3.6 Biological Resources

3.6.1 Physical Setting

Methodology

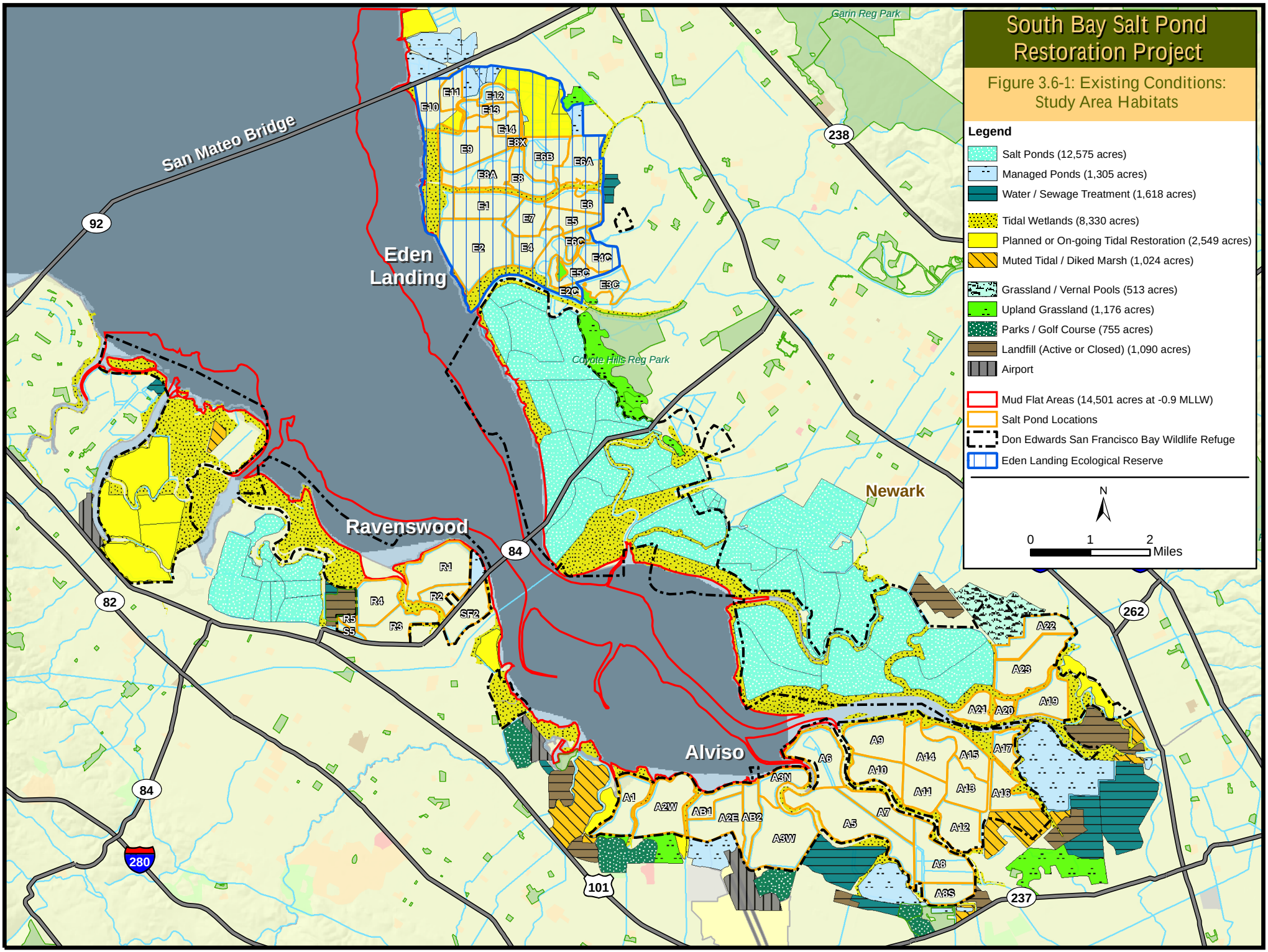
This section characterizes the existing biological conditions related to the SBSP Restoration Project. The principal biological components of concern are the vegetation and habitats, the wildlife, and the area of jurisdictional habitat. The SBSP Restoration Project is divided into three main areas: the Eden Landing, Alviso, and Ravenswood pond complexes (Figure 3.6-1). Existing conditions in the South Bay area were also documented. A substantial amount of data on wildlife use of the South Bay has been collected by resource agencies such as USFWS, CDFG, and USGS, non-profit organization and research groups such as PRBO Conservation Science (PRBO) and the San Francisco Bay Bird Observatory (SFBBO), government entities such as the City of San Jose, consultants, researchers, and private individuals. The information contained in this report is summarized primarily from the SBSP Biology and Habitats Existing Conditions Report (2005) as well as from the Goals Project (2000).

Regional Setting

The San Francisco Bay Estuary is the largest estuary on the west coast of North America and is an extremely productive, diverse ecosystem (Trulio and others 2004). Despite the loss of more than 90 percent of historic tidal wetlands in the Bay Area to diking, draining, and filling (Goals Project 1999; Harvey and others 1988), wildlife diversity is high. The South San Francisco Bay (South Bay) is a vital component of the larger Estuary. The South Bay supports some of the most important habitat remaining in the entire Bay Area for a number of wildlife species, in spite of the highly urbanized surrounding areas and the dramatic alteration of the Bay itself for shipping, salt production, and urban development (Goals Project 1999).

The term “South Bay” refers to the portion of San Francisco Bay south of Coyote Point on the western shore and San Leandro Marina on the eastern shore (Goals Project 1999). This region differs in several physical and ecological aspects from the Central Bay, North Bay, San Pablo Bay and Suisun Bay, and the Delta portions of San Francisco Bay Estuary. The habitats included in the South Bay are open waters and subtidal habitats to the upper reaches of tidal action, the tidal and nontidal wetlands, and former salt evaporation ponds adjacent to the Bay, and the upland areas immediately adjacent to these features (see Figure 3.6-1). This area, which includes the SBSP Restoration Project Area, is bordered by the Central Bay to the northwest and is surrounded by urban development on all other sides. While this area is larger than the actual SBSP Restoration Project Area, a landscape-level description is important when considering restoration options and their resulting benefits and impacts. Included in this regional setting are descriptions of the various biological habitats that occur in the South Bay.

More than 250 species of birds, 120 species of fish, 81 species of mammals, 30 species of reptiles, and 14 species of amphibians regularly occur in the San Francisco Estuary (Siegel and Bachand 2002). Equally important, the Estuary supports populations of species that are of regional, hemispheric, or even global importance. A number of endemic, endangered, threatened, and rare wildlife species or subspecies


South Bay Salt Pond Restoration Project
Figure 3.6-1: Existing Conditions: Study Area Habitats
Legend
Salt Ponds (12,575 acres)
Managed Ponds (1,305 acres)
Water / Sewage Treatment (1,618 acres)
Tidal Wetlands (8,330 acres)
Planned or On-going Tidal Restoration (2,549 acres)
Muted Tidal / Diked Marsh (1,024 acres)
Grassland / Vernal Pools (513 acres)
Upland Grassland (1,176 acres)
Parks / Golf Course (755 acres)
Landfill (Active or Closed) (1,090 acres)
Airport
Mud Flat Areas (14,501 acres at -0.9 MLLW)
Salt Pond Locations
Don Edwards San Francisco Bay Wildlife Refuge
Eden Landing Ecological Reserve
N
0 1 2 Miles
San Mateo Bridge
Eden Landing
Ravenswood
Alviso
Newark
Garin Reg Park
Coyote Hills Reg Park
92
238
84
82
262
280
101
237

reside within the San Francisco Bay Area (see Figure 3.6-2). The diversity of habitat types, particularly within the South Bay, is largely responsible for the diversity of wildlife species that occur, while the high productivity of these habitats allows those species that are not habitat limited to achieve substantial numbers. Tidal salt marshes and open waters that sustain aquatic plants and phytoplankton, as well as salt ponds that sustain high biomass of invertebrates, are the basis of the Estuary's complex and productive food web.

The San Francisco Bay Estuary formed as sea level rose through the Golden Gate approximately 10,000 years ago (Atwater 1979; Atwater and others 1977). As sea level rise slowed approximately 3,000 years ago, vegetation began to colonize and persist on the tidal mudflats along the estuarine margins (Atwater and others 1979; Collins and Grossinger 2004). Collins and Grossinger (2004) describe three major types of historical South Bay wetland landscapes:

- Saline tidal marshes with high channel density, abundant marsh pannes and salinas, moist grasslands along the backshore, large sausals, and extensive tidal flats;
- Riparian tidal marshes existing along a salinity gradient from fresh to brackish to saline waters, and influenced by inputs from Coyote Creek and the Guadalupe River. These areas had large marsh pannes and a moderate density channel network in the vicinity of major freshwater sources; and
- Salt pond landscapes comprising tidal marshlands dominated by salt ponds. These areas comprised roughly equal areas of tidal marsh and salt pond, with minimal tidal channel network development. Small salinas and marsh pannes were adjacent to the salt ponds, with moist grasslands occurring along the backshore.

Many of these habitats have been dramatically modified by anthropogenic activities including dredging, agriculture, salt production and flood protection. The ecology of South Bay wildlife communities currently is characterized by:

- High productivity of tidal marshes, with export of organic matter to tidal sloughs, channels, and mudflats, and to the Bay, supporting high abundance of invertebrates, fish, and birds;
- High productivity of a portion of the former and current salt ponds, supporting an abundance of invertebrates in higher-salinity ponds and high numbers of fish in lower-salinity ponds, but with virtually no export of organic matter to other habitats aside from variable (and at times, very heavy) use of the salt ponds by birds;
- Tidal habitats that support an invertebrate community dominated by nonnative species;
- High use of South Bay habitats by waterbirds, including significant proportions of breeding and migratory shorebird and waterfowl populations;
- Highly dynamic bird and fish communities, with use of different areas varying several times a day with tide height, and with abundance and community composition varying seasonally depending on migration, precipitation, temperature, salinity, and other factors. In particular, large numbers of shorebirds forage on intertidal mudflats at low tide and use salt ponds and other alternative habitats (*e.g.*, water treatment plant ponds) for roosting and/or foraging particularly at high tide;

- The presence of rare San Francisco Bay area endemics, including the California clapper rail (*Rallus longirostris obsoletus*), salt marsh harvest mouse (*Reithrodontomys raviventris raviventris*), and salt marsh wandering shrew (*Sorex vagrans halicoetes*), in remnant tidal marsh habitat; other species such as California least terns, western snowy plovers, and steelhead (also known as steelhead rainbow trout), and
- The small, isolated nature of the tidal salt-marsh remnants, with very limited escape cover for salt marsh harvest mice, salt marsh wandering shrews, and California clapper rails.

