the definitions of salinity categories, which differ from those in other sections of the EIR/EIS.)

Although salt ponds provide foraging and roosting habitat for a wide variety of waterbirds, several species occur almost exclusively in medium-salinity ponds; these include black-necked stilt, Wilson's phalarope, red-necked phalarope, and eared grebe (Anderson 1970, Swarth et al. 1982, Harvey et al. 1988, Stenzel et al. 2002). A significant portion of the total eared grebe species population occurs on the South Bay salt ponds (Cogswell 2000c).

Three species of shorebirds that traditionally forage in tidal mudflats (western sandpiper, least sandpiper, dunlin) also occur at high densities in medium-salinity ponds. These species' use of the salt ponds is highly dependent on the amount of prey available, which in turn depends upon pond salinity. The highest densities of three important waterbird prey species in San Francisco Bay (brine shrimp, water boatmen, and brine flies) occur in salinities of 60-200 ppt (Larsson 2000, Maffei 2000a, b). In one of the few studies to sample invertebrate (i.e., prey) biomass in salt ponds, Swarth et al. (1982) found biomass to be greater in high-salinity ponds than low-salinity ponds in the Coyote Hills (i.e., Newark) pond complex (they did not provide definitions for "high" and "low" salinity).

The Wilson's phalarope was selected by the Goals Project Waterfowl and Shorebirds Focus Team as representative of species that are most dependent on the salt ponds for foraging habitat (Takekawa et al. 2000, Hanson 2000). It is also one of the most halophilic bird species in the world (Jehl 1988). From late June to August, tens of thousands of phalaropes congregate on the South Bay salt ponds (Swarth et al. 1982, Harvey et al. 1988). During this time, adults and juveniles molt into basic plumage and accumulate fat reserves for their non-stop southbound migration to their wintering grounds in South America. During the breeding season, Wilson's phalaropes nest in seasonal wetlands and freshwater marshes in North American grasslands and prairies. Their migratory stopover habitat, however, is mostly tied to highly saline lakes (e.g., Mono Lake [CA], Great Salt Lake [UT], Lake Abert [OR]), where an abundance of prey (brine flies and brine shrimp) provides sorely-needed food for their long migration to South America. San Francisco Bay's salt pond system is the major staging area for this species on its Pacific Coast migration route (Colwell and Jehl 1994).

Under Alternative 2, the total number of medium- or high-salinity ponds will be reduced from 24 to 3 (Alviso Ponds A12, A13, and A15) (Table 2-1), which represents a decrease of 5,702 to 827 acres (an 85 percent decrease). These habitat changes would substantially reduce the amount of available foraging habitat in the South Bay for waterbird species that favor medium- and high-salinity ponds (e.g., black-necked stilts, Wilson's phalaropes, red-necked phalaropes, eared grebes, western sandpipers, least sandpiper, and dunlin. From a regional perspective (including the ISP project area and Cargill's Newark ponds), the acreage of medium- or high-salinity ponds will be reduced from 10,402 to 5,527 acres (a 47 percent decrease). These habitat changes would substantially reduce the amount of available foraging habitat in the South Bay for waterbird species that favor medium- and high-salinity ponds.

Since San Francisco Bay is one of only a few sites in North America that regularly support shorebirds in the hundreds of thousands, the loss of such habitat could have significant impacts on regional shorebird populations, especially for the shorebird species noted above.

Significance: Significant.

> *WILDLIFE MITIGATION MEASURE-1A:* Continue monthly surveys of waterbird use and at least one "window" survey each spring.

USGS has monitored waterbird use at Alviso Ponds A9-A16 for several years and is conducting baseline monitoring for all ponds included in the ISP from April 2003 to April 2004 (ISP, p. 52) Monthly surveys are conducted at high tides and include counts of birds involved in feeding or roosting. Monthly high-tide surveys will continue throughout implementation of the ISP.

In addition, at least one "window" survey will be conducted each spring in all CDFG- and USFWS-owned ponds in the South Bay (including those not included in the ISP), i.e., all ponds will be surveyed within the same time period to determine waterbird distribution and abundance.

WILDLIFE MITIGATION MEASURE-1B: Compare monthly monitoring data to monthly post-ISP implementation data.

The data from monthly high tide surveys carried out throughout implementation of the ISP will be compared to USGS monthly baseline waterbird monitoring data.

WILDLIFE MITIGATION MEASURE-1C: If survey results show a major decline in waterbird populations, manage more ponds as medium- or high salinity batch ponds.

As noted in Section 6.3.2, a "significant" decline in a population is a decrease of 30% or more, compared to baseline conditions of phalaropes, black-necked stilts, eared grebes, or small shorebirds (i.e., western sandpiper, least sandpiper, dunlin), or other waterbird species. If it appears that these declines are related to the loss of medium- and high-salinity ponds, to the extent feasible, more ponds would be managed as medium- or high-salinity batch ponds (see the "possible alternative operations" in Table 2-1), to increase the acreage of medium- and high-salinity habitat and to offset the loss of foraging habitat from ISP implementation,.

Please note that, although Table 2-1 defines batch ponds as "high salinity," they actually fall within the medium-salinity category used by the Goals Project and in the Biology section of this document. To avoid confusion, when referring to ISP management options, the term "high salinity batch pond" will continue to be used.

Post-mitigation Significance: Potentially significant.

WILDLIFE IMPACT-2: Changes in water levels in some ponds would result in impacts to nesting bird colonies from increased predator access and/or flooding, thereby substantially reducing the breeding habitat for certain waterbird species in the South Bay.

Currently, isolated salt pond levees and islands in salt ponds support nesting bird colonies. Ideal nesting habitats are isolated from mainland areas by open water. Open water serves as a barrier to mammalian predators, greatly reducing their ability to gain access to sensitive nesting and/or roosting areas. As a result of reduced water depths, seasonal dry-down, increased tidal action, and changing water levels within various ponds, Alternative 1 could result in "land-bridging" of existing nesting islands and isolated interior levees, exposing nesting colonies to predators that could more easily access islands from levees and the surrounding tidal marsh. Fluctuating water levels could also flood some of the nesting colonies.

The following special-status species could be adversely affected by increased predator access to islands and isolated interior levees: western snowy plover, California gull, black skimmer, Caspian tern, and Forster's tern. American avocets and black-necked stilts (neither of which are special status species) could also be adversely impacted. These species nest and generally roost on the ground and are vulnerable to predators such as the red fox, raccoon, and Norway rat. For example, decreased water levels in Baumberg Pond 10 may land-bridge the existing islands at the southwest and west-northwest corners, which currently support nesting Caspian terns, Forster's terns, and American avocets (SFBBO, unpubl. data).

Significance: Potentially significant.

WILDLIFE MITIGATION MEASURE -2A: Identify islands and interior levees in need of protection from water level fluctuation.

SFBBO is currently conducting breeding bird surveys throughout the South Bay salt ponds. CDFG and USFWS will use those survey results to identify islands and interior levees in need of protection from water level fluctuation.

> *WILDLIFE MITIGATION MEASURE-2B:* During implementation of the ISP, islands and interior levees will be checked weekly (as access conditions permit) from March to July for nesting waterbirds that could be impacted by flooding or land-bridging.

> *WILDLIFE MITIGATION MEASURE-2C*: Water levels will be manipulated as needed to ensure proper isolation from the surrounding levees and tidal marsh during the nesting season and to avoid flooding of nest sites.

Specific ponds that may require close monitoring include Alviso Ponds A1, A7, and A16, and Baumberg Pond 10.

Post-mitigation Significance: Less than significant.

> *WILDLIFE IMPACT-3*: Lower average water levels in project ponds could increase the exposure of some foraging waterbirds to contaminated sediments on the bottoms of some ponds, potentially resulting in a substantial reduction in suitable foraging habitat for some species.

Several ponds that currently receive high waterbird use (e.g., Alviso Pond A9) also have been shown to contain high levels of mercury in the bottom sediments similar to levels in adjacent tidal mudflats and slough channels. For tidal areas around Alviso Slough/Guadalupe River, these levels may be sufficient to cause impacts to avian species through bioaccumulation. Lower water levels in the adjacent ponds would incrase the area available for exposure of certain avian species (i.e., probers) to these contaminants. Refer to Section 5.3.3 for more detailed information.

Significance: Significant

> *WILDLIFE MITIGATION MEASURE-3*: Implement Sediments Mitigation Measure-1A through 1D (See Chapter 5).

Post-mitigation Significance: Less than significant.

> *WILDLIFE IMPACT-4*: The overall reduction in pond salinities and water depths may create conditions suitable for avian botulism, which could substantially reduce the populations of special status bird species and other waterbird species in the project area.

Avian botulism is a neurological disease caused by ingestion of a toxin produced by the bacterium *Clostridium botulinum*. Symptoms include inability to fly, followed by paralysis of the legs. As the disease progresses, the inner eyelid and neck muscles are also paralyzed. Affected birds often drown, as they are no longer able to hold their heads out of the water (Friend and Franson 1999). Some of the environmental conditions which can influence an outbreak of avian botulism are warm and shallow water, fluctuating water levels, high ambient temperatures, presence of vertebrate and invertebrate carcasses, poor water quality, and rotting vegetation.

In surveys conducted from June 28 through November 17, 2002 at Artesian Slough, Coyote Creek, and Alviso Slough, the SFBBO found no evidence of avian botulism in 17 birds that were collected. In addition, avian botulism has not yet been documented in saline waters in the Bay Area (C. Wilcox, pers. comm.). Nevertheless, the overall reduction of water levels within the salt ponds may create conditions susceptible to outbreaks of avian botulism, especially during the warmer summer months.

Avian botulism affects ducks more than any other waterbird species. The following special-status species could also potentially be impacted by an outbreak of avian botulism: California brown pelican, California clapper rail, western snowy plover, Caspian tern, Forster's tern, California gull, black skimmer, and California least tern.

Significance: Potentially significant.

> *WILDLIFE MITIGATION MEASURE-4*: The following measures would be taken to reduce the spread of avian botulism through the project area:
>
> *WILDLIFE MITIGATION MEASURE-4A*: If there is evidence of avian botulism in areas surveyed by SFBBO, Refuge staff will survey the adjacent ponds using shallow draft boats.
>
> *WILDLIFE MITIGATION MEASURE-4B*: All personnel conducting operational activities in the ponds will be trained to recognize symptoms of avian botulism and will make special observation efforts during late August, September, and October, when outbreaks generally occur.
>
> *WILDLIFE MITIGATION MEASURE-4C*: If dead birds are found, they will be retrieved and incinerated in an approved facility. Sick birds will be brought to an approved avian rehabilitation facility.

Post-mitigation significance: Less than significant.

Impacts Related to Alternative 2 Construction Activities

> *WILDLIFE IMPACT-5:* Construction could impact existing tidal salt marsh habitat for the California clapper rail.

The California clapper rail is known to occur in the densely-vegetated portions of mid- to high tidal marsh habitat found along the sloughs and channels in the project area. Construction associated with implementation of the ISP could disturb nesting California clapper rails or their habitat on the outboard side of levees, along sloughs and along the bay shoreline. The vegetation at proposed water control structure locations is described in Section 6.2.2. Six of these locations contain suitable clapper rail habitat (Table 6-5). It is possible, however, that additional locations support clapper rail habitat within 100 feet of proposed construction work. (Note: The construction buffer distance used to minimize harassment to clapper rails is 100 feet. If clapper rails are breeding within that distance from a construction site, work is typically delayed until after the breeding season. However, if a clapper rail is detected within 700 feet of a survey point, and if clapper rail habitat is present at that survey point, then the breeding territory is assumed to include that survey point.)

Significance: Potentially significant.

WILDLIFE MITIGATION MEASURE 5: The following measures will be implemented to avoid or minimize adverse affects on clapper rails:

WILDLIFE MITIGATION MEASURE-5A: Survey construction sites for clapper rails.

Prior to the start of construction activities, a qualified wildlife biologist will visit all construction sites, including locations of water control structures and proposed levee breaches (if any). The biologist will determine whether potential clapper rail nesting habitat is present within 100 feet of each site.

WILDLIFE MITIGATION MEASURE-5B: Locate construction outside clapper rail nesting habitat.

Whenever possible, construction sites will be located in areas that do not support potential nesting habitat for clapper rails. No construction work will occur within 100 feet of potential clapper rail nesting habitat during the nesting season (February 1 - August 31), unless prior surveys indicate that the habitat is not part of an active clapper rail breeding territory. Such surveys will be conducted in accordance with a project-specific clapper rail survey protocol that has been approved by the USFWS and CDFG.

WILDLIFE MITIGATION MEASURE-5C: Any short-term impacts to clapper rail habitat will be offset by the long-term benefits of restoring Alviso Ponds A19, A20, and A21 (475 acres) to tidal marsh.

Post-mitigation Significance: Less than significant. With the implementation of these measures, the amount of construction-related disturbance (e.g., due to displacement or harassment) and habitat loss will be limited in extent and duration. Temporary and localized effects of construction disturbance and habitat loss will likely occur in a few locations as a result of implementing the ISP, but the mitigation measures noted above would reduce these effects to a less-than-significant level.

WILDLIFE IMPACT-6: Construction could impact existing tidal or non-tidal salt marsh habitat for the salt marsh harvest mouse (SMHM) and salt marsh wandering shrew (SMWS).

Construction for implementation of the ISP could impact known or potential habitat for the SMHM and SMWS. Descriptive information has been collected regarding the site-specific characteristics of the vegetation at each of the proposed construction locations . Twenty-three of these locations contain suitable habitat for salt marsh harvest mouse and wandering shrew (Tables 6-5, 6-6, and 6-7).

Measures are incorporated into the project (Mitigation Measure 1.3, below) to relocate salt marsh harvest mice and wandering shrews as well as other native small mammal species from construction areas. The extent of construction will be limited. This should allow movement of mice and shrews from temporarily disturbed marshes to existing undisturbed marshes in the project area. Overall, this short-term, minor reduction in available habitat at a few locations that results from construction for implementation of the ISP will be offset by the long-term establishment of tidal marsh habitat in the project area.

Significance: Potentially significant.

WILDLIFE MITIGATION MEASURE-6: The following measures will be implemented to avoid or minimize adverse affects to salt marsh harvest mice:

WILDLIFE MITIGATION MEASURE-6A: Survey construction sites for SMHM and SMWS prior to construction.

Prior to the start of construction activities, a qualified wildlife biologist will visit all construction sites. The biologist will determine whether potential SMHM or SMWS habitat is present within the immediate disturbance area of each construction site.

WILDLIFE MITIGATION MEASURE-6B: Whenever possible, construction sites will be relocated if necessary to avoid areas that support potential habitat for SMHM or SMWS.

WILDLIFE MITIGATION MEASURE-6C: If a construction site(s) cannot be located outside of such areas, construction impacts will be limited to the smallest possible area of suitable SMHM or SMWS habitat.

The construction areas will be clearly demarcated by temporary fencing and signs throughout the construction period. No construction activities will be allowed in tidal marsh, except within the fenced areas.

WILDLIFE MITIGATION MEASURE-6D: Just before construction, vegetation within the fenced areas will be cleared using hand tools, if feasible.

The purpose of the vegetation clearing is to discourage SMHM or SMWS from remaining in the construction areas by removing the vegetative cover that they require, and making it possible to see any mice that are present. Construction work will start as soon as possible (and no longer than one week) after the vegetation has been cleared.

WILDLIFE MITIGATION MEASURE-6E: A qualified biological monitor will oversee vegetation clearing and construction activities at the construction sites.

The monitor will remain on-site during all construction work directly affecting SMHM habitat. The monitor will have the authority to control or halt construction activity that is not consistent with the protection measures noted above. Additionally, the monitor will notify the USFWS and CDFG of any unanticipated damage to protected habitat areas, or any dead or injured special-status species.

WILDLIFE MITIGATION MEASURE-6F: Short-term impacts to SMHM and SMWS habitat will be offset by the long-term benefits of restoring Alviso Ponds A19, A20, and A21 (475 acres) to tidal marsh.

Post-mitigation Significance: Less than significant.

WILDLIFE IMPACT-7: Construction could impact burrowing owls and/or nesting northern harriers on the levees within the project area.

Burrowing owls and northern harriers nest and forage in upland habitats on levees, and are known to occur within the ISP project area. During the breeding season, construction activities for implementation of the ISP could destroy active nests or disrupt the breeding activities of nesting burrowing owls or harriers. Additionally, construction-related activities that occur during the non-breeding season could adversely affect and displace burrowing owls from their burrows.

Significance: Potentially significant.

Note: Wildlife Mitigation Measure 7, below, applies to impacts to burrowing owls. Wildlife Mitigation Measure-8 applies to impacts to northern harriers.

> *WILDLIFE MITIGATION MEASURE-7*: The following measures will be implemented to avoid or minimize adverse effects to burrowing owls:
>
> *WILDLIFE MITIGATION MEASURE-7A*: Survey construction sites for burrowing owls prior to construction.

Pre-construction surveys for burrowing owls will be conducted in and adjacent to all construction areas within 30 days of all construction activities, or by following the CDFG survey protocols currently in effect at that time. If construction activities at a site are delayed or suspended for more than 30 days, the site will be re-surveyed.

> *WILDLIFE MITIGATION MEASURE-7B:* During the breeding season (February 1 through August 31), if burrowing owls are found on or adjacent to a construction site, a clearly-delineated construction buffer will be established around each occupied burrow at a minimum radius of 250 feet from the burrow.

If construction vehicles must pass through an established buffer in order to access a construction site, a "no stopping" policy will be implemented, and appropriate signs will be posted at the buffer periphery.

> *WILDLIFE MITIGATION MEASURE-7C:* During the non-breeding season, if destruction of an occupied burrow is unavoidable, or if a construction site is located within 160 feet of an occupied burrow, passive relocation measures will be implemented to encourage the owl(s) to move away from the burrow prior to construction. If no suitable alternate burrows are present within 500 feet of the destroyed burrow, two artificial burrows will be installed at an appropriate location, to be determined by a qualified wildlife biologist.

Passive relocation methods and artificial burrow locations will be subject to CDFG approval, but will follow guidelines outlined in the CDFG *Staff Report on Burrowing Owl Mitigation* (CDFG 1995). Passive relocation will not be conducted during the breeding season (February 1-August 31).

> *WILDLIFE MITIGATION MEASURE-7D*: All protection measures will remain in place for the duration of construction at the occupied sites or until a qualified biological monitor verifies that burrowing owls are no longer present.
>
> *WILDLIFE MITIGATION MEASURE-8:* The following measures will be implemented to avoid or minimize adverse effects to northern harriers:
>
> *WILDLIFE MITIGATION MEASURE-8A*: Survey construction sites for northern harriers prior to construction at sites where construction is scheduled during the northern harrier nesting season (generally late March through August).

Pre-construction surveys for northern harriers will be conducted in and adjacent to all construction areas within 30 days of all construction activities, or by following the CDFG survey protocols currently in effect at that time. If construction activities at a site are delayed or suspended for more than 30 days, the site will be re-surveyed.

> *WILDLIFE MITIGATION MEASURE-8B:* If an active harrier nest is found at or adjacent to a site, construction activities will be rescheduled until after the nesting season. If this is not feasible, construction buffers will be established around each nest, at a minimum radius of 200 feet from the nest.

The buffers will be clearly marked with temporary fencing and signs. No construction activities will occur within the buffer as long as the nest is active. If construction vehicles must pass through an established buffer in order to access a construction site, a "no stopping" policy will be implemented, and appropriate signs will be posted at the buffer periphery.

> *WILDLIFE MITIGATION MEASURE-8C*: Active nest sites will be monitored by a qualified biologist throughout the nesting season to verify that the protective measures are effective and to implement additional measures, if necessary.

The protection measures will remain in effect until the biological monitor determines that the nesting cycle has been successfully completed or that the nest is no longer active.

Post-mitigation Significance: Less than significant.

> *WILDLIFE IMPACT-8:* Construction could result in disturbance to breeding activity of salt marsh common yellowthroat, Alameda song sparrow, and/or several nesting waterbird species (western snowy plover, Caspian tern, Forster's tern, California gull, black skimmer, herons, and egrets).

Construction activities associated with implementation of the ISP could destroy active nests and/or disrupt the breeding activities of these special-status bird species. For example, the proposed construction activities on the internal levee between Ponds A5 and A7 could impact Forster's terns reported to nest there.

Significance: Potentially significant.

Note: Wildlife Mitigation Measure 9, below, applies to impacts to salt marsh common yellowthroat and Alameda song sparrow. Wildlife Mitigation Measure-10 applies to impacts to western snowy plover, Caspian tern, Forster's tern, California gull, black skimmer, and other special-status waterbird species (e.g., herons and egrets).

> *WILDLIFE MITIGATION MEASURE-9*: The following measures will be implemented to avoid or minimize adverse effects to salt marsh common yellowthroat and Alameda song sparrow.

> *WILDLIFE MITIGATION MEASURE-9A*: Construction associated with implementation of the ISP will be located and timed to avoid impacts to potential nesting habitat of these species, to the extent feasible.

> *WILDLIFE MITIGATION MEASURE-9B:* If avoidance of construction during the nesting season is not feasible, pre-construction surveys will be completed, prior to the initiation of project construction, at construction sites that are located within, or

adjacent to, suitable nesting habitat for these species (e.g., tidal marsh, riparian, or adjacent brushy habitat).

WILDLIFE MITIGATION MEASURE-9C: If active nests are present, construction buffers will be established at a minimum radius of 50 feet from the nest. Active nest sites will be monitored by a qualified biologist periodically during the nesting season to verify that the protection measures are effective and to implement additional measures, if necessary.

If construction vehicles must pass through an established buffer in order to access a construction site, a "no stopping" policy will be implemented, and appropriate signs will be posted at the buffer periphery. The protection measures will remain in effect until the biological monitor determines that the nesting cycle has been successfully completed or that the nest is no longer active.

WILDLIFE MITIGATION MEASURE-10: The following measures will be implemented to avoid or minimize adverse effects to nesting sites of western snowy plover, Caspian tern, Forster's tern, California gull, black skimmer, or other special-status waterbird species (e.g., herons and egrets):

WILDLIFE MITIGATION MEASURE-10A: Construction associated with implementation of the ISP will be located and timed to avoid impacts to potential nesting sites of these species, to the extent feasible. This construction timing restriction will be implemented from March through September 15 for western snowy plover and from April through August for the other waterbird species.

WILDLIFE MITIGATION MEASURE-10B: If avoidance of construction during the nesting season is not feasible, pre-construction surveys will be completed, prior to the initiation of project construction, at construction sites that are located within, or adjacent to, suitable nesting habitat for these species (e.g., seasonal ponds, islands, and levees).

WILDLIFE MITIGATION MEASURE-10C: If active nests are present, construction buffers will be established at a minimum radius of 200 feet from the nesting site or nesting colony periphery. Active nest sites will be monitored by a qualified biologist periodically during the nesting season unless monitoring demonstrates that nesting is complete and the young are capable of flight.

If construction vehicles must pass through an established buffer in order to access a construction site, a "no stopping" policy will be implemented, and appropriate signs will be posted at the buffer periphery. The protection measures will remain in effect until the biological monitor determines that the nesting cycle has been successfully completed or that the nest is no longer active.

Post-mitigation Significance: Less than significant.

WILDLIFE IMPACT-9: Construction for implementation of the ISP, and various maintenance operations, may impact harbor seals in the area (short-term and long-term impacts).

Harbor seals at haul-out sites are susceptible to human disturbance. They typically flush from haul-out sites when people approach them from shore or by boat or when they are disturbed by various construction activities and noises. Such disturbances can have an adverse impact on harbor seals, particularly during the pupping and molting seasons, when individuals are considered more vulnerable than at other times of the year.

Significance: Potentially significant.

> *WILDLIFE MITIGATION MEASURE-11:* The following measures will be implemented to avoid or minimize adverse effects to harbor seals:
>
> *WILDLIFE MITIGATION MEASURE-11A*: At locations near known harbor seal haul-outs and pupping sites, pre-construction surveys will be conducted prior to initiating project construction.
>
> *WILDLIFE MITIGATION MEASURE-11B*: To the extent feasible, water control structures will not be located at or adjacent to active haul-out or pupping sites.

The installation of such structures and the subsequent maintenance could be a source of significant disturbance to the seals.

> *WILDLIFE MITIGATION MEASURE-11C*: If installation of structures and subsequent maintenance is proposed for locations in close proximity to sensitive harbor seal sites (i.e., within 200 feet for haul-outs and 500 feet for pupping sites; distance subject to approval of NOAA), such activities will be conducted outside of the pupping season (March to May) and the molting season (June to August).
>
> *WILDLIFE MITIGATION MEASURE-11D*: If construction and operations activities cannot be timed to avoid disturbance to haul-out sites, disturbance to hauled out individuals will be minimized. A qualified biological monitor will be present during construction activities near harbor seal haul-outs. A clearly-marked, protective buffer (200 feet wide, as measured from the edge of the haul-out site; distance subject to approval of NOAA) will be established and maintained, and no construction personnel or equipment will be allowed to enter this area while hauled out individuals are present.

Adaptive Management Strategies for Pond Management (Alternatives 2 and 3)

A variety of adaptive management strategies have been proposed. If these strategies are implemented, there would be a smaller loss of mid-salinity ponds (as defined specifically for wildlife; see Section 6.3.1) compared to the ISP. Therefore, the intensity of Wildlife Impact-1 would be reduced under the adaptive management strategies. Mitigation measures proposed for Wildlife Impact-1 under alternatives 2 and 3 would further reduce the severity of the impact, but would not eliminate it. Even with the reduced severity of impact and the proposed mitigation, Wildlife Impact-1 would remain potentially. These would be long-range impacts during the Continuous Circulation Phase of the project.

In addition, parts of Wildlife Mitigation Measures-5 and -6 would not apply if the adaptive management strategies are implemented, because alternatives 2 and 3 include "possible alternative operations" that, if implemented, would convert Alviso Ponds A19, A20, and A21 to seasonal ponds, rather than to tidal marsh. In that case, these ponds would not be available to mitigate for potential impacts on tidal marsh species such as California clapper rails, salt marsh harvest mice, and salt marsh wandering shrews.

The differences between Wildlife Impact-1 and Wildlife Mitigation Measures -5 and -6 if the adaptive management strategies are implemented, compared to Alternatives 2 and 3, are noted below.

> *WILDLIFE IMPACT-1:* Changes in hydrology would result in changes in foraging habitat with positive impacts for some wildlife species (e.g., western snowy plover, a special status species) and negative impacts for some wildlife species.

Adaptive management strategies include system-specific alternatives that are not included in the ISP (see Table 2-1). These alternatives allow considerable management flexibility to the agencies responsible for implementing the ISP. For example, many ponds currently proposed by the ISP as low-salinity ponds could alternatively be managed as medium or high-salinity batch ponds (see salinity categories in Section 6.3.1). These include: Alviso Ponds A2E, A3N, and A8; and Baumberg Ponds 4, 7, 1C, 5C, 12, 13, and 14. As a result, the area of medium- and high salinity habitat would be reduced from 5,702 to 1,872 acres (67 % decrease) rather than 5,702 to 827 acres (85% decrease), as proposed in Alternatives 2and 3. Thus, if the adaptive management strategies are implemented, the reduction would be between 67% and 85%. From a regional perspective (including the ISP project area and Cargill's Newark ponds), the acreage of medium- and high-salinity ponds will be reduced from 10,402 to 6,572 acres (a 37 percent decrease).

Post-mitigation Significance: Potentially significant.

> *WILDLIFE MITIGATION MEASURE-1A*: Continue monthly surveys of waterbird use and at least one "window" survey each spring.

See discussion of this mitigation measure under Section 6.3.5.2.

> *WILDLIFE MITIGATION MEASURE-1B:* Compare monthly monitoring data to monthly post-ISP implementation data.

See discussion of this mitigation measure under Section 6.3.5.2.

> *WILDLIFE MITIGATION MEASURE-1C:* If survey results show a major decline in waterbird populations, manage more ponds as medium or high salinity batch ponds.

See discussion of this mitigation measure under Section 6.3.5.2.

Post-mitigation Significance: Potentially significant.

> *WILDLIFE IMPACT-5*: Construction could impact existing tidal salt marsh habitat for the California clapper rail.

Significance: Potentially significant.

> *WILDLIFE MITIGATION MEASURE 5*: The following measures will be implemented:
>
> *WILDLIFE MITIGATION MEASURE-5C*: Any short-term impacts to clapper rail habitat will be offset by the long-term benefits of restoring Alviso Ponds A19, A20, and A21 (475 acres) to tidal marsh.

Installation of water control structures will disturb only a minimal area of tidal marsh habitat, and most of this area will revegetate naturally after construction. If the adaptive management strategies are implemented, the Alviso “Island Ponds” (A19, A20, or A21) will either be restored to tidal marsh or managed as seasonal ponds. If they are managed as seasonal ponds, no levees will be breached (thus avoiding short-term loss of tidal marsh due to levee breaching). If they are restored to tidal marsh, the levees will be breached, possibly resulting in a short-term loss of existing tidal marsh. However, the long-term benefits of tidal marsh restoration will compensate for the short-term impacts on small areas of tidal marsh. In addition, any long-term impacts on tidal marsh will be mitigated by the large-scale tidal marsh restoration to be implemented under the long-term management plan for the ISP area.

Post-mitigation Significance: Less than significant.

> *WILDLIFE IMPACT-6:* Construction could impact existing tidal or non-tidal salt marsh habitat for the salt marsh harvest mouse (SMHM) and salt marsh wandering shrew (SMWS).

Significance: Potentially significant.

> *WILDLIFE MITIGATION MEASURE-6*: The following measures will be implemented:
>
> *WILDLIFE MITIGATION MEASURE-6F*: Short-term impacts to SMHM and SMWS habitat will be offset by the long-term benefits of restoring Alviso Ponds A19, A20, and A21 (475 acres) to tidal marsh.

Installation of water control structures will disturb only a minimal area of tidal marsh habitat, and most of this area will revegetate naturally after construction. If the adaptive management strategies are implemented, the Alviso “Island Ponds” (A19, A20, or A21) will either be restored to tidal marsh or managed as seasonal ponds. If they are managed as seasonal ponds, no levees will be breached (thus avoiding short-term loss of tidal marsh due to levee breaching). If they are restored to tidal marsh, the levees will be breached, possibly resulting in a short-term loss of existing tidal marsh. However, the long-term benefits of tidal marsh restoration will compensate for the short-term impacts on small areas of tidal marsh. In addition, any long-term impacts on tidal marsh will be mitigated by the large-scale tidal marsh restoration to be implemented under the long-term management plan for the ISP area.

Post-mitigation Significance: Less than significant.

6.3.5.3 Alternative 3 (Phased Initial Discharge)

Impacts would be very similar to those under Alternative 2. No additional significant (or potentially significant) impacts are expected.

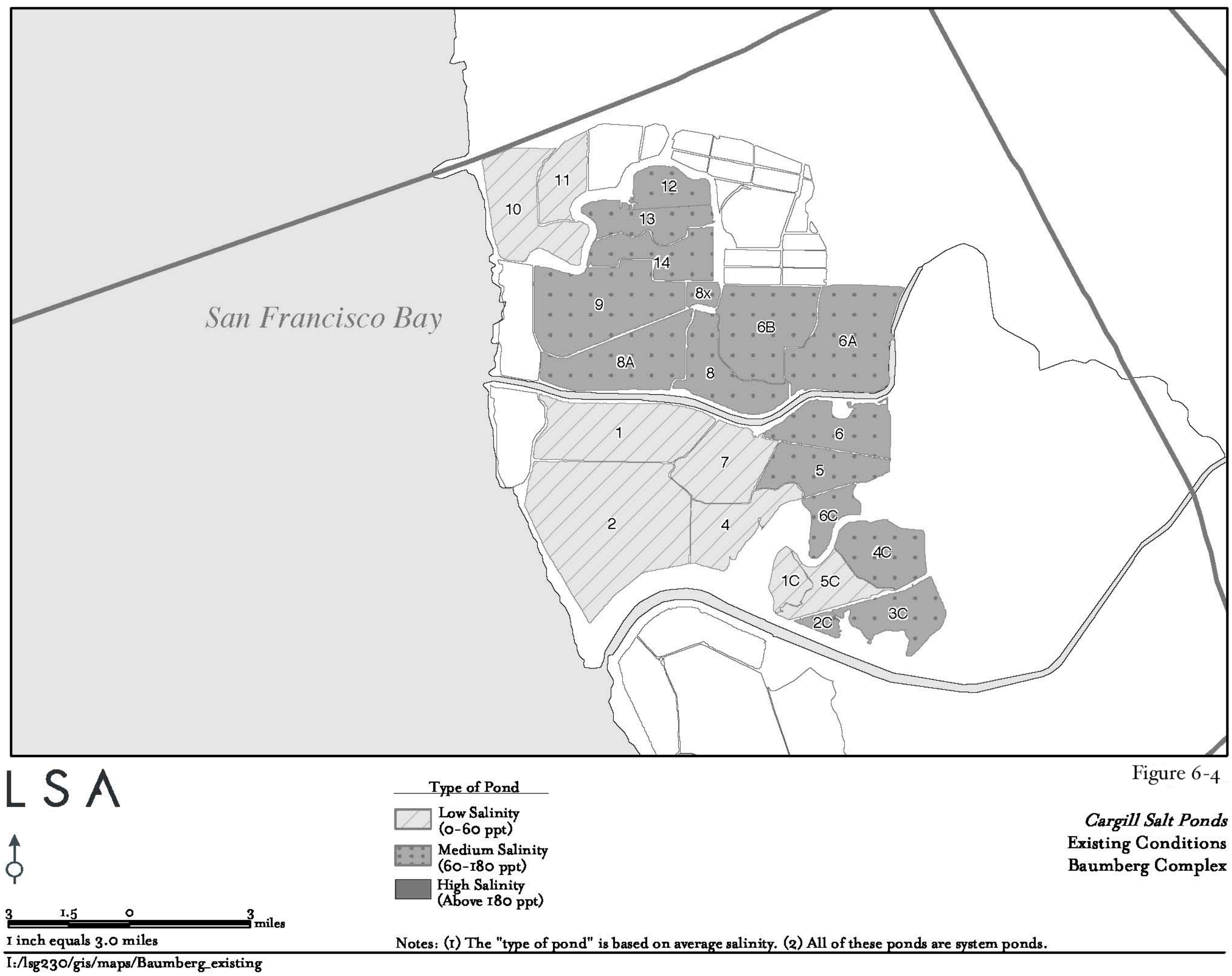
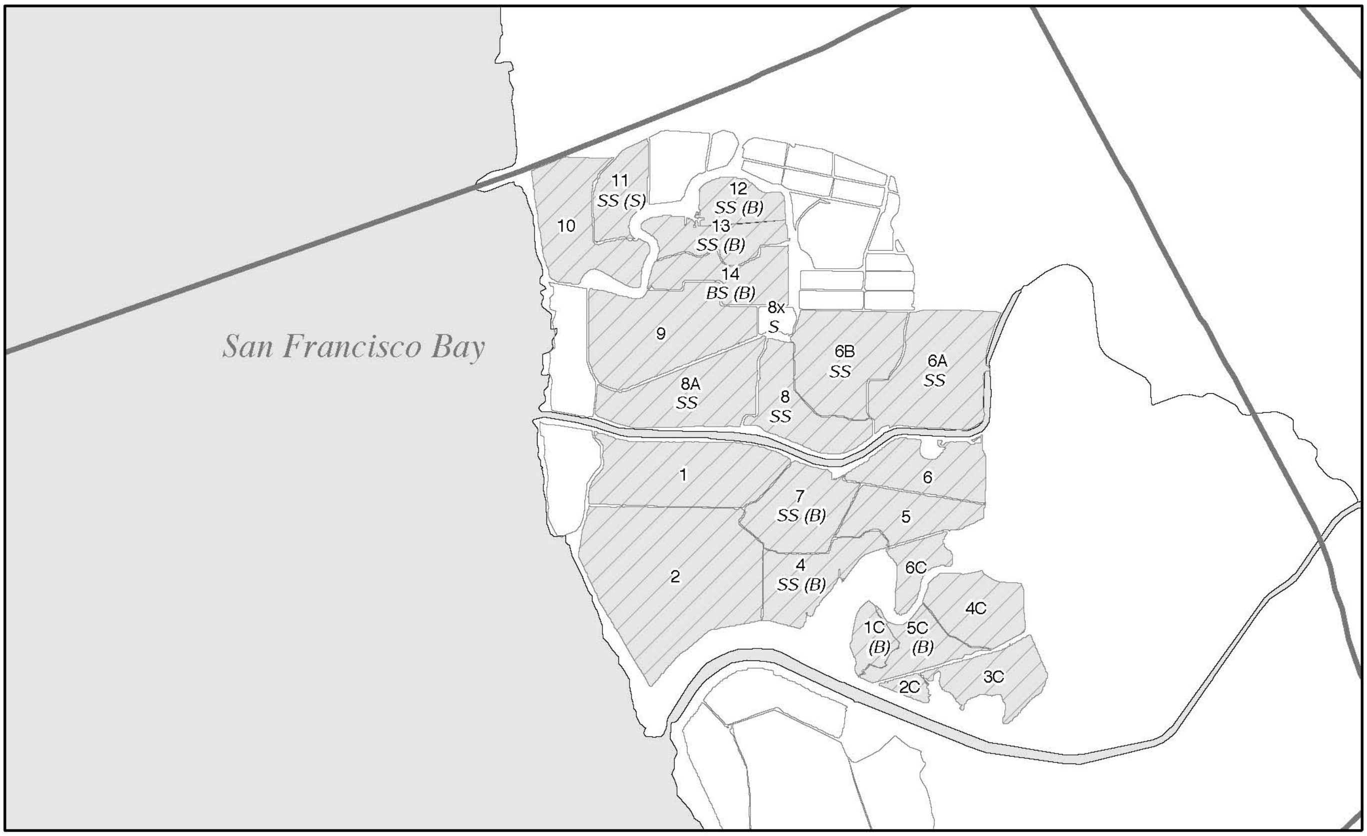


Figure 6-4

Cargill Salt Ponds
Existing Conditions
Baumberg Complex

Notes: (1) The "type of pond" is based on average salinity. (2) All of these ponds are system ponds.



LSA

Type of Pond

Low Salinity (0-60 ppt)

Medium Salinity (60-180 ppt)

High Salinity (Above 180 ppt)

Tidal or Seasonal

S = Seasonal Pond
BS = Batch/Seasonal Pond
SS = System/Seasonal Pond

Possible Alternative Operations

(*B*) = Batch (Medium salinity)
(*S*) = Seasonal

3 1.5 0 3 miles

1 inch equals 3.0 miles

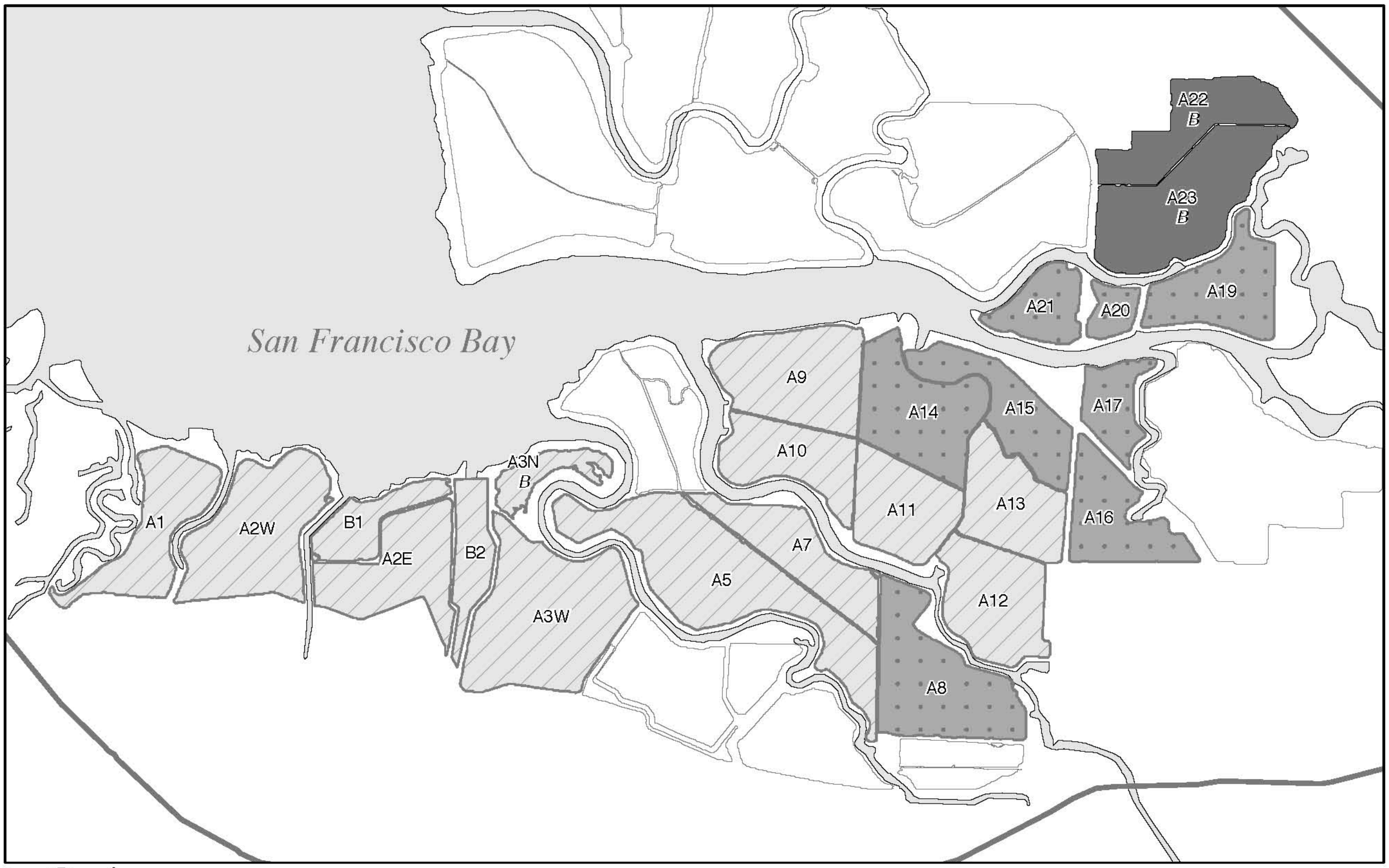
I:/lsg230/gis/maps/Baumberg_proposed

Notes: (1) The "type of pond" is based on average salinity. (2) The other ponds (not labeled as *S, BS* or *SS*) are system ponds.

Figure 6-5

Cargill Salt Ponds
Proposed ISP Conditions
Baumberg Complex

Alternative 2 and 3



LSA

Type of Pond

Low Salinity (0-60 ppt)

B = Batch Pond

Medium Salinity (60-180 ppt)

High Salinity (Above 180 ppt)

Tidal or Seasonal

3 1.5 0 3 miles

1 inch equals 3.0 miles

Notes: (1) The "type of pond" is based on average salinity. (2)The other ponds (not labeled as *B*) are system ponds.

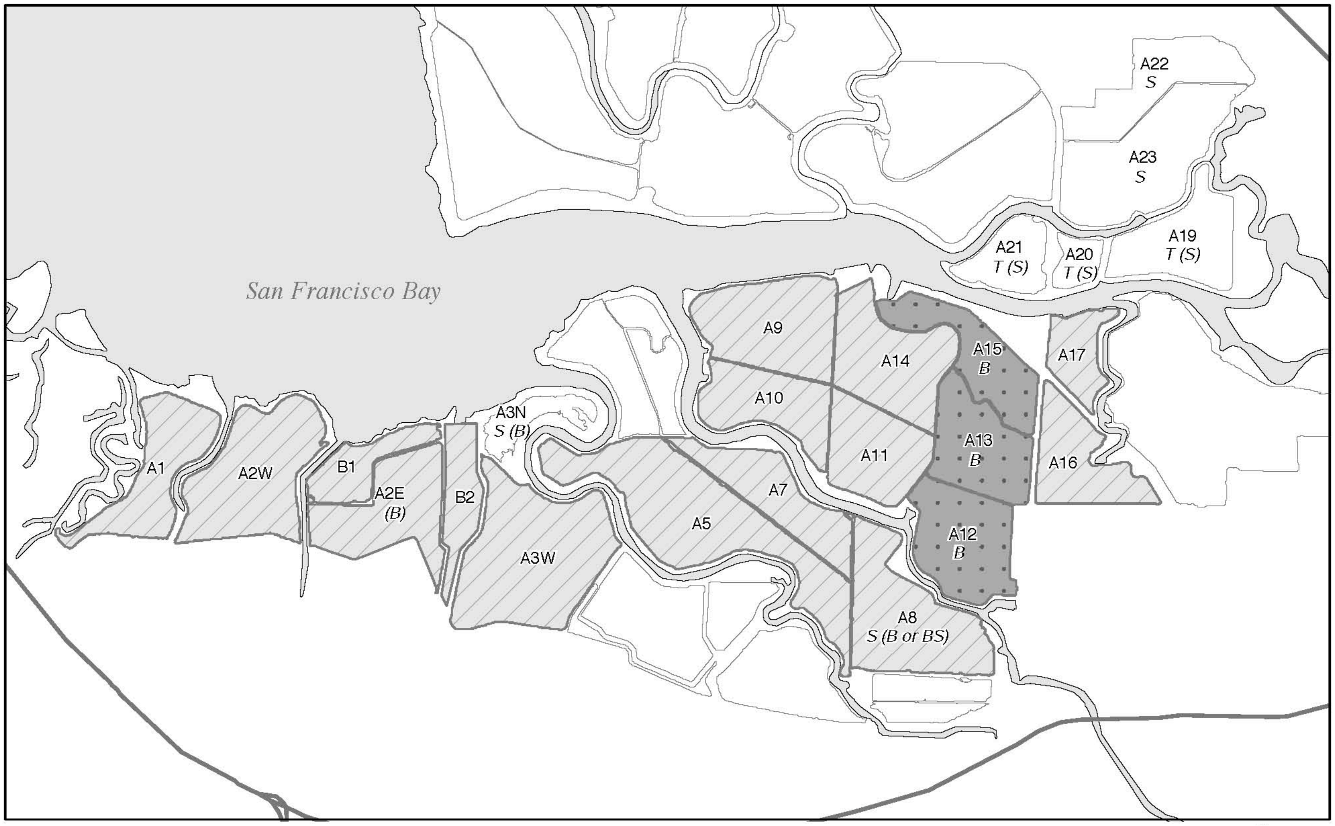
I:/lsg230/gis/maps/Alviso_existing

Figure 6-6

Cargill Salt Ponds

Existing Conditions

Alviso Ponds



LSA

Type of Pond

- Low Salinity (0-60 ppt)
- Medium Salinity (60-180 ppt)
- High Salinity (Above 180 ppt)
- Tidal or Seasonal

B = Batch Pond
T = Tidal Pond
S = Seasonal Pond

Possible Alternative Operations

(*B*) = Batch (medium salinity)
(*S*) = Seasonal
(*BS*) = Batch/Seasonal

3 1.5 0 3 miles
1 inch equals 3.0 miles
I:/lsg230/gis/maps/Alviso_proposed

Notes:(1) The "type of pond" is based on average salinity. (2) The other ponds (not labeled as *B*, *T*, or *S*) are system ponds.

Figure 6-7

Cargill Salt Ponds
Proposed ISP Conditions
Alviso Ponds

Alternative 2 and 3

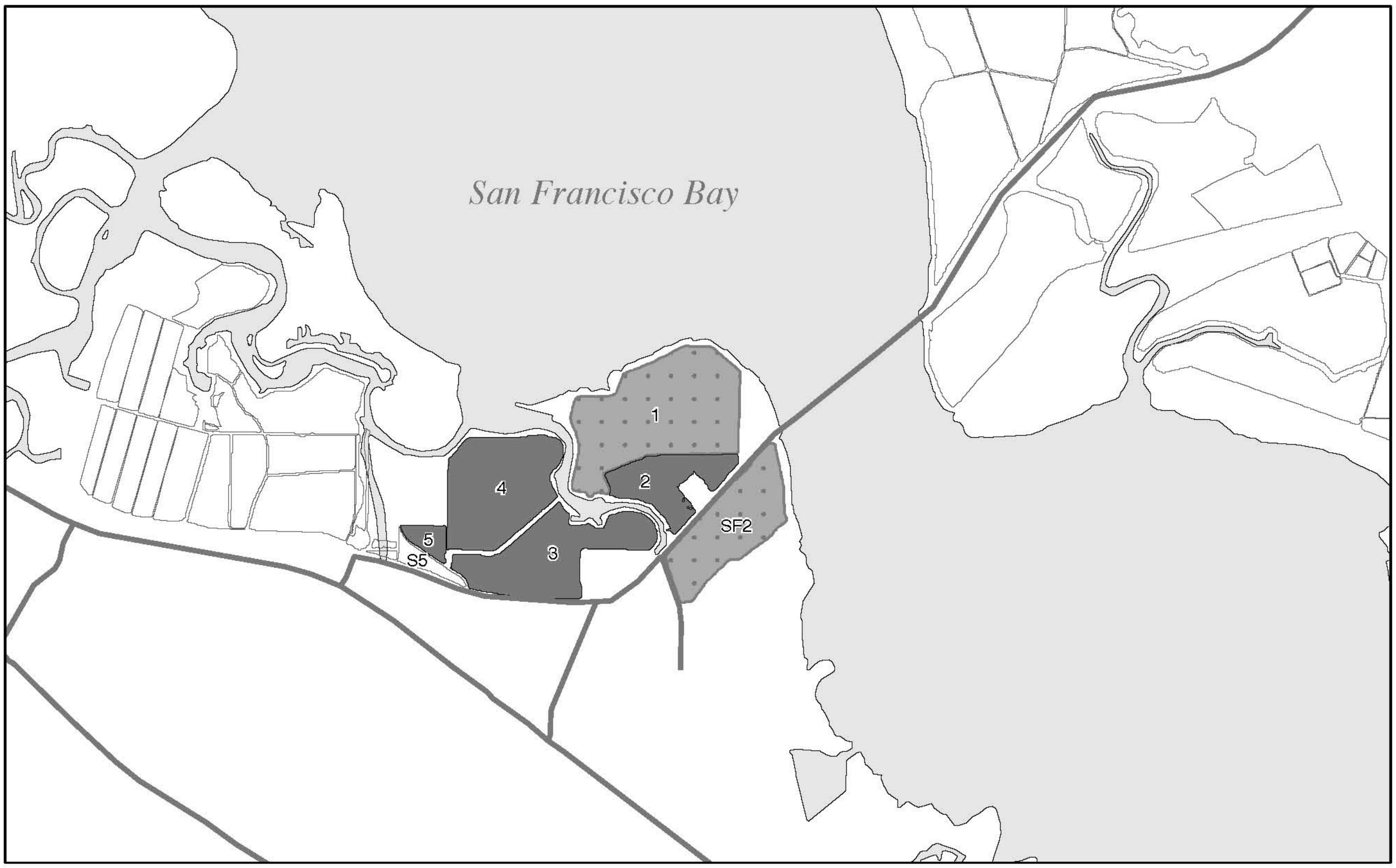


Figure 6-8

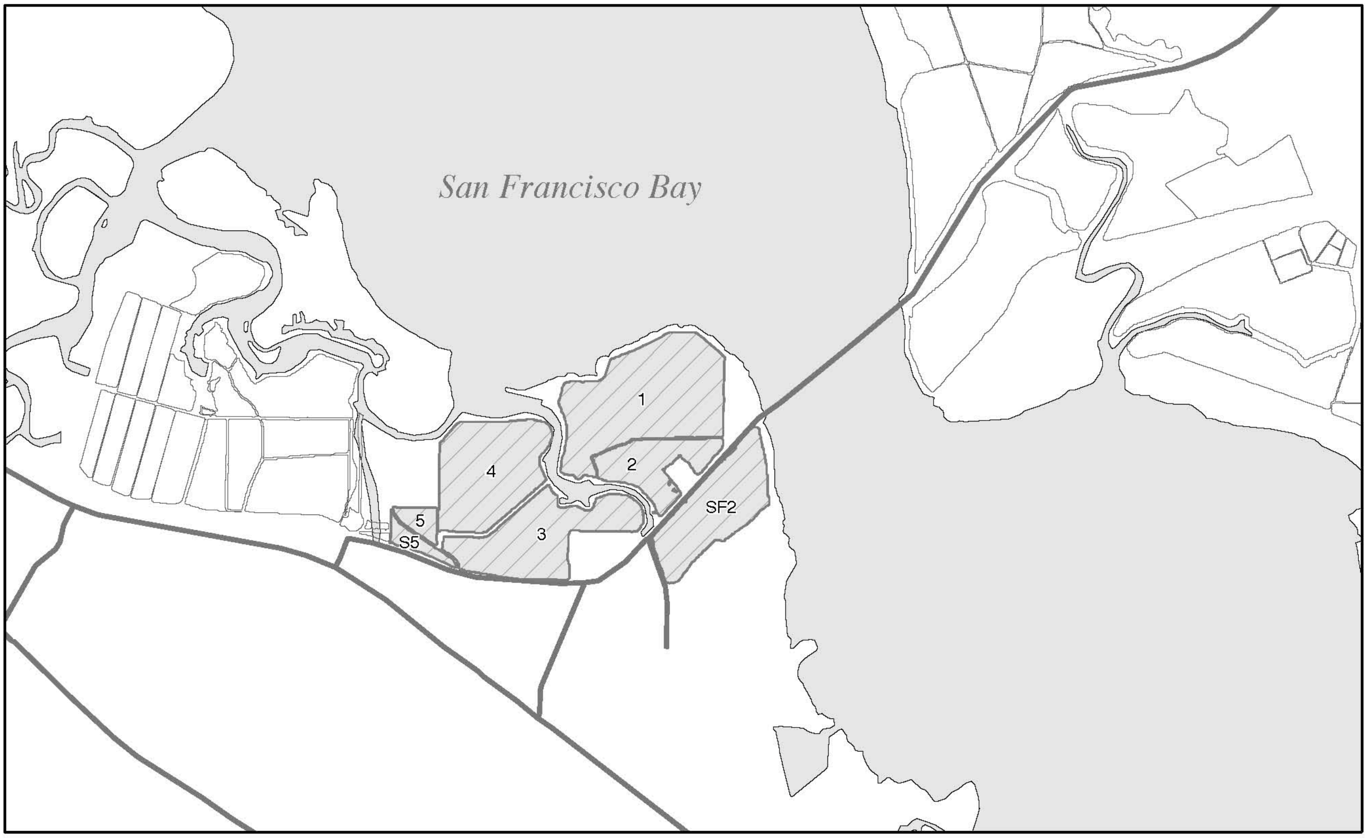
Cargill Salt Ponds
Existing Conditions
West Bay Complex

LSA

Type of Pond
- Low Salinity (0-60 ppt)
- Medium Salinity (60-180 ppt)
- High Salinity (Above 180 ppt)

3 1.5 0 3 miles
1 inch equals 3.0 miles
I:/lsg230/gis/maps/Westbay_existing

Notes: (1)The "type of pond" is based on average salinity.
(2)All of these ponds are system ponds. (3)No salinity data is available for Pond S5.



LSA

Type of Pond

Low Salinity (0-60 ppt)

Medium Salinity (60-180 ppt)

High Salinity (Above 180 ppt)

Possible Alternative Operations

None proposed

Figure 6-9

Cargill Salt Ponds

Proposed ISP Conditions

West Bay Complex

Alternative 2 and 3

3 1.5 0 3 miles

1 inch equals 3.0 miles

Notes: (1)The "type of pond" is based on average salinity. (2) All of these ponds are system ponds.

I:/lsg230/gis/maps/Westbay_proposed

6.4 BIOLOGICAL RESOURCES—FISH AND MACROINVERTEBRATES

This section describes the fish and macroinvertebrate communities known to occur within the salt ponds, sloughs and creeks, open water, and the South Bay shoreline within the project area and the effect that project implementation may have on these communities. The section also addresses impacts to special status fish species within the project area. The existing condition and anticipated impacts to shrimp are addressed in Section 6.2, Benthic Invertebrates.

Site-specific fish surveys were not conducted for this project. However, information specific to the project area or to the region was available from a number of sources, including reports prepared for the Goals Project 2000, Woods (1984), Wild (1969), Lonzarich (1989), in addition to the extensive 1980-2002 California Department of Fish and Game (CDFG) San Francisco Bay-Delta fishery sampling data base (Baxter et al. 1999; CDFG unpublished data). The South Bay Dischargers Association (SBDA) 1982-1986 study (Kinnetics 1987) (was also used, as well as 1978-79 fish egg and larval sampling conducted by PG&E in the South Bay. These sources are cited below and full references are provided in Chapter 13.

6.4.1 Affected Environment

6.4.1.1 Regional Overview

San Francisco Bay provides habitat for a variety of fish species, which may inhabit the system year-round or on a seasonal basis. Fish species inhabiting the Bay include northern anchovy (*Engraulis mordax)*, Pacific herring (*Clupea pallasi)*, flatfish, surfperch, gobies, sharks and rays, smelt, Chinook salmon (*Oncorhynchus tshawytscha)* and steelhead (*Oncorhynchus mykiss)*, and a wide variety of other species (Baxter et al. 1999; Wang 1986).

In addition to the fish community, the Bay provides habitat supporting a diverse assemblage of benthic and epibenthic macroinvertebrates including clams, worms, crabs, and shrimp. Shrimp and crabs (macroinvertebrates) inhabit intertidal and subtidal areas similar to fish, have habitat requirements and preferences similar to many of the fish species (e.g., preferences for sandy substrate, rock outcroppings, etc.), and serve an important ecological role as key prey species for many of the fish inhabiting the South Bay. Shrimp and crabs, as with many of the fish species, also support recreational and/or commercial fisheries within the Bay and coastal waters and, hence, are an important element of the aquatic community to be considered when evaluating potential effects of the proposed project on habitat quality and availability, and the population dynamics of aquatic resources that may be effected by the proposed project.

Fish, shrimp, and crabs use habitats within San Francisco Bay for a number of functions including, but not limited to, adult and juvenile foraging, spawning, egg incubation and larval development, juvenile nursery areas, and as migratory corridors. Species composition, abundance, habitat use, and geographic distribution for many of these species vary seasonally and among years. Factors affecting species composition and geographic distribution within the Bay include salinity gradients; variation in water temperature, water depth, and substrate; and availability of foraging and cover habitat (e.g., pilings, rock outcroppings, submerged aquatic vegetation, and riprap).

The estuarine environment within the areas adjacent to the proposed South Bay salt pond sites is dynamic, varying in response to factors such as the magnitude of freshwater inflow from the Sacramento and San Joaquin river systems and other tributaries to the Bay and resultant changes in salinity gradients, the movement of marine waters from near-shore coastal areas into and out of the Bay on a tidal basis, wind- and tidally-driven current patterns, seasonal variation in water temperatures, and a variety of other physical and biological processes. The habitat use and functions of these intertidal and subtidal areas vary in response to these physical factors as well as to differences in life-history characteristics and habitat requirements for the Bay's wide variety of species.

The presence, abundance, and distribution of fish species in the Bay-Delta estuary are determined by numerous abiotic and biological factors (Moyle and Cech 2000). However, there are some general factors that exert a strong influence and explain much of the spatial and temporal variability in species abundance and distribution. In particular, physical and chemical factors such as temperature, salinity, water velocities and current patterns, substrate, habitat characteristics (e.g., rock outcroppings, emergent vegetation, etc.) and dissolved oxygen levels play important roles in determining the seasonal timing, habitat use, and spatial distribution of fish and macroinvertebrates (e.g., bay shrimp [*Crangon nigricauda]* and crabs) within various regions of San Francisco Bay and the Delta.

Baxter et al. (1999) described the geographic distribution of various fish, shrimp, and crab species inhabiting the Bay and their response to seasonal and geographic variation in salinity gradients and water temperature. The geographic distribution of many of these species within the Bay is determined, in large part, by salinity tolerance and preference. Within the Bay-Delta estuary, salinities range from freshwater within the river systems to marine, as influenced by tidal exchange with nearshore coastal waters. Within the Bay-Delta estuary, freshwater and saltwater mix, forming a highly dynamic and productive estuarine habitat characterized by a wide range of salinities, both geographically and seasonally. The geographic distribution and habitat usage patterns for the fish, shrimp, and crabs inhabiting the Bay, which may vary by different lifestages of the species, reflect in large part the response to these salinity conditions.

The general salinity range for various fish, shrimp, and crabs has been compiled by Baxter et al. (1999). The fish, shrimp, and crab species that use subtidal and intertidal habitat within the estuary typically tolerate mesohaline (5-18 parts per thousand [ppt]), polyhaline (18-30 ppt), and euhaline (>30 ppt) salinities (Baxter et al. 1999). The fluctuating and intermediate salinity typical of estuarine habitats is the factor that limits the penetration of both marine and freshwater species into the mixed waters in the interior of the estuary. Accordingly, the specific area of the estuary in which a species is found is determined largely by the species salinity tolerances (Baxter et al. 1999). Salinity within the estuary varies from freshwater within the creeks and rivers to full strength seawater in Central Bay near the Golden Gate. Within the South Bay, regional, localized, and seasonal variation in salinities affect the fish and macroinvertebrate species that would be present in the area of the proposed project.

The estuary supports a diverse assemblage of resident and migratory fish species and macroinvertebrates. Many of the species use the estuary on a seasonal basis (e.g., Pacific herring, northern anchovy, California halibut [*Paralichthys californicus]*, Dungeness crab [*Cancer magister]*), taking advantage of favorable conditions to complete their life cycles (Baxter et al. 1999). Other species, such as Chinook salmon and steelhead, utilize the Bay-

Delta estuary primarily as a migratory corridor between freshwater spawning and juvenile rearing areas within the creeks and rivers tributary to the estuary and the coastal marine waters.

A number of studies (Kinnetics 1987, Wild 1969) have demonstrated the importance of the sloughs around San Francisco Bay to provide food and habitat for developing fish. Some species (i.e., Pacific herring, northern anchovy) depend upon diatoms, phytoplankton and planktonic copepods for food, while other fish are predators on baitfish (striped bass [*Morone saxatilis*], California halibut, leopard shark [*Triakis semifasciata*]). Other estuarine species, including the early life stages of many fish (i.e., shiner perch [*Cymatogaster aggregate*], speckled sanddab [*Citharichthys stigmaeus*], white croaker [*Genyonemus lineatus*]) depend upon amphipods, other crustaceans and bivalves. Thus, there is a direct link between the benthic communities in South Bay sloughs that supply the food to support the fish populations found in the sloughs.

6.4.1.2 Anadromous Fish Inhabiting South Bay Creeks

Anadromous or migratory species move through the Bay-Delta estuary during passage to or from freshwater and coastal marine habitats. The vast majority of anadromous fish species, including Chinook salmon, steelhead, striped bass, American shad (*Alosa sapidissima)*, and sturgeon, migrate through the northern portion of San Francisco Bay (e.g., Central Bay, San Pablo Bay, and Suisun Bay) during their upstream and downstream migrations into the Sacramento and San Joaquin river systems. A substantially smaller proportion of anadromous fish populations migrate into the South Bay. Chinook salmon and steelhead are known to use South Bay tributaries as spawning and juvenile rearing habitat and have been the focus of several programs designed to improve habitat conditions and the abundance of both salmon and steelhead in these watersheds.

Steelhead and Chinook salmon produced in the South Bay tributaries would migrate through the estuary as both emigrating juveniles and immigrating adults. Although the migration routes for juvenile and adult salmon and steelhead within the South Bay are unknown, it is likely that these fish would occur seasonally in the general vicinity of the proposed project. Adult Chinook salmon migration typically occurs during the fall (September-November) with juvenile migration during the spring (February-May). Adult steelhead migration typically occurs during the winter and early spring (December-April) with juvenile migration primarily during the spring (February-May).

At least nine rivers and creeks flow into the South Bay that either have annual salmonid migrations or potential spawning habitat for Chinook or steelhead: San Leandro Creek, Alameda Creek, Coyote Creek, Upper Penitencia Creek, Alviso Creek, Guadalupe River, Stevens Creek, San Francisquito Creek, and possibly San Lorenzo Creek (Leidy 2000). Historically, all of these rivers and creeks may have supported annual runs of salmon and/or steelhead. Now salmonid numbers are greatly reduced, and only Coyote Creek, Guadalupe River, Stevens Creek, and San Francisquito Creek have consistent records of Chinook salmon and/or steelhead. Anadromous fish use of these four creeks and Alameda Creek are discussed below.

Alameda Creek. Access to Alameda Creek for returning adult Chinook salmon and steelhead has been completely blocked by a passage barrier located in the lower reaches of the creek (Gunther et al. 2000). Both adult Chinook salmon and steelhead have been observed downstream of the passage barrier in recent years (Hanson unpublished data). Restoration plans, including passage facilities, are currently being developed for Alameda Creek.

Steelhead are known to opportunistically migrate upstream into a variety of watersheds tributary to San Francisco Bay, particularly in response to high stream discharge during winter and early spring months. Modifications to many of these watersheds, including Old Alameda Creek, have resulted in barriers and impediments to the successful upstream and downstream migration of adult and juvenile steelhead (including, but not limited to tide gates and other structures), degraded stream habitat and availability of suitable gravels for spawning and egg incubation, in addition to the occurrence of elevated and adverse summer water temperatures which contribute to unsuitable juvenile steelhead rearing conditions. As a result of these factors affecting habitat quality and availability, many of these watersheds do not provide suitable habitat conditions for successful migration, spawning and egg incubation, and juvenile rearing by steelhead required to support self-sustaining populations.

San Francisquito Creek. San Francisquito Creek is known to support a steelhead run of approximately 100 fish. Habitat surveys conducted along this system indicate that sufficient spawning habitat exists to support at least that many fish.

Stevens Creek. Stevens Creek has a relatively large population of resident rainbow trout (*Oncorhynchus mykiss*). These fish are mostly trapped (and thereby prevented from migrating downstream) by a series of passage impediments. Small numbers of steelhead do migrate in and out of the system, but their passage is severely impeded by barriers such as the L'Avenida drop structure, particularly during low-flow periods (Habitat Restoration Group 1994, 1995).

Coyote Creek. Coyote Creek originates at Anderson Reservoir, located 52 km upstream of Dixon Landing Road, and flows north into the South Bay. Streamflow is initially regulated by releases from Anderson Reservoir and further controlled by additional small dams and water diversion facilities located downstream.

Campbell and Cannon (1998) identified potential spawning and rearing habitats for Chinook and steelhead in the lower reaches of Coyote Creek. Adult Chinook salmon migrate upstream in the fall, when flow rates are relatively low, while adult steelhead migrate upstream in winter, when flow rates are usually higher. Historically, Coyote Creek was an important spawning stream for steelhead. Both steelhead and Chinook salmon have been observed spawning in upper Penitencia Creek, a tributary of Coyote Creek (Smith, pers. comm., cited in Habitat Restoration Group 1995). Plans are currently being developed to enhance habitat conditions and fish passage within the Coyote Creek system.

At present, Coyote Creek supports small runs of steelhead and Chinook salmon. It is estimated that annual runs of less than 100 of each species migrate in and out of the river. A number of surveys have been conducted along the lower reaches of the creek in recent years. In each case, the numbers of fish observed or captured have been small, usually less than 10 individuals of each species (Hsueh 1999; Habitat Restoration Group 1989, 1994, 1995). However, larger numbers of fish were caught by fyke netting in lower Coyote Creek in spring 1999: 159 steelhead and 171 Chinook smolts were recorded migrating downstream to the Bay, and 76 adult Chinook were observed migrating upstream to spawn in the fall of that year (Hsueh 2000).

Guadalupe River. Historically, steelhead existed throughout the Guadalupe River system (Skinner 1962). However, after the construction of Almaden and Guadalupe reservoirs in the mid 1930s and Lexington Reservoir in 1952, steelhead were restricted to tributary streams downstream of the dams (USACE 1998). Suitable spawning habitat has been identified in the upper reaches to support steelhead. Juvenile steelhead summer rearing may be limited by water temperature to upper portions of Guadalupe Creek. It is still unknown whether juvenile steelhead rear throughout the summer further downstream in Guadalupe River, where water temperatures in summer often exceed 70 F (USACE 1998).

Although no historical account of the abundance of Chinook salmon migrating and spawning in the Guadalupe River exists, small numbers of fall-run Chinook have been observed in the river within the last 10 years (Habitat Restoration Group 1994, 1995; USACE 1998). These fish may be an undocumented indigenous population or strays from wild or hatchery populations from the Sacramento-San Joaquin River system (Habitat Restoration Group 1994). A total of between 50 and 200 spawning adult fish was estimated to occur in the river in 1994. It is now estimated that the river supports a moderate Chinook salmon run of approximately several hundred fish with a smaller steelhead run (fewer than 100 fish annually) (Habitat Restoration Group 1994). Plans and projects are being developed to enhance habitat conditions and fish passage within the Guadalupe River watershed.

6.4.1.3 Other Fish in Project Area Tributaries

The composition of the fish communities in the five tributaries into which pond water will be circulated (i.e., Coyote Creek, Alviso Slough, Guadalupe Slough, Alameda Flood Control Channel, and Old Alameda Creek) can be estimated based on surveys performed in these and adjacent tributaries. In a five-year study (1982-86) performed for the South Bay Dischargers Association (SBDA) (Kinnetics 1987), fish were collected and identified from two locations in Coyote Creek (SJ2 and SJ4) and one location in Guadalupe Slough (SJ6). The results of this study indicate that these tributaries are inhabited by a number of estuarine fish species, including staghorn sculpin (*Leptocottus armatus*), northern anchovy, starry flounder, shiner perch, yellowfin goby (*Acanthogobius flavimanus*), threadfin shad (*Dorosma petenense*), and longfin smelt (*Spirinchus thaleichthys*).

A more recent study performed for the City of Palo Alto (Cressey 1997) confirmed that the fish species observed in the sloughs in the 1982-1986 were present at that time. In two tributaries to South Bay (i.e., San Francisquito Creek and the channel from the Palo Alto wastewater treatment plant to the bay), several fish species were collected, including northern anchovy and topsmelt (*Atherinops affinis*), yellowfin goby, staghorn sculpin, and threespine stickleback (*Gasterosteus aculeatus)*.

Lonzarich (1989) conducted a fish survey within Alviso Slough, designed to characterize the species composition of the fish community. Species collected from Alviso Slough included bay goby (*Lepidogobius lepidus)*, English sole (*Parophrys vetulus)*, leopard shark, northern anchovy, shiner perch, and striped bass. Juvenile fish were collected indicating that the slough habitat supports rearing in addition to foraging and cover habitat for subadult and adult fish.