While the habitats within the SBSP Restoration Project are the focus of this report, the South Bay region is broadly quantified and described below. Table 3.6-1 highlights the major habitat types/land uses (exceeding 1,000 acres in size) within the South Bay (which includes the SBSP Restoration Project Area).

Table 3.6-1 South Bay Habitats and Land Uses

HABITAT TYPE	APPROXIMATE ACREAGE
Open Water and Subtidal	15,000+
Mudflat	14,500
Active Salt Ponds	12,580
Tidal Wetland (Salt and Brackish Marsh)	8,370
Developed	6,000
Current Tidal Restoration Projects	2,550
Muted Tidal/Diked Wetland	1,880
Water/Sewage Treatment Facility	1,620
Upland (primarily nonnative grassland)	1,100
Agricultural	1,500
Landfills (open or closed)	1,100
Total	66,200
Note: Acreages derived from habitat mapping performed for this Project.	

Within the general habitat types/land uses listed in Table 3.6-1, a number of biological habitats are present. The major biological habitats within the South Bay are described below. The details of the habitats in and adjacent to the former salt ponds are discussed in greater detail as part of the Project Setting section.

Open Water and Subtidal Habitats

The open water category includes a variety of habitat types, including subtidal Bay waters, tidal sloughs and channels, and areas of standing or flowing waters within the salt ponds and tidal marshes. Deep-water habitat does not support emergent vegetation. Deep bays and channels are important for aquatic invertebrates, fishes, waterbirds, and harbor seals. The open waters of South San Francisco Bay support a high diversity of benthic and pelagic macroinvertebrates. Though most of the dominant invertebrates are nonnative species, they nonetheless support native oyster populations, large fish populations representing several different trophic levels, including Pacific herring (*Clupea pallasi*), northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax caeruleus*), staghorn sculpin (*Leptocottus armatus*), several

species of perch, English sole (*Parophrys vetulus*), and California halibut (*Paralichthys californicus*) (Schafer 2004). Many of these fish species in turn support harbor seals and piscivorous (fisheating) birds such as the Forster's tern (*Sterna forsteri*), California least tern (*Sterna antillarum browni*), American white pelican (*Pelecanus erythrorynchos*), brown pelican (*Pelecanus occidentalis*), and double-crested cormorant (*Phalacrocorax auritus*). Waterfowl such as greater scaup (*Aythya marila*), lesser scaup (*Aythya affinis*), canvasbacks (*Aythya valisineria*), and surf scoters (*Melanitta perspicillata*) dive for bivalves, crustaceans, and other invertebrates in shallower subtidal areas. Bird diversity in the open Bay waters is fairly low, as the species of birds that can exploit the subtidal areas are limited to those that can forage from the air (*e.g.*, terns) or under water (*e.g.,* scoters) and those that can swim. However, large densities of diving ducks occur in some areas where appropriate depths and concentrations of benthic invertebrates, particularly bivalves, provide a rich food source. Some species, such as gulls, also roost on the open waters of the Bay, especially at night.

The tidal sloughs and channels that carry water between salt ponds and marsh remnants, and through the marshes, provide important habitat for large numbers of benthic and pelagic invertebrates and fish. These detritus-rich channels serve as important nurseries and feeding areas for estuarine fish. California bay shrimp (*Crangon franciscorum*) spawn in the open ocean but spend much of their lives feeding in the brackish waters of South Bay sloughs (Baxter and others 1999). Diving ducks generally avoid the smaller tidal channels but can be found in abundance, particularly during their nonbreeding season, near the mouths of the larger tidal sloughs, in the open waters and in deeper ponds. Thousands of diving ducks also roost and forage in the artificial lagoons in Foster City and Redwood Shores, north of the Ravenswood pond complex, in winter. Dabbling ducks such as the gadwall (*Anas strepera*), green-winged teal (*Anas crecca*), northern shoveler (*Anas clypeata*), and mallard (*Anas platyrhynchos*) reach high densities in the shallower ponds and in smaller and shallower channels, where they feed on aquatic plants (including algae, submerged aquatic vegetation, and plankton) and invertebrates. Terns often forage in the larger and mid-sized channels and ponds, and several species of herons and egrets forage in the shallows for fish. Many shorebirds feed along the exposed flats along tidal channels at low tide, as do rails and other tidal marsh birds.

Mudflat

Intertidal mudflats are expanses of minimally vegetated to unvegetated mud lying between Mean Lower Low Water and Mean Tide Level in the lower marsh zone. Mudflat habitat typically supports less than 10 percent cover of vascular emergent vegetation; this vegetation typically includes areas of colonization by cordgrass and annual pickleweed (*Salicornia europaea*) and is too sparse to map as distinct salt marsh habitat. Most of this habitat occurs just beyond the edge of fully vegetated wetlands, but also occurs between the low-flow channel and edge of wetlands within the tidal reaches of slough and creek channels draining into the Bay. These flats are generally covered by shallow water during high tide, but are uncovered at low tide (Schoellhamer 2005). Narrow mudflats occur along the edges of the tidal sloughs and channels, and on the outboard side of some salt pond levees, while much more extensive flats are present at the mouths of the major sloughs and along the edge of the Bay. Mudflats are dynamic depositional features, changing in extent and location depending on the nature of erosion and deposition of sediments.

The mudflat substrate is composed primarily of fine-grained silts and clays that support an extensive community of diatoms, worms, and shellfish, as well as algal flora. Inundated mudflats provide foraging habitat for many species of fishes, as well as for wading birds. Detritus from tidal marshes, phytoplankton that settles in the water column, and algae and diatoms growing on the intertidal mudflats are responsible for the high abundance of benthic invertebrates on mudflats (Life Science! 2003; Warwick and Price 1975). Crustaceans, polychaete worms, gastropod and bivalve mollusks, and other invertebrates live on or just below the surface of the mud. During the daily high tides, fish move over the mudflats to feed on these invertebrates. As the tide recedes and the flats emerge, the fish retreat to subtidal areas while considerable numbers of birds, primarily shorebirds, leave their high-tide roosts and feed on the flats. These mudflats are a key reason for the importance of the San Francisco Bay Area to West Coast shorebird populations, with an average of 67 percent of all the shorebirds on the West Coast of the US using San Francisco Bay wetlands (Page and others 1999). Gulls and some dabbling ducks forage on the exposed mudflats as well. Because benthic invertebrates often recede deeper into the mud as the tidal elevation drops, especially large concentrations of foraging birds usually occur along the edge of the receding or rising tideline. Although the largest numbers of shorebirds forage on the broad flats along the edge of the Bay at low tide, some shorebirds, gulls, and large waders (*e.g.*, herons and egrets) feed on the exposed flats along sloughs and channels, and the smaller channels in the brackish and salt marshes are the favored foraging areas for the state and federally endangered California clapper rail.

Shorebirds, gulls, terns, American white pelicans, and ducks often use exposed mudflats as roosting or loafing areas when available, as do Pacific harbor seals (*Phoca vitulina richardsi*). When the tides rise, most of these birds return to roosting areas in salt ponds or other alternate habitats; the seals move to open waters.

Salt Marsh

Areas of tidal salt marsh in the South Bay are characterized by interstitial soil salinities greater than 27 ppt, on average (H. T. Harvey & Associates 2002). Salt-marsh habitat occurs primarily along the outboard (tidal) side of existing levees separating the salt ponds from the Bay.

Salt marsh vegetation consists of a limited number of halophytic (salt tolerant) species adapted to regular immersion by the tides. A natural salt marsh system shows increasing diversity with decreasing salinity levels. South Bay salt marshes typically consist of three zones: low marsh dominated by cordgrass, middle marsh dominated by pickleweed, and high marsh with a mixture of pickleweed and other moderately halophytic (salt tolerant) species that can tolerate occasional high tides. These zones are not necessarily linear, but rather are intermingled throughout marshes, especially in wider, older marshes. South Bay salt marsh habitat consists primarily of low and middle marsh, and is dominated by pickleweed (*Salicornia virginica*), and Pacific cordgrass (*Spartina foliosa*). Pacific cordgrass has hybridized extensively with smooth cordgrass (*Spartina alterniflora*), a nonnative species from the east and Gulf coasts of North America. One or both of these species and/or their hybrids may be present at any one location.

Pacific cordgrass is the only cordgrass that is native to San Francisco Bay. Remnant clonal stands of uninvaded, Pacific cordgrass still exist in areas of the South Bay. It is a salt-tolerant marsh grass that

reproduces by seed dispersal and by rhizomes that send out small clusters of leafy shoots. Individual plants may expand by rhizomes in a circular direction, allowing the plant to expand outward without sexually reproducing. Most shoots are under 5 ft in height, and the plant's relatively low tolerance to submersion (California Coastal Conservancy and USFWS 2003) is reflected by its range in a narrow portion of the intertidal zone, between an elevation just above Mean Sea Level and Mean Higher High Water. Pacific cordgrass is less robust than the introduced nonnative smooth cordgrass in size, growth rate, production, and ecological tolerances (Smart and Barko 1978). Pacific cordgrass naturally grows in sand, mud and peat substrates. In winter, Pacific cordgrass clones die back to young shoots and buds near the sediment surface, making the Pacific cordgrass stands less effective at trapping sediment than the invasive smooth cordgrass (California Coastal Conservancy and USFWS 2003). Pacific cordgrass is the principal native pioneer plant species establishing new marsh on mudflats and provides valuable habitat for a number of species, including the endangered California clapper rail, which forages for food within or near the protective canopy of cordgrass.

Smooth cordgrass, represented in San Francisco Bay primarily by hybrids with Pacific cordgrass, is competitively superior to the native Pacific cordgrass in San Francisco Bay. Factors that make smooth cordgrass more competitive than Pacific cordgrass are its higher above- and below-ground biomass production, greater seed production, faster germination rates, and a wider intertidal distribution than that of the native species (Callaway and Josselyn 1992). In addition, smooth cordgrass can survive in a wider range of temperature, salinity, and inundation conditions. Smooth cordgrass is able to establish in unvegetated areas, and can spread more rapidly by rhizome expansion and dispersal than the native species. Unlike Pacific cordgrass, smooth cordgrass can grow in low intertidal habitats and invade open mud, which is prime habitat for foraging shorebirds and marine life, and important for flood control channel maintenance (Anttila and others 1998). As a result, smooth cordgrass hybrids may clog marsh slough channels, altering marsh hydrology. The rigid, densely packed stems and dense root mats of smooth cordgrass increase sedimentation rates, and subsequently raise the elevation of the marsh plain (Daehler and Strong 1996). The sediment-trapping characteristic of smooth cordgrass can contribute to significant habitat alteration by transforming large expanses of bare mudflat into high marsh areas.