Wild (1969) sampled the fish community inhabiting Plummers Creek (a tributary to South San Francisco Bay in the vicinity of Alviso) between March and September 1966. Species inhabiting the tidally influenced creek included leopard shark, bat ray (*Myliobatis* *californica)*, American shad, Pacific herring, threadfin shad, northern anchovy, whitebait smelt (*Allosmerus elongates)*, Sacramento splittail (*Pogonichthys macrolepidotus)*, rainwater killifish (*Lucania parva)*, bay pipefish (*Syngnathus leptorhynchus)*, shiner perch, walleye surfperch (*Hyperprosopon anale)*, longjaw mudsucker (*Gillichthys mirabilis)*, arrow goby (*Clevelandia ios)*, cheekspot goby (*Ilypnus gilberti)*, bay goby, Pacific staghorn sculpin, jacksmelt (*Atherinopsis californiensis*), topsmelt, speckled sanddab (*Citharichthys stigmaeus)*, starry flounder, sand sole (*Psettichthys melanostictus)*, and plainfin midshipman (*Porichthys notatus)*. The most abundant fish (greater than 100 collected) included Pacific herring (107 collected), threespine stickleback (124), shiner perch (1338), cheekspot goby (106), and topsmelt (8915). Topsmelt, which were the most abundant fish species collected, were primarily juveniles that seasonally inhabit tidal sloughs and marshes as juvenile rearing areas. Results of this study reflect the diversity of resident and seasonal fish species that may inhabitant sloughs within the Bay.

6.4.1.4 Fish Communities in the South San Francisco Bay

Fish Sampling Data from South San Francisco Bay—The 1982-86 SBDA study (Kinnetics 1987) provides data on the likely composition of the fish communities in the waters of southern San Francisco Bay proper, in the vicinity of the proposed pond discharges. Based on this study, it appears that the fish species in the open water habitat of the South Bay are quite similar to those found in the sloughs and will include northern anchovy, staghorn sculpin, shiner perch, longfin smelt, white croaker, and striped bass. The results of this study are based on samples collected from two locations in South San Francisco Bay–one location is designated SB4 and is just north of the Dumbarton Bridge and the other location is designated SB5 and is midway between the Dumbarton Bridge and the mouth of Coyote Creek.

CDFG (Baxter et al. 1999; CDFG unpublished) has conducted an extensive fishery survey within the Bay-Delta estuary, which began in 1980 and continues to date. This is a long-term study with data collected monthly, primarily in deeper subtidal areas, using multiple gear types, including the otter trawl, midwater trawl, beach seine and plankton nets. This survey is useful as a long-term record on the regional occurrence of various species within the area and intra- and interannual variability in their abundance.

Based on the types of trawls and data available, CDFG sampling stations were chosen for analysis that would reflect the conditions of the South Bay that may be affected by the proposed project. Three open water stations, with data collected by otter and midwater trawls and plankton nets, are in the vicinity of the Alviso and Baumberg Complex Ponds: Stations 101, 102 and 140. Two beach seine stations in the general vicinity of the project ponds are Station 171 and 172. The most common fish, crab, and shrimp species at these five stations are presented in Table 6.4-1.

Fish Egg and Larval Data from South San Francisco Bay— Results of fish egg and larval sampling demonstrate that a variety of fish species use portions of South San Francisco Bay as spawning and larval rearing areas as evidenced by the occurrence of both fish eggs and larvae. Northern anchovy, Pacific herring, and gobies are most abundant in open water subtidal areas of the South Bay while species including topsmelt and jacksmelt are abundant in the shallow inshore habitats. The South Bay, in the vicinity of Alviso, also supports a small commercial bait fishery for bay shrimp.

As part of environmental studies conducted at the Potrero and Hunters Point Power Plants, located in the South Bay, extensive fish egg and larval sampling was conducted during 1978-1979 (PG&E 1980, 1982). Results of these studies are summarized below.

Results of fish egg and larval sampling conducted at the Hunters Point Power Plant (PG&E 1982) showed that the most abundant larval fish collected were gobies (totaling 62.7 percent of the larval fish collected), including Bay goby (1.7 percent), arrow goby (0.5 percent), yellowfin goby (less than 0.1 percent), and chameleon goby (*Tridentiger trigonocephalus)* (less than 0.1 percent). Pacific herring larvae were the second most abundant species collected (27.9 percent), followed by northern anchovy (2.6 percent). Other larval fish collected included plainfin midshipman, staghorn sculpin, white croaker, surfperch, silversides *(Artheriniformes*), smelt, bay pipefish *(Syngnathus leptorhynchus)*, striped bass, cabezon *(Scorpaenichthys marmoratus),* and English sole. Of the fish eggs collected, northern anchovy represented 20.1 percent, silversides represented less than 0.1 percent, and unidentified fish eggs represented 77.9 percent.

Fish egg and larval sampling conducted at the Potrero Power Plant (PG&E 1980) provided similar results. Pacific herring (50.4 percent) and gobies (40.4 percent) were the two most abundant larval fish taxa collected. Other larval fish collected at the plant included white croaker, staghorn sculpin, silversides, sculpin, kelpfish (*Clinidae*), rockfish *(Sebastes* sp.), smelt, bay pipefish*,* cabezon, starry flounder, plainfin midshipman, pricklebacks (*Cebidichthyidae*), greenlings (*Hexagrammidae*), English sole, and unidentified fish larvae. Northern anchovy eggs accounted for 69.8 percent of the eggs collected; the remaining 30.2 percent of the fish eggs were unidentified.

6.4.1.5 Fish Communities in Tidal Marshes

Tidal marshes provide habitat for fish and macroinvertebrate species that are residents, partial residents, tidal visitors (or tidal transients), and seasonal visitors (or seasonal transients). Residents are those species (e.g., killifish) that complete their entire life cycles in the marsh. Partial residents (e.g., inland silverside [*Menida beryllina*]) are found in the marsh as juveniles and may continue to inhabit the marsh throughout the year. Tidal visitors are typically larger fishes (e.g., jacksmelt, and flounders) that move into the marsh at high tide to feed on the abundant juvenile fish and invertebrates. Seasonal visitors are species that use the tidal marsh as spawning or nursery areas (e.g., sticklebacks) or as seasonal refuges from predators (e.g., Chinook salmon).

The broad range of environmental conditions in tidal marshes and sloughs in the San Francisco Bay Estuary leads to highly variable species composition and abundance. Single-event sampling can yield low species numbers (e.g., six species at Napa River Salt Marsh Pond 2A), whereas species occurrence over a year or several years can be quite high (e.g., 63 species reported at Bair Island marshes). Large fluctuations in species composition and numbers, as well as biomass, are typical of coastal wetland systems (Moyle and Cech 2000, Williams and Desmond 2001). Variability is caused not only by seasonal and tidal movements of fishes but also by differing responses of fishes to environmental stressors (e.g., salinity, temperature, abundance of prey, and predators). The spatial and temporal dynamics contribute to the importance of fish in the transport of nutrients and energy across habitats at multiple trophic levels in the estuarine food web (Allen 1982, Kneib 1997, Kwak and Zedler 1997, Williams and Desmond 2001).

The ecological benefits that vegetated tidal marsh offers to assemblages of fish species have been well documented (Kneib 1997). Fish migrate with the tides onto the marsh surface to feed and frequently exhibit a fuller gut at high or ebbing tides than at other times (Harrington and Harrington 1961, McIvor and Odum 1988, Rozas and LaSalle 1990, Rountree and Able 1992, Kneib 1997). A bioenergetics model of killifish has indicated that sporadic foraging on marsh surfaces, in conjunction with tidal cycles, enhances growth (Madon et al. 2001). Marsh vegetation is known to provide cover from predators for transient and resident fish species (Ryer 1988). Moreover, several transient visitors (mostly species from the silverside family *Atherinidae*, such as topsmelt) and resident species (e.g., killifish) spawn in marsh vegetation (Kneib 1997).

Woods (1984) sampled the fish community inhabiting a tidal marsh, the Hayward restoration site, located in the South Bay in the general vicinity of the proposed project (Baumberg Complex). Sampling was conducted at various locations within the restored marsh monthly from June 1980 through May 1981. Results of the sampling provide insight into the fish species utilizing tidal marsh habitat and the seasonal patterns in occurrence. During the study, a total of 20 fish species (6801 individuals) were collected. The five most abundant fish included the topsmelt (2,891 fish), Arrow goby (2,173), yellowfin goby (709), Pacific staghorn sculpin (578), and threespine stickleback (170). The highest abundance of fish within the marsh occurred during the summer (June-August) when juveniles were most common.

Open water areas adjacent to tidal marshes are important habitat for fishes such as white sturgeon (*Acipenser transmontanus*) and brown rockfish (*Sebastes auriculatus*) (Goals Project 1999). Deep water and channels also serve as migration corridors for anadromous fishes such as Chinook salmon and steelhead.

6.4.1.6 Listed and Fully Protected Species

Steelhead are the only fish species listed for protection under the California and/or federal ESA that occur in the South Bay in the general vicinity of the proposed project. Fall-run Chinook salmon, which are a candidate species under the federal act, also occur in the area. Other protected fish species that inhabitant the Bay-Delta estuary, including delta smelt (*Hypomesus transpacificus)*, winter-run Chinook salmon, spring-run Chinook salmon, coho salmon, and tidewater goby (*Eucyclogobius newberryi)*, have not been collected in the South Bay and are not expected to occur in the area or be adversely affected by the proposed project.

Based on discussions with staff from CDFG, NOAA Fisheries (formerly NMFS), and the San Francisco RWQCB, Chinook salmon and steelhead trout were identified as being of particular interest in locations where circulated pond waters would enter receiving water bodies during the ISP. The Central California Coast steelhead evolutionarily significant unit (ESU) has been listed as threatened under the ESA (62 FR 159), and the Guadalupe River (which discharges into Alviso Slough), is designated critical habitat for this species (65 FR 7764).

NOAA Fisheries considers the Chinook salmon in the project area to be part of the Central Valley fall-run and late fall-run Chinook salmon ESUs. NOAA Fisheries has determined that the Central Valley fall-run and late fall-run Chinook salmon ESU does not warrant listing, but the species is considered a candidate species (64 FR 50394). In addition, the Guadalupe

River, Coyote Creek, and the Bay-Delta estuary are considered essential fish habitat (EFH) for Chinook (Pacific) salmon. (Note: The Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (PL 104-267), defines EFH as the waters and substrate necessary for managed fish to spawn, breed, feed, and grow to maturity.) The Bay-Delta estuary is also EFH for other managed species such as northern anchovy and Pacific herring.

Steelhead Trout – Steelhead trout is native in tributaries to South San Francisco Bay, using these streams for spawning and rearing of juveniles. Small runs of steelhead trout have been identified in Coyote Creek and Alviso Slough/Guadalupe River, with each run numbering approximately 100 to 300 individuals annually (personal communication: J. Abel, Santa Clara Water District; G. Stern, NMFS). The steelhead do not spawn in those sections of Coyote Creek and Alviso Slough/Guadalupe River which could potentially receive saline water circulated from the South Bay salt ponds during the ISP, but would use these sections as migration corridors to upstream spawning and rearing sites. According to M. Roper (CDFG), there is an effort to develop a steelhead run in Alameda Creek. Steelhead historically used Alameda Creek as spawning and juvenile rearing habitat, but are unable to do so now due to man-made physical blockages, which prevent upstream migration. Efforts have been made, primarily by local anglers, in recent years to collect and physically transport upstream migrating adult steelhead around these blockages so they can reach their spawning grounds.

Due to their life history, steelhead trout are only present in the potential circulation areas during limited portions of the year. Generally, adult steelhead migrate from the ocean to the South Bay tributaries from late December through early April, with the greatest activity in January through March. During this time frame, adult steelhead would be migrating through the potential circulation areas. Spawning occurs in the upper reaches of the Coyote Creek and Guadalupe River watersheds, well upstream of any elevated salinity plume. After either 1 or 2 years of rearing, juvenile steelhead migrate from their upstream rearing areas to the ocean. Most of this downstream migration of juveniles occurs between February and May, with the peak between March and April. During this period, the juveniles would pass through the potential circulation areas.

The steelhead remain in the ocean for 2 to 4 years until they reach reproductive condition. At that point, they migrate into the estuary and return to their South Bay tributaries to spawn. Once spawning has occurred, the adults swim downstream and return to the ocean. Each winter, for several successive years, these adults repeat their upstream migration to spawn and, subsequent, downstream migration to the ocean waters.

Chinook Salmon – Chinook salmon are known to spawn and rear in tributaries to South San Francisco Bay. Chinook salmon were first observed in South Bay tributaries in the early 1980s and, based on genetic analyses, are probably from Sacramento River hatchery stock (personal communication G. Stern, NOAA Fisheries). Small runs of this species have been identified in Coyote Creek and Guadalupe River, with each run numbering approximately 100 to 200 individuals annually (personal communication: J. Abel, Santa Clara Water District). The Chinook salmon do not spawn in those sections of Coyote Creek and Alviso Slough which could potentially receive saline water circulated from the South Bay salt ponds during the ISP, but would use these sections as migration corridors to upstream spawning and rearing sites. Due to their life history, Chinook salmon are only present in the potential circulation areas during limited portions of the year.

Generally, these fall-run adult Chinook salmon migrate from the ocean to the South Bay tributaries from late September through November. During this timeframe, adult fish would be migrating through the potential circulation areas. Spawning occurs in November through December in the upper reaches of the Coyote Creek and Guadalupe River watersheds, well upstream of any elevated salinity plume.

After a few months of rearing, juvenile Chinook salmon generally migrate from their upstream rearing areas to the ocean. Most of this downstream migration (smolts) occurs between mid-March and early May. However, during big winter storm events, these juvenile salmon (fry) could be carried downstream as early as late January or February. During this period, the juveniles would pass through the potential circulation areas. The Chinook salmon remain in the ocean for 2 to 4 years until they reach reproductive condition. At that point, they complete their life cycle by migrating into the estuary and returning to their South Bay tributaries to spawn. Unlike steelhead trout, the Chinook salmon adults spawn only once and die after their first and only upstream migration.

6.4.2 Criteria for Determining Significance of Effects

Impacts on fish were analyzed quantitatively and qualitatively. Criteria based on the *CEQA Guidelines* were used to determine the significance of fish impacts. The project would have a significant impact on fish if it would substantially:

- Reduce population abundance of fish or macroinvertebrate species inhabiting the Bay-Delta estuary
- Reduce the amount of aquatic habitat
- Remove spawning and rearing grounds for fish and macroinvertebrates within the Bay-Delta estuary
- Interfere with or prevent the movement or migration of any fish species
- Cause a temporary or long-term decline in growth rates, survival or reproductive success of special-status species (i.e. steelhead trout, Chinook salmon) within the Bay-Delta estuary
- Reduce or degrade the habitat of a state or federal special-status species

The term *substantial* reduction in a population, its habitat, or its range has not been quantitatively defined in CEQA. What is considered substantial varies with each species and with the particular circumstances pertinent to a particular geographic area.

For the purposes of this analysis, significance thresholds for fish or macroinvertebrates are based on short- and long-term impacts to the salinity of receiving waters under the Initial Release Period and Continuous Circulation Period of the ISP. For this analysis, a scale of salinity categories was developed that correspond to organism responses. The scale consists of the following categories: Ambient (<33ppt salinity), Drought (33-35 ppt), Stage 1 (36-38 ppt), Stage 2 (39-41 ppt), Stage 3 (42-45 ppt), and Stage 4 (>45 ppt). This scale and the organism responses that correspond approximately to each of the salinity categories are discussed in greater detail in Section 4.3.1.1 and Section 6.1.3.1.

6.4.3 Impacts and Mitigation Measures

This section addresses impacts to fish within the project area, including impacts to special-status fish species (steelhead trout and Chinook salmon). The section also presents proposed mitigation for impacts that are significant or potentially significant.

The project will have the potential to impact fish and macroinvertebrates through impacts to water quality, substrate, continuity, and habitat area and type. In general, the following types of project impacts are considered in this section:

- Impacts to fish and macroinvertebrates related to increased salinity
- Impacts to fish and macroinvertebrates related to other water quality changes
- Impacts to anadromous fish due to migration impedances
- Impacts to juvenile salmon related to their accidental entrainment

The No Action/No Project Alternative would result in potential impacts to fish and macroinvertebrates from increased salinity and water quality changes in receiving waters following the collapse of pond levees. Alternative 1, Seasonal Ponds would include levee and facility maintenance to minimize the potential for unplanned levee failures. Tidal management techniques and water quality monitoring proposed under Alternatives 2 and 3 would reduce these impacts to less than significant.

Both Alternatives 2 and 3 include the option to breach the Island Ponds, which would be expected to provide access to habitat for a variety of fish species. Woods (1984), sampling the Hayward Marsh after levee breaching and reestablishing tidal exchange with the South Bay, demonstrated habitat use by a diverse community of fish species. Increasing habitat access by levee breaching and reestablishing tidal exchange with the South Bay is identified as a beneficial impact of the project on fishery resources for both alternatives. The types of anticipated project impacts are discussed generally first and then in relationship to each of the proposed project alternatives below.

Increased Salinity

Fish respond to salinity through a number of physiological, behavioral, and ecological mechanisms that affect survival, growth, migration, and reproduction. Specific responses of fish to salinity in the South Bay and sloughs have not been investigated. Salinity in the South Bay and associated sloughs and creeks can vary substantially throughout the year and on a daily basis for any fixed location. Potential salinity impacts to fish and macroinvertebrates were assessed for the Initial Release Phase (IRP) and the Continuous Circulation Period (CCP) as discussed in Chapter 4.

Salinity outside the optimal range may affect the abundance of fish and macroinvertebrates through blockage of movement or migration, reduced egg viability, reduced survival of eggs to the larval stage, and reduced survival of rearing juveniles. Because numerous factors influence the response of fish to salinity regimes under natural conditions (e.g., fish size, temperature acclimation, food availability, genetic variation, water chemistry, predation, disease), a range of salinity tolerance, based on the salinities where various species have been collected from the Bay-Delta estuary (Baxter et al. 1999) was applied to assess generally whether the potential for an adverse or beneficial effect would exist, given a change in salinity from baseline conditions. Optimal salinities for estuarine and marine fish and macroinvertebrate species are typically within the range up to 33 ppt or less, although salinity tolerance may exceed 33 ppt for more tolerant species.

Fish and macroinvertebrates that occur in the South Bay and associated creeks and sloughs are resident and seasonally resident estuarine species and anadromous species that are currently subject to daily and seasonal changes in salinity levels. Estuarine and anadromous species must be able to tolerate environmental changes. Fish in salty water decrease their rate of water intake, and chloride cells in the gills remove excess salts back to the environment. What the chloride cells do not remove, the kidney will process, and saltwater fish will secrete urine high in salt. Fish in fresh water are exposed to an environment that has less salt than the organism. The fish must drink copious amounts of water to receive the necessary salts, and then produce highly dilute urine, once the salt has been removed from the water and taken into their bodies.

Because of the dynamic nature of their surrounding environment, estuarine and anadromous fish must be able to react to fresh water and saltwater. Most estuarine species are capable of surviving a wide salinity range. Estuarine and anadromous fish exposed to conditions less than optimal may move to areas with more suitable salinity.

Other Water Quality Variables

Other water quality elements, besides salinity, potentially affected by the project include DO, BOD, contaminants, water temperature, and suspended sediment (Section 4.3). The impact of water quality on fish habitat would be significant if implementation of the project would result in a substantial change in water quality that would physiologically stress sensitive fish species.

Impedance of Salmonid Migration

A special concern for impacts to salmonids arises from the fact that these species spawn in several of the tributaries to the South Bay and use a few of the proposed circulation areas as migration corridors to their upstream spawning grounds. Changes in the composition of water (i.e., percentage of upstream "natal-stream" water and salinity profiles) in the circulation areas during the ISP could disorient the salmonids and adversely affect the ability of (1) adult salmonids to reach their upstream spawning areas and (2) juvenile salmonids to successfully migrate downstream from their natal streams to the ocean. Each of these concerns is discussed below.

Upstream migrating adult steelhead trout and adult Chinook salmon are both thought to be following a chemical signal (olfactory cues) to their natal spawning areas. The exact nature of this signal is not known, but is thought to be associated with some mixture of waterborne chemical constituents, which are unique to the stream in which they were born and imprint as juveniles and to which they are returning as adults to spawn. It has been suggested that for upstream migration to be successful, there should be an increasing concentration of this chemical signal as one moves upstream in the sloughs and streams leading to the spawning areas. Since the exact chemical compounds that serve as signals for the upstream migration have not been identified, it is reasonable to assume that maintenance of a "natal-stream water" gradient (i.e., concentration of natal-stream water increases as one moves further upstream) may be a reasonable surrogate. If the circulation of pond water during the ISP interrupts this "natal-stream water" gradient, upstream migration of Chinook salmon and/or steelhead trout could be impaired.

It has also been hypothesized that a decreasing salinity gradient might be playing a role in guiding salmonids to their upstream spawning areas. Consequently, significant interruptions in these salinity gradients in the sloughs and creeks used by steelhead trout and Chinook salmon as migration corridors might impair their upstream migrations.

The downstream migration of steelhead trout and Chinook salmon juveniles occur primarily between February and May. However, since these juveniles are traveling towards the more saline waters of the South Bay and eventually the ocean, it does not seem likely that zones of elevated salinity would adversely affect their downstream migration behavior as long as the salinity was not high enough to cause mortality or other acute impacts.

Entrainment of Juvenile Salmonids

There is a potential that downstream migrating juvenile salmonids (both juvenile Chinook salmon and steelhead trout) would be entrained along with intake water into the salt ponds during the ISP. Any juvenile salmonids entrained into the salt ponds would likely be lost from the population.

6.5.3.1 No Project/No Action Alternative

Under the No Project/No Action Alternative, Bay water would not be let into the ponds and salinity levels would not be managed. Additionally, levees would not be maintained and unplanned breaches of the ponds would be more likely to occur. Potentially significant impacts under this alternative are related to unplanned discharges of pond contents as a result the eventual collapse of pond levees. The impacts include elevated salinity levels and changes in water quality in receiving waters of the unplanned discharges. Although the timing of collapse is unknown and could take months or years to occur, if levees are not maintained, its eventual occurrence is inevitable.

> *FISH IMPACT-1:* Discharge of pond contents would increase salinity levels in the receiving waters in the immediate vicinity of discharges beyond normal tolerance ranges for fish and macroinvertebrates, resulting in direct impacts to these aquatic organisms and indirect impacts to their food source (macroinvertebrates).

Under the No-Project Alternative, there would be no management of the salt ponds by CDFG or USFWS. High salt conditions would continue to occur in the existing ponds closed to tidal influence. The pond levees would be subject to catastrophic failure or inundation of the ponds by high tide elevations in extreme storm events. Following a breach of the levees, the duration and magnitude of high salinity in the South Bay and associated creeks and sloughs near any levee breach would increase. It is likely that levees would remain breached and high-salinity water would be discharged for several weeks.

Typically, levees fail in the winter when there is a greater amount of fresh water flowing downstream. The greater amount of freshwater could dilute the salt in the inundated ponds, but the initial change in salt concentration could be substantial. Chinook salmon and/or steelhead may be migrating through the area during periods of high flow and may be exposed to elevated salinity resulting from a levee failure. If the breach were to occur when the flow of the surrounding sloughs was low, and the more sensitive life stages of fish were present (e.g., juveniles), the salinity changes in the South Bay and associated creeks and sloughs could cause substantial adverse impacts on the fish in the vicinity. The discharge associated with sudden levee failure could also adversely impact fish and macroinvertebrates (e.g. bay shrimp and others) inhabiting creeks and sloughs as well as the local intertidal and subtidal habitats in the area. Resident and seasonally resident fish and macroinvertebrates would potentially be affected directly by the pond discharge in addition to a reduction in habitat quality and availability until sufficient flushing had occurred to return local water quality conditions to suitable levels.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

FISH IMPACT-2: Discharge of pond contents may impact other water quality variables (i.e., it may raise temperatures, decrease DO, and increase BOD) in the receiving waters in the immediate vicinity of discharges beyond normal tolerance ranges for fish.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

6.5.3.2 Alternative 1 (Seasonal Pond Alternative)

This alternative minimizes impacts from uncontrolled discharge of pond contents into the South Bay. Maintenance of the levees and water control structures would prevent their deterioration and minimize the potential for accidental breaching of the ponds and release of pond contents to the Bay. The existing intake structures for each pond complex would be closed. Intake ponds would no longer be present. so the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for picivorous (fish-eating) birds. The alternative would involve construction activity required for levee maintenance and repair.

FISH IMPACT-3: Impacts from contaminants and/or suspended sediments could result from the mobilization of construction equipment to repair breached levee sites.

Contaminants (e.g., petroleum products, suspended sediments, etc.) associated with the operation of equipment and other construction activities may enter the receiving waters. The contaminants could adversely affect fish and macroinvertebrates by affecting their growth, reproduction, and overall survival. In addition, sediment would be mobilized during repair activities. The increased suspended sediment could adversely affect benthic and planktonic organisms, including fish. The effect, however, would likely be minimal because of the relatively small area affected and the high rates of sediment mobility in the South Bay and associated creeks and sloughs.

As part of this alternative, best management practices (BMPs) for construction and levee repair and maintenance would be followed. A hazardous spill prevention and response plan would be prepared and incorporated as part of the alternative. In addition, an erosion control and sediment management plan would be developed and included as part of the alternative. Management plans (emergency response, routine maintenance activity, and preventative maintenance activities would be addressed in the plan) would be prepared and implemented as part of the levee repair and maintenance activities. Plans would be provided to NOAA Fisheries, CDFG, USFWS, and the RWQCB for review and comment.

Significance: Less than significant. Since this alternative will include development of operational plans to address potential impacts, no further mitigation would be required.

6.5.3.3-- Alternative 2 (Simultaneous March/April Initial Release)

Under the Alterative 2, the contents of most of the Alviso and Baumberg Ponds would be released simultaneously in March and April (Initial Release Phase; IRP). The ponds would then be managed as a mix of continuous circulation ponds, seasonal ponds and batch ponds. Management of some ponds could be altered through adaptive management during the Continuous Circulation Period (CCP). Higher salinity ponds in the West Bay Complex would be discharged in March and April in a later year when salinities in the ponds have been reduced to appropriate levels. The Island Ponds (A-19, 20, and 21) would be breached and open to tidal waters.

Potential impacts evaluated under Alternative 2 include:

- Direct impacts to fish and macroinvertebrates and indirect impacts to fish as a result of elevated salinities and other changes in water quality in waters receiving pond discharge.
- Impacts to fish and macroinvertebrates related to water quality impacts from the operation of construction equipment
- Impacts to fish (salmonid) migration through dilution of "natal stream" gradients and creation of salinity gradient reversals and exposure to localized elevated salinities affecting migration behavior
- Impacts to juvenile fish from entrainment in water control structures.

All impacts under this alternative are temporary and localized during the IRP and/or less than significant or are reduced to less than significant with the implementation of proposed mitigation measures.

During the Continuous Circulation Period elevated average salinities in the South Bay proper are expected to be virtually non-existent. For daily-averaged salinity, it is predicted that any increases will be 1 ppt or less and occur in very localized areas near discharge points and at the mouths of sloughs. During the Continuous Circulation Period tidal management techniques would be used to control salinity levels within a pond or pond system prior to discharge. In addition, water quality measurements would be made within each pond, as part of individual pond management strategies to monitor water quality prior to discharge under Alternative 2.

> BENEFICIAL IMPACT –1: Breach Island Ponds resulting in tidal exchange and access for fish and macroinvertebrates to suitable habitat.

The Island Ponds (A19, A20, and A21) will be breached as part of the ISP, after the initial releases of the other ponds. The Island Pond breach effects would be the same for Alternatives 2 and 3. The existing pond bottoms are approximately 2 feet below mean higher high water. With large enough breach openings to allow full tidal range in the Island Ponds, the typical pond bottoms will only be inundated on higher high tides. During the Continuous Circulation Period, the ponds (except for the perimeter borrow ditches) would only contain water for a few hours at high tide. Therefore, the ponds would not contain water with higher salinity than the inflow from Coyote Creek. Based on the hydrodynamic model, it is predicted that the daily averaged salinities in Coyote Creek during the Continuous Circulation Period will increase by 4 ppt or less. These increases in salinity are unlikely to adversely impact the estuarine species, which are resident in Coyote Creek. The resident fish and macroinvertebrates inhabiting Coyote Creek normally experience variations of 15-20 ppt on a daily basis and up to 30 ppt on a seasonal basis. However, since this area of Coyote

Creek is predominantly affected by freshwater flows from the SJ/SC WPCP, this long-term salinity increase would likely beneficially affect the estuarine aquatic communities in the area, by restoring more natural conditions.

During the Initial Release Period, the maximum discharge salinity from the Island Ponds would be 135 ppt for all three ponds. The proposed Initial Breach Scenario included a restricted initial breach into each pond, with a bottom width of 25 m and the bottom of the breach at the bottom of the pond. Based on the rate of breach erosion observed at two breach locations in Napa, the assumed initial breaches are oversized and would result in conservatively high estimates for the discharge from the Island Ponds during the Initial Release. The maximum increase in salinity is predicted to be 12 ppt near the Island Pond discharges. Salinity increases will be lower in other segments of the creek and nowhere in the creek will depth-averaged and daily-averaged salinities exceed approximately 30 ppt. At the end of the Initial Release Period, a maximum salinity increase of 4 ppt will occur near Pond A19 breaches and lower salinity increases will occur in other segments of the slough.

Both Alternatives 2 and 3 include the option to breach the Island Ponds, which would be expected to provide access to habitat for a variety of fish species during high tide periods when the ponds are inundated. Woods (1984), sampling the Hayward Marsh after levee breaching and reestablishing tidal exchange with the South Bay, demonstrated habitat use by a diverse community of fish species. Increasing habitat access by levee breaching and reestablishing tidal exchange with the South Bay during the Continuous Circulation Period is identified as a beneficial impact of the project on fishery resources under Alternatives 2 and 3. Increased salinity in the immediate area of the pond breaches during the Initial Release Phase would be expected to result in temporary localized reductions in the abundance and local habitat use by sensitive fish and macroinvertebrate species. The temporary localized impact of pond breaching and the resulting increase in salinity during the Initial Release Phase is considered to be less than significant given the long-term beneficial impacts of increasing access to shallow-water habitat during the Continuous Circulation Period of the project.

Significance: Short-term impact (IRP) – less than significant

Long-term impact (CCP) - Beneficial impact

> *FISH IMPACT-1:* Discharge of pond contents would increase salinity levels or water quality conditions in the receiving waters in the immediate vicinity of discharges beyond normal tolerance ranges for fish and macroinvertebrates, resulting in direct impacts to these aquatic organisms and indirect impacts to fish impacts to their food source (macroinvertebrates).

In response to the elevated salinity levels, aquatic organisms may migrate out of the higher salinity segments of the sloughs and creeks during the Initial Release Period. Exposure of fish and macroinvertebrates to the elevated salinity levels has the potential to result in stress and reduced health and condition of these aquatic organisms within the receiving waters during the spring discharge period and may temporarily adversely affect localized movement patterns, habitat quality and availability within the immediate area of the pond discharges. Avoidance of the discharge area may result in a temporary, localized reduction in fish and macroinvertebrate abundance in the areas affected by the discharge.

March and April represent a seasonal period when a number of fish and macroinvertebrates are reproducing within the estuary (Baxter et al 1999, Wang 1986) and eggs and larvae may be exposed to the discharge. The spring also represents a period when juvenile steelhead and Chinook salmon would be migrating downstream through the creeks and sloughs and would be present in the South Bay and hence would potentially be exposed to elevated salinity levels within the receiving waters in the immediate area of the pond discharges. Therefore, simultaneous pond discharges during the Initial Release Phase under Alternative 2 would have a higher likelihood of adversely affecting juvenile Chinook salmon and steelhead when compared to initial discharges during the summer months.

Dilution and mixing of the discharge within the receiving waters would rapidly reduce salinity levels and thereby reduce the potential area where exposure to elevated salinity levels may occur. The potential impact would be temporary and localized to the immediate vicinity of the discharge. Finally, as discussed in the introduction to Section 6.4.3, fish and benthic macroinvertebrates inhabiting estuarine waters are typically characterized by having relatively high tolerance to salinity and other environmental conditions.

Initial release of the existing pond contents as part of project operations would result in the discharge of moderately to highly saline water that could lead to a deterioration of water quality and a reduction in aquatic habitat. There are no quantitative standards established for salinity discharges, but the San Francisco Bay RWQCB has a narrative standard that states that the allowable increase in salinity cannot adversely affect beneficial uses such as aquatic habitat. The specific water quality effects are described in Chapter 4, "Water Quality."

Additionally, bay shrimp use the sloughs into which saline pond water will be circulated during the ISP as rearing habitat. The potential impacts to bay shrimp are discussed in Section 6.1.3.

Refer to Chapter 4 (Water Quality) for a complete discussion of impacts to water quality affecting habitat values for aquatic organisms. Since significance thresholds for salinity impacts to water quality are based on impacts to benthic organisms, potentially significant and significant salinity impacts to water quality are, by definition, also potentially significant and significant impacts to fish and macroinvertebrates. In Chapter 4, short-term and long-term salinity impacts to water quality are addressed separately for each of the receiving water bodies. Other constituents could also affect the receiving waters and be toxic to aquatic organisms, degrading habitat and affecting populations. Water quality impacts from other constituents are also discussed in detail in Chapter 4.

As discussed in Chapter 4 (see Section 4.3), the following significant short-term water quality impacts may affect fish and macroinvertebrates:

- Short-term impacts to aquatic habitat are anticipated from elevated salinities in the following receiving water bodies:
- Alameda Flood Control Channel (Baumberg Complex)— See Water Quality (Salinity) Impact-7 for a complete discussion.
- Old Alameda Creek (Baumberg Complex)— See Water Quality [Salinity] Impact-8 for a complete discussion.
- Under some circumstances, total mercury in discharged water and receiving water will exceed total mercury WQOs and may have short-term impacts on water quality—See Water Quality (Metals) Impact-3 for a complete discussion.

- Increased algal activity in ponds leads may lead to decreased dissolved oxygen in receiving waters—See Water Quality (DO) Impact-1 for a complete discussion.
- Discharge of pond water at temperatures more than 5 degrees Fahrenheit above the temperature of the receiving water may adversely affect water quality and biota in adjacent waterways—See Water Quality (Temperature) Impact-2 for a complete discussion.

Significance: Short-term impact—Significant
Long-term impact—Less than Significant

Implementation of mitigation measures proposed in Chapter 4 (Water Quality), in combination with Fish Mitigation Measure-1 below, would reduce this impact to less-than-significant level. Relevant mitigation measures in Chapter 4 are as follows (see Section 4.3 for details):

- WQ-Salinity Mitigation Measure 1A
- WQ- Salinity Mitigation Measure 1B
- WQ-Metals Mitigation Measure 1A
- WQ- Metals Mitigation Measure 1B
- WQ-DO Mitigation Measure 1A
- WQ- DO Mitigation Measure 1B
- WQ-Temperature Mitigation Measure 1A
- WQ- Temperature Mitigation Measure 1B
- WQ-pH Mitigation Measure 1A
- WQ- pH Mitigation Measure 1B

Fish Mitigation Measure-1: Assess and maintain salinity and other water quality parameters at levels protective of aquatic resources.

The data developed through WQ-Salinity Mitigation Measure 1A will be assessed relative to the salinity and other water quality requirements of aquatic communities. If the assessment of water quality, based on analysis of monitoring data, indicates a potential measurable effect on population abundance, measures could be implemented to minimize the water quality effects. The measures may include change in discharge magnitude, timing, and duration. The data would support real time operations that could minimize effects to all life stages.

Based on the water quality mitigation action, in combination with the localized and temporary changes in fish and macroinvertebrate abundance and distribution in the receiving waters in response to salinity changes, and the tolerance and ability of estuarine and marine fish inhabiting the area to behaviorally avoid adverse salinity conditions, it has been concluded that impacts resulting from IRP and CCP operations would be lees than significant. Temporary localized reductions in habitat use, particularly by sensitive species, would be expected in the immediate area of the pond discharges, with the greatest change occurring during the Initial Release Phase.

Post Mitigation Significance: Less than Significant

FISH IMPACT-4: Changes in water quality during the Continuous Circulation Phase of the ISP could disrupt adult salmonid migration though dilution of “natal stream” signal and/or imprinting by juvenile salmonids.

An evaluation was performed to determine whether the circulation of saline waters from the salt ponds during the Continuous Circulation Phase of the ISP would interfere with the “natal-stream” gradient in the sloughs and creeks used by salmonids as migration corridors to their upstream spawning areas. This evaluation was targeted to those sloughs and creeks actually used by salmonids (i.e., Alviso Slough, Coyote Creek, and Alameda Flood Control Channel) and to those times during which the peak upstream migrations actually occur (i.e., January-March for adult steelhead trout and September-November for adult fall-run Chinook salmon).

As noted previously, the Initial Release Period of the ISP (either April-May or July-August), when the highest salinity discharges will occur, is not considered in this evaluation because the adult salmon and steelhead do not migrate upstream during those months. In addition, it is believed that the discharge would have temporary and localized impacts that would not impact salmonid migration.

The evaluation consisted of three components. First, the three sloughs used by salmonids as migration corridors were each divided into 1-km segments. Second, using modeling techniques, the percentage of various types of water (i.e., upstream “natal” river water, bay water, saline pond water) in each segment was predicted under existing and ISP conditions. Third, a determination was made whether circulation of saline waters during the ISP would produce a break in the “natal-stream gradient” and, if so, whether adult salmon or steelhead migration would be adversely impacted.

The results of these evaluations clearly indicate that circulation of saline water during the ISP is not expected to disrupt the “natal-stream” gradients in the sloughs and creeks used by adult salmonids as migration corridors to their upstream spawning areas. In all cases examined, the salinity gradient within the receiving waters used as potential adult migration corridors will not decrease due to the addition of saline pond water, and adult steelhead trout and adult Chinook salmon should have a strong “natal stream” signal to follow to their spawning grounds.

Juvenile Chinook salmon and steelhead migrate downstream from freshwater tributaries into the Bay-Delta estuary and coastal waters during the late winter and spring (February -- May). During juvenile outmigration the fish imprint on chemical and olfactory characteristics of their natal stream, which are then used as migration cues for adult upstream migration. Discharges, including salt pond effluent, have the potential to alter chemical characteristics within the receiving waters that may affect imprinting by juveniles, and potentially result in increased straying by returning adults. During their downstream migration juvenile salmon and steelhead would be expected to pass through the tidally influence portions of the stream channels in relatively short period of time (hours or days), where they would also be exposed to a range of salinities and other environmental conditions. As a result of the anticipated short-duration of exposure of these juvenile downstream migrating salmon and steelhead to the salt pond effluent, in combination with the rapid dilution and localized area where the effluent may affect water quality conditions and imprinting, the potential impact of salt pond discharges on juvenile salmon and steelhead imprinting during spring months (April -- May) is considered to be less than significant. Since juvenile salmon and steelhead do not migrate during the summer months, and would not be expected to inhabit the area the proposed project during July -- August, pond discharges during summer months under Alternatives 2 and 3 would have no impact on juvenile salmon or steelhead.

Significance: Long-term impact (CCP) - Less than significant.

> *FISH IMPACT-5:* Changes in water quality could disrupt fish migration though creation of salinity gradient reversals.

The salinity in a tidal slough generally increases in the downstream direction. Therefore, the salinity at any given point in a tidal slough is usually lower than the salinity at any point further downstream (toward the bay). Discharges from salt ponds during the ISP could lead to localized regions, near the salt pond system outlets, where there are maxima in salinity. When passing through such a local maxima, an upstream migrating adult or juvenile salmonid would experience a local "salinity gradient reversal" (i.e., lower salinity to higher salinity to lower salinity). The effect that such a local "salinity gradient reversal" would have on upstream migrating adult salmonids and downstream migrating juvenile salmonids is not known, but there is, at least theoretically, a possibility that it could confuse a fish and impede its migration.

It should be noted that salinity gradient reversals occur naturally in San Francisco Bay and do not appear to hinder the upstream migration of adult salmonids. Salinity data collected for the SBDA between December 1981 and November 1986 (Kinnetic Laboratories 1987) suggests that salinity reversals occur regularly and naturally in both Alviso Slough and Coyote Creek. In addition, the salinity observation data collected by the USGS for the South San Francisco Bay (Baylosis et al. 1997) demonstrate that there are reversals in the salinity gradient in the South Bay during periods of salmonid migrations. Since salmonids are known to navigate through the South Bay, Coyote Creek, and Alviso Slough during these periods, it is reasonable to assume that these natural reversals do not impede the migratory pathways of the salmonids.

Despite the uncertainty as to the importance of salinity gradients in salmon migratory behavior, an evaluation was performed to determine whether the circulation of saline waters from the salt ponds during the ISP might interrupt the salinity gradient in the sloughs and creeks used by salmonids as migration corridors to their upstream spawning areas. Similar to the evaluation of natal stream signal dilution under the ISP, this evaluation of salinity gradient reversals was targeted to those sloughs and creeks actually used by salmonids (i.e., Alviso Slough, Coyote Creek, and Alameda Flood Control Channel) and to those times during which the peak upstream migrations actually occur (i.e., January-March for adult steelhead trout and September- November for adult Chinook salmon).

As noted previously, the Initial Release Period of the ISP (either April-May or July-August), when the highest salinity discharges will occur, is not considered in this evaluation because the adult salmon and steelhead do not migrate upstream during those months.

The evaluation consisted of three components. First, for each slough and relevant time period, mathematical modeling techniques were used to predict salinity gradients under existing conditions (i.e., no pond circulation). Second, using the same models, salinity gradients were predicted under ISP conditions. Third, these existing condition and ISP condition gradients were compared to determine if discharge from the ponds during the ISP would produce significant salinity gradient reversals.

It should be noted that the identification of salinity gradient reversals is dependent upon the threshold that is used – i.e., how much more saline does the upstream water have to be in order for a gradient reversal to be considered reportable). In this evaluation, two threshold values were used, 3 ppt and 1 ppt. The 3 ppt threshold is considered representative of what might be reasonably detected by salmonids and might potentially influence their behavior (Emmett et al. 1991). The 1 ppt threshold is considered a very conservative prediction of a salinity gradient reversal and is unlikely to have an influence on salmonid migratory behavior.

It should also be noted that salinity gradient reversals presented in this evaluation are calculated based on depth-averaged salinities, which include reversals that only affect a portion of the water column. Salinity reversals are often due to a low salinity region near the slough bed, with no salinity reversal occurring closer to the water surface. In such cases, a zone of passage for upstream migrating adult salmonids exists in the upper portion of the water column in which the salinity gradient is intact.

The results of these evaluations indicate that continuous circulation of saline water during the ISP has the potential to disrupt salinity gradients in the sloughs and creeks used by adult salmonids as migration corridors to their upstream spawning areas. During the winter months when steelhead trout are migrating upstream, model predictions based on the 3 ppt threshold indicate that for the two streams currently used (i.e., Alviso Slough and Coyote Creek) and the one stream that could potentially be used (i.e., Alameda Flood Control Channel), salinity gradients would be intact for more than 99% of the time during the ISP. During the fall months when Chinook salmon are migrating upstream, model predictions indicate that for Coyote Creek, salinity gradients would be intact for 100% of the time during the ISP. For Alviso Slough, even though the modeling predicts a greater frequency and duration of salinity gradient reversals during this fall period, intact salinity gradients on a monthly basis are still predicted to exist for between 49 and 98% of the time. Salinity gradient reversal within Alviso Slough has the potential to disrupt and cause temporary impediments to adult salmon migration during fall months. The range of expected frequencies for salinity reversals within the slough suggests that under extreme conditions pond discharges have the potential to affect migration.

The actual dynamics of the water-quality and tidal hydraulics within the slough would affect the actual migration conditions for adult salmon on an hourly or daily basis that are beyond the resolution of the monthly model. The distribution of salinity within the slough water column and increase in salinity after dilution with receiving waters also affect the actual migration behavior of adult salmon. Field monitoring of the actual salinity gradient within the slough during discharge would be required to further evaluate the potential significance of project operations on adult salmonid migration. In the event that field monitoring demonstrates that the salt pond discharge would impact salmonid migration, alternative pond management strategies would be implemented to reduce and avoid adverse conditions to a less than significant level.

It should be noted that all predicted salinity gradient reversals were geographically limited to a relatively small area in each slough around the point of discharge from the salt pond. The model predictions indicate that during the ISP, salinity gradients are sufficiently intact to provide a consistent signal for upstream migration, if the steelhead trout and Chinook salmon actually follow such a signal.

Juvenile Chinook salmon and steelhead would be migrating downstream within Coyote Creek and Alviso Slough during the April-May period proposed for the initial discharge under Alternative 1. During downstream migration, the juvenile salmonids experience an increasing salinity gradient as they move from the freshwater rearing habitat within the creeks and rivers and enter the Bay and subsequently Pacific coastal waters. Prior to their downstream migration, both juvenile Chinook salmon and steelhead undergo a physiological transformation (smolting) that enables the fish to inhabit marine waters.

The juvenile salmonids migrating downstream would potentially be temporarily exposed to localized areas of increased salinity resulting from pond discharges. The short-duration exposure and rapid dilution of salinity within the receiving waters, in combination with their ability to tolerate higher salinity waters, would not be expected to result in adverse impacts to the downstream migrating juvenile steelhead or salmon. The increasing salinity gradient that naturally occurs along the migratory corridor and the localized increase in salinity in the immediate vicinity of the points of discharge would not be expected to block, disorient, or delay the downstream migration of juvenile salmonids during the Continuous Circulation Period. As a result of the temporary and localized affect of the salt pond discharges on receiving water quality conditions and salinity gradients, in addition to the physiological tolerance of juvenile salmon and steelhead smolts to respond to fluctuating salinity conditions, the effects of salt pond discharges on juvenile salmonid migration during the April-May Continuous Circulation Period under Alternative 2 is considered the less than significant. Exposure of juvenile salmonids to high salinity at the point of pond discharge would be expected to be of short duration (minutes or hours) and may result in physiological stress and/or behavioral avoidance or delayed migration during the April-May IRP. The short-term exposure to salinity during the IRP would occur over a small area within the receiving waters, have short duration, and rapid dilution which may result in increased stress or behavioral changes to juvenile salmonids but the magnitude of these effects is considered to be small and less than significant.

Significance: Short-term impacts (IRP) - Less than significant
Long-term impacts (CCP) – Less than significant

FISH IMPACT-6: Installation of water control structures could lead to juvenile fish entrainment.

Water control structures would be constructed and operated to divert water from areas surrounding the ponds into the pond complex to control salinity levels of the waters prior to discharge during the Continuous Circulation Period. There is a potential that downstream migrating juvenile salmonids (both Chinook salmon and steelhead trout) would be entrained along with intake water into the salt ponds during the ISP. Juvenile salmon or steelhead entrained into the pond complex would be expected to experience 100% mortality. The magnitude of risk to juvenile salmonids as a result of entrainment, however, cannot be estimated in the absence of information on the seasonal timing, locations, ambient flow conditions within the creek and slough, and the corresponding density of juvenile salmonids vulnerable to entrainment.

In addition to juvenile Chinook salmon and steelhead, a number of resident and seasonally resident fish and macroinvertebrates inhabiting the area would potentially be vulnerable to entrainment into the water diversions. Many of these estuarine species would be expected to survive within the lower salinity pond cells. The survival of these individuals would depend on water quality within the ponds. The ability of these individuals to successfully move into and out of the ponds is unknown.

Significance: Short-term impacts (IRP)/Long-term impacts (CCP) -Potentially significant**.**

FISH MITIGATION MEASURE-2 Close intakes on salmonid migration routes during periods of juvenile migration.

As part of the ISP operation plan, intakes will be situated on Alviso Slough (into Pond A9), Coyote Creek (into Pond A17), and Alameda Flood Control Channel (into Pond 1C). To minimize any possibility of entrainment, it was decided in consultation with NOAA Fisheries to close the intakes on all salmonid creeks and sloughs from December 1 through April 30. This period encompasses the peak downstream juvenile migration period (March through April) as well as any early storm-induced juvenile washouts (late December through February). During the Initial Release Period (first year of discharge), this closure period may be shortened by one month (i.e., December 1 – March 31) for the Pond A9 intake from Alviso Slough in order to prevent higher than desired salinities in the Pond A14 discharge. During subsequent years, the Pond A9 intake will observe the December 1 through April 30 closure period. The Pond A9 intake is and existing facility and has operated in April in the past.

Post-mitigation Significance: Less than significant.

6.5.3.4-- Alternative 3 (Phased Initial Discharge)

In Alternative 3 (Phased Initial Discharge), many of the lower salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

Impacts to fish and macroinvertebrates due to salinity and water quality under Alternative 3 are essentially the same as those for Alternative 2. Mitigation proposed for Alternative 3 is identical to mitigation proposed for Alternative 2 and would reduce all identified water quality impacts to a less than significant level. A list of impacts and proposed mitigation for Alternative 3 is provided below.

FISH IMPACT-1: Discharge of pond contents would increase salinity levels or water quality conditions in the receiving waters in the immediate vicinity of discharges beyond normal tolerance ranges for fish and macroinvertebrates, resulting in direct impacts to these aquatic organisms and indirect impacts to fish impacts to their food source (macroinvertebrates).

As discussed in Chapter 4 (see Section 4.3.1.3), the following significant short-term water quality impacts may affect benthic organisms under Alternative 3:

- Short-term impacts to aquatic habitat are anticipated from elevated salinities in the following receiving water bodies:
- Guadalupe Slough (Alviso Complex)— See Water Quality (Salinity) Impact-6 for a complete discussion.

- Old Alameda Creek (Baumberg Complex)— See Water Quality (Salinity) Impact-8 for a complete discussion.
- Old Alameda Creek (Baumberg Complex)— See Water Quality (Salinity) Impact-8 for a complete discussion.
- Under some circumstances, total mercury in discharged water and receiving water will exceed total mercury WQOs and may have short-term impacts on water quality—See Water Quality (Metals) Impact-3 for a complete discussion.
- Increased algal activity in ponds leads may lead to decreased dissolved oxygen in receiving waters—See Water Quality (DO) Impact-1 for a complete discussion.
- Discharge of pond water at temperatures more than 5 degrees Fahrenheit above the temperature of the receiving water may adversely affect water quality and biota in adjacent waterways—See Water Quality (Temperature) Impact-2 for a complete discussion.

Significance: Short-term impact—Significant
Long-term impact—Less than Significant

Implementation of mitigation measures proposed in Chapter 4 (Water Quality), in combination with Fish Mitigation Measure-1 below, would reduce this impact to less-than-significant level. Relevant mitigation measures in Chapter 4 are as follows (see Section 4.3 for details):

- WQ-Salinity Mitigation Measure 1A
- WQ- Salinity Mitigation Measure 1B
- WQ-Metals Mitigation Measure 1A
- WQ- Metals Mitigation Measure 1B
- WQ-DO Mitigation Measure 1A
- WQ- DO Mitigation Measure 1B
- WQ-Temperature Mitigation Measure 1A
- WQ- Temperature Mitigation Measure 1B
- WQ-pH Mitigation Measure 1A
- WQ- pH Mitigation Measure 1B

Fish Mitigation Measure-1: Assess and maintain salinity and other water quality parameters at levels protective of aquatic resources.

The data developed through WQ-Salinity Mitigation Measure 1A will be assessed relative to the salinity and other water quality requirements of fish and macroinvertebrate communities. If the assessment of water quality, based on analysis of monitoring data, indicates a potential measurable effect on population abundance, measures could be implemented to minimize the water quality effects. The measures may include change in discharge magnitude, timing, and duration. The data would support real time operations that could minimize effects to all life stages.

Post Mitigation Significance: Less than Significant

Operations under Alternative 3 would schedule initial discharges from some of the ponds into the receiving waters during the summer months (July -- August). The operational characteristics outlined for Alternative 2 would apply to the analysis and evaluation of potential impacts to fisheries and aquatic habitat within the receiving waters under

Alternative 3. Rescheduling initial discharges from the ponds, having elevated salinity concentrations, until the summer months would avoid all potential adverse impacts to adult and juvenile Chinook salmon and steelhead. The seasonal occurrence of salmonids and their life cycle results in the species not being present in the proposed project area during summer months.

> *FISH IMPACT-4:* Changes in water quality during the Continuous Circulation Phase of the ISP could disrupt adult salmonid migration though dilution of "natal stream" signal and/or imprinting by juvenile salmonids.

Fish Impact-4 for adult steelhead and Chinook salmon apply only to Continuous Circulation Period of Alternatives 2 and 3. These impacts do not apply to the Initial Release Period of the ISP (either April-May or July-August), when the highest salinity discharges will occur, because the adult salmon and steelhead do not migrate upstream during those months. Exposure of juvenile steelhead and Chinook salmon migrating downstream during the spring months (April-May) may be exposed to elevated salinities that would affect migration behavior however the potential for adverse effects is considered to be localized and temporary as a result of effluent dilution within the receiving waters. Since juvenile steelhead and salmon do not migrate during summer months (July-August), and would not be in the vicinity of the pond discharges, there would be no adverse impact. Potential impacts for Alternative 3 would be similar to the estimated impacts for Alternative 2.

Significance: Long-term impact (CCP) - Less than significant.

> *FISH IMPACT-5:* Changes in water quality could disrupt fish migration though creation of salinity gradient reversals.

Fish Impact-5 for adult steelhead and Chinook salmon apply only to Continuous Circulation Period of Alternatives 2 and 3. These impacts do not apply to the Initial Release Period of the ISP (either April-May or July-August), when the highest salinity discharges will occur, because the adult salmon and steelhead do not migrate upstream during those months. Exposure of juvenile steelhead and Chinook salmon migrating downstream during the spring months (April-May) may be exposed to elevated salinities that would affect migration behavior however the potential for adverse effects is considered to be localized and temporary as a result of effluent dilution within the receiving waters. Since juvenile steelhead and salmon do not migrate during summer months (July-August), and would not be in the vicinity of the pond discharges, there would be no adverse impact. Potential impacts for Alternative 3 would be similar to the estimated impacts for Alternative 2.

Significance: Short-term impacts (IRP) - Less than significant.
Long-term impacts (CCP) – Less than significant

> *FISH IMPACT-6:* Installation of water control structures could lead to juvenile fish entrainment.

Water control structures would be constructed and operated to divert water from areas surrounding the ponds into the pond complex to control salinity levels of the waters prior to discharge during the Continuous Circulation Period. There is a potential that downstream migrating juvenile salmonids (both Chinook salmon and steelhead trout) would be entrained along with intake water into the salt ponds during the ISP. Juvenile salmon or steelhead entrained into the pond complex would be expected to experience 100% mortality. The magnitude of risk to juvenile salmonids as a result of entrainment, however, cannot be estimated in the absence of information on the seasonal timing, locations, ambient flow conditions within the creek and slough, and the corresponding density of juvenile salmonids vulnerable to entrainment.

In addition to juvenile Chinook salmon and steelhead, a number of resident and seasonally resident fish and macroinvertebrates inhabiting the area would potentially be vulnerable to entrainment into the water diversions. Many of these estuarine species would be expected to survive within the lower salinity pond cells. The survival of these individuals would depend on water quality within the ponds. The ability of these individuals to successfully move into and out of the ponds is unknown.

Potential impacts for Alternative 3 for the Continuous Circulation Period and the Initial Release Period for ponds to be included in the April initial release would be similar to the estimated impacts for Alternative 2. Juvenile Chinook salmon and steelhead do not inhabit the receiving waters where Initial Release Phase pond discharges may occur during the summer months (July-August) under Alternatives 2 and therefore would not be exposed to the pond discharge at this time of year.

Significance: Short-term impacts (IRP)/Long-term impacts (CCP) -Potentially significant**.**

FISH MITIGATION MEASURE-2 Close intakes on salmonid migration routes during periods of juvenile migration.

As part of the ISP operation plan, intakes will be situated on Alviso Slough (into Pond A9), Coyote Creek (into Pond A17), and Alameda Flood Control Channel (into Pond 1C). To minimize any possibility of entrainment, it was decided in consultation with NOAA Fisheries to close the intakes on all salmonid creeks and sloughs from December 1 through April 30. This period encompasses the peak downstream juvenile migration period (March through April) as well as any early storm-induced juvenile washouts (late December through February). During the Initial Release Period (first year of discharge), this closure period may be shortened by one month (i.e., December 1 – March 31) for the Pond A9 intake from Alviso Slough in order to prevent higher than desired salinities in the Pond A14 discharge. During subsequent years, the Pond A9 intake will observe the December 1 through April 30 closure period. The Pond A9 intake is and existing facility and has operated in April in the past.

Post-mitigation Significance: Less than significant.

7.0 CULTURAL RESOURCES

This chapter assesses the effects of the proposed project on cultural resources, including districts, sites, buildings, structures, and objects that contain evidence of past human activities.

7.1 AFFECTED ENVIRONMENT

7.1.1 Prehistory

People inhabited the project area for at least 11,000 years prior to the arrival of Spanish explorers to California in the 18th century. Evidence suggests that Paleoindian (12,000 to 9,000 years before present (YBP) populations throughout California and elsewhere were small and the subsistence economies emphasized the capture of big game, including now extinct megafauna, such as mammoth and mastodon. Although Paleoindian sites are rare in California, when found, they are often near areas containing pluvial lakes and marshes.

During the Archaic Period (9,000 to 4,000 YBP), California prehistoric cultures, as elsewhere, lost their emphasis on large game hunting. Subsistence economies probably diversified somewhat, and Archaic people may have begun to use certain ecological zones, such as the coast littoral zone, more intensively than before. Advances in technology enabled more efficient use of certain plant foods, including grains and plants with hard seeds. Archaic sites are relatively rare throughout California. The earliest sites in the Bay Area are from the late Archaic Period (around 7,000 to 4,000 YBP). These sites contain large projectile points, milling stones, and a lack of high-density shell deposits that indicate the early inhabitants of the project area relied on hunting and gathering of terrestrial foods (Moratto 1984).

Population densities increased throughout the Pacific Period (4,000 to 150 YBP). Consequently, California populations sought to produce more food from available land and to locate more dependable food supplies. The Pacific period saw the human occupation and specialized use of virtually all ecological niches in California. Populations became increasingly sedentary and settled in larger villages. Increasing social stratification, ceremonialism, and long-distance trading activity is evident in the archaeological record (Chartkoff and Chartkoff 1984). In the Bay Area, many villages were established by 4,000 YBP. Village sites, commonly located near a stream, adjacent to resource-rich bayshore and marsh habitats, often had deep stratified deposits of shellfish and other remains from repeated occupations over time. Beginning around 1,700 YBP, there was an increasing complexity in artifact assemblages that seems to reflect an intensified hunting, gathering, and fishing adaptation. The introduction of the bow and arrow, harpoon, and the use of clam disk beads as currency for trade are just a few indications that populations were larger and more densely settled (Moratto 1984).

7.1.2 Ethnography

Inhabitants of the project area at the time of European contact were the Ohlone (as they presently refer to themselves) or Costanoan (from the Spanish “Costano” for coastal people). The term “Costanoan” refers to an ethnographic grouping of people who shared similar cultural and linguistic traits, and does not refer to a politically unified entity. The

Ohlone occupied the Coast Ranges surrounding the San Francisco and Monterey Bays and probably arrived in central California sometime after 1,500 years ago (around 500 A.D.). Levy (1978) estimates the Ohlone population at about 10,000 at the time of European contact. The Spanish missionized the Ohlone people quickly and occupied nearly the entire coastal portion of the Ohlone territory in the latter part of the 18th century. Introduced diseases and lower birth rates drastically affected native population levels during this period. With mission secularization in 1821, Ohlone and other mission Indians left the missions to work in surrounding areas, mostly as manual laborers on ranchos (Levy 1978).

Ethnographic information on the pre-contact Ohlone is not available; ethnographic studies from the late 1800s and early 1900s were of a population whose culture had already been significantly altered by high-intensity contact with Europeans. Today, approximately 200 Ohlone descendants live in the San Francisco and Monterey Bay areas. They formed a corporate entity, the Ohlone Tribe, in 1971. There is presently no federally recognized Ohlone group.

7.1.3 History

Below is a brief historical overview of the project area, summarized from the *Final Cultural Resources Inventory Report for the Habitat Mitigation Planning Sites, San Francisco International Airport Proposed Runway Reconfiguration Program* (Jones & Stokes, 2001). Special attention is given to the history of the salt industry and the town of Drawbridge, which has relevance for the proposed South Bay Salt Ponds ISP.

San Francisco Bay has a long history of maritime activities that undoubtedly left material remains along the water's edge. Spanish exploration of northern California began around 1769 with the expedition of Gaspar de Portola. Juan Bautista de Anza led the first Spanish overland expedition into the San Francisco Bay region in 1776 and established the Mission Dolores and San Francisco Presidio. In 1777, Lieutenant Jose Joaquin Moraga and Father Tomas de la Pena led a party of settlers from Mission Dolores into the Santa Clara Valley to establish a mission there. Father Junipero Serra founded Mission Santa Clara de Asis that year. Early explorers in present-day Alameda County included Jose Francisco Ortega in 1769, Pedro Fages in 1770 and 1772 and Bautista de Anza and Moraga in 1776. However, the project area remained largely unsettled by Euroamericans until the founding of Mission San Jose near the present town of Fremont in 1797. Mission San Jose was one of the most prosperous and populous of the Spanish missions in California.

Mexico achieved independence from Spain in 1821 and the following year, California was declared a territory of the Mexican republic. In 1834, the Mexican government secularized the missions and divided their vast holdings into individual land grants, or ranchos, opening the way for the emergence of a new landed elite, who introduced large-scale cattle ranching in California. The project area includes portions several of these ranchos.

Commercial activity between the United States and California increased during the Mexican Period, and the region experienced an influx of overland trappers and mountain men in search of beaver and other fur-bearing animals. Tensions between the new arrivals and native Californians intensified and hostility between the U.S. and Mexican governments culminated in outbreak of the Mexican War in 1846. The conflict was marked by repeated American land and naval victories, and formally ended with the signing of the Treaty of Guadalupe Hidalgo in February 1848 and the cession of California to the United States.

Just over a week before the signing of the Treaty of Guadalupe Hidalgo, James Marshall discovered gold in the Sierra Nevada foothills while constructing a sawmill for John A. Sutter. Marshall's discovery led to a massive incursion of miners, prospectors, and settlers into California known as the Gold Rush (1848–1852). Although the gold seekers converged primarily on the interior mining country, the coastal regions attracted scores of merchants and settlers, who sought to take advantage of California's emerging maritime and agricultural economies. The lumber and fishing industries both boomed during the Gold Rush. The fishing industry also expanded in the 1870s following an increase in the immigration of fishermen from Italy, Greece, China, and Portugal. By the beginning of the 20th century, the staple yields of the fishing industry were salmon, crabs, cod, and oysters. Commercial oystering, which also began with the Gold Rush, was a major industry through the end of the 19th century in the willow waters and marsh areas surrounding the bay. From 1895 to 1904, oysters were the most valuable fishing product of the state. Production declined shortly thereafter, and oystering ended completely in the 1930s as a result of pollution in the San Francisco Bay (Hart 1978). The Gold Rush also fueled the growth of the salt industry in the Bay, discussed further below.

The importance of maritime shipping in the project vicinity continued throughout the Gold Rush and all succeeding historic periods and areas near major watercourses, estuaries, and nearby mudflats. Several large communities in the present South Bay area had their origins as ranchos and then grew into large agricultural centers later, facilitated by extensive transportation networks. The present-day cities of Union City, San Leandro, and Fremont originated from the consolidation of several farming communities and then grew into residential and manufacturing centers. Several fruit-growing communities, including the present city of Sunnyvale, followed a similar economic pattern.

The first roads sprang up across the South Bay in the mid-19th century to late 19th century to facilitate travel and the transportation of agricultural goods to market. The city of Mountain View in Santa Clara County originated as an agricultural community and the location of a stage stop along the road between San Jose and San Francisco in the early 1850s. Before the coming of the railroads, maritime transportation of agricultural products was an essential component in the economy of the San Francisco Bay Area. Various landings were established along the East Bay that served as vital commercial and travel links before the development of additional transportation facilities. The Port of Alviso, one of the oldest ports in the western United States, was created in the late 1840s by land speculators, to replace the Embarcadero de Santa Clara/Alviso, located 0.5 mile south of the city of Mountain View. The town of Alviso was surveyed in 1849. Alviso was the major commercial shipping depot in northern California during its heyday, but the town began to decline when the San Francisco to San Jose Railroad that bypassed Alviso was completed in 1864. In 1968, Alviso was annexed by the city of San Jose. Redwood City and Union City also emerged as important shipping centers in the South Bay. An association of farmers known as the Mt. Eden Company established a series of landings along Mt. Eden Creek in the Baumberg area in the 1850s. In 1855, Captain

Richard Barron built numerous warehouses and wharves at Eden Landing. He built a salt works in the area in the late 19th century and operated at least two other landings in the area (Wood 1883).

In 1864, the Southern Pacific Railroad (SPRR) Company built a standard-gauge line from San Francisco to San Jose. The town of San Mateo grew up around this railroad. This San Francisco-San Jose line was extended to Gilroy in 1869. However, the SPRR line did not adequately serve the fruit growing regions of Santa Clara County. In 1876, Alfred C. "Hog" Davis purchased the bankrupt narrow-gauge Santa Clara Valley Railroad (SCVRR). The SCVRR had connected Alviso, San Jose, and Santa Clara, but had gone bankrupt trying to extend the line to Santa Cruz. Davis formed the South Pacific Coast Railroad (SPCRR), which later received some financial backing from Senator James G. "Slippery Jim" Fair. Davis and Fair envisioned a new town of Newark and a line that would extend from this town to Santa Cruz via the Santa Cruz Mountains. The SPCRR originally provided a ferry service from Newark to San Francisco, but the East Bay terminal was later moved to Alameda. The San Francisco to Santa Cruz service began in May 1880 and involved an 80-mile-long trip lasting 3 hours, 30 minutes. The line was leased to SPRR in 1887 and was recognized at the time as the most profitable railroad for its size in California (Dewey, 1989). SPRR later acquired the SPCRR (now Union Pacific Railroad). Alameda County experienced considerable industrial and economic growth with the coming of the San Francisco and Alameda Railroad in 1865. By 1869, the line extended along the East Bay from San Francisco to San Jose. This line was later absorbed into the Union Pacific system.

History of the Salt Industry in South Bay. The solar salt industry in San Francisco Bay began in the mid 1850s. The first operations were simple levees built around naturally occurring salt pans in Alameda County to increase their capacity. They were small family enterprises that used intensive hand labor for production and harvest. Nearly all of the salt produced in San Francisco Bay during this era was shipped to Nevada to be used for the processing of silver ore. By the late 1800s, an estimated 37 salt production facilities had been established throughout the South Bay. Most of these facilities were constructed by diking tidal marshes. The diked marshes were fitted with operator-controlled intake structures to capture seawater during high tides. The Baumberg ponds first came into production in the late 1800s. The Alviso ponds came into production in 1929 (Ver Planck 1958).

By the early 1900s, the quality of the salt produced in San Francisco Bay had increased significantly, and the market expanded to include fine or "table" salt. Between 1924 and 1941, many of the small plants consolidated. Following the consolidation, only Leslie and Oliver salt companies remained. The Leslie Salt Company was created in 1936 from the consolidation of 19 small operations (Jones & Stokes 2003). In that year, the Leslie Salt Company produced 300,000 to 325,000 tons of salt on roughly 12,500 acres. By 1946, the company produced 500,000 tons on 25,000 acres. In 1950, the company's production was up to 750,000 tons and by 1959 production reached one million tons and included production in the North Bay (Siegel and Bachand 2002). By the 1950s, 85 percent of wetlands in the San Francisco Bay had been filled, dried out, or converted to salt ponds. By the 1960s, Leslie Salt owned 50,000 acres of salt ponds around the Bay.

The Oliver Salt Company, located at the foot of the Hayward-San Mateo Bridge, ceased to operate in the early 1980s. In 1979, Cargill bought Leslie and is now is the only solar salt producer in San Francisco Bay (San Francisco BCDC 1994, Jones & Stokes 2003).

In 1972, Congress created the San Francisco Bay National Wildlife Refuge (renamed the Don Edwards SFBNWR in 1995 in honor of the former congressman). In 1979, SFBNWR purchased 11,430 acres from Leslie Salt (now Cargill Salt). Cargill still retains the salt making rights on these lands. In 2000, Cargill Salt decided to consolidate its Bay Area salt operations and offered 19,000 acres of excess ponds in the North and South Bays (reduced to 16,500 acres in 2002) to the state and federal government. In March 2003, USFWS and CDFG acquired 16,500 acres of industrial salt ponds and/or associated salt-making rights from Cargill, of which 15,100 acres are located in the South Bay. To date, there has been no formal NRHP eligibility evaluation of the South Bay salt works.

Historic Town of Drawbridge. Drawbridge is located on Station Island, between Coyote Slough on the north, Warm Springs Slough (now Mud Slough) on the south, and two salt ponds on the east and west. The SPCRR (now the Union Pacific Railroad; see railroad history above) built a narrow-gauge railroad bridge over Coyote Slough and a second over Mud Slough. The following history is summarized from the San Francisco Bay Wildlife Society's booklet *"Drawbridge: A Hand-Me-Down History"* (Dewey, 1989) and the website: www.sjunderbelly.com/ unbelly/ Draw/ draw9.html.

The first building on the island was a two-room cabin the SPCRR built in 1876 for the railroad bridge tender. At that time, the only access to the island was by rail or boat. The tidal marsh that covered the island presented some challenges to early builders. All buildings were elevated (built on pilings or sills) to avoid daily flooding and walkways between the buildings were also elevated. The railroad bed was sometimes called "Main Street" or "A Street." The SPCRR charged one dollar a year for setting a walkway on railroad property.

The area provided an abundance of waterfowl, fish and shellfish to attract Bay Area sportsmen, who began to flock to the area in the 1880s, following completion of the SPCRR line to Santa Cruz. Numerous duck hunter's cabins and blinds were built, the first of which was the Gordon Gun Club (built 1880), and Drawbridge became a popular stopover along the SPCRR line. The first permanent residence was built in 1894, SPCRR officially named the stop Drawbridge in 1897, and by the early 1900s, there were about 40 buildings on the island. The Sprung Hotel was built in 1902 and collapsed in the 1960s. By 1906, the town had two hotels (the Sprung and the Hunter's Home, or Sportsman's Hotel, also built in 1902) and 79 cabins (a mixture of private residences and duck clubs). The town experienced considerable damage during the earthquake of 1906.

Drawbridge peaked in popularity in the 1920s. By 1926, there were 90 cabins and 5 passenger trains came through town each day. Electricity came to the island in 1931. Most of the cabin owners were middle class professionals. A number of boat builders also took up residency on the island. Residents reported an ethnic division between the north and south ends of town and residents of the two ends apparently did not get along very well. Cabins were individually designed and the exterior and interior designs varied considerably. People also lived in dwellings called "arks"; houseboats pulled up on the marsh and hoisted onto pilings. A freshwater aquifer underlying the island supplied several wells.