Smooth cordgrass readily hybridizes with the native Pacific cordgrass. Hybrids (*S. alterniflora* x *S. foliosa*) exhibit a wide range of flowering times, allowing the hybrid plants to serve as an effective reproductive bridge between the shorter flowering times of the native and pure smooth cordgrass. Hybrids (*S. alterniflora* x *S. foliosa*) also produce pollen in greater abundance (21 times greater), and with higher fertility, than the native Pacific cordgrass. Due to its higher seed production and germination rate, smooth cordgrass and its hybrids establish new colonies faster than the native cordgrass (Josselyn and others 2004). In addition, smooth cordgrass and its hybrids have a similar appearance and behavior, making differentiation difficult. Morphological characteristics alone are often insufficient to identify the smooth cordgrass hybrids. In these cases, genetic analysis must be employed. Hybrids (*S. alterniflora* x *S. foliosa*) were discovered in San Francisco Bay in 1997 (Daehler and Strong 1997), and are the most widespread invasive *Spartina* species in San Francisco Bay.

The pickleweed and cordgrass salt marsh habitats are separated by elevation, whereby cordgrass typically occurs below the Mean High Water mark and pickleweed occurs above this mark and often extends up

the levee banks. Other halophytic plant species commonly found in the salt-marsh habitat of the South Bay include alkali heath (*Frankenia salina*), salt grass (*Distichlis spicata*), saltmarsh dodder (*Cuscuta salina*), fleshy jaumea (*Jaumea carnosa*), spearscale (*Atriplex triangularis*), sea lavender (*Limonium californicum*), perennial pepperweed (*Lepidium latifolium*), and marsh gumplant (*Grindelia stricta* var. *angustifolia*). These species also typically occur above the Mean High Water mark in the high marsh zone, up to the ecotone between salt marsh and upland habitats. While these species usually occur in areas dominated by pickleweed, species such as the marsh gumplant and perennial pepperweed sometimes occur in dense patches with less than 50 percent aerial coverage of pickleweed. At the upper tidal limits, salt marsh communities are replaced by transitional communities (high marsh) and wrack (layers of dead plant material set at high tide). Northern salt marsh bird's beak could occur in wrack panne (high marsh panne) habitat, although the chance that this species is present is extremely low and, in general, plant species diversity is lower in South San Francisco Bay than in North San Francisco Bay.

Current tidal marshes in the South Bay occupy mere remnants of their former extent but they still support high densities, and fairly high diversity, of wildlife species, including several San Francisco Bay endemics. The state and federally endangered salt marsh harvest mouse and the salt marsh wandering shrew occur particularly where pickleweed is present. The California vole (*Microtus californicus*) occurs here as well, and is often the most common small mammal in tidal marshes. California clapper rails nest in gumplant on the higher-elevation channel edges and in high pickleweed clumps, and more rarely in thicker stands of cordgrass, in both salt and brackish tidal marshes. Due to the relatively low mobility of these marsh obligates, expansive, unfragmented marshes with high connectivity to other large marshes and ample high-tide refugia (*e.g.*, upland transitional zones) provide the optimal landscape configuration for these species by allowing for large population sizes in a given area and facilitating dispersal among marshes. Higher-elevation areas, such as natural levees along higher-order channels and upland transitional zones on the upper sides of tidal marshes, are important during spring tides, when rails, salt marsh harvest mice, and passerines must seek cover from high water (and from the avian predators that hunt the marshes during these tides). However, very little high-quality tidal salt marsh habitat with these attributes is present in the South Bay. Most subpopulations of the salt marsh harvest mouse and salt marsh wandering shrew are threatened by extirpation due to poor connectivity among small habitat patches. Local populations of these species are also threatened by flooding during high tides, especially in narrow strip marshes. Few existing marshes are actually wide and high enough to support large, viable populations of small mammals unless they contain highly channelized slough systems in the marsh interior with ample gumplant or other high escape cover throughout.

The Alameda song sparrow (*Melospiza melodia pusillula*), endemic to the Central and South San Francisco Bay, nests in dense herbaceous vegetation in salt and brackish marshes as well, while the savannah sparrow (*Passerculus sandwichensis*) nests in pickleweed and peripheral halophytes in the upper marsh and upland transitional zones. The saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) nests in tidal and nontidal brackish and freshwater marshes, and possibly also in low densities in salt marsh habitat (Ray 1919; Steve Rottenborn, pers. obs.), in the South Bay. Several species of ducks, and in a few locations herons and egrets, also nest in the tidal marshes of the South Bay (Gill 1977), and California black rails (*Laterallus jamaicensis coturniculus*) winter and possibly breed in small numbers in these marshes (Liu and others 2005). Non-breeding birds, including larger shorebirds, swallows,

blackbirds, and other species roost, occasionally in large numbers, in the tidal marsh. Tidal marshes (and mudflats) in several South Bay locations are also used as haul-out and pupping sites by harbor seals.

Salinas, salt pannes, and marsh ponds are lentic (stillwater) habitats within the tidal marsh that may be inundated permanently, seasonally, or only during high tides, depending on elevation and connectivity to tidal channels (Collins 2004). Such features generally occur in the higher marsh, at the upper ends of tidal channels, near drainage divides, and near the landward edge of the marsh. Ponds not subject to flooding at high tide, or that are flooded only shallowly at high tide, provide shallow-water habitat ideal for foraging by shorebirds and waterfowl; such features may be used regardless of tidal stage, but they are particularly important at high tide when the favored foraging habitat of many shorebirds (intertidal mudflats) is flooded. More permanent ponds provide valuable brooding and foraging habitat for breeding waterfowl, while higher-salinity salt pannes and ponds support high densities of brine shrimp (*Artemia franciscana*) and brine flies (especially *Ephydra millbrae*), which in turn serve as prey for waterfowl and shorebirds. Large numbers of herons, egrets, shorebirds, and waterfowl use marsh ponds as roosting sites as well. Marsh ponds were a common component of historical marshes in the South Bay, varying in size and abundance within the marsh according to the salinity regime (Grossinger 1995), prior to diking of these marshes for salt ponds. Today, marsh ponds are sparsely dispersed remnants in the South Bay.

A study of the birds using tidal marshes and salt ponds in the South Bay, conducted by PRBO, found that salt ponds supported more bird species than salt marsh, but that salt marsh provided habitat for more bird species more consistently (year round) than do salt ponds (Stralberg and others 2003). The overall density of birds was much lower in salt marshes than in salt ponds, although the densities of passerines, rails, and raptors were higher in salt marsh than in salt ponds. Some species of dabbling ducks, such as the cinnamon teal (*Anas cyanoptera*), mallard, gadwall, and green-winged teal, were also present in higher densities in salt marsh than in salt ponds. Within salt marshes, more small shorebirds, gulls, terns, and diving ducks were found at high tide, with more dabbling ducks at low tide.

Tidal marshes are nearly as important to the aquatic components of the San Francisco Bay ecosystem as they are to the species that use these marshes directly (*i.e.*, the benthic invertebrates of subtidal areas and mudflats, fishes, water birds, and shorebirds that forage primarily on intertidal mudflats). Detritus from tidal marshes forms much of the foundation for the food web that ultimately provides sustenance for these species, providing nutrients and carbon for a significant component of the aquatic flora and fauna of the Bay (Harvey and others 1977; Warwick and Price 1975).

Brackish Marsh

Brackish marsh habitat typically occurs in the low-to-mid intertidal reaches of sloughs and creeks draining into the Bay, where the vegetation is subject to tidal inundation diluted by freshwater flows from upstream, and groundwater emergence along the terrestrial edge of salt marshes. As such, the average interstitial soil salinity of vegetation associated with tidal brackish marsh in the South Bay is lower than in salt marshes, ranging from 15 ppt to 20 ppt (H. T. Harvey & Associates 2002).

Marsh plant species richness and diversity increase in brackish marshes compared with salt marsh. The vegetation in brackish marsh habitat is dominated by emergent, vascular plant species adapted to

intermediate (brackish) interstitial soil salinities, including short bulrushes such as alkali bulrush (*Scirpus robustus*) and saltmarsh bulrush (*Scirpus maritimus*). These species dominate lower, brackish marsh habitat where sediment deposits have formed terraced floodplains between the low-flow channels and levees. The edges of these channels are also dominated by the shorter bulrushes, but may also have dense stands of tall bulrushes such as California bulrush (*Scirpus californicus*) and hard-stem bulrush (*Scirpus acutus*) adjacent to the low-flow channel of creeks and sloughs. Other plants that can occur in brackish marshes include alkali heath, saltgrass, dodder, sea-lavender (*Limonium californicum*), cattails (*Typha* sp.) along major slough channels, spearscale, and pickleweed along the high marsh/upland ecotone. Large, dense patches of the invasive perennial pepperweed (*Lepidium latifolium*) may also occur within the terraced areas in these middle reaches otherwise exclusively dominated by alkali and/or saltmarsh bulrush (Josselyn and others 2004). This non-native invasive is of concern for the conservation and recovery of rare or endangered plant species because of its widespread distribution and ability to invade rapidly and develop monotypic stands.

Brackish marshes support many of the wildlife species that use salt marsh and freshwater marsh habitats. Species composition and the relative abundance of different species may vary spatially within brackish marshes depending on water salinity, vegetation type, and habitat structure. Variability in salinity within brackish marshes is likely most important for aquatic species, which are directly subject to variation in salinity. Brackish marshes are particularly important for anadromous fish (migrating from saline to fresh water to spawn) and catadromous fish (migrating from fresh to saline water to spawn) and invertebrates such as shrimp, which use brackish marshes while physiologically acclimating to changing salinity on their migrations between saline and freshwater habitats.

Most terrestrial and wetland wildlife species are tolerant of a range of salinities, and thus are affected more by habitat structure and food availability than by salinity *per se*. Brackish marshes support most of the bird species occurring in both salt and freshwater marshes. California clapper rails occur in brackish marshes, and likely breed in these marshes, although reproductive success in brackish (versus salt) marshes has not been well studied. The often taller, more dense vegetation in brackish marshes supports large densities of breeding song sparrows, saltmarsh common yellowthroats, and marsh wrens (*Cistothorus palustris*), and large numbers of Virginia rails (*Rallus limicola*) and soras (*Porzana carolina*) during migration and winter.

Trapping in salt marsh harvest mouse preserves in the range of the northern subspecies in the Suisun Bay by Barthman-Thompson of CDFG has shown that salt marsh harvest mice do make some use of bulrushes and cattails in brackish marshes (Howard Shellhammer, pers. comm.). Recent results of trapping conducted in the range of the southern subspecies, indicate that salt marsh harvest mice also occur in brackish marshes in the South Bay (H.T. Harvey & Associates, in preparation for the City of San Jose).

Freshwater Marsh

Freshwater marsh habitat typically occurs in the upper reaches of sloughs and creeks draining into the Bay or from groundwater emergence. While the upper reaches of sloughs and creeks draining into the Bay may be subject to tidal influence, these reaches are otherwise flushed with fresh water on a daily basis and therefore support mostly freshwater emergent vegetation. The water-surface elevation within

reaches of freshwater marsh may also vary by as much as 10 ft depending on daily tidal activity and seasonal, fresh water flows from upstream. Broad-leaf cattail (*Typha latifolia*), and the taller bulrushes, including California bulrush and hard-stem bulrush, typically dominate the freshwater marsh habitat in the upper reaches of sloughs and creeks draining into the Bay. Due to regular inundation, these species often form dense stands covering entire floodplain terraces along channels. Patches of perennial pepperweed and thickets of California blackberry (*Rubus ursinus*) also occur in regions of freshwater marsh.