By 1940, there were only about 50 cabins left. Several factors contributed to the decline of the town in subsequent decades. The island began to sink and buildings and structures on the island subsided as a result of groundwater pumping in nearby communities. Wildlife was impacted by pollution from raw sewage that was dumped by neighboring communities into the South Bay. The smell of sewage became a nuisance, wells were fouled, and swimming in the sloughs lost its attraction. Construction of railroads and highways led to a decline in maritime shipping and construction of salt ponds by Arden Salt and other companies also reduced the navigability of the sloughs in the area. The Depression probably also played an earlier role. Reports in local newspapers that Drawbridge had become a ghost town brought vandals and squatters to the town, accelerating its demise. By 1976, one resident and 24 taxed residences remained at Drawbridge. The last two residents, Nellie Irene Dollin and Charlie Luce, left in 1974 and 1979, respectively.

Drawbridge is now within the Don Edwards SFBNWR. Although suggestions for preserving the town were initially included in plans for the refuge, the current plan is to do nothing. None of the remaining structures at Drawbridge have been formally evaluated for eligibility to the NRHP.

7.1.4 Research Methods

A screening level analysis of cultural resources, consisting of archival research, review of historic maps, and contact with Native American organizations, was undertaken for this project. The layout of the ponds in the South Bay is not conducive to archaeological survey and intensive archaeological survey of the entire project area was not undertaken for this EIR/EIS.

Archival research was conducted at the Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS), located at Sonoma State University, Rohnert Park in April of 2003. Research included a review of cultural resources and cultural resource surveys within 0.5-mile of the project area. The following lists were reviewed:

- National Register of Historic Places
- California Register of Historical Resources
- California Inventory of Historic Resources (State of California 1976)
- California Points of Historical Interest (State of California 1992)
- Historic Spots in California (Kyle et al. 1990)

USGS topographic maps and historical maps were also studied to determine where unrecorded historic structures were located and to understand details regarding the topography of the project area prior to extensive land alteration during construction of the salt ponds. Information from an effects assessment of cultural resources within the Eden Landing (Baumberg) Ecological Mitigation Tract was also used (Far Western Anthropological Research Group, Inc., Past Forward, Inc., Caltrans, 2001).

The California Native American Heritage Commission (NAHC) was contacted to incorporate the opinions and concerns of Native Americans in the project area. The

NAHC consulted its Sacred Lands File for Native American burial sites and sacred places that could exist in the project area. The NAHC did not indicate the presence of Native American burial sites and sacred places in the project area, but cautioned that persons of Native American descent with an interest in the project area could have additional knowledge and/or concerns. The NAHC provided several Native American contacts for the project area. A list of the contacts supplied appears in Appendix H. Letters were mailed to these contacts in May 2003, informing them of the proposed project and soliciting their comments and concerns regarding the project (see Appendix I). A letter was received from Katherine Perez, representing the Ohlone Indian Tribe, indicating the project's potential to impact unknown burials and recommending that ground disturbance be minimized and monitored to minimize the potential for impacts to unknown sites. To date, no comments or concerns have been expressed by the other individuals/groups contacted.

A public scoping meeting to solicit comment on the environmental effects of the ISP and the scope and significant issues to be analyzed in the EIS/EIR was held on March 27, 2003. To date, no comments pertaining to cultural resource issues have been received.

7.1.5 Cultural Resources in the Project Vicinity

Based on the information provided during archival research and knowledge of the natural setting, the West Pond Complex is located in an area of low to moderate sensitivity for prehistoric archaeological sites, while the sensitivity of the Baumberg and Alviso ponds ranges from low to high.

Nearly all of the prehistoric tidal marsh in the South Bay was diked between the 1850s and 1950s. Almost all prehistoric marsh surfaces in the area are located in the interior side of dikes. Nearly all existing tidal marshes formed in sediments deposited after dikes were constructed. These tidal "fringing" or "strip" marshes outboard of dikes established in the positions of previously unvegetated historic tidal channel beds or mudflats (Atwater *et al*. 1979). Within the modern South Bay, prehistoric tidal marsh surface with the potential for relatively shallow-buried prehistoric archaeological sites are restricted to locations within (a) diked bayland interiors, and (b) rare, locally preserved, undiked, prehistoric tidal marshes. Ground disturbance under the ISP would not occur within these locations and would be restricted only to the levees.

Historic archaeological sites associated with maritime or fishery activities could be located where mudflat harbors and anchorages once existed, although the likelihood of discovering such remains has been reduced by infilling, diking, land reclamation, and other large-scale modifications of the bayshore landscape. Moreover, subsidence and sea-level rises have continued to accrete sediments in the project area. However, as discussed below, features of this modified landscape are now more than 50 years old and may themselves qualify as significant cultural resources.

Records at the NWIC indicate that portions of the project area have been surveyed for cultural resources. At fifteen of the Alviso ponds, accessible areas have been completely surveyed for archaeological resources. Less than 5 percent of the area of the remaining ponds has been surveyed, and many ponds have not been surveyed at all (J&S 2001). Surveys have been conducted within the Baumberg Complex in conjunction with the Eden Landing Ecological Reserve Project (Hope et al, 1996; Ananian 1985; and Far

Western Anthropological Research Group, Inc., Past Forward, Inc., Caltrans, 2001).. Surveys within the project area are too numerous to list here, but are available for review by qualified individuals at the NWIC.

According to information available at the NWIC, there are 7 previously recorded archaeological sites within the project area (1 prehistoric and 6 historic), and 13 previously recorded archaeological sites (4 prehistoric, 8 historic, 1 prehistoric/historic) outside the project area, but within a 0.5-mile radius of the project. These resources are summarized by pond complex in Tables 7-1 and 7-2 below.

Table 7-1.
Recorded cultural resources within the project area

Pond complex	Trinomial site no.	Primary site no.	P/H	Description
Alviso Ponds	CA-SCL-810H	P-43-001110	H	Port of Alviso historic ship building facility
	CA-ALA-338	P-01-002057	P	Disturbed remnants of shell midden site
Baumberg Ponds	CA-ALA-494H	P-01-000210	H	Oliver Salt Co. piling and foundations
	CA-ALA-495H	P-01-000211	H	Location of former Rocky Point Saltworks (pre-1898, absorbed by Oliver Salt Company by 1909); no surface remains
	CA-ALA-496H	P-01-000212	H	Pilings and foundation of former Union Pacific Salt (ca. 1872-1927)
	CA-ALA-489H, -497H, -501H	P-01-000217	H	Eden Landing historic shipping station (warehouses, wharves, associated developments)
	CA-ALA-593H	P-01-002257	H	Small late-19th century historic refuse scatter (on levee)

Table 7-2.
Recorded cultural resources within 0.5 mile of the project area.

Pond complex	Trinomial site no.	Primary site no.	P/H	Description
Alviso Ponds	CA-SCL-23	P-43-000043	P	Midden mound (occupation site)
Baumberg Ponds	CA-ALA-485	P-01-000201	P	Sparse marine shell deposit
	CA-ALA-487H	P-01-000203	H	Refuse scatter
	CA-ALA-492H	P-01-000208	H	Small, low density refuse scatter
	CA-ALA-493H	P-01-000209	H	Medium density refuse scatter
	CA-ALA-498H	P-01-000214	H	Location of former Nielsen Salt Works (no surface indication of site remains)
	CA-ALA-499H	P-01-000215	H	Stock shute, old fencing
	CA-ALA-500H	P-01-000216	H	Historic occupation area
	---	P-01-001791	H	Shipwreck
	CA-ALA-592H	P-01-002256	H	Small refuse scatter
West Bay Ponds	CA-SMA-248	P-41-000244	P	Lithic scatter
	CA-SMA-386H	P-41-002076	P/H	Lithic scatter/ two refuse dumps
	C-155 (reported find, not formally recorded)		P	unknown

Of these sites, only CA-ALA-338, the disturbed remnants of a prehistoric shell midden site, is within an area of potential construction. Construction of a new inlet is proposed at or near this location. The site was recorded in 1980 by D. Chavez. Extensive shell, powdery grey midden soil, and some charcoal were observed along the levee. Chavez noted the site was "greatly disturbed." No features, burials, or artifacts were located.

In addition to the recorded sites discussed above, the following structures of potential historic interest are noted within the project area:

- Levees and other structures associated with the South Bay salt works (all three complexes)
- Abandoned historic town of Drawbridge (Alviso Pond Complex)
- Historic SPCRR line, now Union Pacific Railroad (Alviso Pond Complex)

None of these resources have been formally evaluated for the CRHR or NRHP. As noted in the historical overview above, the salt industry dates back to the 1850s in the South Bay and the existing network of ponds is at least 50 years old. Given the social and economic significance of the salt industry in the South Bay, it is likely that the salt pond complexes would qualify as an historic district for the NRHP. A similar complex in San Diego County, the Western Salt Company Salt Works in Chula Vista, California, was evaluated by EDAW in 2001 and recommended eligible as an historic district for the NRHP and CRHR (Gustafson and Gregory, 2001).

The abandoned town of Drawbridge dates back to 1876 when the town was founded. The last resident left Drawbridge in 1979. Many of the remaining buildings are older than 50 years, but subsidence, flooding, and vandalism have taken their toll on the town and the integrity of most of these buildings is very poor.

The South Coast Pacific Railroad (now Union Pacific Railroad), which was constructed as a narrow-gauge railroad by James Fair and Alfred Davis, opened in 1880. Railroads in general, and this railroad in particular, played an important roll in the social and economic development of the area. It is not known whether portions of the original rail alignment remain.

No other structures of potential historic interest were noted in the ISP area. The Port of Alviso (listed as an historic district on the NRHP) and several duck cabins are also noted in proximity to the ISP area, but outside its area of impact.

7.2 CRITERIA FOR DETERMINING SIGNIFICANCE OF EFFECTS

7.2.1 Federal Significance Criteria

The National Historic Preservation Act (NHPA) of 1966 established the federal government's policy on historic preservation and the programs, including the National Register of Historic Places (NRHP), through which that policy is implemented. Under the NHPA, historic properties include "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (16 United States Code [USC] 470w (5)). The criteria used to evaluate the NRHP eligibility of properties affected by federal agency undertakings are contained in 36 CFR 60.4 and are as follows:

The quality of the significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

1. That are associated with events that have made a significant contribution to the broad patterns of our history;
2. That are associated with the lives of persons significant in our past;
3. That embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguished entity whose components may lack individual distinction; or
4. That has yielded or may be likely to yield information important in prehistory or history.

An historical property must also retain the integrity of its physical identity that existed during the resource's period of significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association.

An action is considered to have an effect on an historic property when the action has the potential to alter the characteristics of the property that may qualify the property for inclusion in the NRHP, including its location, setting, and use. The effect is considered adverse when it may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Pursuant to 36 CFR 800.9, adverse effects on historic properties include, but are not limited to, the following:

- Physical destruction or alteration of all or part of the property
- Isolation of the property from, or alteration of, the property's setting, when that character contributes to the property's qualifications for listing in the NRHP
- Introduction of visual, audible or atmospheric elements that are out of character with the property or that alter its setting
- Neglect of a property, resulting in its deterioration or destruction
- Transfer, lease, or sale of the property

Section 106 (16 USC 470f) of the NHPA requires federal agencies, prior to taking action to implement an undertaking, to take into account the effects of their undertaking on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment regarding the undertaking.

Specific regulations regarding compliance with Section 106 state that although the tasks necessary to comply with Section 106 may be delegated to others, the federal agency (in this case, the USFWS) is ultimately responsible for ensuring that the Section 106 process is completed according to statute. The Section 106 process has four basic steps:

- Identify and evaluate historic properties.
- Assess adverse effects of the project on historic properties.
- Resolve any adverse effects of the project on historic properties in consultation with the State Historic Preservation Officer (SHPO)/Tribal Historic Preservation Officer (THPO), and other interested parties, resulting in a memorandum of agreement (MOA).
- Proceed in accordance with the MOA.

7.2.2 State Significance Criteria

A project may have a significant effect on the environment if the project could result in a substantial adverse change in the significance of an historical resource (California Code of Regulations (CCR) Section 15064.5[b]). The *CEQA Guidelines* (Section 10564.5[c]) also require consideration of potential project impacts to "unique" archaeological sites that do not qualify as historical resources. Impacts to resources that do not qualify as historical resources or "unique" archaeological sites are not considered significant, and need not be considered further in the CEQA process (Public Resources Code (PRC) Section 21083.2).

CEQA establishes statutory requirements for establishing the significance of archaeological sites in (PRC) Section 21083.2 and historical resources in PRC Section 21084.1. The two PRC sections operate independently to ensure that significant potential effects on archaeological and historical resources are considered as part of a project's environmental analysis. Section 21083.2 defines a "unique archaeological resource" as "...an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
- It has a special and particular quality such as being the oldest of its type or the best available example of its type.

- Is directly associated with a scientifically recognized important prehistoric or historic event.

Section 21084.1 defines historical resources as those listed on or eligible for listing on the California Register of Historical Resources (CRHR). The CRHR establishes 50 years as the period in which sufficient time has passed to allow a scholarly perspective in understanding the historic importance of a resource. An historical resource must be significant at the local, state, or national level under one or more of the following four criteria:

- It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States;
- It is associated with the lives of persons important to local, California, or national history;
- It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values; or
- It has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

An historical resource must also retain the integrity of its physical identity that existed during the resource's period of significance. Similar to the NRHP, integrity under the CRHR is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association.

As noted above, under CEQA, a project may have a significant effect on the environment if the project could result in a substantial adverse change in the significance of a resource, meaning the physical demolition, destruction, relocation, or alteration of the resource would be materially impaired. This would include any action that would demolish or adversely alter the physical characteristics of an historic resource that convey its historic significance and qualify it for inclusion in the CRHR or in a local register or survey that meets the requirements of PRC Section 5020.1(l) and 5024.1(g).

The following steps normally are taken in a cultural resources investigation to comply with CEQA:

- Identify cultural resources.
- Evaluate the significance of the cultural resources.
- Evaluate the effects of a project on all cultural resources.
- Develop and implement measures to mitigate the effects of the project on significant cultural resources.

CEQA and the *CEQA Guidelines* also recommend provisions be made for the accidental discovery of archaeological sites, historical resources, or Native American human remains during construction (PRC Section 21083.2(i) CCR Section 15064.5[d and f]).

7.3 IMPACTS

A screening level cultural resource investigation was conducted for this project. As discussed above, this consisted of a record search at the Northwest Information Center of the California Historical Resources Information System, additional background research and review of historical maps, and contact with Native American organizations including the Native American Heritage Commission. Pedestrian surveys were not conducted in conjunction with this project. As identified above, 7 archaeological sites have been recorded within the project area, and an additional 14 archaeological sites have been recorded within 0.5 mile of the project area.

Under Alternatives 2 and 3, ground disturbance and compaction from the use of heavy vehicles and machinery during construction of new water conveyance features (inlets and outlets) along the existing salt pond levees has the potential to impact recorded and unrecorded archaeological sites, as discussed below. A single prehistoric site (CA-ALA-338) is recorded at one of the proposed inlet locations at the Alviso Pond complex. This site could be directly impacted by ground disturbance for the new inlet construction. The site has not been formally evaluated. However, as noted above, the site has been greatly disturbed and probably does not retain sufficient integrity to qualify for listing on the NRHP or CRHR. None of the other previously recorded sites would be directly impacted by project-related construction. Ground disturbance would occur in areas with potential to contain unrecorded prehistoric and historical archaeological sites, or Native American human remains. Thus, Alternatives 2 and 3 could result in a substantial adverse change to such resources.

In addition, construction of new water conveyance features that would occur under Alternatives 2 and 3 could impact potentially significant features of the built environment, including the historic salt works infrastructure. Impacts to these resources would be addressed under the terms of an existing Programmatic Agreement (PA) between USFWS and the SHPO.

7.3.1 No Project/No Action Alternative

The No Project/No Action alternative would not cause any impacts to cultural resources from construction of water control structures because no such structures are proposed under this alternative. The following impacts have been identified for the No Project/No Action alternative:

> CULTURAL RESOURCES IMPACT-1: *Potentially significant archaeological sites or human remains could be exposed through erosion and evaporation.*

The existing infrastructure would not be maintained. Without maintenance, erosion of the levees into the ponds over time could expose potentially significant archaeological sites or human remains. There is potential for greater exposure of surface sites as the ponds dry down in the summertime; however, this is not likely to significantly impact sites.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

> CULTURAL RESOURCES IMPACT-2: *Accidental breaches of levees could result in impacts to surface archaeological sites and features of the built environment.*

Accidental breaches of levees that have served a flood control purpose in the past, but would not be maintained under this alternative, could impact surface sites and features of the built environment with historical significance (e.g., features of the historic salt works, the historic town of Drawbridge, and the South Coast Pacific RR).

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

In addition, drying of the ponds has the potential to create gypsum/salt-affected soil conditions (see Chapter 5.0, Sediments) and more acid conditions in some ponds. The specific impact of saline and low pH soils on archaeological sites is not known.

7.3.2 Alternative 1 (Seasonal Ponds Alternative)

Alternative 1 would not cause any impacts to cultural resources because no new water control structures are proposed and no new ground disturbance is anticipated. Levees would be maintained, so impacts to cultural resources from accidental breaches are not expected. The following impacts have been identified for Alternative 1:

> *CULTURAL RESOURCES IMPACT-1: Potentially significant archaeological sites or human remains could be exposed through erosion and evaporation.*

The levees would be maintained, so erosion is less likely to impact sites. Ponds would be allowed to dry down in the summertime and archaeological sites could become more exposed at these times. However, as noted above for the No Project/No Action Alternative, this is not likely to significantly impact sites.

Significance: Less than significant.

Drying of the ponds has the potential to create gypsum/salt-affected soil conditions (see Chapter 5.0, Sediments) and more acid conditions in some ponds. The specific impact of saline and low pH soils on archaeological sites is not known.

7.3.4 Pond Management Alternative 2 (Simultaneous March-April Initial Discharge)

Impacts to cultural resources from Alternatives 2 and 3 are expected to be the same since the timing of initial discharge will not affect the nature or degree of the impacts. The following impacts have been identified for Alternative 2:

> *CULTURAL RESOURCE IMPACT-3: Ground-disturbing activities and use of heavy vehicles and machinery could damage known and unknown archaeological sites that meet the criteria for listing on the NRHP or CRHR.*

Significance: Potentially significant, but mitigated.

> *CULTURAL RESOURCE MITIGATION-1A:* Contractors and construction personnel involved in ground-disturbing activities will be advised of the possibility of encountering cultural resources (including, but not limited to, chipped or ground stone, historic debris, building foundations, and non-human bone) during construction work. If such resources are encountered or suspected, work within 100 feet of the discovery will be halted immediately and the USFWS (Alviso, West Pond complexes) or CDFG (Baumberg Pond complex) will be notified. A qualified professional archaeologist will be consulted, who will assess any discoveries and develop appropriate management recommendations for

treatment of the resource. USFWS or CDFG will obtain concurrence from SHPO on measures to be implemented before allowing construction activities in the area of the find to resume. This procedure will be included on all construction plans and specifications.

CULTURAL RESOURCE MITIGATION-1B: USFWS/CDFG will pursue a strategy of avoiding impacts to cultural resources, where feasible. If avoidance of potentially significant resources is determined to be infeasible, USFWS/CDFG will conduct a controlled archaeological test excavation to determine archaeological site significance. If a resource that cannot be avoided is determined to be significant, USFWS/CDFG and SHPO will consult to develop a plan for data recovery excavation. Data recovery excavations will then be completed by a qualified professional archaeologist in accordance with the plan.

Post-mitigation Significance: Less than significant

CULTURAL RESOURCE IMPACT-4: Ground-disturbing activities and use of heavy vehicles and machinery could disturb or damage buried human remains not identified during field surveys. (Note that according to the California Health and Safety Code, six or more human burials at one location constitute a cemetery (Section 8100), and disturbance of Native American cemeteries is a felony (Section 7052)).

Significance: Potentially significant, but mitigated.

CULTURAL RESOURCE MITIGATION-2: If bone is encountered and appears to be human, California law (PRC Section 7050.5) and federal law (the Native American Graves Protection and Repatriation Act, or NAGPRA) require that potentially destructive construction work in the vicinity of the find and in nearby areas reasonably suspected to overlie adjacent human remains is halted and the county coroner (in the county where the find occurs) is contacted. After contacting the coroner, steps will be taken to contact the appropriate Native American individual or tribe and to determine the appropriate disposition.

Post-mitigation Significance: Less than significant

CULTURAL RESOURCE IMPACT -5: Construction of new water control features could affect potentially significant features of the built environment.

The construction of new water control features could impact the historical integrity of the salt works, which have not yet been formally evaluated. The types of impacts that would occur would be similar to those which have occurred under Cargill operations and maintenance. However, since a federal agency (USFWS) would assume responsibility for the Alviso and West Bay ponds, actions on these ponds may be considered a federal undertaking under Section 106 of the NHPA and would be covered under an existing Programmatic Agreement (PA) between the USFWS and SHPO. Actions on the Baumberg ponds with the potential to impact potentially significant features of the built environment would be reviewed by CDFG.

Significance: Potentially significant, but mitigated**.**

CULTURAL RESOURCE MITIGATION-3: USFWS would review proposed construction projects within the Alviso and West Bay ponds under the terms of the existing PA between the USFWS and SHPO, and determine the level of work required to identify, evaluate, and conduct an assessment of effects to cultural resources within the construction area of potential impact. Actions on the Baumberg ponds with the potential to impact potentially significant features of the built environment would be reviewed by CDFG. If implementing the ISP would result in unavoidable effects on identified significant features of the built environment within the Alviso or West Bay ponds, the USFWS will determine the appropriate course of action in accordance with the PA. If implementing the ISP would result in unavoidable effects on identified significant features of the built environment within the Baumberg ponds, CDFG will determine the appropriate course of action.

Post-mitigation Significance: Less than significant

CULTURAL RESOURCES IMPACT-6: Planned breaches of the Island Pond levees could result in impacts to surface archaeological sites and features of the built environment.

Under Alternatives 2 and 3, the Island Ponds (Alviso Ponds A19, A20, and A21) would be breached. This could cause scouring effects from increased velocities in Coyote Creek, which could erode and cause some damage to known and unknown archaeological sites and potentially to unknown human remains along the Coyote Creek levees. The breaching would also impact the integrity of the existing Island Pond levees, which have not been formally evaluated, but may have historical significance. The introduction of tidal waters to these ponds would not result in a significant change in water levels from the present and therefore is unlikely to significantly impact other features of the built environment, including the remnants of the historic town of Drawbridge and South Coast Pacific RR. USFWS would assume responsibility for Island Ponds and any actions on these ponds may be considered a federal undertaking under Section 106 of the NHPA and would be covered under an existing PA between the USFWS and SHPO.

Significance: Potentially significant

CULTURAL RESOURCE MITIGATION-4: Under the terms of the existing PA between the USFWS and SHPO, the USFWS would review the potential impact of breaching of the Island Pond levees and determine the appropriate course of action with respect to potential impacts to cultural resources.

Post-mitigation Significance: Less than significant

7.3.5 Pond Management Alternative 3 (Phased Initial Release)

As noted above, the timing of initial release does not affect cultural resources. Therefore, impacts to cultural resources under this alternative would be identical to those under Alternative 2, above.

8.0 RECREATION, PUBLIC ACCESS, VISUAL RESOURCES AND PUBLIC HEALTH

This chapter provides the environmental and regulatory background necessary to analyze recreation, public access, and visual resources effects of the project. It also evaluates public health and safety issues for this project, focusing on issues associated with mosquitoes and diseases transmitted to humans by mosquitoes including West Nile Virus (WNV). This chapter includes regulatory, regional, and project settings to provide a context for analyzing the effects of the project. Sources of information used in this chapter include applicable City of Fremont and Alameda, San Mateo and Santa Clara County General Plans, the Bay Plan, the Bay Trail Plan, and literature on mosquito ecology and control methods.

8.1 AFFECTED ENVIRONMENT

8.1.1 Recreation and Public Access

All the lands covered in this Initial Stewardship Plan are being used for salt production until Cargill completes its phase out activities and transfers management of the lands to USFWS and CDFG. Some of the ponds (Alviso Ponds A9-17, and West Bay Ponds 1 and 2) were purchased by USFWS in 1979 as part of the Don Edwards San Francisco Bay National Wildlife Refuge, and although Cargill retained the right to produce salt on these ponds, the levees have been open to public access since that time (see Figures 1-2 and 1-3). Permitted public access activities on these ponds include wildlife observation, wildlife photography, interpretation, environmental education, hiking and bicycling, with waterfowl hunting allowed on West Bay ponds 1 and 2 only.

The remainder of the Alviso ponds, the West Bay ponds and all of the Baumberg ponds, were owned by Cargill in fee title and were closed to general public access, except for one open trail on Alviso pond A2W along Stevens Creek. However, Cargill leased the majority of its ponds for hunting activities, with approximately 400 hunters holding leases or subleases.

Since the Initial Stewardship Plan is intended to only cover interim management of the ponds until a long-term restoration and public access plan can be developed and implemented, few changes in existing public access are proposed at this time. Under the No Action and Seasonal Pond Alternatives, no new public access is proposed. For the two active pond management alternatives, proposals include scheduled docent-led tours to many ponds and some limited hunting activities on specific ponds. Under the pond management alternatives (2 and 3), for the Baumberg Ponds, CDFG plans several lottery-based hunts per year. Under these same alternatives, for the Alviso ponds, USFWS proposes to distribute a draft hunt plan, a Compatibility Determination, and an environmental document for public comment under a separate cover.

The project sites adjoin or are near to bicycle and foot trails, shallow waterways used for recreational and public access, open space, other wildlife refuge lands, ecological reserves , and public parks. Proximal to the project sites (especially in Santa Clara and San Mateo counties) are several existing and planned parks. Recreation and public access in and around the project area are described in a variety of plans that include the Bay Trail Plan, Bay Plan, and city and county General Plans.

The table that follows shows some of the factors that influence public access and recreational use of the Alviso, Baumberg and West Bay complexes.

Table 8-1
Recreational Facilities in the Project Vicinity

Site	Parks	Reserves & Refuges	Other Recreational Facilities
Alviso Complex	• Shoreline at Mountain View • Palo Alto Baylands Park • Sunnyvale Baylands Park • Northern Santa Clara County Shoreline Regional Park Complex* • Alviso Marina County Park • Dixon Landing Park*	• Don Edwards San Francisco Bay National Wildlife Refuge (NWR) • Palo Alto Baylands Nature Preserve • Stevens Creek Nature Study Area	• Bay Trail (existing trail adjacent or very near to A1, A2W,, , A8,-13; proposed trail adjacent or near to A18, A19, A2E, A3W, B2, A4) • Stevens Creek Trail • San Tomas Aquino Creek Trail • Guadalupe River Trail • Coyote Creek Trail
Baumberg Complex	• Coyote Hills Regional Park • Hayward Regional Shoreline Park • Hayward Shoreline Interpretive Center • Mt. Eden Park*	• Eden Landing Ecological Reserve • Don Edwards San Francisco Bay NWR	• Bay Trail (existing trail adjacent or very near to 2, 4, 1C, 2C, 3C; planned trail adjacent or very near to 1, 6, 7) • Shoreline Trail • Bayview Trail
West Bay Complex	• Menlo Park Waterfront Park * • Bayfront Park (Menlo Park)	• Don Edwards San Francisco Bay NWR • Ravenswood Open Space Preserve	• Bay Trail (existing trail adjacent or very near to 2, SF2, 3, S5)

* Parks proposed in General Plans or other documents.

The newly acquired Alviso and West Bay ponds are located within the Don Edwards San Francisco Bay National Wildlife Refuge (Refuge), which includes a number of existing public access facilities, including trails, a visitor center and an environmental education center. Ponds within the Baumberg Complex are being added to the Eden Landing Ecological Reserve. This Reserve is now undergoing major wetland restoration activities that will include development of a public access trail to connect with adjacent facilities.

In addition to the recreational facilities noted in Table 8-1, cities proximal to the project sites include Mountain View, Sunnyvale, San Jose, and Alviso (Alviso Complex); Union City and Hayward (Baumberg Complex); and East Palo Alto and Menlo Park (West Bay Complex). These cities may contain additional recreational facilities and populations within these cities will likely have an impact upon recreational use of and access to the project sites.

The Bay Trail passes through portions of Alviso and West Bay pond complexes, and skirts the north and east sides of the Baumberg complex. The Association of Bay Area Governments (ABAG) adopted The Bay Trail Plan in 1989 in support of the Bay Plan's goal of increasing public access to the Bay and its shorelines. Once completed, the Bay

Trail will be a 400-mile continuous recreation corridor around the Bay, linking nine counties and 47 cities..

Depending on the location of its segments, the Bay Trail consists of paved multi-use paths, dirt trails, bike lanes, sidewalks or city streets signed as bike routes. A description of existing portions of the Bay Trail within or in the vicinity of each of the three pond complexes is provided below.

Alviso Complex A portion of the Bay Trail consisting of off-street paved or gravel trail provides a large loop route around Alviso Ponds A9 through A13, which are located within the Refuge. Other portions of the Bay Trail, consisting of off-street paved or gravel trail, are adjacent to the Alviso ponds (including Ponds A1, A2W). An unimproved on-street portion of the Trail (no bike lanes and/or no sidewalks) leads from the Alviso Marina and Historic District (adjacent to Alviso Ponds A8 and A12), south toward San Jose and Highway 237. Another unimproved on-street portion of the Trail runs along the north side of Pond A22. Access to the Bay Trail and spur trails is provided at both Matilda Avenue and Sunnyvale Baylands Park. The Bay Trail runs along Calabasas Creek, Baylands Park, and Pond A4.

Baumberg Complex An off-street shared-use paved or gravel portion of the Bay Trail ends at the Point Eden bicycle/pedestrian bridge, just south of the Hayward Shoreline Interpretive Center and northeast of Baumberg Ponds 10 and 11. Off-street paved or gravel trails are located between Union City Boulevard and the San Francisco Bay on both sides of the Alameda Flood Control Channel (adjacent or very near to Baumberg Ponds 2, 4, 1C, 2C, and 3C). The southern of these two trails connects with the Shoreline and Bayview Trails that run south through the Refuge and Coyote Hills Regional Park.

West Bay Complex In San Mateo County, in the vicinity of the West Bay Complex, the Bay Trail follows the Dumbarton Bridge/Highway 84/Bayfront Expressway route (running adjacent to West Bay Ponds 2, SF2, 3, and S5, and loops through Bayfront Park, adjacent to Pond 5. These segments are off-street shared use paved or gravel paths and provide access to the Don Edwards San Francisco National Wildlife Refuge.

8.1.2 Visual Setting

The Project is set within the South San Francisco Bay region. The region is surrounded on the west, south, and east by the California Coastal Ranges and on the north by San Francisco Bay. Visual resources adjacent to the southern part of San Francisco Bay vary from rural to urban. Urban area visual resources include industrial, commercial and residential developments and associated infrastructure. Also, numerous creeks, sloughs, and rivers drain into south San Francisco Bay, adding a distinctive element to the region’s visual character.

Although surrounded by urban development, the immediate visual setting of the project areas is primarily rural and consists of marsh, salt pond, and other undeveloped open space. The pond management alternatives would occur within salt ponds and be surrounded by associated creeks, sloughs, bayside mud flats, and parks or preserves with public access. Ground level public streets and trails (see Bay Trail discussion above) provide views of the pond system. Some of the ponds are also visible from major highways in the South Bay and all are highly visible to airline passengers in the approach patterns for San Francisco, Oakland, and San Jose airports. The ponds are striking land features, especially in early morning and late afternoon periods when the reflective quality of the ponds is increased. The colorful salt ponds make a strong first impression (not always favorable) of the South Bay from these views.

8.1.3 Public Health

Other than potential impacts from mosquitoes, the proposed project is not expected to impact public health or safety. Mosquitoes are an important part of the biological food chain for fish and birds. However, this section focuses on public nuisances associated with mosquitoes and diseases transmitted to humans by mosquitoes, including West Nile Virus (WNV).

Mosquito-Borne Diseases—Compared with the historical levels of mosquito-borne diseases in humans, levels of mosquito-borne diseases now in California are extremely low. These diseases, including encephalitis and malaria, however, are still present or could be readily reintroduced. (Bohart and Washino 1978, Sacramento-Yolo County Mosquito Abatement and Vector Control District 1990.)

Most recently, the spread of West Nile Virus (WNV) has increased concern over mosquito abatement for the protection of wildlife, domestic animals, and humans. WNV is transmitted to humans and animals through a mosquito bite. Mosquitoes become infected when they feed on infected birds. The California Department of Health Services (CDHS), in collaboration with the University of California, Davis, California Department of Food and Agriculture, local mosquito and vector control districts and other state and local agencies, has launched a comprehensive surveillance program to monitor for WNV in California. WNV has been detected in animals in several southern California counties in 2003 and is anticipated to spread to northern California counties in 2004.

Mosquito Abatement Districts in the Project Area—The project area is in the jurisdictions of the Alameda and San Mateo County Mosquito Abatement Districts (MADs) and Santa Clara County Vector Control District. These districts are governmental organizations formed at the local level that are responsible for controlling specific disease vectors within specific geographic areas. MADs receive most of their revenue from property taxes and are primarily responsible for controlling mosquitoes as pest species and as disease vectors. In the project area, MAD mosquito abatement efforts are primarily focused on controlling mosquitoes that can transmit malaria, WNV and several types of encephalitis, or cause a substantial nuisance in surrounding communities.

The decision to control mosquitoes as a nuisance to human populations is based on a number of factors,including the number of service calls received from a given locality, the proximity of mosquito sources to population centers, the availability of funds for abatement, the density of mosquito larvae present in a mosquito production source, and the number of adult mosquitoes captured per night in light traps (Jones & Stokes Associates 1995). Once a recurring mosquito production source has been identified, abatement schedules are often adopted and maintained for that source (Jones & Stokes Associates 1995).

Mosquito Species in the Project Area—The two primary pest mosquitoes produced in the project areas have long flight ranges and are very aggressive biters, though they are less likely to carry diseases than fresh or brackish marsh mosquitoes: winter salt marsh mosquito (*Ochlerotatus squamiger, formerly Aedes squamiger*) and the salt marsh mosquito (*Ochlerotatus dorsalis, formerly Aedes dorsalis*). Two additional mosquito species are associated with marsh habitats, but prefer fresh to brackish water, and cause more localized problems: winter marsh mosquito (*Culiseta inornata*) and encephalitis mosquito (*Culex tarsalis*). The control of these latter species is a high priority locally.

Favorable Environmental Conditions for Mosquitoes—All species of mosquitoes require standing water to complete their growth cycle; therefore, any body of standing water represents a potential mosquito breeding site. Areas that pond surface water but are flushed by daily tides are not stagnant for periods sufficient for mosquito larvae to mature; therefore, such areas are not likely to be mosquito production sources (Maffei pers. comm.). Similarly, ponds that are subject to constant wind-driven wave action are also unlikely to produce many mosquitoes.

Water quality affects the productivity of a potential mosquito-breeding site. Typically, greater numbers of mosquitoes are produced in water bodies with poor circulation, higher temperatures, and higher organic content (and therefore with poor water quality) than in water bodies having good circulation, lower temperatures, and lower organic content (Collins and Resh 1989). Irrigation and flooding practices may also influence the level of mosquito production associated with a water body. Typically, greater numbers of mosquitoes are produced in water bodies with water levels that slowly increase or recede than in water bodies with water levels that are stable or that rapidly fluctuate (Jones & Stokes Associates 1995). Additionally, the types of vegetation growing in standing ponds can have major effects on mosquito production. For instance, mosquitoes will not reproduce in areas with an abundance of California cordgrass, but they will reproduce in areas growing saltgrass and pickleweed (Maffei, Wes. Manager. Napa County Mosquito Abatement District. Napa, California. March 4, 2002—telephone conversation cited in Napa River Salt Marsh Restoration Project Draft Environmental Impact Report/Environmental Impact Statement, Jones & Stokes; February 2003).

Mosquitoes are adapted to breed during periods of temporary flooding and can complete their life cycles before water evaporates and predator populations become well established. Poor drainage conditions that result in ponding water and water management practices associated with the creation of seasonal wetlands for waterfowl use result in the types of flooding that can produce problem numbers of mosquitoes (Jones & Stokes Associates 1995). Permanent bodies of open water that have good water quality (good circulation, low temperatures, and low organic content) typically sustain stable nutrient content and support rich floral and faunal species diversity, including mosquito predators and pathogens. Wave action across larger bodies of water physically retards mosquito production by inhibiting egg-laying and larval survival (Jones & Stokes Associates 1995).

Conditions in the Project Area—Mosquito problems rarely occur in the project areas because of the lack of vegetation in the ponds, the high salinity levels, and the broad wind fetch in the ponds. When outbreaks do occur, they are usually associated with the marsh areas that run between and around the pond systems. For adjacent marshes, the goal is to maintain effective mosquito control with a minimum of pesticide treatments and the least vehicular intrusion into the salt marshes.

8.2 Criteria for Determining Significance of Effects

The impacts of the project on recreation and public access, visual setting, and public health and safety were analyzed qualitatively. Criteria based on the State CEQA

Guidelines and professional judgment were used to determine the significance of impacts. Criteria used for each of the impact areas are presented below.

8.2.1 Recreation and Public Access

The proposed project would have a significant impact on recreation and public access if it would:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.
- Substantially reduce existing public access to the Bay.

8.2.2 Visual Setting

The proposed project would have a significant impact on visual resources if it would:

- Have a substantial adverse effect on a scenic vista
- Substantially damage scenic resources, including, but not limited to, trees, outcroppings, and historic buildings within a scenic highway
- Substantially degrade the existing visual character or quality of the site and its surroundings
- Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area

8.2.3 Public Health and Safety

The project would be considered to have a significant impact if habitat changes would necessitate substantially increasing levels of mosquito abatement programs to maintain mosquito populations at pre-project levels. Habitat changes that could result in a substantial decline of available mosquito breeding habitat or greater efficiency of the three county's MAD's abatement program could result in beneficial impacts for public health and safety, while potentially having negative impacts on certain wildlife species.

8.3 IMPACTS AND MITIGATION MEASURES

Recreation and Public Access—All four alternatives under consideration would be consistent with existing recreational use and policies and plans pertaining to recreational use of the project area. Portions of the project will be annexed to the Refuge and to the Ecological Reserve regardless of the alternative selected. Proposed alignments of the Bay Trail are located along routes that traverse or pass by the project sites, as discussed in Section 6.1, and these proposed alignments would not be directly affected by any of the project alternatives. However, under the No Project/No Action Alternative, levees with existing public access would not be maintained. If these levees eroded and/or breached, public access to these levee segments, including the Bay Trail segments, would be lost.

Therefore, the impact of the No Project/No Action alternative is potentially significant.

Both pond management alternatives (2 and 3) include a limited amount of additional public access to the project area, including docent-led tours and controlled waterfowl hunting in some ponds. This increase in public access is considered to be a beneficial impact.

None of the project alternatives would promote an increase in the use of recreational facilities such that substantial physical deterioration of a recreational facility would occur or be accelerated.

All the project alternatives would result in some changes to wildlife habitat, which could have species-specific impacts on wildlife populations and concomitant mixed (beneficial and negative) impacts to wildlife-dependent recreational uses of the project areas (e.g., duck hunting and bird watching). The species-specific impacts will tend to cancel each other out in terms of significant recreational impacts, so that the impacts of wildlife changes to recreational use of the project areas can be said to be less than significant.

The two pond management alternatives (Alternatives 2-3) would cause temporary impacts to public access and recreation from changes in access during construction of proposed water control structures. However, because these impacts would be very limited in area and duration, they are deemed less than significant.

Visual Setting—The project alternatives would not cause an obstruction to any major viewsheds. The alternatives would all result in substantial changes to existing views from various locations; however, it cannot be clearly said whether these changes would be positive or negative. The color of some of the ponds, as viewed from an airplane, is expected to change from red or green to match the colors of bay waters. Those who enjoy the existing colors may be concerned about the change, while others will enjoy a more natural view of the Bay. To the extent that views of the project area are enhanced by the presence of an abundance and diversity of birds and other wildlife, alternatives that support an abundance and diversity of wildlife would have the least negative impact, and possibly a positive visual impact.

The two-pond management alternatives (Alternatives 2 and 3) would cause temporary impacts to the quality of project area views during construction of proposed water control structures. However, because these impacts would be very limited in area and duration, they are deemed less than significant.

Public Health— The proximity of human and animal activity to the project sites and the sites' potential as a vector for mosquito breeding is a potential concern for planning at these locations..

The project will not directly impact the numbers of people who come in contact with mosquitoes. Indirectly, incorporation of the project area into two publicly- managed sites (the Refuge and the Ecological Reserve), would likely boost the numbers of people who visit the project areas. However, this is likely to occur regardless of whether the No Project or one of the other project alternatives is selected. As discussed in Section 8.1, above, mosquito production is higher in water bodies with poor circulation, higher temperatures, and higher organic content. On the other hand, higher salinities can have the effect of inhibiting mosquito production. To the degree that the project alternatives maintain or improve water quality within the salt ponds, there would be less potential impacts to public health.

8.3.1 No-Project/No Action Alternative

RECREATION IMPACT-1. Recreational use and views of the project areas may be impacted from the loss of levee trail access.

Public access to the project areas could be affected by this alternative. Under this alternative, ponds would be expected to dry out and water structures would deteriorate, ultimately reducing USFWS' and CDFG's ability to manage water and salinity levels for wildlife. In the long term, if not maintained, the pond levees are likely to fail, with the result that levees presently open to public access will no longer be accessible.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

RECREATION IMPACT-2. Recreational use and views of the project areas may be impacted as a consequence of changes in wildlife populations.

Under this alternative, the ponds are expected to dry in the summer and fill with rainwater in the winter.. The result of anticipated short-term and long-term events is that habitat for some waterbirds would improve, while habitat for other waterbirds would deteriorate, as discussed in greater detail in Section 6.3, Wildlife. Impacts to wildlife-related recreation in the project areas, such as duck hunting and bird watching, would likewise be a mixture of positive and negative impacts.

Significance: Less than significant.

VISUAL IMPACT-1. The quality of views of the project areas may be impacted as a consequence of changes in wildlife populations.

Under this alternative, when seasonal ponds dry down completely, they would likely support fewer species of birds and other wildlife than they currently do. Therefore, in the shorter term, there may be indirect impacts to the visual setting (to the degree that the presence of birds and wildlife enhance the visual setting). Note that in the long-term, lack of maintenance for levees would result in the levees being breached and ponds opened to tidal influence, creating conditions more favorable for some birds and wildlife. However, it is not known when this would occur. This impact is expected to be less than significant.

Significance: Less than significant.

PUBLIC HEALTH IMPACT-1. As the seasonal ponds dry down, increased mosquito production may result from deterioration of pond water quality, which would increase the potential for the MADs to undertake additional mosquito control and abatement efforts.

This alternative could produce more favorable conditions for mosquito production, at least in the short term. All the ponds would become unmanaged seasonal ponds. As they dry down, the seasonal ponds would have worse circulation, higher temperatures, and higher organic content, which are all favorable conditions for mosquitoes.. Since the water levels could not be managed under this alternative, no management responses to increased mosquito production could be made. Note that in the long-term, lack of maintenance for levees would result in the levees being breached and ponds opened to tidal influence, creating conditions less favorable for mosquitoes. However, it is not known when this would occur.

Significance: Significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

8.3.2 Alternative 1 (Seasonal Ponds)

Under this alternative, the levees would continue to be maintained and existing public access would not be threatened. Impacts on recreational wildlife viewing under this alternative are expected to be similar to those under the No Project/No Action Alternative. In the long-term, the changes to wildlife habitat and wildlife will be different under this alternative since levees would be maintained and would not be allowed to deteriorate and become breached. However, this is not expected to change the magnitude of impacts to recreational use of the project areas or to visual impacts.. All the ponds would be allowed to become unmanaged seasonal ponds under this alternative.

> *PUBLIC HEALTH IMPACT-1*. As the seasonal ponds dry down, increased mosquito production may result from deterioration of pond water quality, which could increase the potential for the MADs to undertake additional mosquito control and abatement efforts.

Like the No Project/No Action alternative could produce more favorable conditions for mosquito production. As they dry down the seasonal ponds would have worse circulation, higher temperatures, and higher organic content, which are all favorable conditions for mosquitoes. Since water levels could not be managed under this alternative, no management responses would be possible.

Significance: Significant.

> *PUBLIC HEALTH MITIGATION MEASURE-1*. Coordinate project activities with the county MADs.

USFWS and CDFG will coordinate with county MADs during the implementation, and operations phases of the project. Specifically, they will:

- Work with county MADs to have access to the project area to monitor or control mosquito populations.
- Consult with county MADs regularly to identify mosquito management problems, mosquito monitoring and abatement procedures
- Consult with the MADs to identify opportunities to share costs, obtain the necessary permits from the Corps, BCDC, the San Francisco Bay RWQCB, and USFWS, and otherwise participate in implementing mosquito abatement programs, if it is necessary for county MADs to increase mosquito monitoring and control programs beyond pre-project levels.

Post-Mitigation Significance: Potentially significant, since no water management options would be available under this alternative.

8.3.3 Alternative 2 (Simultaneous March-April Initial Release)

Under this alternative, a limited amount of additional public access would be available, included docent-led tours and waterfowl hunting,

There may be temporary and very minor impacts to recreational use of the project areas due to changes in access during construction of water control structures under this alternative. Construction would also temporarily change the quality of views of the project areas. Construction would be very limited in scope and duration; thus, impacts would be less than significant.

MADs in the project areas would experience positive impacts from this alternative since changes in pond hydrology and water quality would result in less favorable conditions for mosquito production. This is considered a beneficial public health impact.

> *BENEFICIAL RECREATION IMPACT -1.* Additional public access will be available on previously closed private lands.

Since this is a beneficial impact, no mitigation is necessary.

Historic uses of the project ponds for recreational hunting will not be eliminated, but the areal extent of lands available for hunting will likely be more restricted under CDFG and USFWS management of the ponds. Under Cargill's ownership, the ponds were not open to the public, but were available to hunters through annual leasing arrangements with Cargill. The agencies cannot authorize private leases for hunting activities on these publicly owned ponds. Therefore, access to some areas will become less restricted for the general public because it will no longer be necessary to purchase a lease for access. Other areas may be closed to hunting to reflect species and habitat needs, safety, staffing and other recreational interests. Generally, few changes to existing public access are proposed for the ISP implementation period, since with the exception of private hunting leases, all public access was restricted by Cargill.

The overall impact to public access for various purposes is expected to be beneficial.

> *RECREATION IMPACT-3.* Recreational use and views of the project areas may be impacted as a consequence of changes in wildlife populations.

Under this alternative, pond salinities would be reduced, with the result that habitat for some waterbirds would improve, while habitat for other waterbirds would deteriorate, as discussed in greater detail in Section 6.3, Wildlife. Impacts to wildlife-related recreation in the project areas, such as duck hunting and bird watching, would likewise be a mixture of positive and negative impacts and would be less than significant overall.

Significance: Less than significant.

> *RECREATION IMPACT-4.* Construction of proposed water control structures would have temporary effects on public access to and recreational use of the project areas.

Access restrictions during construction would be limited to specific areas surrounding the construction activities and would last for a period of days to months. There may be restricted access to parts of the Refuge during these times. The public would have access to the majority of the site and the Refuge during construction activities. Once the activities are completed, public access would resume as before.

Significance: Less than significant.

Although mitigation is not required for less-than-significant impacts, the following measure is proposed to further reduce the impact described above.

RECREATION MITIGATION MEASURE-1. Prepare a Public Access Plan for project construction activities.

Before beginning construction, the contractor will develop, in consultation with the appropriate representative(s) of USFWS and/or CDFG, a plan indicating how public access to the Bay Trail and proximal roads, trails, paths, and park areas will be maintained during construction work. If needed, flaggers will be stationed near the construction activity areas to direct and assist members of the public around these areas while maintaining public access.

VISUAL IMPACT-1. The quality of views of the project areas may be impacted as a consequence of changes in wildlife populations and in pond colors.

The project areas would continue to support an abundance and diversity of wildlife, including birds. Therefore, impacts to the quality of the visual setting, which relies to some extent on this diversity and abundance of wildlife, would be less than significant. Changes in pond colors may be seen as an improvement, while others will miss the visually striking reds and oranges. Since the project will return the pond colors to more natural conditions, the impacts would be less than significant.

Significance: Less than significant.

VISUAL IMPACT-2. Construction of proposed water control structures would have temporary effects on the quality of views of the project areas.

Construction activity, such as the operation of heavy equipment and material storage, would temporarily change the visual character of the area; however, these effects would be temporary and the project is not located in a designated scenic area. It is anticipated that areas disturbed by construction activities would re-vegetate naturally. Therefore, construction would not cause a permanent effect on the visual quality of the area.

Significance: Less than significant.

In Alternative 2 , those ponds managed as seasonal ponds could produce more favorable conditions for mosquito production. As they dry down the seasonal ponds would have less circulation, higher temperatures, and higher organic content; all favorable conditions for mosquitoes.

PUBLIC HEALTH IMPACT-3. As the seasonal ponds dry down, increased mosquito production may result, which could increase the potential for the MADs to undertake additional mosquito control and abatement efforts.

Several ponds are to be managed as seasonal ponds in this proposed alternative, with water added during winter and ponds drying by evaporation during the summer. The conditions created in seasonal ponds proposed under this alternative may be conducive to mosquito production in those ponds.

Significance: Potentially significant.

PUBLIC HEALTH MITIGATION MEASURE-1. Coordinate project activities with the county MADs.

USFWS and CDFG will coordinate with county MADs during the implementation and operations phases of the project. Specifically, they will:

- Work with county MADs to have access to the project area to monitor or control mosquito populations.
- Consult with county MADs regularly to identify mosquito management problems, mosquito monitoring and abatement procedures, and opportunities to adjust water management practices in non-tidal wetlands to reduce mosquito production during problem periods.
- Consult with the MADs to identify opportunities to share costs, obtain the necessary permits from the Corps, BCDC, the San Francisco Bay RWQCB, and USFWS, and otherwise participate in implementing mosquito abatement programs, if it is necessary for county MADs to increase mosquito monitoring and control programs beyond pre-project levels.

Post-Mitigation Significance: Less than significant.

8.3.4 Alternative 3 (Phased Initial Release)

Impacts to recreation/public access, visual resources, and public health would be similar to Alternative 2. The timing of initial discharge would not change the nature or severity of these impacts.

9.0 AIR QUALITY

This chapter describes air quality in the San Francisco Bay area in general and in the project area specifically. It includes regulatory, regional, and project settings to provide a context for analyzing the effects of the project. The information presented in this section was compiled largely from information provided by the Bay Area Air Quality Management District (BAAQMD). References to other documents are provided as appropriate.

9.1 Affected Environment

9.1.1 Topography and Meteorology

The project areas are located in the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB is composed of the counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara, along with the southeast portion of Sonoma County and the southwest portion of Solano County. The SFBAAB covers an area of approximately 5,540 square miles.

Atmospheric conditions such as wind speed and direction, air temperature gradients, and local and regional topography influence air quality. The SFBAAB is affected by a Mediterranean climate of warm, dry summers and cool, damp winters. During the summer, maximum temperatures are about 64°F along the coast, and about 88°F farther inland. In winter, average minimum temperatures are in the low to mid-40s along the coast and in the low to mid-30s inland.

Topographical features, the location of the Pacific high-pressure system, and varying circulation patterns resulting from temperature gradients affect the speed and direction of local winds. The winds play a major role in the dispersion of pollutants. Strong winds can carry pollutants far from their source; a lack of wind will allow pollutants to concentrate in an area.

Air dispersion also affects pollutant concentrations. As altitude increases, air temperature normally decreases. Inversions occur when colder air becomes trapped below warmer air, restricting the air masses' ability to mix. Pollutants also become trapped, which promotes the production of secondary pollutants. Subsidence inversions, which can occur during the summer in the SFBAAB, result from high-pressure cells that cause the local air mass to sink, compress, and become warmer than the air closer to the earth. Pollutants accumulate as this stagnating air mass remains in place for 1 or more days.

9.1.2 Regulatory Setting

The project area is subject to major air quality planning programs required by both the federal Clean Air Act (CAA), which was last amended in 1990, and the California Clean Air Act of 1988. Both the federal and state statutes provide for ambient air quality standards (AAQS) to protect public health, timetables for progressing toward achieving and maintaining ambient standards, and the development of plans to guide the air quality improvement efforts of state and local agencies.

AAQS specify the concentration of pollutants to which the public can be exposed without adverse health effects. Individuals vary widely in their sensitivity to air pollutants, so standards are set to protect more sensitive populations (e.g., children and the elderly).

The NAAQS and CAAQS are reviewed and updated periodically based on new health studies. CAAQS tend to be at least as protective as NAAQS and are often more stringent. The NAAQS and CAAQS for criteria pollutants that are a potential concern for the proposed project (ozone [O_3], carbon monoxide [CO], nitrogen oxides [NO_x], sulfur oxides [SO_x], and particulate matter less than 10 micrometers in diameter [PM_{10}]) are listed in Table 9-1.

The U.S. Environmental Protection Agency (USEPA) oversees state and local implementation of CAA requirements. It sets NAAQS for criteria air pollutants. USEPA also sets emission standards for mobile sources, which include on-road motor vehicles, off-road vehicles, and marine engines. Finally, USEPA sets nationwide fuel standards.

The CAA requires states to submit a State Implementation Plan (SIP) for review and approval by USEPA. The SIP must contain control strategies that demonstrate attainment with national ambient air quality standards (NAAQS) by deadlines established in the CAA. States that fail to submit a plan or to secure approval may be denied federal funding and/or be required to increase emission offsets for industrial expansion. In California, the state plan is called the Clean Air Plan (CAP) (BAAQMD 1997a). The CAP must show satisfactory progress in attaining state ambient air quality standards.

Under California law, the responsibility to carry out air pollution control programs is split between the California Air Resources Board (CARB), USEPA, and BAAQMD.

- BAAQMD can require stationary sources to obtain permits, and can impose emission standards, set fuel or material specifications, and establish operational limits to reduce air emissions.
- CARB shares the regulation of mobile sources with USEPA and sets the California Ambient Air Quality Standards (CAAQS) (see below). CARB has the authority to set emission standards for on-road motor vehicles and for some classes of off-road mobile sources that are sold in California. CARB also regulates vehicle fuels; it has set emission reduction performance requirements for gasoline (referred to as *California reformulated gasoline*) and has limited the sulfur and aromatic content of diesel fuel to make it burn cleaner (this is referred to as *California diesel* or *California red-dyed diesel*).

The CAA contains conformity provisions, which are designed to ensure that federal agencies contribute to efforts to achieve the NAAQS. A conformity analysis may be required for a project if emissions of reactive organic gases (ROG) and oxides of nitrogen (NOx) are above the conformity thresholds of 50 tons of ROG and 100 tons of NOx per year. The proposed project will not exceed these emissions thresholds; therefore, no conformity analysis is required for this project.

Table 9-1

National and California Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS	NAAQS Primary	NAAQS Secondary
Ozone (O_3)	1-hour	0.09 ppm	0.12 ppm	Same as primary standard
Carbon Monoxide (CO)	8-hour	9 ppm	9 ppm	—
	1-hour	20 ppm	35 ppm	—
	Annual		0.053 ppm	
Nitrogen Dioxide (NO_2)	Annual		0.25 ppm	Same as primary standard
	1-hour	0.25 ppm	—	—
Sulfur Dioxide (SO_2)	Annual	—	0.03 ppm	—
	24-hour	0.04 ppm	0.14 ppm	—
	3-hour	—	—	0.5 ppm
	1-hour	0.25 ppm	—	—
Suspended particulate matter (PM_{10})	Annual. (Geometric)	30 µg/m3	50 µg/m3	—
	Annual (arithmetic)	—	15 µg/m3	Same as Primary Standard
	24-hour		65 µg/m3	Same as Primary Standard

Notes:
ppm = parts per million
µg/m^3 = micrograms per cubic meter
µg/m^3 = milligrams per cubic meter

1. California standards for O_3, CO, SO_2 (1-hour and 24-hour), NO_2, PM_{10}, and visibility-reducing particles are not to be exceeded. The standards for sulfates, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded.
2. National standards other than 1-hour O_3 and 24-hour PM_{10} and those based on annual averages are not to be exceeded more than once a year. The 1-hour O_3 standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile 24-hour concentrations is below 150 µg/m^3.
3. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects from a pollutant.

9.1.3 SFBAAB Air Quality Attainment Status

Areas with monitored pollutant concentrations that are lower than ambient air quality standards are designated as *attainment areas* on a pollutant-by-pollutant basis. When monitored concentrations exceed ambient standards, areas are designated as *non-attainment areas*. An area that recently exceeded ambient standards, but is now in attainment is designated as a *maintenance area*. Areas are often designated as *unclassified* when data are insufficient to have a basis for determining the area's attainment status. Non-attainment areas are further classified based on the severity and persistence of the air quality problem as *moderate, serious*, or *severe*. Classifications determine the minimum pollution control requirements. In general, the more serious the air quality classification, the more stringent the control requirements that must be contained in the regional air quality plans (see discussion above of the SIP and CAP).

The SFBAAB is currently in attainment of the federal standards for NO_x and SO_x, in non-attainment for O_3 and CO (urbanized areas only), and unclassified for PM_{10} (California Air Resources Board 2001a). The urbanized areas of the SFBAAB are moderate non-attainment areas for CO.

CARB designates areas of the state as either in attainment or in non-attainment of the CAAQS. An area is in non-attainment if the CAAQS have been exceeded more than once in 3 years. At the present time, the SFBAAB is in non-attainment of the CAAQS for O_3 and PM_{10} and in attainment of the CAAQS for CO, NO_2, and SO_2 (California Air Resources Board 2001a). The SFBAAB is designated as a serious state non-attainment area for O_3.

Table 9-2 displays the estimated annual average air emissions for the SFBAAB in the year 2000 (CARB, 2001b). Mobile sources are one of the largest contributors to air pollutants in the SFBAAB. Mobile sources account for approximately 60% of the reactive organic gases (ROG), 93% of the CO, 81% of the NO_x, 39% of the SO_2, and 12% of the PM_{10} emitted in the SFBAAB.

Table 9-2
Year 2000 Estimated Annual Average Emissions for SFBAAB (tons/day)

Source Type/Category	ROG	CO	NO_x	SO_2	PM_{10}
Stationary Sources					
Fuel Combustion	2.8	33.4	77.4	10.7	3.9
Waste Disposal	7.1	0.1	0.1	0.0	0.0
Cleaning and Surface Coating	71.0	0.0	0.0	--	0.0
Petroleum Production and Marketing	33.3	1.2	8.7	36.5	1.2
Industrial Processes	11.0	0.7	3.0	7.5	12.2
Subtotal	125.2	35.4	89.2	54.7	17.3
Area wide Sources					
Solvent Evaporation	74.6	--	--	--	--
Miscellaneous Processes	15.6	169.0	17.1	1.4	130.1
Subtotal	90.2	169.0	17.1	1.4	130.1
Mobile Sources					
On-Road Motor Vehicles	255.1	2,149.6	273.6	4.9	8.5
Other Mobile Sources	63.7	513.3	178.1	31.4	12.4
Subtotal	318.8	2,662.9	451.7	36.3	20.9
Total for the Air Basin	534.2	2,867.3	558.0	92.4	168.3

9.1.4 Ambient Air Quality in the Project Area

The three nearest air quality monitoring stations to the project areas are Central San Jose, Fremont, and Redwood City. Table 9-3 shows ambient air quality data from the years 1997 to 2002 for the criteria pollutants, O_3, CO, and PM_{10}.

Table 9-3

Summary of Ambient Air Quality in the Vicinity of Redwood City and Mountain View, 1997 – 2002

			Days above standard					
Pollutant	**Time Standard**	**Monitoring Station**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
0_3	Federal 1-hour	Fremont	0	0	0	0	0	0
		San Jose Central	0	1	0	0	0	0
		Redwood City	0	0	0	0	0	0
	State 1-hour	Fremont	2	7	3	2	0	3
		San Jose Central	0	4	3	0	2	-
		Redwood City	0	0	0	0	1	0
	Federal 8-hour	Fremont	0	0	1	0	0	0
		San Jose Central	0	0	0	0	0	-
		Redwood City	0	0	0	0	0	0
CO	Federal 8-hour	Redwood City	0	0	0	0	0	0
		Fremont	0	0	0	0	0	0
		San Jose Central	0	0	0	0	0	0
PM_{10}	State 24-hour	Redwood City	2	0	3	1	4	1
		Fremont	1	1	2		3	1
		San Jose Central	2	3	5	7	4	2
	Federal 24-hour	Redwood City	0	0	0	0	0	0
		Fremont	0	0	0	0	0	0
		San Jose Central	0	0	0	0	0	0

Source: BAAQMD 1998, 1999, 2000 Internet Air Quality Data Summaries

Notes to Table 9-3:

ppm = parts per million;
pphm = parts per hundred million,
ppb = parts per billion

PM_{10} = particulate matter under 10 micrometers in diameter Pollutant standards listed as follows (state, federal): Ozone 1 hour peak (9pphm, 12 pphm); CO 8 hour (20 ppm, 35 ppm); NO_2 1 hour (25 pphm, na) annual (na, 5.3 pphm); SO_2 24 hour (40 ppb, 140 ppb); PM_{10} annual geometric mean (30 ppm, na) 24 hour (50 ppm, 150 ppm).

9.2 CRITERIA FOR DETERMINING SIGNIFICANCE OF EFFECTS

Criteria based on the *CEQA Guidelines* and federal, state, and local air pollution standards and regulations, as well as professional judgment, were used to determine the significance of air quality impacts. The project would have a significant impact on air quality if it would:

- Conflict with or obstruct implementation of applicable air quality plans;
- Increase ambient pollutant levels from below to above the NAAQS or CAAQS;
- Substantially contribute to an existing or projected air quality standard violation;
- Exceed the following thresholds that BAAQMD defines as significant under CEQA for project operation activities: total emissions greater than 80 pounds per day or 15 tons per year of ROG, NO_x, PM_{10}, or PM_{10} precursors, such as SO_x (BAAQMD 1996);
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people.

BAAQMD has not identified thresholds of significance for emissions from construction activities. Construction-related emissions are generally short-term in duration, but still may cause adverse air quality impacts. PM_{10} is generally the pollutant of greatest concern with respect to construction activities that disturb the ground surface (e.g., during installation of water conveyance features or levee repairs). Construction equipment emits CO and O_3 precursors; however, these emissions are included in the emission inventory that is the basis for regional air quality plans. These pollutants are therefore not expected to impede attainment or maintenance of the O_3 and CO standards in the Bay Area (BAAQMD 1996).

9.3 IMPACTS AND MITIGATION MEASURES

The baseline for comparison of air quality impacts is current conditions, which is the operation of the salt pond system for brine concentration. Current conditions involve movement of brine through the salt ponds, with infrequent drying of some of the salt ponds. Periodic levee maintenance is conducted by topping levees with mud from within the salt ponds, and disking and grading the levees once the mud has dried. Employees drive on the unpaved levee roads to maintain and monitor the salt pond system.

While current conditions are used as a baseline for comparison purposes, it is important to note that Cargill Salt no longer owns the property, and operation of the ponds to concentrate brine for salt production will not continue into the future. If the project is not approved, future conditions will more closely resemble the No Project alternative.

Impacts due to the salt ponds in their current condition can be broken down into three categories:

- Dust generation: Dust is generated as a result of driving on unpaved levee roads and from maintenance of levee roads.
- Combustion emissions: Combustion emissions are generated from routine vehicle use and from construction and maintenance related equipment.
- Odor emissions: Odor complaints have occasionally been received as a result of ongoing salt pond operations due to hydrogen sulfide from dredging pond mud, due to algae decomposition in ponds containing brine, or due to decomposition of organic material in mud at the bottom of ponds that have dried out.

9.3.1 No Project/ No Action Alternative

Under the No Action alternative the majority of pond waters/brines would be moved to the Cargill plant site and the remainder of the waters would be allowed to evaporate in the ponds. The ponds would then fill seasonally with rainwater in winter and dry through evaporation in summer. No new public access would be available. No action would be conducted by the agencies, including levee maintenance, and some levees would likely fail during this period.

> *Air Quality Impact 1:* Increased dust generation due to exposed dry pond bottoms in seasonal ponds.

Under this alternative, all of the ponds would be seasonal ponds. The majority of the pond bottom areas would be dry during summer and fall. Fine materials and sediments on the dry pond bottoms may become airborne during windy periods.

Significance: Potentially significant

> *Air Quality Benefit 1:* Decreased dust generation due to driving on unpaved roads and levee maintenance.

Under this alternative, the amount of driving on unpaved roads and construction activities related to salt pond maintenance would be eliminated.

Significance: Beneficial

> *Air Quality Benefit 2:* Decrease in combustion emissions due to decrease in vehicles and equipment use.

Under this alternative vehicle use for levee inspection and construction equipment for pond maintenance would cease.

Significance: Beneficial

> *Air Quality Impact 2:* Generation of odors

Decomposition of algae, brine shrimp, and other biomass that grows and accumulates in the ponds can degrade and produce odors. There are two ways that odor can occur in the ponds. First, algae and other biomass that naturally grow in the ponds can accumulate in certain areas of the ponds. As the algae naturally decompose, hydrogen sulfide gas can be produced. Warm weather and very little wind, similar to the Bay Area Indian summer condition, can accelerate the decomposition in the ponds and aggravate the odor condition. Second, odors can develop as the ponds dry and the mud bottoms are exposed to air, especially in hot weather. These odors are caused by the exposure of algae or brine shrimp.

The occurrence of the odor depends to a large part on the number of degree-cooling days that occur in summer months. The potential for odor impacts is also dependant on prevailing winds and the proximity and location of downwind receptors.

The Baumberg ponds may have the greatest potential for odor impacts because of their close proximity to residences downwind of the ponds. Transferring the ponds in a dry condition would lead to unmanaged wetting and drying cycles as the ponds accumulate rainwater and dry through natural evaporation. Any biomass produced while the pond contains water would be exposed as the pond dried. This could potentially expose more areas to unmanaged drying, potentially during the warmest periods of the year. It could also potentially lead to ponds drying out that are either in close proximity to neighboring populations or have not dried out in the past, exposing neighboring residents to odors they have not experienced before.

Significance: Potentially significant

9.3.2 Alternative 1 – Seasonal Ponds

In Alternative 1, the majority of pond waters/brines would be moved to the Cargill plant site and the remainder of the waters would be allowed to evaporate in the ponds. The ponds would then fill seasonally with rainwater in winter and dry through the evaporation process in summer. The only action taken by the agencies would be to maintain the levees at their current standard of maintenance (i.e., salt pond maintenance, not for flood control).

Air Quality Impact 1: Increased dust generation due to exposed dry pond bottoms in seasonal ponds.

Under this alternative, all of the ponds would be seasonal ponds. The majority of the pond bottom areas would be dry during summer and fall. Fine materials and sediments on the dry pond bottoms may become airborne during windy periods.

Significance: Potentially significant

Air Quality Benefit 1: Decreased dust generation due to driving and levee maintenance.

Under this alternative, the amount of driving on unpaved levees would be decreased from that which is allowed by current permits. The amount of levee maintenance conducted would be similar to current levels; current weekly pond visits for inspection and operation adjustments would not be required.

Significance: Beneficial

Air Quality Benefit 2: Decrease in combustion emissions due to vehicles and equipment

Under this alternative, the amount of driving on unpaved levees would be decreased. The amount of levee maintenance conducted would be similar to current levels. However, current weekly pond visits for inspection and operation adjustments would not be required.

Significance: Beneficial

Air Quality Impact 2: Generation of odors

For Alternative 1, the seasonal pond conditions would be same as for the No Action alternative.

Significance: Potentially significant

9.3.3 Alternative 2 – Simultaneous Marsh/April Initial Release

In Alternative 2, the contents of most of the Alviso and Baumberg Ponds would be released simultaneously in March and April. The ponds would then be managed as a mix of continuous circulation ponds, seasonal ponds and batch ponds, though management of some ponds could be altered through adaptive management during the continuous circulation period. Higher salinity ponds in Alviso and in the West Bay would be discharged in March and April in a later year when salinities in the ponds have been reduced to appropriate levels. The Island Ponds (A-19, 20, and 21) would be breached and open to tidal waters.

Air Quality Impact 1: Dust generation

Dust contains particulate matter (PM_{10}), for which the BAAQMD has established significance thresholds of 80 pound per day.

Pond management alternative 2 will require the construction and installation of several structures for water management. Construction activities will temporarily result in an increase in traffic on unpaved levee roads, and may result in a temporary increase in dust generation. However, the majority of the work would be done in moist or wet soil or mud, thereby minimizing the likelihood of dust generation. The primary source of airborne dust generated by the project would be travel on unpaved access roads and levees. Dust generation is expected to be localized and not result in emissions that affect off-site receptors or exceed the BAAQMD significance thresholds. Therfore the impact would be less than significant.

Construction activities may require the stockpiling of dirt, either from excavations or for use in construction. These stockpiles, if allowed to dry out, may become a source of blowing dust. Dust generation from stockpiles will be rare in that the soils excavated and used in the construction are damp-to-muddy in nature and do not pose a potential source of dust.

Under pond management alternative 2, some ponds will be managed as seasonal ponds, and as a result they will be dry for part of the year. As discussed under the No Action Alternative, there is potential for dust generation due to dry ponds. The number of acres of dry ponds under this management alternative will be significantly less than under either the No Action Alternative or Alternative 1, the Seasonal Pond Alternative.

Significance: Less than significant

Air Quality Impact 2: Generation of odors

In Alternative 2, some ponds would be managed as seasonal ponds and the remaining ponds would intake, circulate and discharge brine. The potential odor impacts associated with the seasonal ponds under this alternative would be the same as those listed under the No Action Alternative, except that a significantly fewer number of ponds would be dry at any time.

Odor impacts associated with the ponds containing brine would be similar to impacts under the baseline scenario of current pond management. Algae and other biomass grows in the ponds and can accumulate in certain areas of the ponds and decompose, particularly in ponds that have remained stagnant for a long period of time and during hot weather.

The greatest odor impacts will be at the Baumberg ponds, due to the proximity and downwind location of residences within 500 yards of the edge of ponds subject to seasonal drying and the number of ponds that will become seasonal ponds under the various alternatives, including the No Project/No Action Alternative. At residences near the Baumberg ponds (within 500 yards) the odor will be noticeable after a succession of degree-cooling days. Table 9-4 shows the odor risk factors associated with the Baumberg ponds.

Table 9-4.
Odor Risk Factors Associated with the Baumberg Complex Ponds

Type	Pond(s)	Odor Risk Factor
System Intake	1, 1C, 5, 6, 4C, 9,	None
System Outlet	2, 2C, 5C	None
Winter System Pond; Summer Seasonal	4, 7, 8, 6B, 6A, 12, 13, 14	Possible
Winter System Pond; Summer Seasonal	6A	Probable
System Pond	6C, 5, 3C, 2C	None
Winter System Outlet/Summer Seasonal, tidally muted in borrow ditch	8A	None
Open tidal culvert do ditch-pond is seasonal	8X	Possible
Winter system intake; Summer intake and outlet	10, 11	None

The Alviso ponds are also located upwind of residential areas, but at a greater distance than the Baumberg Ponds. Odors from the Alviso Ponds will therefore be dispersed to a high degree resulting in little significant impact to residential and other receptors. In addition, fewer of the Alviso ponds are proposed to be managed as seasonal ponds, so overall odor production will be less than at the Baumberg ponds.