Relatively limited areas of freshwater marsh occur in the South Bay, and wildlife communities of these marshes (vs. those of brackish and salt marshes) in the South Bay have been little studied. Where fresh water occurs along the inland margins of the Project Area, the Pacific treefrog (*Hyla regilla*), bullfrog (*Rana catesbeiana*), and western toad (*Bufo boreas*) are present. California tiger salamanders (*Ambystoma californiense)* occur in vernal pool habitats in the Warm Springs area, primarily on Refuge lands, adjacent to the SBSP Restoration Project Area and the Newark salt ponds managed by Cargill Inc. (Cargill).

Most wetland-associated birds respond more to food availability and habitat structure than to salinity, and therefore may occur in abundance in freshwater, brackish, or salt marsh habitats with suitable habitat structure. Some birds that are typically associated with fresh (versus more saline) marshes during the breeding season, such as bitterns, Virginia rails, and soras, breed sparingly in the South Bay, likely due to the limited extent of freshwater marshes. In contrast, red-winged blackbirds (*Agelaius phoeniceus*), American coots (*Fulica americana*), common moorhens (*Gallinula chloropus*), pied-billed grebes (*Podilymbus podiceps*), song sparrows, saltmarsh common yellowthroats, and marsh wrens breed commonly in freshwater marsh habitats in the South Bay. A variety of mammals occur in these freshwater habitats as well, although with the exception of the muskrat (*Ondatra zibethica*), none are associated primarily with this habitat type. Rather, mammals associated more with adjacent upland habitats use freshwater marsh for cover or foraging habitat.

Unvegetated (Non-mudflat) Areas

Unvegetated areas are typically confined to the salt pond basins of each complex, and comprise bare ground and salt flat areas. Most of the salt pond basins were historically subject to regular tidal inundation and were vegetated with salt marsh species, but the salinity in these basins, due to their use as salt ponds over decades, is now too high to support even halophytic vegetation. While these areas typically lie below the Mean High Water mark, they are no longer subject to tidal flooding because they are surrounded by levees. Unvegetated areas are also sometimes present on levee side slopes below Mean High Water.

Bare ground and dry salt flats typically support low wildlife diversity, including invertebrates and vertebrates. However, occasionally high concentrations of invertebrates such as brine flies occur in these habitats after rain events, providing foraging opportunities for insectivorous shorebirds and other bird species. Few species breed in such habitats, although the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*) is well adapted for nesting on dry, pale substrates such as salt flats. killdeer (*Charadrius vociferus*), American avocets (*Recurvirostra americana*), and California horned larks (*Eremophila alpestris actia*) occasionally nest on bare ground within the study area as well. The largest colony of California gulls (*Larus californicus*) in the South Bay nests on dry flats within Pond A6

in Alviso; a few pairs of western gulls (*Larus occidentalis*) occasionally nest here as well. Shorebirds occasionally roost on dry salt flats when preferred habitats such as intertidal mudflats are not available, and gulls often loaf on dried-out salt pond bottoms during the day.

Upland Habitat

Areas dominated by assemblages of annual, nonnative plants that thrive in disturbed areas (ruderal species) and/or ornamental vegetation (landscaping), and agricultural areas, or areas that occur as natural terrestrial ecotones, including within Newark Slough and Coyote Hills, are characterized as upland vegetation habitat. This habitat typically occurs well above the elevation of most marsh habitats, and is mostly absent along levees due to relatively high salinity. This habitat is, therefore, primarily confined to the mainland perimeter of each salt pond complex, and to the upland portions of the South Bay (*e.g.*, grasslands and agricultural habitats).

This classification includes most tree, shrub and herbaceous species found in upland areas. The predominant ruderal species include Italian ryegrass (*Lolium multiflorum*), ripgut brome (*Bromus diandrus*), black mustard (*Brassica nigra*), wild radish (*Raphanus sativus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), wild oats (*Avena fatua*), yellow star-thistle (*Centaurea solstitialis*), common sow thistle (*Sonchus oleraceus*), bull thistle (*Cirsium vulgare*), bristly ox-tongue (*Picris echioides*), rabbitsfoot grass, brass buttons (*Cotula sp*.), alkali heath (*Frankenia salina*), and coyote brush (*Baccharis pilularis*). Perennial pepperweed (*Lepidium latifolium*) is also an aggressive colonizer in upland areas. Some native upland habitat may include native, clonal, perennial species such as alkali rye (*Leymus triticoides*), western goldentop (*Euthamia occidentalis*), clustered field sedge (*Carex praegracilis*), and western ragweed (*Ambrosia psilostachya*) which act as effective competitors of invasive wetland weeds such as perennial pepperweed. A wide variety of upland land uses and habitat types occur on the landward side of the bayland habitats previously described (*e.g.*, tidal sloughs, tidal marsh, and salt ponds). These land uses include residential, commercial, and industrial areas, landfills (both closed and active), parks, freshwater riparian habitats, agricultural lands (including cropland and limited pasture), ruderal areas, and nonnative grassland. Thus, a wide variety of wildlife species occurs in these edge habitats. Due to the intense disturbance of much of this adjacent area, with most areas lacking an obvious transitional zone between the aquatic bayland habitats and adjacent habitats, most of the wildlife species found in these peripheral areas are common species adapted to urban or ruderal habitats. Reptiles such as the western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis melanoleucus*), and southern alligator lizard (*Elgaria multicaranata*), and mammals such as the house mouse (*Mus musculus*), California vole (*Microtus californicus*), western harvest mouse (*Reithrodontomys megalotis*), California ground squirrel (*Spermophilus beecheyi*), black-tailed jack rabbit (*Lepus californicus*), cottontail (*Sylvilagus audubonii*), brush rabbit (*S. bachmani*), valley pocket gopher (*Thomomys bottae*), and striped skunk (*Mephitis mephitis*), all occur in the upland transitional areas along the edge of the Bay.

In most areas, the bird species that occur in the peripheral upland habitats are also common, widespread species. These include permanent residents such as the Anna's hummingbird (*Calypte anna*), mourning dove (*Zenaida macroura*), black phoebe (*Sayornis nigricans*), northern mockingbird (*Mimus polyglottos*), bushtit (*Psaltriparus minimus*), California towhee (*Pipilo crissalis*), red-winged blackbird (*Agelaius*

phoeniceus), Brewer's blackbird (*Euphagus cyanocephalus*), house finch (*Carpodacus mexicanus*), lesser goldfinch (*Carduelis psaltria*), summer residents such as the barn swallow (*Hirundo rustica*) and cliff swallow (*Petrochelidon pyrrhonota*), transients (some of which breed at higher elevations in the Bay Area), including the orange-crowned warbler (*Vermivora celata*) and Swainson's thrush (*Catharus ustulatus*), and winter residents such as the hermit thrush (*Catharus guttatus*), white-crowned sparrow (*Zonotrichia leucophrys*), golden-crowned sparrow (*Zonotrichia atricapilla*), yellow-rumped warbler (*Dendroica coronata*), and American pipit (*Anthus rubescens*).

Burrowing owls (*Athene cunicularia*) are also present in ruderal habitats and grasslands (all now nonnative) in scattered areas surrounding the South Bay salt ponds and marshes. Ruderal habitats, which are particularly extensive on former landfills (*e.g.*, Bayfront Park, and in Sunnyvale and Alviso), and grasslands, agricultural lands, and pastures in the Mountain View, Alviso, Fremont, and Newark areas provide foraging habitat for large numbers of diurnal raptors, such as red-tailed hawks (*Buteo jamaicensis*), northern harriers (*Circus cyaneus*), white-tailed kites (*Elanus caeruleus*), loggerhead shrikes (*Lanius ludovicianus*), peregrine falcons (*Falco peregrinus*), and American kestrels (*Falco sparverius*). Vegetated levees and other ruderal habitat provide nesting habitat for ducks and Canada geese (*Branta canadensis*) as well. The extent of the upland fields that once probably provided extensive alternate foraging habitat for shorebirds has been reduced considerably by development. Nevertheless, shorebirds such as killdeer, long-billed curlews (*Numenius americanus*), and dunlin (*Calidris alpina*) occasionally forage in more extensive upland fields in the Alviso, Fremont, and Newark areas during the wet season, and greater yellowlegs (*Tringa melanoleuca*) and least sandpipers (*Calidris minutilla*) may forage around ponded water in such fields in winter.

The Newby Island landfill is located south of the main stem of Coyote Creek in the City of Milpitas and the Tri-Cities Recycling and Disposal Facility located in Fremont provide food for thousands of breeding California gulls in the South Bay and for tens of thousands of wintering gulls of several species. High winter counts include 20,000 herring gulls (*Larus argentatus*; among 29,000 gulls total) on 24 February 1998 and 24,000 herring gulls (among 33,000 total) on 22 December 1998 at the Newby Island Landfill (Santa Clara County Bird Data Unpublished). Tens of thousands of California gulls regularly forage at this landfill year round. Virtually all of the gulls foraging at these landfills roost on the Bay or salt ponds/levees at night. Black-crowned night-herons (*Nycticorax nycticorax*), American crows (*Corvus brachyrhynchos*), common ravens (*Corvus corax*), and turkey vultures (*Cathartes aura*) forage on refuse at these landfills as well.

Other Waterbird Habitats

In addition to landfills (used by gulls) and agricultural fields (used by gulls and some shorebirds during winter and migration), several other land use types surrounding baylands in the South Bay, including water treatment plants, nontidal freshwater, brackish and salt marshes, and managed ponds and lakes, provide habitat for numerous waterbird species that are more commonly associated with the Bay. Nontidal ponds and lakes, such as Shoreline Lake in Mountain View, near Sunnyvale Baylands Park, and at Coyote Hills Regional Park, are used by numerous ducks, gulls, terns, herons, egrets, and other waterbirds. Counts of 1,200 double-crested cormorants on 16 November 1996 and 382 Surf Scoters on 3 January 2003 at Shoreline Lake in Mountain View (Santa Clara County Bird Data Unpublished)

exemplify the high densities of birds that may be present at these ponds. Non-tidal freshwater ponds east of the lower Eden Landing ponds are also well used by waterbirds (John Krause, pers. comm.).

The Coyote Creek Reach 1A pond along lower Coyote Creek was created and is managed specifically for waterbird use and provides habitat for numerous shorebirds, waterfowl, gulls, terns, and larger waders. This pond was created as mitigation for the loss of a portion of Pond A18 for flood control purposes. It is a fresh/brackish pond, being fed by Coyote Creek and having a salinity varying from three to 11 ppt (Strong 2003). Regular monitoring by SFBBO of this 16-acre pond recorded 57 species of waterbirds using the pond, the most common of which were dowitchers (averaging more than 1,000 individuals per survey in summer 1995), American avocets (which averaged more than 500 per survey in summer 2002), northern shovelers, and California gulls (Strong 2003). The mean number of individuals per survey varied among years (between 540 and 1,486 birds per survey) over all seasons. Additional observations have resulted in counts of up to 180 pectoral sandpipers (*Calidris melanotos*; 27 September 1991), 3,500 western sandpipers (*Calidris mauri*; 13 July 1997), and 2,065 Wilson's phalaropes (24 July 1993), as well as large numbers of nesting black-necked stilts (*Himantopus mexicanus*), American avocets, and ducks (Santa Clara County Bird Data Unpublished; Steve Rottenborn, pers. obs.).

New Chicago Marsh, a managed, diked salt marsh located south of Pond A16 and east of Pond A12 in Alviso, provides habitat for the salt marsh harvest mouse, nesting habitat for Forster's terns, black-necked stilts, and American avocets, and foraging habitats for large numbers of shorebirds during migration and winter. This marsh is used heavily by roosting shorebirds during high tide and hundreds to thousands of both red-necked and Wilson's phalaropes forage in the marsh in late summer and fall. Crittenden Marsh, a small nontidal salt marsh west of the north end of Moffett Federal Airfield runways, also supports high numbers of waterbirds, including breeding black-necked stilts, American avocets, and waterfowl, foraging ducks and terns, and up to thousands of shorebirds that roost and forage in the shallow water and on exposed mud during high tide (when water levels within the marsh are not too high). Coyote Hills Regional Park supports an extensive freshwater marsh/open water system located east of the Cargill salt ponds in the Newark area. This park provides foraging, nesting, and/or roosting habitat for a variety of ducks, grebes, terns, gulls, herons, egrets, and shorebirds. The Palo Alto Flood Control Basin likewise provides freshwater, brackish, and salt marsh in a managed system that supports numerous waterbirds. The Warm Springs wetlands, comprised of vernal pools and seasonal wetlands, provide foraging and breeding habitat for waterfowl and shorebirds.

Sludge ponds, oxidation ponds, drying beds, and associated impoundments at the South Bayside System Authority Wastewater Treatment Works in Redwood City, the San Jose-Santa Clara Water Pollution Control Plant (WPCP) in Alviso, and the Sunnyvale WPCP support high densities of breeding dabbling ducks, Canada geese, and black-necked stilts, and depending on pond conditions can support very high densities of migrant and wintering waterfowl (particularly northern shovelers), shorebirds (including thousands of Wilson's and red-necked phalaropes), and gulls (being particularly important for Bonaparte's gulls [*Larus philadelphia*]). High counts of selected species at these plants include 4,750 northern shovelers (19 December 1999), 4,000 western sandpipers (10 July 1998), and 81 nests/broods of black-necked stilts (2 July 1999) at the San Jose-Santa Clara WPCP and 428 snowy egrets (*Egretta thula*; 25 August 1994), 5,500 northern shovelers (20 December 1996), 650 gadwalls

(including 25 broods of young; 24 July 1993), 1,950 canvasbacks (19 December 2000), 2,950 ruddy ducks (*Oxyura jamaicensis*; 20 December 1996), 4,000 red-necked phalaropes (14 September 1997), and 380 Forster's terns (21 September 1998) at the Sunnyvale WPCP (Santa Clara County Bird Data Unpublished; Steve Rottenborn, pers. obs.).

Levees

Levees are linear, barren, earthen structures that separate tidal areas from salt ponds, and salt ponds from each other. The levees in the South Bay salt pond complexes were typically constructed from soils excavated from borrow ditches in former salt marshes which have since been developed into salt ponds; standing water can usually be found in the borrow ditches of otherwise empty salt ponds. The levee substrate is therefore primarily silty-clay in texture and saline. Some levees have been reinforced with rip-rap or concrete debris. Peripheral halophytes (plants adapted to living in a saline environment) occur along the banks and tops of levees separating tidal areas from salt ponds, and occasionally along levees separating salt ponds from each other. The extent of peripheral halophytes is primarily determined by the salinity of the levee soils and how recently the levee soils were excavated from borrow pits in adjacent salt ponds. Peripheral halophytes typically include nonnative, ruderal species such as iceplant (*Mesembryanthemum nodiflorum*), New Zealand spinach (*Tetragonia tetragonioides*), Russian thistle (*Salsola soda)*, and Australian saltbush (*Atriplex semibaccata*).

In more remote areas (*e.g.*, levees between salt ponds far from the upland edge), South Bay levees are heavily used for nesting by birds such as double-crested cormorants, California gulls, black-necked stilts, and American avocets. Western snowy plovers historically nested in large numbers on some South Bay levees. Large numbers of shorebirds use salt pond levees for roosting, particularly when intertidal foraging habitats are inundated during high tide (Warnock 2004). Some species, particularly western snowy plovers, black-necked stilts, and least sandpipers, also forage frequently along the margins of levees. Gulls, Forster's and Caspian terns, cormorants, pelicans, and other waterbirds also frequently roost on levees. The California least tern uses levees in the South Bay as post-breeding roosting sites. After breeding (primarily at Central Bay sites), adult California least terns bring their juvenile offspring to the South Bay to forage before migration. Mammals use levees for dispersal and to obtain access to foraging areas, and red foxes (*Vulpes vulpes*) and California ground squirrels often excavate dens within levees (usually near the upland edge). Levees with rip-rap or concrete debris provide some cover for other small mammals such as the Norway rat (*Rattus norvegicus*), roof rat (*Rattus rattus*), and feral cat (*Felis catus*), while peripheral halophytes along the lower edges of the levee provide high-tide refugia for species such as the salt marsh harvest mouse, California clapper rail, and California black rail.

Developed Areas

Developed areas include residential and commercial areas, roadways, parking areas, building complexes, pump facilities, and powerline facilities. Such areas are typically maintained free of vegetation, but may occasionally support isolated ruderal upland vegetation (described above). Wildlife species occurring in developed habitats are typically associated primarily with adjacent habitats, and use developed areas only occasionally. However, birds such as cliff swallows (*Petrochelidon pyrrhonota*), barn swallows (*Hirundo rustica*), black phoebes (*Sayornis nigricans*), and introduced species such as the European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), and rock pigeon (*Columba livia*), nest primarily on or in

artificial structures. Power lines also provide nesting platforms for great blue herons (*Ardea herodias*), double-crested cormorants, common ravens, and red-tailed hawks, and hunting perches for peregrine falcons, merlins (*Falco columbarius*), golden eagles (*Aquila chrysaetos*), and other raptors. A variety of urban-adapted, usually non-native mammals, including the feral cat, Norway rat, roof rat, house mouse, and Virginia opossum (*Didelphis virginiana*), occur most abundantly in and near developed habitats.

Invasive Plants in Upland and Wetland Habitats

Many invasive plant species are known to occur or may potentially occur within the SBSP Restoration Project Area. These species out-compete native plants, displacing entire communities of plants and associated wildlife. While some non-native plants are not problematic, control of invasive non-native plant species throughout the SBSP Restoration Project Area is important to allow the Project's objectives to be met. While the scope of this analysis does not include a species-by-species prescription for removal, the California Invasive Plant Council (Cal-IPC) publishes the Weed Worker's Handbook (1994) which describes the biology and tested methods of removal for 35 of the most noxious weeds in the Bay Area. The following species occur or may occur within the SBSP Restoration Project Area:

1) Non-native smooth cordgrass and, particularly, hybrids between smooth and Pacific cordgrass have spread throughout tidal salt marshes in much of the San Francisco Bay Area. The Invasive Spartina Project is actively engaged in eradicating non-native smooth cordgrass. Smooth cordgrass and its hybrids have been the primary focus of invasive plant control in tidal wetlands of San Francisco Bay;

2) Salt wheatgrass (*Agropyron elongatum.*) has been planted along many levees to stabilize levee banks throughout San Francisco Bay, and has spread in areas near Union City;

3) Perennial pepperweed (*Lepidium latifoium*) has invaded many wetland areas within San Francisco Bay, including the South Bay, but also occurs in upland areas with ruderal grassland habitat dominated by Italian ryegrass, various non-native bromes, Mediterranean barley, and wild oats;

4) Black mustard (*Brassica nigra*) and wild radish (*Raphanus sativus*) dominate the banks of the levees within much of the Shoreline SBSP Restoration Project Area;

5) Pampas grass (*Cortaderia* sp.) occurs in ruderal areas including adjacent to developed areas;

6) French broom (*Genista monspessulana*) and Scotch broom (*Cytisus scoparius*) occur in upland, disturbed areas;

7) Giant reed (*Arundo donax*) invades freshwater marsh and creeks;

8) Sweet fennel (*Foeniculum vulgare*) spreads quickly within ruderal areas;

9) Yellow star-thistle (*Centaurea solstitialis*), purple star-thistle (*Centaurea calcitrapa*), and Italian thistle (*Carduus pycnocephalus*) quickly invade and dominate grassland areas;

10) Russian wheatgrass (*Elytrigia pontica*) inhabits disturbed places throughout most of California;

11) Smilo grass (*Piptatherum miliaceum*) inhabits riparian areas, canyons, roadsides, fields, waste places, and other disturbed sites;

12) Australian bentgrass (*Agrostis avenacea*) inhabits open, disturbed, often moist places; and

13) Stinkwort (*Dittrichia graveolens*) inhabits disturbed places and margins of tidal marshes in the absence of competition, especially in the southern portion of San Francisco Bay, although it does not seem to do well in healthy marshes.

With the restoration of the SBSP Restoration Project Area, documentation of infestation by non-native plant species should allow for better planning of the removal/containment of these species.

The conversion of formerly hypersaline managed ponds to saline ponds, the creation of new islands and berms, and the creation/opening of trails opens many new areas to weed invasions. Realistic control of invasive, non-native plant species like perennial pepperweed and stinkwort will require pre-construction suppression of seed sources, rapid pre-emptive cover of levees by competitive, clonal, perennial, native plant species, substantial, specific, explicit weed management design (including timely revegetation designs) to target these species, and cooperation of adjacent landowners. Many of the invasive species listed above require labor-intensive methods of control (seed source removal, mowing, hand removal, or other manual extraction) for many years in sensitive areas and complete eradication is difficult to impossible. Monitoring of infestations of invasive plants and prevention of their spread using Best Management Practices are important steps in invasive plant management.

SBSP Restoration Project Setting

The South Bay Salt Pond Restoration Project's three main areas are the Eden Landing, Alviso, and Ravenswood pond complexes (Figure 3.6-1). A summary of the major habitat categories (Salt Pond, Marsh Habitat, Bay Habitat and Other Habitats) that were mapped in 2004 as part of this Project within the immediate vicinity of each of the three SBSP Restoration Project pond complexes is shown in Table 3.6-2. Please note that the area that was mapped is greater than the approximately 15,100-acre Project Area in order to encompass associated adjacent habitats.