The West Bay ponds are located downwind from the nearest residential areas and seasonal management is not proposed for any of the West Bay ponds. Therefore, odor impacts from these ponds will be of minor significance.

Significance: Potentially significant (Baumberg Complex ponds only)

Air Quality Mitigation 1A: Drain the seasonal ponds early enough in the dry season so that any exposure of organic material is allowed to occur before the onset of particularly warm, still weather at the end of summer.

Air Quality Mitigation 1B: If odors result from biomass accumulating and stagnating in ponds containing brine, increase circulation through the ponds.

Post Mitigation Significance: Less than Significant

Air Quality Impact 3: Increase in combustion emissions

The construction of structures proposed under Alternative 2, may result in a temporary increase in combustion emissions from construction equipment. Construction-related air quality impacts were analyzed by comparing anticipated construction-generated concentrations of criteria pollutants to the appropriate federal and/or state ambient air quality standard. Inventories of construction-related emissions, used to evaluate construction impacts, included:

- Combustion emissions from equipment used in the installation of water conveyance equipment and its supporting equipment and levee repairs and upgrades

- Combustion emissions from landside vehicles used for worker commute trips and material delivery trips, and fugitive dust emissions from any ground disturbance or stockpiling activities

An evaluation of construction phase emissions also considers the following factors:

- Types and sizes of mobile equipment, vessels, and vehicles used;
- Daily hours of operation;
- Load factors of the engines;
- Type(s) of fuel used;
- Vehicle miles traveled;
- Area of disturbed land surface; and
- Schedule of activities (when the various activities would occur).

Ozone Precursor emissions:
Construction of water control structures will require the use of internal combustion engines which are a source of ozone emissions. The BAAQMD has established significance thresholds for emissions of ozone precursor pollutants (reactive organic gasses and nitrogen oxides) of 80 pounds per day for each pollutant. The BAAQMD CEQA Guidelines indicate that projects with potential to exceed the established thresholds are traffic associated with subdivision developments of 320 homes, shopping centers of 44,000 square feet, or office parks of 210,000 square feet. Therefore, the combination of direct and indirect vehicular or equipment-related emissions associated with implementation of the project would result in emissions less than the BAAQMD thresholds for ozone precursor pollutants. Vehicle and equipment emissions would be less than significant. Therefore, no mitigation is required for this impact.

Carbon Monoxide emissions:
Construction of water control structures will require the use of internal combustion engines which are a source of CO emissions. The BAAQMD CEQA guidelines indicate that exceedances of the CO air quality standard are not anticipated from projects that generate less than 550 pounds per day of CO, do not cause congestion at intersections, do not increase traffic substantially (by 10 percent or more) at congested intersections. Traffic generated by implementation of the project would not lead to exceedances of the CO air quality standards. Therefore, no mitigation is required for this impact.

Additionally, emissions for all project alternatives are assumed to be less than the emissions for Cargill's past operation and maintenance permits, since pumping operations will be considerably reduced, and several ponds will be restored and no longer managed. In addition, emissions will be less than for right-of-way and easement operation and maintenance permits awarded to PG&E for its transmission lines; Southern Pacific Rail Road for its rail lines, and East Bay Waste Water management for its interceptor line. All vehicle emissions are below the thresholds under existing permits.

Significance: Less than significant.

9.3.4 Alternative 3 – Phased Initial Release

In Alternative 3, many of the lower salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

The construction for Alternative 3, and long-term operations for Alternative 3 would be the same as for Alternative 2.

All air quality related impacts for Alternative 3 would be the same as for Alternative 2.

10.0 SOCIO-ECONOMIC RESOURCES

There are two resources addressed in this section: Mineral Resources consisting of Salt Production (Section 11.1) and Bay Shrimp harvest (Section 11.2).

10.1 MINERAL RESOURCES-SALT PRODUCTION

10.1.1 Affected Environment

Cargill Salt Corporation began consolidation of its salt production at its Newark facilities. This decision to consolidate operations provides an opportunity to restore the evaporative ponds and surrounding levy system as a wetland, open-space wildlife preserve.

For more than four years, state and federal agencies worked with Minneapolis based agribusiness Cargill, Incorporated to buy thousands of acres of land and saltmaking rights in San Francisco's South Bay and Napa. The property was available because Cargill planned to focus salt production on 11,000 acres near its Newark plant site. The agencies pursued acquisition because restoration of this land presents an historic opportunity to:

- Increase the Bay's tidal wetlands by nearly 50 percent;
- Preserve open space;
- Improve water quality;
- Act as natural flood control;
- Prevent shoreline erosion;
- Provide critical habitat for endangered species; and
- Create opportunities for public access and environmental research and education in one of the most urbanized regions in the country.

The following table provides the background changes in Cargill's employment and salt production. These factors are pre-existing conditions in the project area.

Table 10-1
Employment and Production Changes Resulting from Consolidation of Cargill Salt Production

Factor	Before Consolidation	After Consolidation
Number of Employees	• 200 Full-Time Equivalent • 40 Seasonal	No Change
Tons of Salt Produced	1.3 million tons/year capacity	650 thousand tons/year

Personal Contact: Lori Johnson, 510-790-8157 Cargill Salt, Minneapolis, MN; 9-29-03

10.2 COMMERCIAL HARVEST OF BAY SHRIMP

10.2.1 Affected Environment

The commercial fishery for bay shrimp in San Francisco Bay began in the early 1860s. By 1871, Chinese immigrants established fishing camps along the shores of the bay and exported large quantities of dried shrimp meal (dried heads and shells) to China. At the height of the fishery in the 1890s, as many as 26 fishing camps operated up to 50 nets each in San Francisco Bay with daily landings of 400 to 8,000 pounds of shrimp, and annual landings exceeding five million pounds. Studies were required by the California Fish and Game Commission between 1897 and 1911 to address concerns that many young fish, particularly striped bass, were killed in the shrimp nets. The results of these studies prompted a May to August season closure and a prohibition of Chinese shrimp nets in 1911. The legislature modified this decision in 1915 allowing Chinese shrimp nets to be used in south San Francisco Bay. About this time, beam trawl nets began to be used by commercial shrimp harvesters in northern San Francisco Bay and San Pablo Bay. Annual landings gradually increased over the next two decades and peaked at 3.4 million pounds in 1935. Following this period, landings steadily declined in response to a decline in demand for fresh and dried shrimp as food. By the early 1960s, average annual landings declined to 1,500 pounds, and in 1964 no shrimp were landed.

Since 1985, annual landings of bay shrimp have averaged 120,000 pounds and have ranged from 75,000 to 150,000 pounds. In 1999, 11 boats participated in the bay shrimp fishery; only three fished exclusively in south San Francisco Bay. However, the total weight of bay shrimp landed was almost twice as high in the south San Francisco Bay versus north San Francisco Bay due to higher catch per boat, and higher catch per hour trawled. Primary fishing locations are Alviso Slough and Redwood Creek in south San Francisco Bay. Fishing generally occurs in waters less than 20 feet deep in channels of the estuary's shallow reaches.

The absolute abundance of bay shrimp has not been estimated nor has the impact of commercial fishing on these populations. However, annual abundance indices of bay shrimp indicate that abundance can vary widely from year to year. Annual abundance indices of adult California and blacktail bay shrimp varied by more than a factor of 10 from 1980 to 1996. Studies indicate that the abundance of California bay shrimp increases with increased river inflow to the estuary, probably because of the increased low-salinity habitat which is favorable for the rearing of juveniles. In contrast, abundance of blacktail bay shrimp increased during years of low river inflow, although not to levels capable of replacing California bay shrimp in abundance.

The current lack of catch limits, closed seasons or restricted areas is based upon the assumption that limited demand for bay shrimp maintains effort at levels far below the level that would threaten long-term sustainability of the fishery. Data is not available to test this assumption. (DFG 2001)

In addition to the forgoing bay shrimp catches are impacted by the introduction since 1992 of the Asian Mitten Crab. Mitten crabs caught in large numbers in bay shrimp nets damage the shrimp catch. Mitten crabs are an invasive, migratory (into fresh water) species of crab that burrow into the shoreline between mean high and low tides. They have been known to burrow deep into levees and are cause for concern over the integrity of levees.

Current catch levels for bay shrimp will not be significantly affected by the Pond Management Alternatives (Alternatives 2 and 3) in this Initial Stewardship Plan or the construction activities that will take place in initiating the proposed action at the start of the stewardship.

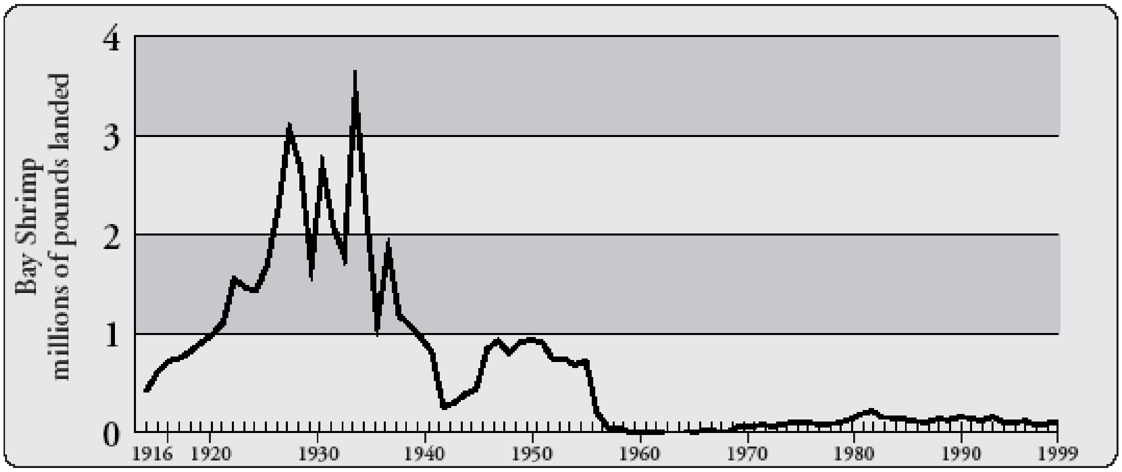


Figure 10-1
Commercial Landings 1916-1999, Bay Shrimp Data
Source: DFG Catch Bulletins, log books, and commercial landing receipts.

It is not known the extent to which increased salinity in outfalls from ponds will affect the migration of to fresh water or brackish water of juvenile Mitten Crabs, thus affecting the presence of Mitten Crabs in bay shrimp catches.

An evaluation was performed to determine if the altered salinity profiles in the sloughs during the Initial Stewardship Period would adversely impact the bay shrimp. The results of this evaluation indicate that salinity changes associated with the circulation are predicted to be relatively small and localized and are, therefore, not expected to adversely impact the long-term quality or quantity of habitat available to the bay shrimp. Any local decreases in habitat quality are predicted to be of short duration and limited to the first few months following the initial release of pond water. The evaluations upon which these conclusions are based are described in Section 6, and Appendix

10.3 CRITERIA FOR DETERMINING SIGNIFICANCE OF EFFECTS

As above: Social and economic effects are not considered significant effects under CEQA unless a chain of cause and effect can be established between the social or economic effect and an adverse effect on the physical environment. According to CEQA and the *CEQA Guidelines*, the following standards may be considered in determining whether the project would cause a significant socioeconomic impact:

- Would the project disrupt or adversely affect property of cultural significance to a community or ethnic or social group?
- Would the project induce substantial growth or concentration of population?
- Would the project cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system?
- Would the project displace a large number of people?
- Would the project disrupt or divide the physical arrangement of an established community?
- Would the project conflict with established recreational, educational, religious, or scientific uses of the area?

- Would the project convert prime agricultural land to non-agricultural use or impair the agricultural productivity of prime agricultural land?
- Would the project interfere with emergency response plans or emergency evacuation plans?

10.4 IMPACTS AND MITIGATION MEASURES

Employing the forgoing criteria it is determined that there are no significant environmental effects anticipated to result from any action alternative (Alternatives 1, 2 or 3). This is true as well as the pond maintenance, the ISP and all measures and options under the ISP. All actions will provide benefit to the habitat and harvest of bay shrimp through the preservation of habitat and water flows through which the bay shrimp migrate.

Physical changes caused by the project are constrained to those construction elements designed to maintain the evaporative ponds as wetland, open space, and recreational use. Construction will be short-term and is considered to have no impact on the economic or social characteristics of the surrounding community and, subsequently, no impact on the environment as a result of changes in the socio-economic characteristics of the project area.

All elements of the alternatives require coordination of operation and maintenance easements of utility services in the project areas. This coordination is not dissimilar from existing easement rights Cargill Salt maintains with utility providers. These utilities consist of power lines, a sewer connector line, and a rail line.

Other potential socioeconomic impacts that have been given consideration and determined to be less than significant include socioeconomic impacts related to changes in access to the ISP project ponds for hunting and from the loss of revenue from hunting leases (all project alternatives). Historically, a number of hunters obtained annual revocable leases from Cargill. These primary lessees in turn issued subleases to additional hunters. Approximately 400 hunters held these annual revocable leases or subleases on the Cargill ponds. All Cargill leases expired in the winter of 2003, prior to acquisition of the salt ponds by the agencies.

Although some individual hunters will no longer receive revenue from issuing subleases to the salt ponds, and some hunters will no longer have private hunting access to the ponds, socioeconomic impacts to hunters as a whole are expected to be less than significant since hunters will no longer be required to pay for access to the project areas and the lands will be available to more members of the public.

In addition, the No Project/No Action Alternative would result in potentially significant socioeconomic impacts to Silicon Valley industries along the bay front due to deterioration of the salt pond levees and consequent flooding problems that may result from the alternative. Although this is a potentially significant impact, since this alternative would result in the project not being implemented, no mitigation measures are proposed.

There are no mitigation measures proposed.

Significance: Less than significant.

11.0 LAND USE PLANNING

This chapter provides the environmental and regulatory background necessary to analyze land use effects associated with the proposed project. Applicable land use plans and policies were reviewed to identify any project-related incompatibilities with existing plans, policies, or surrounding land uses.

11.1 AFFECTED ENVIRONMENT

The project area is in the South San Francisco Bay (made up of parts of Alameda, Santa Clara and San Mateo counties) and is part of a 12-county San Francisco Estuary planning area (the Estuary). The project sites include portions of the incorporated cities of San Jose, Alviso, and Fremont (Alviso Complex); Hayward (Baumberg Complex); and Menlo Park (West Bay Complex).

11.1.1 Existing Land Use in the Project Area

The project sites currently include the following land uses: bay shore mud flats, salt flats, salt marsh, salt evaporative ponds, creeks, flood control, rural land and wildlife interpretative areas, and open space areas, including existing parks and planned parks. In the recent past, the project sites were used for salt production by Cargill Corporation. Land uses surrounding the project sites include residential, commercial and light industry, public facilities, and heavy industry.

11.1.2 Regional Land Use Trends

The population of the San Francisco Estuary planning area is projected to increase by over one million people during the next two decades. This growth and the corresponding changes in land uses will have direct and indirect impacts on the health of the Estuary. Most notably, these impacts include increased pollutants from point and non-point sources and alteration of vital habitats, such as wetlands and streams.

Regional land use trends include the following (San Francisco BCDC, 2000):

- Development of urban uses along interstate and state highway corridors
- Acquisition of large rural areas by federal and state wildlife agencies for wildlife habitat
- Conversion of bay shore extraction facilities to wetland marsh and wildlife habitat

Until recently, opportunities for acquisition and restoration along the South Bay shoreline have been limited. The acquisition and proposed restoration of over 15,000 acres of Cargill salt production lands represents a unique opportunity to achieve some of the long-term regional goals for Bay shoreline, as described in various regional land use plans and policies (see Section 11.1.4 below)..

11.1.3 Regional Land Use Planning Authority

Local government has the primary authority to regulate land use and therefore has the potential to minimize impacts associated with land use change. Current California planning law and guidelines provide a framework that can be used to protect natural resources. However, there is no requirement that ensures that the San Francisco Estuary, its wetlands, and other associated natural resources be given any special protection.

The following represents the current state of regional land use planning for the Estuary:

- There is no state-legislated regional comprehensive land use planning and regulatory authority.
- The San Francisco Bay Conservation and Development Commission (BCDC) administers the state's federally approved management program for the San Francisco Bay segment of the California coastal zone and the Estuary. BCDC manages the open waters, tidal marshes, managed wetlands, salt ponds, and narrow shoreline band of the San Francisco Bay segment of the Estuary. BCDC is responsible for permitting new placement of dredged material or fill in the Bay and for implementing the policies of the San Francisco Bay Plan (discussed below). BCDC does not have jurisdiction over the diked lands that were historically part of the Bay, nor over the tributary streams that are hydrologically part of the Estuary.
- Although the San Francisco Bay and Central Valley Regional Water Quality Control Boards (RWQCBs) have regulatory control over discharges to the Estuary, they do not have comprehensive land use planning authority and cannot mandate specific land use development and management practices that would minimize pollutants entering the Estuary.
- The U.S. Army Corps of Engineers (the Corps) and the U.S. Environmental Protection Agency (USEPA) have regulatory authority over the open waters and adjacent wetlands (as defined by federal regulations). The Corps can require Best Management Practices (BMPs) as part of its Clean Water Act Section 404 permitting process, which is administered on a project-by-project basis.

None of these agencies have comprehensive land use planning authority to require specific land use development or management practices that would protect the Estuary. As discussed in the following section, regional land use planning efforts have stemmed largely from a number of regional plans and policies developed by interagency organizations.

11.1.4 San Francisco Bay Regional Plans and Policies

The San Francisco Bay Estuary is the nation’s second largest and perhaps the most biologically significant estuary on the Pacific Coast. Years of filling, pollution, and alien species invasions have taken a great toll on the ecosystem. As a result, the Estuary has become a major center for a regional habitat restoration planning and implementation, including wetlands restoration.

Efforts to protect and enhance wetlands in the Estuary are driven by the following beliefs:

- The ecological health of the region requires more wetlands of higher quality than currently exist.
- As urban development continues, the land area available for wetlands restoration decreases.
- A variety of types of wetlands is required to provide all the desired and necessary functions of wetlands.

Restoration work on the Estuary is being undertaken by diverse entities, including public agencies, conservation groups, landowners, corporate interests, local businesses, and citizen volunteers. These entities are guided in part by a number of regional plans and policies.

The following is a list of plans and policies developed by agencies and organizations with authority of interest over habitat restoration within the San Francisco Estuary planning area. These plans and policies are discussed in greater detail below.

- County-wide General Plans for Alameda, Santa Clara, and San Mateo counties
- BCDC San Francisco Bay Plan (Bay Plan)
- San Francisco Estuary Project (SFEP) Comprehensive Conservation Management Plan (CCMP)
- Baylands Ecosystem Habitat Goals Project Report (Goals Report)
- San Francisco Bay Joint Venture (SFBJV) Implementation Strategy
- San Francisco Bay Trail Plan (Bay Trail Plan)

Countywide General Plans California law provides the authority for local land use decision-making and establishes the framework for those decisions. First, the state constitution protects home rule authority. Second, each city and county must prepare a comprehensive General Plan containing state-specified elements oriented toward meeting local goals and needs. All local ordinances, development plans, and activities are required to be consistent with that plan. However, local plans are not required to be coordinated with plans for adjacent communities, nor are they required to meet regional or state goals and objectives for Estuary protection. Moreover, there is no consistent forum or standard for review of local plans.

A majority of local governments in the 12-county planning area have adopted General Plan policies that address wetland or stream environment protection. However, fewer than 15 percent have adopted specific ordinances or other regulations to carry out these policies intended to protect the Estuary. Each of the local governments in the planning area can, and often do, have differing goals, policies, and regulations concerning use and treatment of the Estuary. In addition, many of the Land Use and Open Space elements for the county and municipal General Plans are outdated. For these reasons, regional land use planning documents and programs often supercede the documents and programs of local jurisdictions with respect to planning, protection, and restoration of lands within the Estuary. These regional planning efforts are described below.

BCDC San Francisco Bay Plan (Bay Plan) The McAteer-Petris Act established the BCDC and mandated the preparation of a regional San Francisco Bay Plan to encompass a 12-county San Francisco Estuary planning area. Completed in 1969, the Bay Plan describes the values associated with the Bay and presents policies and planning maps to guide future uses of the Bay and surrounding shorelines. Under the Bay Plan, suitable uses for the Bay's waterfront and shorelines include port and water-related industry, airports, wildlife refuges, and water-related recreation. In addition, the Bay Plan supports extensive public access along the Bay's waterfront and shorelines via marinas, waterfront parks, and beaches. The Bay Plan designates the project sites as wildlife area and managed wetlands. BCDC is responsible for implementing the policies of the Bay Plan.

The San Francisco Bay Conservation and Development Commission provides the following policies and commission recommendations with regard to salt ponds in the south bay area (BCDC 2003):

- If not needed for salt production, ponds between Stevens Creek and Charleston Slough should be wildlife area."
- **South Bay -** Enhance and restore valuable wildlife habitat. Bay tidal marshes and

salt ponds may be acquired as part of Don Edwards San Francisco Bay National Wildlife Refuge and managed to maximize wildlife and aquatic life values. Salt ponds can be managed for the benefit of aquatic life and wildlife. Provide continuous public access to the Bay and salt ponds along levees if in a manner protective of sensitive wildlife.

- **Harbor Seal Haul-Out** - Protect harbor seal haul-out and pupping site where harbor seals rest, give birth and nurse their young. Projects allowed only if protective of harbor seals and other sensitive wildlife.
- **Regional Restoration Goal for South Bay** - Restore large areas of tidal marsh connected by wide corridors of similar habitat along the perimeter of the Bay. Several large complexes of salt ponds, managed to optimize shorebird and waterfowl habitat functions, should be interspersed throughout the region, and natural unmanaged salt ponds should be restored on the San Leandro shoreline. Natural transitions from tidal flat to tidal marsh and into adjacent transition zones and upland habitats should be restored wherever possible. See the Baylands Ecosystem Habitat Goals report for more information.

Commission Suggestions:

- If no longer needed for salt pond production, enhance area for wildlife and aquatic life.
- Alviso-San Jose - Provide continuous public access to slough frontage only at Alviso.

SFEP Comprehensive Conservation Management Plan (CCMP) The SFEP was established by USEPA in 1987 because of growing public concern related to the health of the Bay and the Delta. SFEP is jointly sponsored by USEPA and the State of California and is part of the National Estuary Program. In June of 1993, the SFEP developed the Comprehensive Conservation Management Plan (CCMP) for the Bay-Delta planning area.

The CCMP provides a thorough implementation strategy and 145 specific actions to restore and maintain the chemical, physical and biological integrity of the Bay and Delta. It seeks to achieve high standards of water quality; to maintain an appropriate indigenous population of fish, shellfish and wildlife; to support recreational activities; and to protect the beneficial uses of the Estuary. It includes the following land use goals:

- Establish and implement land use and transportation patterns and practices that protect, enhance, and restore the Estuary's open waters, adjacent wetlands, adjacent essential uplands habitat, and tributary waterways.
- Coordinate and improve planning, regulatory, and development programs of local, regional, state, and federal agencies to improve the health of the Estuary.
- Adopt and utilize land use policies that provide incentives for more active participation by the private sector in cooperative efforts that protect and improve the Estuary.

Ten program areas are identified in the CCMP. For each program area, the CCMP presents a problem statement, discusses existing management, identifies program area goals, recommends approaches, and states objectives and actions specific to the program. With regard to wetlands, the CCMP focuses on the restoration and ultimate enhancement of ecological productivity and habitat value.

Baylands Ecosystem Habitat Goals Report The need to establish regional wetlands goals emerged initially from discussions among participants of SFEP in the early 1990s. SFEP's CCMP (discussed above) of June 1993 recommended the preparation of a regional wetlands management plan based on wetlands goals, and recommended that the San Francisco Estuary Institute (SFEI) coordinate the effort. Later that year, SFEI developed a proposal to help establish regional wetland goals and the proposal was approved by the California Resources Agency, the San Francisco Bay RWQCB, and the USEPA. Additional discussions were held in 1994 with CDFG, USFWS, and NOAA Fisheries (formerly NMFS) to improve interagency coordination and to forge a shared vision of the regional habitat requirements of fish and wildlife. In late 1994, representatives of these agencies began discussions with SFEI staff that ultimately led the development of the San Francisco Bay Area Wetlands Ecosystem Goals Project (Goals Project).

The geographic scope of the goals Project includes the following four primary subregions of the San Francisco Bay, downstream of the western boundary of the Sacramento-San Joaquin Delta at Broad Slough: Suisun Marsh and Bay, San Pablo Bay, and the South Bay. The current focus of the project is on the region's baylands, including mudflats, existing tidal marsh, tidal marsh cannels, and seasonal and other wetlands within diked historical tidal marshlands. Adjacent uplands and subtidal areas are involved only as needed to develop ecological goals for the baylands. Eventually, the Goals Project may expand to include in-stream, riparian, and terrestrial habitats of the Bay Area to facilitate watershed planning and comprehensive estuarine conservation efforts. Ultimately, it may develop wetlands goals for the Sacramento-San Joaquin Delta.

In 1999, the Goals Project compiled the *Baylands Ecosystem Habitat Goals: A Report of Habitat Recommendations* (Goals Report) to identify wetland restoration goals within the baylands. Recommendations in the Goals Report were developed through a consensus process with the input of more than 100 participants representing local, state, and federal agencies, academia, and the private sector. General goals include:

- Restore tidal marsh along the Bay edge and where the Bay's tributary streams enter the baylands.
- Restore continuous corridors of riparian vegetation along the tributary streams.
- Restore the salinity gradient of the estuary and its tributaries.
- Restore and enhance extensive areas of managed seasonal ponds.
- Re-establish natural transitions from tidal flat through tidal marsh to upland.
- Provide adequate buffer areas to protect restored habitats from disturbance.

The report recommends the types, areal extent, and distribution of habitats needed to sustain healthy wetlands ecosystems in the South Bay and identifies the Cargill salt ponds as a key area to restore in the South Bay.

San Francisco Bay Joint Venture (SFBJV) Implementation Strategy The SFBJV was formed in 1995 to bring together public and private agencies, conservation groups, development interests, and others seeking to collaborate in restoring wetlands and wildlife habitat within the San Francisco Bay Estuary. It is one of 13 similar habitat joint ventures formed in the United States. The primary goal of the SFBJV is to protect, restore, increase and enhance all types of wetlands, riparian habitat and associated uplands throughout the San Francisco Bay region to benefit waterfowl and other fish and wildlife populations" (www.sfbayjv.org/mission.html). The SFBJV is composed of a

Management Board of 27 agencies and private organizations, and four Working Committees established to accomplish specific SFBJV objectives. These objectives include the following:

- Secure wetlands, riparian habitat and associated upaldns through fee or permanent easement acquisition.
- Restore and enhance wetlands, riparian habiatat and associated upaland son both public and private lands using non-regulatory techniques.
- Improve habitat management on publicly and privately owned wetland, riparian habitat and associated uplands through the use of cooperative management agreements and voluntary incentive programs.
- Strengthen existing and promote new funding sources for wetlands acquisition, restoration, enhancement and management programs.
- Support monitoring and evaluation of existing restoration projects, as well as pertinent research studies, to improve future restoration projects.

In 2001, SFBJV published a 20-year collaborative plan for the restoration of wetland and wildlife in the Bay region called *Restoring the Estuary: an Implementation Strategy for the SFBJV*. The Implementation Strategy builds on the science-based recommendations of the Goals Project and establishes specific acreage goals for wetlands, including bay habitats, seasonal wetlands, and creeks and lakes. The Implementation Strategy lays out programmatic and cooperative strategies for accomplishing these goals. Over the next two decades, the SFBJV partners have agreed to acquire and/or restore or enhance 260,000 acres of a variety of wetlands types located throughout the San Francisco Bay Estuary.

Along shoreline within the project vicinity, SFBJV activities will focus on restoring parcels already owned by the Don Edwards San Francisco Bay National Wildlife Refuge (Refuge), such as Mayhew's Landing and the Knapp Tract. Other SFBJV shoreline activities include developing partnerships for purchasing Cargill's salt ponds. Away from the Bay's edge, there are a number of watershed and riparian restoration efforts, such as the work being undertaken as part of the San Francisquito Coordinated Resource Management Plan. There are also ongoing projects involving the restoration of scores of miles of Coyote Creek and the Guadalupe River in San Jose, some of which have been underway for over a decade.

San Francisco Bay Trail Plan (Bay Trail Plan) The Bay Trail is a planned recreation corridor that will provide 400 miles of biking and hiking trails when completed. It will link nine counties, 47 cities, and 130 parks and recreation areas around San Francisco and San Pablo Bays. As mandated under Senate Bill 100, ABAG developed the Bay Trail Plan as a framework to provide guidance in the selection and implementation of the Bay Trail project. The main goal of the Bay Trail Plan is to provide public access to the Bay and its surrounding shorelines. Existing and planned segments of the Bay Trail are adjacent to the project sites. (For further discussion of the Bay Trail and Bay Trail Plan, see Chapter 8.0, *Recreational and Public Access, Visual Resources and Public Health.*)

11.2 CRITERIA FOR DETERMINING SIGNIFICANCE OF EFFECTS

Criteria based on the State CEQA Guidelines were used to determine the significance of land use and planning–related impacts. The project would have a significant impact on land use and planning if it would:

- Conflict or be incompatible with the land use goals, objectives, or guidance of applicable land use plans or regulations of an agency with jurisdiction over the project;
- Substantially alter present or planned land uses of a site or the surrounding area;
- Disrupt or divide the physical arrangement of a community; or
- Result in a substantial conversion of farmland.

The criteria for determining significance of effects relies on the congruence of alternatives with existing plans, policies, and easements as well as proposed land uses.

11.3 IMPACTS AND MITIGATION MEASURES

None of the proposed project alternatives will conflict or be incompatible with the land use goals, objectives, or guidance of applicable land use plans or regulations. Nor will it disrupt or divide the physical arrangement of a community. None of the project sites are currently in agricultural production.

Under every alternative, including the No Project/No Action Alternative and Seasonal Ponds Alternative, there will be a land use conversion from existing use of the project sites for mineral extraction, open space, and recreation, to open space, habitat restoration, wildlife conservation and recreation uses. Although the ponds within the project sites will no longer be used for salt production, the land use setting, including its rural open space characteristics, will remain essentially unaltered. The proposed land use conversion is consistent with existing local and regional land use plans and policies, described above in Section 11.1.4.

To the extent that project alternatives incorporate options to manage the existing ponds for desired habitat values, the project will be instrumental in furthering the goals and objectives of the regional land use plans and policies. In this respect, the two pond management alternatives will provide a greater benefit than the no project alternative, which includes no management of project ponds.

To the extent that ponds become seasonal ponds (either managed under the pond management alternatives or unmanaged under the no project and seasonal pond alternatives), there may be objectionable odors from these ponds that are incompatible with nearby residential and commercial land uses. Impacts from objectionable odors are addressed in Chapter 9 (Air Quality).

11.3.1 No Project/No Action Alternative

Under this alternative, all 15,100 acres of salt ponds would be seasonal ponds without levee maintenance. Ponds would be expected to seasonally hold rainwater during the winter, and dry out during summer months. No levee maintenance would be conducted under this alternative. Eventually, without maintenance, the levees would be expected to breach and the ponds would be opened to tidal influence.

This alternative would reduce the agencies' ability to manage water and salinity levels for specific habitat values. However, the use of the project sites for open space, wildlife conservation, and recreation under this alternative would still be compatible with land uses identified for project area in the Bay Plan. The alternative would also be consistent with other regional plans and policies described in Section 11.1.4.

LAND USE IMPACT-1. The unmanaged wetting and drying cycles in the seasonal ponds have the potential to produce objectionable odors. These odors would be incompatible with nearby residential and commercial land uses.

The potential of this alternative to generate pond odor impacts is addressed in Chapter 9 (*Air Quality)*. Leaving the ponds in a dry condition, with unmanaged wetting and drying cycles as the ponds accumulate rainwater and dry through natural evaporation, could result in exposure of biomass produced while the pond contained water. This alternative could potentially expose more areas to unmanaged drying, potentially during the warmest periods of the year. It could also potentially lead to ponds drying out that are either in close proximity to neighboring populations or have not dried out in the past, exposing neighboring residents to odors they have not experienced before.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

11.3.2 Alternative 1 Seasonal Ponds

Impacts under this alternative are expected to be the same as those under the No Project/No Action Alternative.

11.3.3 Alternative 2 Simultaneous March-April Initial Release

In Alternative 2, the contents of most of the Alviso and Baumberg Ponds would initially be released simultaneously in March and April. The ponds would then be managed as a mix of continuous circulation ponds, seasonal ponds and batch ponds, though management of some ponds could be altered through adaptive management during the continuous circulation period. Higher salinity ponds in Alviso and in the West Bay would be discharged in March and April in a later year when salinities in the ponds have been reduced to appropriate levels. The Island Ponds (A-19, 20, and 21) would be breached and open to tidal waters.

As noted above, implementation of the ISP is consistent with existing local and regional land use plans and policies, described above in Section 11.1.4.

LAND USE IMPACT-2. Management of the ponds has the potential to produce objectionable odors incompatible with nearby residential and comercial land uses.

The potential of this alternative to generate odor impacts is addressed in Chapter 9 (Air Quality). The potential odor impacts associated with the seasonal ponds under this alternative would be the same as those listed under the No Project Alternative, except that a significantly fewer number of ponds would be dry at any time.

Odor impacts associated with the ponds containing brine would be similar to impacts under the baseline scenario of current pond management. Algae and other biomass grows in the ponds and can accumulate in certain areas of the ponds and decompose, particularly in ponds that have remained stagnant for a long period of time and during hot weather.

Air Quality Mitigation-1 would mitigate the impacts from Land Use Impact-1 as follows (see also Chapter 9, *Air Quality*):

AIR QUALITY MITIGATION-1: Mitigation for those ponds noted above where there is a possible risk of odor production in summer months consists of the following:

AIR QUALITY MITIGATION-1A: Drain at-risk ponds by releasing all water to expose any organic material before the onset of warm weather during the summer.

AIR QUALITY MITIGATION-1B: If odors result from biomass accumulating and stagnating in ponds containing brine, increase circulation through the ponds.

Post-mitigation significance: Less than significant

11.3.4 Alternative 3 Phased Initial Release

Impact under this management scenario would be the same as those listed under Alternative 2.

12.0 CUMULATIVE IMPACTS AND OTHER REQUIRED ANALYSES

12.1 INTRODUCTION TO CUMULATIVE ANALYSIS

NEPA and CEQA require the analysis of cumulative impacts (Sections 12.1 and 12.2), irreversible and irretrievable commitments of resources (Section 12.3), the relationship between short-term uses of the environment and the maintenance and enhancement of long-term environmental productivity (Section 12.4), and growth-inducing effects (Section 12.5). NEPA also requires a consideration of impacts to environmental justice and the protection of children (Section 12.6). Finally, this chapter identifies any significant unavoidable adverse impacts that were identified during preparation of the EIR/EIS (Section 12.7).

Cumulative impacts are effects which result incrementally from an action or undertaking and other past, present, and reasonably foreseeable near-term future actions, taken together (regardless of the agencies or parties involved). In other words, significant cumulative impacts can result from the combination of effects within a given locality or region that are not individually significant.

For the purposes of this analysis, "past actions" are actions within the project region of influence (ROI) that occurred within the past 10 years. "Present actions" include (1) current operations within the ROI and (2) current resource management programs, land use activities and development projects that are being implemented by other governmental agencies and the private sector (where they can be identified) within the region. To avoid undue speculation about possible future projects that may contribute to cumulative effects, "reasonably foreseeable future actions" are those which have been approved for implementation by appropriate authorities and can be identified and defined with some respect to time frame and location.