Salt ponds were previously managed for the purpose of commercial salt production. Marsh Habitat includes salt, brackish and fresh marshes with peripheral halophytes as a component. The Alviso pond complex contains approximately 7,400 acres of former salt ponds and 420 acres of salt marsh, 900 acres of brackish marsh, as well as other associated Bay habitats. The Ravenswood pond complex contains 1,440 acres of salt ponds, with a mix of other habitats surrounding the ponds, including salt marsh (over 100 acres). The Eden Landing pond complex contains approximately 4,400 acres of salt ponds and over 700 acres of salt marsh. Of the over 18,000 acres mapped in the three pond complexes, over 13,000 acres consist of salt ponds. Bay Habitat comprises mudflat (less than 10 percent vegetated) and open water. Hardscape such as levees, ruderal upland vegetation or landscaping, unvegetated areas, and areas developed for commercial use or infrastructure, are categorized as "Other".

Table 3.6-2 Habitat Categories for Each Restoration Complex

HABITAT CATEGORY	COMPLEX	ACREAGE
Salt Pond[1]	Alviso	7,364
(Total acreage = 13,227)	Ravenswood	1,440
	Eden Landing	4,423
Marsh Habitat	Alviso	1,607
(Total acreage = 2,584)	Ravenswood	153
	Eden Landing	824
Bay Habitat	Alviso	838
(Total acreage = 1,231)	Ravenswood	283
	Eden Landing	110
Other	Alviso	617
(Total acreage = 1,228)	Ravenswood	176
	Eden Landing	435

Note:
[1] These areas represent the actual amount of salt pond habitat contained within the existing levees of the Project Area, and should not be confused with the 15,100 acre figure which represents the entire area purchased from Cargill and includes levees and some adjacent habitats.

Note that the baseline conditions for this report are the conditions that are predicted to be present once the ISP is fully operational. Thus, the ponds that are the subject of the proposed restoration effort are technically no longer salt production ponds after ISP implementation. However, because the vast majority of research that has been conducted on these ponds was performed when they were functioning as salt ponds, the term "salt pond" is used to refer to these ponds. The observed or predicted changes in wildlife use as ISP controls become operational (which will not occur for years in some ponds, such as those in the Ravenswood pond complex) is noted where appropriate, and any necessary distinction between the "salt ponds" that are included in the restoration plan and the ponds that have been retained for salt production by Cargill is explicitly noted as necessary.

In addition to the habitat categories listed above, the salt ponds themselves can be described according to their prescribed management regime. The salinity and hydrologic circulation regimes outlined in the ISP (Life Science! 2003) result in five types of pond management systems:

- System;
- Full Tidal;
- High Salinity (Batch);
- Seasonal; and
- Mixed (*e.g.*, Seasonal /High Salinity) Ponds.

System Ponds are managed to have water circulating through a series of ponds linked by water-control structures that are controlled to reduce or maintain ambient salinities. Full Tidal Ponds have levees breached to allow full tidal action to be reintroduced to the pond. High Salinity (Batch) Ponds consist of a series of ponds, managed to maintain higher salinity levels to provide habitat for specific wildlife species.

Seasonal Ponds have no Bay water inputs; water levels rise and recede depending on precipitation and groundwater hydrology. Mixed Ponds (Seasonal/High Salinity) are managed seasonally to provide transitions between various habitat types during migrational periods, and to adaptively partition wildlife resources.

The following discussion presents a description of the existing conditions for vegetation and wildlife resources in the SBSP Restoration Project Area, including habitat descriptions, discussions of the species composition and structure of invertebrate, fish, reptile, amphibian, mammal, and bird communities. Detail on these species' life histories, habitat requirements, and habitat use in the South Bay, and the spatial and temporal variation in these species' presence/distribution in the region are discussed in further detail in the Biology and Habitats Existing Conditions Report.

Salt Pond Complex Habitat Types

Generally, salt ponds in the South Bay are characterized by expanses of non-tidal open water, bare mud, or bare salt flats surrounded by mostly barren levees. Vegetation is sparse and is limited primarily to some levees. Due to the paucity of vegetation, salt ponds provide little to no cover for small mammals or reptiles, and provide nesting habitat only for species that nest on the bare levees and the occasional islands that have been created (by breaching of levees or deposition of material dredged from borrow ditches) within the ponds.

The South San Francisco Bay Area, including the salt ponds and managed ponds, provide habitat for more than one million waterbirds each year, including large percentages of the Pacific Flyway populations of some shorebird, duck, and tern species (Accurso 1992; Harrington and Perry 1995; Page and others 1999; Stenzel and Page 1988; Takekawa and others 2001; Trivedi and Gross 2004). With its extensive mudflats, remnant salt marsh, and salt ponds, the South Bay in particular supports very high diversity and abundance of waterbirds (Harvey and others 1992; Takekawa and others 2000; Warnock 2004b). Bird use of the salt ponds varies considerably among species. Some species, such as the Wilson's phalarope (*Phalaropus tricolor*), red-necked phalarope (*Phalaropus lobatus*), eared grebe (*Podiceps nigricollis*), and the federally threatened Western Snowy Plover, occur in the South Bay most abundantly in salt ponds. In contrast, a number of bird species use other habitats extensively as well, and most shorebirds occur in salt ponds primarily during high tide when their preferred intertidal foraging habitats are inundated (Warnock 2004). Use of individual salt ponds by foraging birds is influenced primarily by water depth and salinity, which mediate food availability. Because most shorebirds forage on moist sediment or in water less than 4 centimeters (cm) in depth (occasionally up to 10 to 15 cm deep in the case of large shorebirds) (Isola and others 2000), they are confined to shallow water and margins of islands or levees for foraging. Dabbling ducks are also limited to shallow waters, generally preferring water depths from 10 to 30 cm (Life Science! 2004), while diving ducks generally prefer water at least 30 cm (and up to several meters) deep (Life Science! 2004). Salinity mediates the availability or abundance of prey in these ponds – fish for piscivorous species occur in low-salinity ponds, while species that forage on brine flies, water boatmen, and brine shrimp in the higher-salinity ponds can benefit from the considerable biomass of these invertebrates in areas where water depths are suitable for foraging. At any

given time, only a relatively small portion of the salt pond complexes provide suitable conditions (*e.g.*, moist soil or shallow water) for foraging by shorebirds.

Numerous waterbirds use the salt ponds and their associated islands and levees primarily for roosting, either at night or during high tide when their preferred foraging habitats are submerged. Large mixed-species flocks of shorebirds, gulls, terns, cormorants, pelicans, herons, and other birds are often seen roosting or loafing on levees, in shallow water, or on exposed mud in the ponds (see Figure 3.6-3). A few species, including the black-necked stilt, American avocet, western snowy plover, Caspian tern (*Sterna caspia*), Forster's tern, black skimmer (*Rhynchops niger*), California gull, and double-crested cormorant nest on islands or levees within the ponds, particularly those that are not accessible by mammalian predators, or in the case of the western snowy plover and California gull, on barren salt flats on the bottoms of dried ponds.

Plant and invertebrate communities in these ponds vary primarily depending on the salinity of the pond. General descriptions of the pond habitats based on salinity levels can be broadly described as low, medium, or high salinity.

Low Salinity Ponds. "Intake ponds", into which water is transferred directly from the Bay, are close to the salinity of the Bay and are therefore the lowest salinity ponds in the circulation systems. These ponds, which generally have salinities below 40 ppt, support high abundances of macroscopic green algae (particularly *Rhizoclonium* spp. and *Enteromorpha* spp.), microscopic algae and diatoms, and occasionally the vascular plant wigeon grass (*Ruppia maritima*). Wigeon grass may be an important food source for waterfowl and may function as nursery for invertebrate prey. Benthic invertebrate density and diversity tend to be relatively high in these lower-salinity ponds, with numerous nematodes, polychaete worms, rotifers, arthropods, and crustaceans (most notably *Corophium* spp.). At least 12 species of fish occur in the lower-salinity intake ponds, where they feed on an abundant supply of benthic and pelagic invertebrate prey (including copepods, which often dominate the pelagic invertebrate community in low- and medium-salinity ponds). The topsmelt (*Atherinops affinis*), yellowfin goby (*Acanthogobius flavimanus*), longjaw mudsucker (*Gillichthys mirabilis*), rainwater killifish (*Lucania parva*), and staghorn sculpin (*Leptocottus armatus*) are among the most common fish within these ponds. Because most of these fish cannot tolerate salinity exceeding 70 to 80 ppt (Carpelan 1957; Lonzarich 1989), piscivorous birds in salt ponds generally forage only in the lower salinity intake ponds. Dabbling ducks are also usually present in highest concentrations in the lower salinity ponds, where they feed on both invertebrates and aquatic vegetation.

Medium Salinity Ponds. The plankton, invertebrate, and vertebrate communities in salt ponds become less complex, being dominated by fewer species as salinity increases. Macroscopic algae are replaced by unicellular algae, such as *Stichococcus bacilaris*, in the higher salinity ponds. The brine shrimp *Artemia franciscana* is the predominant invertebrate in the medium salinity ponds, having an optimal salinity range of 70 to 175 ppt (two to five times the salinity of seawater). Within the SBSP Restoration Project ponds, this species produces an estimated eight generations per year, and biomass production by brine shrimp is estimated at 56 pounds per acre per year in some Alviso salt ponds (Carpelan 1957). The reticulate water boatman (*Trichocorixa reticulata*) is also found in medium salinity ponds, and brine flies

are also tolerant of medium and high salinities, reaching very high densities in some ponds. Even as adults, water boatmen are primarily aquatic, but adult brine flies can be seen in dense swarms on the edges of medium salinity ponds from late spring through fall. These three species provide an abundant food source for shorebirds, gulls, swallows, and other birds where water depths are conducive to efficient foraging on these invertebrates (Warnock 2004).

High Salinity Ponds. The highest salinity ponds support little, if any, wildlife. Above a salinity of 200 ppt, even brine shrimp cannot survive, and thus there is no prey to support predatory wildlife. Although birds may occasionally roost in these hypersaline ponds, the high salinity may have adverse effects on the birds, such as impairing the waterproofing of their feathers (Rubega and Robinson 1997), and little use is made of such ponds by wildlife (Takekawa and others 2000).

SBSP Restoration Project Pond Complexes

As noted above, the existing conditions documented in this report actually refer to the ISP conditions. The ISP is designed to circulate water through salt ponds and discharge water via sloughs or directly to the Bay to minimize adverse effects on habitat values and salinity levels during the planning of the long-term SBSP Restoration Project (Life Science! 2003).

The ponds within the SBSP Restoration Project Area are, collectively, highly productive systems, supporting very high invertebrate biomass due to the abundance of a few key species and providing roosting, nesting, and foraging habitat for large numbers of waterbirds. However, with the exception of the birds that move in and out of the ponds (as discussed below), and some fish and aquatic invertebrates that are drawn into intake ponds, the salt ponds are primarily a closed system, with virtually no export of detritus, nutrients, or energy to the tidal marsh, sloughs, mudflats, or open waters of the Bay. Furthermore, much of the biomass produced by these ponds is unavailable to birds or fish due to water depths (for shorebirds) and salinities (for fish) that preclude these vertebrates' use of most of the invertebrates in the deeper, higher-salinity ponds.

The ecology of the plant and invertebrate communities that provide the basis for community structure and abundance of vertebrates using salt ponds has been described by several researchers (Anderson 1970; Carpelan 1957; Lonzarich 1989). Each of the SBSP Restoration Project pond complexes contains some combination of the management regime described above. Specific habitat descriptions for each of the pond complexes are listed here.

Eden Landing. Mudflat and open water bay habitats are found in the Eden Landing pond complex. Open-water habitat exists in OAC, North Creek, along Mt. Eden Creek and as internal marsh ponds within the Whale's Tail marsh, a marsh at the mouths of the Old Alameda and Mt. Eden Creeks along the western edge of the Eden Landing pond complex.

Vegetation. The Eden Landing pond complex includes salt marsh, brackish marsh, freshwater marsh and peripheral halophyte marsh habitat. Open water borders the northeastern ponds. Mudflat borders the western edge of Whale's Tail marsh. Developing cordgrass salt marsh in Cargill Marsh borders Whale's Tail marsh to the east. Large areas of pickleweed salt marsh lie to the west of the Eden Landing pond

complex within the Whale's Tail marsh. The lower reaches of Mt. Eden Creek, which intersect the northern ponds in the complex, consist of pickleweed salt marsh. Pickleweed salt marsh also dominates the lower reach of the ACFCC along the southern boundary of the pond complex. Peripheral halophyte marsh habitat borders the northeastern ponds inland along Mt. Eden Creek. Brackish marsh exists upstream in OAC and continues along the eastern boundary of the pond complex. In addition to the habitats described above, small oyster shell beach ridges are found within the north end of Whale's Tail marsh and on the north end of the outboard marsh of Pond E2.

Wildlife. Characteristics of ponds such as salinity and depth may change rapidly, influencing wildlife use. In particular, changes in salinity and depth that may occur seasonally or among years may affect the abundance and species composition of invertebrates, fish, and feeding and roosting assemblages of birds, in ponds. However, based on recent monitoring conducted by USGS, SFBBO, and others, the most prominent wildlife resources and patterns of wildlife distribution in the Eden Landing pond complex and vicinity in recent years are as follows:

- Great blue herons have recently nested on telephone poles and old wooden structures in Ponds E13 and E14, and on structures in Ponds E6B, E9, and E12 (see Figure 3.6-4);
- Breeding concentrations of black-necked stilts and American avocets occur in a number of ponds within the Eden Landing pond complex (see Figure 3.6-5);
- The largest concentration of breeding and wintering western snowy plovers in the San Francisco Bay Area is located in the salt ponds north of OAC within the Eden Landing pond complex (see Figure 3.6-6);
- Large numbers of shorebirds forage on mudflats west of the Eden Landing pond complex at low tide;
- Large numbers of shorebirds roost, and forage to varying degrees, in a number of ponds north of OAC, primarily at high tide (see Figure 3.6-3);
- California clapper rails occur in Whale's Tail Marsh, and along OAC and the ACFCC;
- Forster's terns nest primarily on islands within salt ponds, in a number of ponds in the Eden Landing pond complex, and Caspian terns have bred in Pond E10 (see Figure 3.6-4). Black Skimmers have nested on Ponds E10 and E4C;
- California least terns nested in Pond E8A in 2007. Ponds E1, E2, E10, and E11 are regularly used as foraging and roosting areas by California least terns during the post-breeding period in late summer, and California least terns forage over the Bay nearby (sometimes immediately outboard of the salt pond levees);
- Ponds supporting large numbers of dabblers include Ponds E3C, E4C, and E10, whereas Ponds E1, E2, E4, E7, E9, E10, and E14 support the greatest abundance of diving ducks;
- Ponds E1, E2, E4, E7, and E10 support large numbers of piscivorous birds;
- Steelhead or steelhead trout (*Oncorhynchus mykiss*) and chinook salmon (*Oncorhynchus tshawytscha*) occur in the ACFCC;
- Salt marsh harvest mouse habitat in the Eden Landing pond complex is limited, being most extensive along Whale's Tail Marsh, OAC, and the ACFCC, and in several areas on the landward side of this pond complex. Smaller habitat units are present in remnant marshes elsewhere in this pond complex (see Figure 3.6-7); and

Figure 3.6-4 South Bay Tern, Heron and Egret Colonies (1990 – 2006)

- Red-tailed hawks and common ravens nest on electrical transmission towers in and among the salt ponds and tidal marshes.

Phase 1 Action Areas. Characteristics of individual ponds that were selected for Phase 1 of the SBSP Restoration Project are discussed below.

Ponds E8A, E8X and E9.

Pond E8A is approximately 240 acres in size and is bordered by OAC on the south, North Creek on the east, and by Ponds E9 and E8 on the north and east. The west side of Pond E8A is bordered by tidal salt marsh extending outward to the Bay. Pond E8A is currently managed under the ISP as a System Pond.

Pond E8X is approximately 30 acres in size and is bordered by North Creek on the south and east and by Ponds E9 on the west and E14 on the north. Pond E8X is currently managed under the ISP to receive water only during the highest tides, and is mostly mudflat and/or shallow water throughout much of the year.

Pond E9 is approximately 360 acres in size and is bordered on the south by Pond E8A, on the west by tidal salt marsh extending to the Bay, and on the north and east by Ponds E14 and E8X. Mt. Eden Creek borders the northwest edge of Pond E9. Pond E9 is currently managed under the ISP as a System Pond.

System Ponds provide habitat for a number of wildlife species, including waterfowl, shorebirds, and other species. The abundance of particular groups of species within these ponds varies seasonally depending primarily on water depth and salinity. All three of these ponds have a gypsum layer of varying depth.

Ponds E8A and E9 are used by a variety of waterbird species. Surveys conducted by USGS from 2002 to 2005 detected high numbers of bufflehead (*Bucephala albeola*) and eared grebes in Pond E9, and high numbers of American avocets, black-bellied plovers (*Pluvialis squatarola*), willets (*Tringa semipalmata*), dunlin, and western sandpipers in both ponds (Takekawa and others 2005). Pond E8A and the levee between E8A and E9 are used heavily, at least in some years, by foraging western snowy plovers.

Ponds E12 and E13.

Pond E12 is approximately 110 acres in size and is bordered on the south by Pond E13 and on the north and east by Mt. Eden Creek. Pond E12 is currently managed as a Seasonal Pond.

Pond E13 is approximately 120 acres in size and is bordered by Pond E12 to the north, Mt. Eden Creek to the west and Pond E14 to the south. Pond E13 is currently managed as a Seasonal Pond.

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Seasonal ponds provide different types of habitat, including aquatic habitat for waterfowl during winter, shallow water foraging during the spring and fall shorebird migration periods and salt panne habitat for nesting shorebirds during summer. Western snowy plovers, black-necked stilts, and American avocets nest in and adjacent to these ponds. Ducks such as northern shovelers and lesser and greater scaup forage in deeper portions of these ponds in winter, and shallow-water habitat present within these ponds (at least in winter and spring) provides foraging and/or roosting habitat for Black-bellied plovers, dunlin, western sandpipers, and other shorebirds (Takekawa and other 2005).

Alviso. Large areas of mudflat and open water Bay habitats are found adjacent to the Alviso pond complex. Open water exists along Mountain View Slough, Stevens Creek, Alviso Slough, Artesian Slough, Guadalupe Slough, and in Coyote Creek. Large expanses of newly formed mudflat habitat exist downstream of the Island Ponds (A19, A20, and A21), including a large newly formed mudflat island at the mouth of Alviso Slough adjacent to Pond A9. Mudflat occurs at the mouth of Guadalupe Slough and along Charleston Slough. Advancing mudflat occurs adjacent to Calaveras Point, and also at the mouths of Mountain View Slough and Stevens Creek adjacent to Ponds A1 and A2W. Small areas of mudflat surrounded by open water are adjacent to Pond A12. Additional small areas of mudflat are surrounded by freshwater marsh at the upper end of the reach to the south of the Island Ponds.

Vegetation. Marsh habitat adjacent to the Alviso pond complex includes salt marsh, brackish marsh, freshwater marsh as well as areas of peripheral halophytes. Salt marsh habitat occurs on the outboard levees along the extent of the Alviso pond complex. Salt marsh dominated by cordgrass is found at lower elevations bordering the mudflats and along the fringing lower elevations of Coyote Creek. Cordgrass also borders Mountain View Slough, the mouth of Stevens Creek, Guadalupe Slough and Alviso Slough, the mouth of Mud Slough, and also includes formation of a new cordgrass salt marsh island at the mouth of Alviso Slough between Ponds A9 and A6. Pickleweed marsh is found at higher elevations just above cordgrass dominated marsh and extends upstream into Mountain View Slough, Stevens Creek, Coyote Creek, Guadalupe Slough, Mud Slough, and Alviso Slough. Brackish marsh covers the marsh plain in the transition from salt to brackish marsh along Coyote Creek, and also dominates the outboard levees near the junction of Mud Slough and Coyote Creek. Brackish marsh replaces salt marsh moving upstream along Guadalupe Slough, Alviso Slough, Mountain View Slough, and Stevens Creek. To the east of the Artesian Slough junction, the brackish marsh initially contains patches of pickleweed salt marsh within the marsh plain, and then becomes primarily brackish marsh. Brackish marsh dominates Triangle Marsh and extends into the lower reaches of Artesian Slough. Artesian Slough becomes dominated by freshwater marsh upstream (south) of Pond A17. Levees separate many of the individual ponds in the Alviso pond complex. Upland vegetation borders sections of the freshwater and brackish marshes. Unvegetated islands exist within several of the salt ponds.