For this project, the ROI is the South Bay; that is, approximately the portion of the Bay from the vicinity of the San Mateo Bridge (Highway 92) and to the south. In addition, the 9,456-acre Napa Restoration Project in the North Bay is included because of its scale and similar nature to the South Bay Salt Ponds Project, making it a likely contributor to cumulative impacts.

12.1.1 Methodology

The project specific effects of the alternatives were evaluated to assess the potential cumulative effects. Only those effects that were identified as permanent effects and that have the potential to be additive to the effects of other projects in the region are analyzed. The analysis focuses on the following resource categories:

- Hydrology
- Water-quality
- Sediments
- Biological resources—benthic organisms
- Biological resources—birds and other wildlife
- Biological resources—fish

Effects to the following resource categories discussed in detail in this EIR were found not to have the potential to contribute to cumulative impacts because effects are expected to be extremely minor, of very short duration, and/or to have no potential to be additive and therefore contribute to cumulative impacts:

- Cultural resources (see Chapter 7)— No significant impacts to cultural resources have been identified. The pond management alternatives (2 and 3) will involve construction on the salt pond levees. The levees are historic features of the salt production industry in the South Bay, portions of which may be over 100 years old. Any disturbance to the levees will be similar in nature to disturbances that have been a routine part of Cargill's operations and maintenance activities at the ponds. The South Bay salt works have not been evaluated for National Register or California Register eligibility. However, the project will not impact the integrity of the salt works beyond the impacts that have already occurred under existing salt operations.
- Recreation and public access (see Chapter 8)— Although the No Project/No Action alternative could affect existing public access, all other project alternatives will maintain existing public access. The two pond management alternatives provide a modest increase in public recreation and access opportunities. In addition, none of the alternatives foreclose options for future development of public access facilities, which are being planned under the Long Term Salt Pond Restoration Plan.
- Air quality (see Chapter 9)— Impacts from pond odors in ponds that are managed seasonally are limited to the immediate project area, are similar to existing conditions, and are therefore not considered subject to cumulative impacts. Construction of the water control structures proposed under the ISP would involve very limited production of fugitive dust and emissions from construction vehicles. The addition of this project impacts to impacts from other construction projects and from motor vehicle emissions on highways and streets in the project area would be insignificant.
- Socio-economic resources (see Chapter 10)— No project alternative would contribute to significant loss of jobs, movement of people, or loss of taxes or other revenue; therefore, the project would not contribute to cumulatively socio-economic impacts.
- Land use planning (see Chapter 11)— Implementation of the ISP (Alternatives 2 and 3)is part of a long-range strategy to convert land use of the project sites from mixed industrial/wildlife conservation/recreation to a focus on wildlife conservation/recreation uses. This change is consistent with existing local and regional plans and policies and is considered an overall positive land use impact.

In addition, the following resource categories were eliminated from detailed discussion in this EIR (see explanation in Section 1.6.1):

- Agriculture
- Indian trust assets
- Navigation and navigation safety
- Noise
- Population and housing
- Soils, geology and geologic hazards
- Transportation, traffic and roadway safety

- Public services and utilities

The project would have a significant cumulative impact if it, in conjunction with other projects, would exceed the significance criteria established for a resource topic.

The methodology used to analyze the cumulative impacts associated with the key resource topics identified above included:

1. Developing a list of past-present and reasonably foreseeable future projects in the vicinity of the project area (see Section 12.1.2 below)
2. Reviewing concerns recently expressed by a scientific panel about the cumulative impacts of bay-wide restoration and mitigation efforts
3. Reviewing the general plans of local counties
4. Qualitatively evaluating the cumulative impacts of past, present, and future projects

12.1.2 Projects Addressed in the Cumulative Impacts Analysis

Past, ongoing, and reasonably projects in the South San Francisco Bay region that could result in cumulative impacts are summarized in Table 12-1. Most of these are wetlands restoration, enhancement, and creation projects, representing a total of approximately 6,409 wetland acres (including tidal wetlands, muted tidal wetlands, managed marsh, perennial and seasonal non-tidal wetlands) in the South Bay.

The Napa Restoration Project in the North Bay is not included in Table 12-1, but is also included in the cumulative impacts analysis because of its scale and similarity to the South Bay Salt Ponds Project. This project is not included in Table 12-1, but is discussed further below. The Lower Guadalupe Flood Control Project does not include any plans for wetlands restoration, enhancement, or creation, but its scale and location upstream of the Alviso project ponds makes it a potential contributor to cumulative impacts. This project is also excluded from Table 12-1, but is discussed further below.

Together with the 15,100 acres of Cargill salt ponds being considered in this EIR, and the 9,456-acre Napa Restoration Project, the total area of completed and planned wetlands that are subject to cumulative impacts under the proposed project is 30,965 acres.

Table 12-1
Past, ongoing, and reasonably foreseeable future projects in the project region of influence (ROI), subject to cumulative impacts.

Project/Component Projects	County[1]	Acreage[2]	Status
Completed Projects			
Bair Island SFO Mitigation	SM	220.16	Completed 2000
Bayside Business Park, Phase II	A	40.6	Completed 2002
Cargill Mitigation Marsh (Baumberg)	A	49.16	Completed 1998
Charleston Slough	SC	101.32	Completed 1996
Cooley Landing	SM	118.43	Completed 2002
Harvey Marsh	SC	52.01	Completed 1994
Hayward Shoreline Enhancement Project	A	72.07	Completed 2002
KGO Towers	A	1.27	Completed 1996
La Riviere Marsh	A	141.22	Completed 1987
Oro Loma Mitigation Marsh	A	12.87	Completed 2000
Oro Loma Restoration	A	316.74	Completed 1997
Pacific Commons	A	878.66	Completed 2002
Pacific Shores Deep Water Slough	SM	113.67	Completed 2000
Palo Alto Harbor	SC	14.29	Completed 1994-1997
Plummer Creek Mitigation	A	26.94	Completed 1998
Ravenswood Triangle	SM	3.03	Completed 2001
San Carlos Airport North Clear Zone	SM	0.37	Completed 1997
Sanchez Creek Wetland	SM	3.12	Completed 1987
Seal Slough	SM	47.19	Completed 1983
Triangle Marsh, Hayward Shoreline	A	8.69	Completed 1990
Triangle Marsh, Refuge Entry	A	9.37	Completed 2001
Planned Projects			
Bair Island, USFWS	SM	1,385.22	Planned
Coyote Creek Flood Control Project	SC	77.28	Planned
Eden Landing	A	854.00	Under construction
Perry Gun Club (at Eden Landing)	A	62.04	2002
Foster City Marsh	SM	29.15	Planned
Hayward Shoreline Enhancement Project – Oliver Salt Ponds	A	134	Planned 2004
Moseley Tract	SM	60.99	Planned
Pond A4	SC	306.43	Planned
Pond A18	SC	855.56	Planned
San Mateo Shoreline Parks	SM	13.1	Planned
Warm Springs Pasture	A	295.41	Planned

Source: San Francisco Estuary Institute's website: dev.sfei.org

[1] Counties: A=Alameda, SC=Santa Clara, SM=San Mateo

[2] Where different mapped and reported acreages were provided, the mapped acreage was selected for this table.

Primary Contributors to Cumulative Impacts

Additional information is provided below on several projects that, due to their scale, location, and/or relationship to the proposed South Bay Salt Ponds Project, are expected to be the primary projects contributing to cumulative impacts.

Cargill Salt Consolidation of the Newark Ponds — Cargill Salt will continue to operate salt concentrating and harvesting operations on approximately 11,000 acres surrounding the Newark Plant site. These continued operations are expected to be modified to improve the efficiency of the salt concentration process on a reduced number of acres. As quoted from Siegel and Bachand 2001, 2002, improvements to the consolidated salt making system at the Newark Ponds is to "…become more flexible, cost efficient, and more effective in producing high quality brines to support a sustainable tonnage of harvest each year." Cargill began its consolidation prior to the agencies acquiring the Alviso, Baumberg and West Bay ponds, and their activities are independent of the ponds affected by the ISP.

Alameda Flood Control Channel —The Alameda Flood Control District is currently re-evaluating the design of the lower reaches of the Alameda Flood Control Channel which border the Baumberg System to the South. The design capacity of the lower reaches of the channel to carry flood flows has been reduced substantially by sediment deposition. The planning process is evaluating the potential for allowing flood flows to be diverted into the salt ponds as an alternative to dredging the existing channel. The project is still in the design and evaluation process. The planning process is expected to be completed by 2008 and is being coordinated with the Long-term Planning Process for the South Bay Salt Ponds which is currently under way. It is anticipated that if a flood control design is selected which would allow flooding of the Baumberg Ponds it would be designed to be compatible with the ISP management of the area or the restoration plan developed as part of the Long-term Planning process.

CDFG Eden Landing Ecological Reserve—The CDFG Eden Landing Ecological Reserve was established in May 1996 to restore former salt ponds and crystallizers to tidal salt marsh and seasonal wetlands. Restoration was initiated in 2001 and is ongoing.

Lower Guadalupe River Flood Protection Project—The Santa Clara Valley Water District (SCVWD) has obtained all permits necessary to implement the Lower Guadalupe River Flood Protection Project and construction is underway with completion scheduled for December 2004. This project, in acction to accommodating the 17,000 cfs 100-year flood capacity of the Guadalupe River Flood Protection Project currently under construction, will also accommodate up to an additional 1,350 cfs of flow from pump stations and gravity outfalls, for a projected capacity of 18,350 cfs in the Lower Guadalupe River. The Guadalupe River Project is located upstream of the Lower Guadalupe River Flood Protection Project and is scheduled to go on line in spring 2004.

The purpose of the Lower Guadalupe River Flood Protection Project is to provide flood protection to the Alviso community. As currently designed, the Lower Guadalupe River Flood Protection Project would affect the magnitude and duration of flooding downstream of the project at the Cargill Salt Ponds, and in Alviso. Currently, when flood flows in the lower Guadalupe River exceed 8,600 cfs, Alviso Slough downstream of the Union Pacific Railroad crossing will over-top its west bank at Pond A8W. The flood control project would increase lower Guadalupe River channel capacity at the railroad crossing to 17,000 cfs and therefore increase the potential for flooding conditions in the downstream salt ponds on the west bank of Alviso Slough, primarily Pond A8. During flood conditions, estimated depths in ponds A5, A7, A8D and A8W would increase by up to 1 foot compared to current conditions. Flood volumes would increase from 15 to 21% and duration of flooding would increase by 12 to 30%. Without pumping or other evacuation methods, it would take months, even years for the floodwaters to evaporate under current conditions.

To reduce the potential for flooding and duration of flooding in the ponds, addition mitigation measures to be implemented include constructing an Alviso Slough Overflow Weir at Pond A8W and hardening of the Pond A6 levee. Continuing flood flows into ponds A5, A6, A7, A8, and A8D via the Alviso Weir would allow adequate storage of floodwaters to minimize over-banking in Alviso Slough.

Alviso Pond A4—Alviso Pond A4 will be used by the SCVWD to restore wetland habitat to mitigate for impacts resulting from the Stream Maintenance Program and construction of the Lower Guadalupe River Flood Protection Project.

Pond A5 includes an existing siphon under Guadalupe Slough from Pond A4. Pond A4 has been acquired by the SCVWD for a proposed restoration project. Based on the proposed schedule for the long-term restoration of pond A4 there may be a requirement for interim management of the pond during the initial stewardship period for the CDFG and USFWS ponds. One or more alternatives being considered by the SCVWD for interim management may include operation of Pond A4 as a batch pond with periodic outflows through the siphon to Pond A5. If SCVWD and USFWS agree that flows from A4 are appropriate, the flows would be restricted to time periods and salinity levels that would not have a significant effect on flow rates or discharge salinities from Pond A7.

Alviso Pond A18—The City of San Jose recently purchased Alviso Pond A18 from Cargill. Plans for the 855.56 acres that comprise this pond have not yet been developed.

Napa-Sonoma Marshes Restoration Project—Salt marsh habitat restoration efforts are ongoing at the 9,456-acre Napa River Unit of the Napa-Sonoma Marshes Wildlife Area (NSMWA). This site consists of 7,190 acres of salt ponds and levees and 2,266 acres of fringing marsh and slough. This project is in the planning phase. The DEIR/EIS for this project was circulated in April 2003 and the comment period has closed.

12.2 CUMULATIVE ANALYSIS

The impacts of the proposed South Bay Salt Ponds ISP (Alternatives 2 and 3) and other wetlands restoration, enhancement, and creation projects in the Bay can generally be considered cumulatively and significantly beneficial. These projects will result in a long-term net increase in habitat suitable for sensitive plant communities and special-status plant species. They will provide improved habitat for fish in the Bay. In the long-term, they will result in improvements to water quality by sediment filtering and other mechanisms by which wetlands can improve water quality.

Although the proposed South Bay Salt Ponds ISP (Alternatives 2 and 3) will have some initial impacts from increased salinity in receiving waters following initial pond discharges, these impacts are considered to be short-term and are not subject to cumulative effects. Following the short-term impacts during the Initial Release Period, longer-term impacts are expected to be the same for the two Pond Management alternatives. Since cumulative impacts are generally limited to the longer-term impacts, cumulative impacts are also expected to be the same for the two Pond Management alternatives. The No Project Alternative may also be subject to cumulative impacts in a few resource categories and these cases are explained below. Generally, mitigation proposed for significant impacts of each of the Project alternatives will also serve to mitigate any potential contribution these alternatives would have to cumulative effects.

12.2.1 Hydrologic and Hydraulic Conditions

The No Project alternative could result in increased flood risk for the ponds and adjacent property from some levee erosion and unplanned levee failures. Alternative 1, Seasonal Ponds, would include maintenance of existing levees and facilities and would not change the existing risk of flooding. For both the No Project alternative and Alternative 1, the water levels in the ponds would be lower than existing conditions and would increase the available storage within the ponds to contain potential overflows from adjacent creeks or sloughs.

For Alternatives 2 and 3, the existing levees and facilities would be maintained and the existing risk of flooding due to unplanned levee failures would not be affected. In general, water levels in the ponds would be similar to existing conditions and would not affect the available storage within the ponds to contain potential overflows from adjacent creeks or sloughs. The proposed Lower Guadalupe River Flood Control Project would include flood overflows in large flood events (greater than a 10-year flood) into Pond A8 and the A7 system. The proposed water levels in Ponds A5 and A7 would be similar to existing conditions. Pond A8 would be a seasonal pond with winter water levels lower than existing conditions. These alternatives would not reduce the existing available storage in the ponds. The Lower Guadalupe River Flood Control Project also identified a smaller overflow into Pond A12 in the A14 system. The A14 system includes two ponds (A9 and A10) with water levels which would increase during the ISP. The estimated overflow volume during the 100-year design flood would not exceed the existing pond system capacity. In addition, inflow to the A14 system would be stopped during the winter to protect salmonids. Therefore, the winter water levels in the system could be maintained a levels similar to existing conditions. The potential for increased flooding would be less than significant.

Discharge of ISP pond waters would only occur at low tides when water levels in the creek or slough are low. The ISP discharges would not occur during flood events when channel water levels are high. Therefore, the ISP discharges would not affect the peak flow conditions considered in the design of the lower Guadalupe River channel capacity, and would not increase potential channel impacts from erosion, scour, re-suspension of sediments, and deposition into receiving waters.

12.2.2 Water Quality

The reintroduction of tidal influence to the project site and other restoration projects in the region would generally improve water quality in San Francisco Bay. Implementation of the ISP (Alternatives 2 and 3) could result in some potentially significant temporary water quality impacts; however, these impacts would be limited in scope and duration and are unlikely to contribute to cumulative water quality impacts in the Bay or any of its tributaries. Operation of construction equipment during construction of proposed water control structures under the Pond Management alternatives (Alternatives 2 and 3) could result in minor releases of contaminants and minor erosional impacts that would not contribute significantly to cumulative impacts. Likewise, potentially significant water quality impacts from saline discharges from project ponds into Alviso Slough, Guadalupe Slough, the Alameda Flood Control Channel, and Old Alameda Creek are expected to be limited to a 3- to 5-week period and would not, therefore, contribute to cumulative water quality impacts in these waters or in the Bay to which they discharge.

Differences in conventional constituents (e.g., pH, temperature, TSS, DO, BOD and biostimulatory nutrients [nitrogen and phosphorus] between the project ponds and background receiving waters are relatively low, compared to the differences in salinities in the ponds and receiving waters. Therefore, careful management of salinity during ISP implementation should result in small changes in conventional constituents in the receiving waters. Project impacts from heavy metals are limited to exceedances of the nickel water quality objectives (WQOs) at the pond discharge points. The limited scope of this impact exempts it from cumulative impact analysis.

In the long-term, the impact of the project and other wetlands restoration, enhancement, and creation projects, is expected to be positive since wetlands are generally acknowledged to provide favorable water quality improvement mechanisms, such as filtration, settling and entrapment of sediment, photodegradation, adsorption, and enhanced biological activity (uptake, chemical transformation, degradation). The project would also have a specific beneficial impact in Coyote Creek, where the discharge of saline pond water would mitigate impacts in the creek from the release of fresh water from the San Jose Wastewater Treatment Plant, located upstream of the ISP ponds.

Results from data collection efforts at the project sites will be shared with regional natural resource managers who are evaluating habitat conditions within the San Francisco Bay as a whole and with planners who are developing the Long Term Salt Pond Restoration Plan. Information on the relationship between water quality and impacts to biological organisms may be gained from monitoring included as a part of the project or as project mitigation. By shedding additional light on this issue and providing the opportunity to respond to problem areas, the project may be considered to have an overall beneficial impact. Under the No Project/No Action alternative, the opportunity of monitoring and responsive adaptive management would be lost.

12.2.3 Sediments

Under all alternatives, project impacts, including increases in the mobility and bioavailability of contaminants in sediments, formation of salt/gypsum-affected soils, and changes in pond water levels resulting in greater potential exposure of wildlife to contaminants in pond sediments, are largely limited in scope to the ponds themselves. However, these changes could cause indirect cumulative impacts to birds and other wildlife that may be exposed to mercury, nickel, and other contaminants at other locations, as well as at the South Bay Salt Ponds project area. On the other hand, information on the relationship between the mobility and bioavailability of contaminants in sediments and impacts to biological organisms may be gained from monitoring included as a part of the project or as project mitigation. By shedding additional light on this issue and providing the opportunity to respond to problem areas, the project may be considered to have an overall beneficial impact. Under the Not Project/No Action alternative, the opportunity of monitoring and responsive adaptive management would be lost.

There is some concern that, with the scale of wetland restoration projects being undertaken around the San Francisco Bay, there may not be adequate local sediments available for the restoration projects. Many of the proposed sites are subsided and would require substantial sedimentation before restoration could proceed. In addition, there is a concern that these large-scale projects could alter the sediment balance in the Bay and result in a reduction in mudflat/shallow water habitats. Implementation of the ISP only involves marsh restoration on the Island Ponds site. This area involves a relatively small acreage and higher elevation ponds, and is therefore not expected to be a major sedimentation "sink", Consequently, the project is not expected to contribute to cumulative impacts to the sediment balance in the Bay.

12.2.4 Biological Resources-

Potentially significant adverse cumulative impacts to biological resources include the spread of invasive plant species, such as invasive cordgrasses; conversion of open water habitat favored by some shorebirds to habitat favoring tidal marsh-dependent bird species; and the overall loss of medium- to high-salinity pond waters with resulting impacts to water birds.

Benthic Organisms

Under Alternatives 2 and 3, impacts to benthic organisms are tied largely to impacts to the quality of the water they inhabit. As noted above (see Section 12.2.2), water quality impacts from the proposed project are anticipated to be of short duration and scope and are therefore not considered subject to cumulative effects. The primary impacts of the project to benthic organisms would be from increased salinity in waters that receive initial pond discharges. Potentially significant elevations in salinity in receiving waters would be limited to 3- to 5-weeks following the Initial Release Period. This may result in some mortality of benthic organisms and some shifts in location of sessile benthic organisms. For example, the major change for bay shrimp as a result of the initial high saline discharges would probably be a shift in their preferred habitat to locations upstream. After the Initial Release Period, juvenile and adult shrimp in receiving sloughs and creeks will not be significantly impacted by continuous circulation of relatively low salinity pond water.

Benthic organisms in the Bay Area have in the past shown a remarkable resiliency to ecosystemic disturbances, including changes in water salinity. Although the benthic community in the South Bay will likely exhibit such resiliency in response to the short-term changes in salinity and other water quality constituents immediately following the initial discharge of project ponds, continued challenges to these communities could, over time, weaken their ability to rebound. However, other projects in the vicinity are not expected to have similar impacts to water quality. Therefore, cumulative impacts to benthic organisms from the proposed project are not anticipated.

Vegetation and Wetlands

Implementation of ISP (Alternatives 2 and 3) is part of a long-term strategy to re-create a complex mosaic of wetlands habitats in the San Francisco Bay area. The installation or replacement of water control structures would remove or disturb small areas containing jurisdictional wetland vegetation and pickleweed cover (significant because it provides habitat for the state- and federally-listed endangered salt marsh harvest mouse and because there is so little existing vegetation at the project sites). The total area of disturbance at all three pond complexes (Alviso, Baumberg, and West Bay) would be approximately 2.91 acres of jurisdictional wetlands, including 1.99 acres of areas with a greater than 25% pickleweed cover. However, the overall cumulative impact of the project on marsh and wetland vegetation will be positive.

The project presents the opportunity to restore sensitive wetlands vegetation communities on over 15,000 acres of lands in the South Bay. Some actions proposed in the ISP would contribute directly to the cumulative beneficial impacts of other restoration projects in the Bay Area. Specifically, breaching the Island Ponds under Pond Management Alternatives 1 and 2 would allow the establishment of transitional salt marsh and brackish marsh plant communities within an area of 475 acres, contributing to other efforts to restore, enhance, or create these types of plant communities in the Bay Area. Although the ISP does not include proposals for wetlands restoration (other than the tidal wetland restoration that would naturally occur following the proposed breaching of the Island Pond levees), it should be viewed as part of a long-range plan for habitat restoration on the over 15,000 acres of the South Bay Salt Ponds.

The project may contribute to negative cumulative impacts related to the invasion of aggressive non-native plant species. The project, along with other proposed or reasonably foreseeable tidal restoration projects would expand tidal habitat suitable for the rapid invasion and dominance by non-native cordgrasses (*Spartina alterniflora, S. densiflora, S. patens*) and other aggressive exotic plant species. Smooth cordgrasses and other non-native invasive species are aggressive colonizers of open, unvegetated habitats typical of early tidal marsh restoration projects.

As discussed in Section 6.2, if left unabated, *S. alterniflora* could become a dominant salt marsh plant species in the South Bay, changing important ecosystem functions such as sedimentation dynamics and detrital production. Once established in the San Francisco Bay Estuary, invasive cordgrasses could rapidly spread to other estuaries along the California coast through seed dispersal on the tides, potentially resulting in a variety of long-term cumulative impacts to existing plants and wildlife throughout the California coast.

The number of restoration projects planned in the area increases the availability of suitable habitat for colonization. Several restoration projects along San Francisco Bay have been degraded because non-native, smooth cordgrass has out-competed native California cordgrass. Concerning the proposed South Bay Salt Ponds ISP, the proposed breaching of the Island Ponds could create conditions favorable for establishment of invasive cordgrass species and their hybrids on approximately 475 acres. Monitoring by the San Francisco Estuary Invasive *Spartina* Project found that non-native *Spartina* species had spread to dominate nearly 500 acres of tidal marsh, predominantly in the South and Central Bay, by the year 2000 (CSCC and USFWS, 2003). Additional cordgrass colonization on the 475 acres made suitable by the Island Pond breaching would be a significant contribution to this cumulative impact.

The ability to successfully control the cumulative effects and spread of exotic species of cordgrass and other plants requires a region-wide effort and the willingness of resource agencies to fund bay-wide control programs. The ISP includes provisions for monitoring and control of exotic pest plant species within the restored marsh and adjacent tidal marshes. USFWS will coordinate with the SCVWD to ensure that existing clusters of *S. alterniflora* in the vicinity of the Island Ponds are removed prior to breaching the ponds. USFWS and CDFG will also coordinate the ISP implementation with the Invasive *Spartina* Project, a region-wide program to control non-native *Spartina* in the San Francisco Estuary.

Birds and Other Wildlife

Implementation of the pond management alternatives in conjunction with other projects envisioned in the area would result in an overall increase in the availability, and ultimately the quality, of marsh fringe aquatic habitats throughout the San Francisco Bay area. Nursery habitat for many birds and other wildlife species would be greatly enhanced by the implementation of this and other restoration efforts. Changes in water levels in some of the ISP project ponds could result in impacts to nesting colonies of certain water birds in the South Bay from increased predator access and/or flooding. However, wetlands restoration, enhancement, and creation projects in the South Bay would generally provide a cumulative benefit to nesting birds. In addition, monitoring of impacts to bird species is included in the project alternatives or mitigation measures.

Impacts to birds and other wildlife from increased mobility and bioavailability of contaminants in sediments are discussed in Section 12.2.3. As stated there, these impacts are not expected to contribute to cumulative impacts and the impacts would be largely mitigated by monitoring measures included in the project alternatives or in mitigation measures. Any potential impacts from avian botulism would also be reduced to less than significant by monitoring and adaptive actions, and would not be subject to cumulative effects.

Restoration of tidal action to the 475-acre Island Pond area, following the proposed breaching of the Island Ponds, would result in a substantial long-term increase in middle marsh and high marsh habitats. These habitats are suitable for various endangered species and species of special concern, including the California clapper rail, California black rail, salt marsh harvest mouse, salt marsh wandering shrew, northern harrier, and salt marsh common yellowthroat.

Although the ISP does not include proposals for wetlands restoration (other than the tidal wetland restoration that would naturally occur following the proposed breaching of the Island Pond levees), it should be viewed as part of a long-range plan for habitat restoration on the over 15,000 acres of the South Bay Salt Ponds. Cumulatively, habitat restoration efforts in the South Bay would result in greater habitat complexity, diversity, and productivity.

Impacts to Waterbirds from Loss of Medium- and High-Salinity Ponds— Under the No Project/No Action and Seasonal Pond Alternatives, 100% of the Medium and High Salinity Ponds in the project area (5,702 acres) would be lost. From a regional perspective (including the ISP project area and the remaining active salt ponds in Fremont and Newark), the acreage of medium or high salinity ponds would be reduced from 10,402 acres to 4,700 acres (a 49% decrease).

Under the Pond Management Alternatives (2 and 3), the total number of medium- or high-salinity ponds would be reduced from 24 to 3 (Alviso Ponds A12, A13, and A15) (Table 2-1), which represents a decrease from 5,702 to 827 acres (an 85 percent decrease). From a regional perspective (including the ISP project area and Cargill's Newark ponds), the acreage of medium- or high-salinity ponds would be reduced from 10,402 to 5,527 acres (a 47 percent decrease). These habitat changes would substantially reduce the amount of available foraging habitat in the South Bay for waterbird species that favor medium- and high-salinity ponds.

However, under various adaptive management strategies, the following ponds could be managed as medium-salinity batch ponds rather than low-salinity ponds, if the ISP manager determines such alternative operations are necessary: Alviso Ponds A2E, A3N, and A8 and Baumberg Ponds 4, 7, 1C, 5C, 12, 13, and 14. As a result, the area of medium- and high-salinity habitat would be reduced from 5,702 to 1,872 acres (67 % decrease). Thus, under the Pond Management alternatives, the reduction in medium to high salinity ponds in the project area could range between 67% and 85%. From a regional perspective (including the ISP project area and the remaining active salt ponds in Fremont and Newark), the acreage of medium- and high-salinity ponds would be reduced from 10,402 to 6,572 acres (a 37 percent decrease), compared to the 47 percent decrease without adaptive management).

Note: please see Section 6.3.1.1 (Habitat Conditions) for the definitions of salinity categories, which differ from those in other sections of the EIR/EIS.

Impacts to Shorebirds and Waterfowl from Loss of Open Water Habitat—The potential large-scale conversion of salt ponds and other types of seasonal wetland habitats to tidal habitats could have a long-term adverse impact on shorebird and waterfowl populations and use in the Bay. A cumulative change in open water habitats used by migratory shorebirds and waterfowl is expected over the next 20 to 50 years. This change could result in either an increase or decrease of open –water habitat, depending on which restoration/mitigation projects are implemented.

Under the No Project/No Action and Alternative 1- Seasonal Ponds, all 12,900 acres of salt ponds would be dry in the summer and ponded with shallow water in wet years during winter. This would result in loss of open water habitat year round for waterbirds that use deep water habitat (diving ducks and piscivorous birds) and during summer and fall for shorebirds that use shallow ponds. However, these unmanaged seasonal ponds would provide additional habitat for the threatened Western Snowy Plover.

Implementation of the Managed Pond alternatives (2 and 3) would contribute much less to a cumulative loss of open water habitat. Approximately 475 acres of open waters within the Island Ponds would be converted to tidal habitat and the area of managed seasonal ponds within the project area would increase from 715 to at least 2,830 acres.

Since San Francisco Bay is one of only a few sites in North America that regularly support shorebirds in the hundreds of thousands, the loss of such habitat could have significant impacts on regional shorebird populations, especially for the shorebird species noted above. San Francisco Bay is also a critically important site for wintering and migrating water birds in the Pacific Flyway and the project could contribute to cumulative impacts on water bird populations throughout the Pacific Flyway.

The San Francisco Bay Ecosystems Goals Project (1999) has attempted to address this issue and develop recommendations for goals for key habitats in different regions in the Bay. In the South Bay subregion, the habitat goal recommendations are to increase tidal marsh habitats from the approximately 9,000 acres to 25,000 or 30,000 acres and managing 10,000 to 15,000 acres of salt pond habitat. This equates to a rough ratio of 2 to 2.5 acres of tidal marsh to 1 acre of managed salt pond habitat. Implementation of the ISP would contribute approximately 475 acres of tidal marsh restoration and during the interim project period it would contribute approximately 14,500 acres of managed salt pond/panne habitat to these broad, long-term goals.

Cumulative impacts to migratory shorebirds and waterfowl could be mitigated to some degree by the availability of numerous foraging and refuge areas throughout the Bay. Migratory shorebirds and waterfowl would likely re-distribute among available habitats in the South Bay, such as the existing salt ponds at Don Edwards National Wildlife Refuge, the Cargill Salt Ponds, and the open waters of the Eden Landing Ecological Reserve and Outer Bair Island.

Impacts to Special Status Species Habitat—Implementation of the ISP (Alternatives 2 and 3) would result in the short-term loss of existing salt marsh harvest mouse habitat (SMHM), a state- and federally-listed endangered species and California species of special concern. This loss of this habitat could also impact other endangered species and species of special concern, including the California clapper rail, California black rail, salt marsh wandering shrew, northern harrier, and salt marsh common yellowthroat. This loss (approximately 1.99 acres of >25% pickleweed cover) is very small in comparison to habitat loss that has occurred or is expected to occur as a result of other past, present, or future foreseeable tidal restoration and development projects, and is not likely to contribute to cumulative impacts to SMHM or other special status species. Overall, the project is likely to provide a very significant beneficial effect to SMHM with the potential for a significant increase in SMHM habitat within the 475-acre Island Pond area, following breaching of the Island Ponds. This, together with improvement in SMHM habitat resulting from other habitat projects, would contribute to a cumulative benefit by improving long-term habitat viability and expanding and connecting existing habitat areas as part of the recovery strategy for the species.

It should be noted that the cumulative acreage of impacted SMHM habitat is not a good measure of the significance of the impact to the species. This is because SMHM populations tend to be confined to small, disjunct marsh areas. The populations are typically genetically isolated and the long-term survival of these individual populations is dependent on the ability to maintain viable numbers of individuals within the specific habitat area. The significance of impacts to the species is based on the ability to sustain these separate populations. Impacts of habitat loss or gain would only be cumulatively significant if the loss or gain reduced, eliminated, or improved the ability of a site to sustain or expand the population at that site.

Construction-related impacts to other special status wildlife species would be extremely minor and/or of short duration and are not likely to contribute to significant cumulative effects.

Fish

Implementation of the project in conjunction with other projects envisioned in the area could result in an overall increase in the availability, and ultimately the quality, of marsh fringe aquatic habitats throughout the San Francisco Bay area. Juvenile and rearing habitat for many species of fish would be greatly enhanced by the implementation of this and other restoration efforts. Restoration of the tidal marshes in the project area would result in a substantial long-term increase in lower marsh and middle marsh habitats. Cumulatively, restoration efforts would result in greater habitat complexity, diversity, and productivity and contribute to the overall re-establishment of tidal marsh habitats throughout the Bay.

The installation of water control structures required by Alternatives 2 and 3 could lead to juvenile fish entrainment. This would be a potentially significant impact for anadromous fish only. Other fish that become entrained in the project ponds would readily adapt to the in-pond habitat. Following the initial saline discharges from these ponds, the ponds would provide significantly improved habitat for non-anadromous fish. To mitigate any potentially significant impacts to anadromous fish, the inlet structures located on migration corridors will be closed during periods of juvenile fish migration.

The Lower Guadalupe Flood Control Project proposes to use Pond A8 during flood events to reduce flooding. Following implementation of the flood control project, juvenile fish may be entrained in Pond A8 during flood events, which in combination with impacts to anadromous fish under the proposed ISP, could cause cumulative impacts to anadromous fish. However, since the pond inlet structures along Alviso Slough (Guadalupe River) will be closed during the period flooding is likely to occur,, it is not expected to cause significant cumulative impacts.

12.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Implementation of Alternatives 2 and 3 would require a relatively small and insignificant, but irretrievable commitment of fossil fuels and other energy sources to construct water control features at the ponds. Discharge of pond waters to receiving waters and the proposed breaching of the Island Ponds are actions that could theoretically be reversed at some point in the future.

12.4 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Short-term uses of the environment that would occur with restoration include the impacts on existing wetlands and habitat and those from construction-related activities. However, in the long term, the site is expected to be substantially more productive for habitat and wildlife values.

12.5 GROWTH-INDUCING IMPACTS

Section 15162.2(d) of the State CEQA Guidelines requires that an EIR address the potential growth-inducing impacts of a proposed project. Specifically, the EIR shall "discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing either directly or indirectly, in the surrounding environment."

Implementation of the ISP (Alternatives 2 and 3) would not foster economic or population growth or the construction of additional housing, and therefore would not have a growth-inducing impact.

12.6 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

For NEPA purposes, developments or population/housing changes that cause impacts in terms of environmental justice are considered significant. On February 11, 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations*. The purpose of the order is to avoid the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and low-income populations that might be affected by implementation of the proposed action or alternatives.

On April 21, 1997, the President issued Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. Each federal agency must, according to this order, address disproportionate risks to children resulting from environmental health risks or safety risks in all policies, programs, activities, and standards.

Implementation of the ISP (Alternatives 2 and 3) would not result in any unmitigated off-site environmental, economic, social, or health impacts that would affect inhabited areas. Therefore, implementation of the ISP (Alternatives 2 and 3) would not result in environmental justice impacts; that is, it would not result in disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and low-income populations. Nor would it cause disproportionate environmental health or safety risks to children.

12.7 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

The impact to waterbirds from the loss of medium- and high-salinity ponds under all of the project alternatives is a significant impact. Measures are proposed to mitigate this impact (see Section 6.3.5), but the impact remains potentially significant even with these measures. All other impacts identified in this EIR/EIS are expected to be less than significant with the implementation of proposed mitigation measures.