Wildlife. Characteristics of ponds such as salinity and depth may change rapidly, influencing wildlife use. In particular, changes in salinity and depth that may occur seasonally or among years may affect the abundance and species composition of invertebrates, fish, and feeding and roosting assemblages of birds, in ponds. However, based on recent monitoring conducted by USGS, SFBBO, and others, the most prominent wildlife resources and patterns of wildlife distribution in the Alviso pond complex and vicinity in recent years are as follows:

- Mixed heronries are currently located along Guadalupe Slough and at the west end of the Coyote Creek Lagoon near Newby Island, a black-crowned night-heron rookery has been observed at least some years in the northern part of Moffett Federal Airfield, and small numbers of great blue herons nest on transmission towers in or adjacent to several salt ponds in this pond complex (see Figure 3.6-4);
- Breeding concentrations of black-necked stilts and American avocets occur in New Chicago Marsh, in the vicinity of Pond A22, and in the Palo Alto Flood Control Basin, with additional concentrations of avocets at the Warm Springs Marsh and Reach 1A waterbird pond, and stilts in the San Jose-Santa Clara WPCP (see Figure 3.6-5). Breeding numbers may increase in the salt ponds as the ISP is implemented on a broader scale due to drawdown of water in seasonal ponds (possibly increasing the extent of terrestrial breeding locations);
- Moderate numbers of western snowy plovers breed in Pond A22. In the past western snowy plovers have bred in Pond A6, although they have not nested in this pond years, likely due to the gull colony there. Western snowy plovers have recently nested in Pond A8 and in a small impoundment north of the Alviso marina, although occurrence in these areas has been sporadic in recent years (see Figure 3.6-6);
- Large numbers of shorebirds forage on the intertidal mudflats ringing the South Bay south of the Dumbarton Bridge during low tide;
- Large numbers of shorebirds roost, and forage to varying degrees, in Ponds A5 and A7, with high numbers also present in Ponds A3N, A6, A9, A14, and A8, and in Crittenden Marsh, at times (see Figure 3.6-3);
- Several California gull colonies, including the state's second largest colony in Pond A6, are present in the Alviso pond complex (see Figure 3.6-5);
- Double-crested cormorants nest on transmission towers in Pond A2W, in the AB1/AB2/A3N area, and (at least formerly) in Pond A18, and on the levee between Ponds A9 and A10;
- Red-tailed hawks and common ravens nest on transmission towers in several ponds, and in 2006 a pair of peregrine falcons nested on a tower in the Alviso pond complex;
- Forster's terns nest on small islands in a number of locations (primarily in salt ponds), and black skimmers nest in the Palo Alto Flood Control Basin and in Ponds A1, AB1, AB2, A8, and A16. Caspian terns nest in Pond A7 and AB2, and on the levee between Ponds A5 and A7 (see Figure 3.6-4);
- The main post-breeding staging area for California least terns breeding in San Francisco Bay is within the Alviso pond complex, primarily in the ponds north of Moffett Federal Airfield but with birds regularly using a number of other ponds in this pond complex for foraging and roosting. California least terns also forage over the Bay off the Alviso salt ponds.
- California clapper rails occur in a number of locations, although high-quality habitat is limited. The highest numbers are likely to occur within the more extensive tidal salt marshes along Coyote Creek and near Palo Alto, although this species is also present in brackish marshes in the Warm Springs area, along Guadalupe Slough and Alviso Slough, and in smaller marsh remnants along sloughs and the Bay edge;
- Ponds A1, A2E, A2W, A5, A7, A9, and AB2 support high numbers of dabbling ducks, and Ponds A1, A2W, A9, and A10 support large numbers of diving ducks;

- Tens of thousands of gulls roost in the Alviso ponds and levees, with many foraging at landfills near Milpitas and in Fremont;
- Within the Alviso pond complex, piscivorous bird abundance is highest in Ponds A1, A2W, A3W, A5, A7, A9, A10, and AB2;
- Ponds A19, A20, and A21 have been restored to tidal action under the ISP. These ponds initially provide intertidal foraging habitat for shorebirds and other waterbirds at low tide, and tidal foraging habitat for waterfowl at high tide. As sediment accumulates (and the gypsum layer is buried and/or deteriorates), tidal marsh vegetation will become established, providing breeding and foraging habitat for the California clapper rail and other marsh species;
- Steelhead occur in Stevens Creek, the Guadalupe River, and Coyote Creek;
- Chinook salmon occur in the Guadalupe River and Coyote Creek;
- Salt marsh harvest mouse habitat in the Alviso pond complex is limited, but occurs in tidal salt marshes that fringe the existing salt ponds and more extensively in the diked salt marsh habitat at New Chicago Marsh. Most of the Alviso marshes are brackish marshes, areas in which salt marsh harvest mice have been recently been discovered. While their use of these brackish habitats in the South Bay is not well understood, early indications are that populations in the brackish marshes are not as dense as those in mature salt marsh dominated by pickleweed. The salt marsh that does exist typically has little to no high marsh or escape cover (see Figure 3.6-7); and
- A small population of western pond turtles (*Clemmys marmorata*) is present along the northern edge of Moffett Federal Airfield and the Sunnyvale WPCP.

Phase 1 Action Areas. Characteristics of individual ponds that were chosen for Phase 1 of the SBSP Restoration Project are discussed below.

Pond A6.

Pond A6 (also called the Knapp Tract) is approximately 330 acres in size and is bordered by Guadalupe Slough on the west and Alviso Slough on the east. The northern portion of Pond A6 is bordered by Coyote Creek. Ponds A5 and A7 border Pond A6 on its southern edge. Pond A6 is currently managed as a Seasonal Pond. As mentioned above, this pond contains the second largest California gull colony in the state, with more than 9,700 breeding pairs in 2006. While small numbers of western snowy plovers have nested here in the past, they do not currently nest in this pond given the large gull numbers. This pond is mostly dry through the summer, but shallow water during winter provides foraging habitat for shorebirds and other waterbirds. Winter salinities are moderate (*e.g.*, a low salinity of 46 ppt in January 2005), but summer salinities in the surrounding borrow channel are high (*e.g.*, a high salinity of 329 ppt in September 2004). A small amount of tidal salt marsh is present along the outboard levees of Pond A6, but this vegetation is unlikely to provide breeding habitat for California clapper rails due to the narrow shape of the marsh.

Pond A8.

Pond A8 is approximately 410 acres in size and is located at the upstream extent of Alviso Slough near the community of Alviso. Fringing tidal marsh borders the northern and eastern edges of Pond A8. Ponds A5 and A7 border the western edge and Pond A8S borders the southern edge of the pond. Pond A8 is currently managed as a Seasonal Pond. Due to slightly deeper water, this pond has

more moderate year-round salinities than Pond A6. Shallow water and patches of dry habitat provide foraging and roosting opportunities for shorebirds during summer and fall, and shallow to moderate water levels during winter provide habitat for waterfowl and other waterbirds. Large numbers of Forster's terns, black skimmers, and American avocets have nested on islands in Pond A8, and western snowy plovers nest sporadically (though not every year) on remnant levees and pannes within the pond. Surveys conducted by USGS from 2002 to 2005 detected large numbers of eared grebes, gulls, American avocets, Black-necked stilts, and western sandpipers using this pond (Takekawa and others 2005).

Pond A16.

Pond A16 is approximately 240 acres in size and is located north of the Refuge's Alviso Education Center and New Chicago Marsh and west of Artesian Slough. The railroad right-of-way is west of Pond A16 and farther west are Ponds A13 and A15. Pond A16 is currently managed as Muted Tidal.

Salinity varies throughout the year, but is moderate (*e.g.,* 28 ppt in June 2005; 114 ppt in October 2002). Pond A16 provides foraging and roosting habitat for shorebirds, and foraging habitat for waterfowl and other waterbirds. Surveys conducted by USGS from 2002 to 2005 detected large numbers of eared grebes, gulls, and American avocets using this pond (Takekawa and others 2005).

Forster's terns, American avocets, and a few pairs of black skimmers and Black-necked stilts have nested on islands within this pond. Salt marsh harvest mouse habitat is present south of Pond A16 in New Chicago Marsh, and to the north in Triangle Marsh.

Ravenswood. Mudflat and open water bay habitats are found in the Ravenswood pond complex. Open-water habitat exists throughout the pond complex in the historic slough channels. Mudflat habitat has formed at the mouth of Ravenswood Slough. The pond complex primarily includes salt marsh and peripheral halophyte marsh habitats. A large expanse of mudflat lies to the north and east of the pond complex.

Vegetation. The Ravenswood pond complex is surrounded by salt marsh, consisting of cordgrass marsh along the lower elevation fringes of the marsh and pickleweed marsh in the higher elevation marsh plain. There are some patches of salt marsh dominated by other species, particularly along the southern edge of the pond complex. Peripheral halophyte vegetation borders the salt marsh in much of the transitional zone to upland areas. Upland vegetation is also found at higher elevations around the salt marsh boundary, often bordering the levees. There is one small area of freshwater marsh along the southern boundary of the Ravenswood pond complex.

Wildlife. Characteristics of ponds such as salinity and depth may change rapidly, influencing wildlife use. In particular, changes in salinity and depth that may occur seasonally or among years may affect the abundance and species composition of invertebrates, fish, and feeding and roosting assemblages of birds, in ponds. However, based on recent monitoring conducted by USGS, SFBBO, and others, the most prominent wildlife resources and patterns of wildlife distribution in the Ravenswood pond complex and vicinity in recent years are as follows:

- Moderately large numbers of western snowy plovers breed and winter in salt ponds throughout the Ravenswood pond complex (see Figure 3.6-6);
- Large numbers of shorebirds forage on mudflats north and east of the Ravenswood pond complex at low tide;
- Large numbers of shorebirds roost, and forage to varying degrees, in Ponds R1, R2, and SF2 (see Figure 3.6-3);
- American avocets, black skimmers, Forster's terns, and Caspian terns have nested on islands in Pond R1 (see Figure 3.6-4);
- Pond R1 is regularly used as a foraging and roosting area by California least terns during the post-breeding period in late summer. These terns often forage on the Bay off this pond;
- California clapper rails occur along Ravenswood Slough, but otherwise California clapper rail habitat is very limited in this pond complex, while it is much more extensive on Greco Island to the northwest and in East Palo Alto and Palo Alto marshes to the south;
- Pond R1 supports large numbers of piscivorous birds; and
- Salt marsh harvest mouse habitat is very limited in extent and quality (*i.e.*, the tidal marshes are very narrow and have little to no escape cover) (see Figure 3.6-7). Even in more expansive tidal marsh areas nearby, such as at Greco Island, the extent of high marsh habitat and upland transition zones (for refugia during the highest spring tides) is limited enough to constrain habitat quality for the salt marsh harvest mouse.

Phase 1 Action Areas. Characteristics of individual ponds that were chosen for Phase 1 of the SBSP Restoration Project are discussed below.

Pond SF2.

Pond SF2 is approximately 240 acres in size and is adjacent to the Dumbarton Bridge and San Francisco Bay. Pond SF2 is bordered by diked marsh to the southwest and the southeast, and a small section of upland habitat borders the pond to the south. The northeast portion of the pond borders narrow fringe marsh along the Bay. Pond SF2 is currently managed as a Seasonal Pond. Portions of this pond are dry during summer, providing nesting habitat for western snowy plovers. Shallow water habitats provide foraging and roosting habitat for shorebirds, and surveys conducted by USGS from 2002 to 2005 detected large numbers Western sandpipers and dunlin using this pond (Takekawa and others 2005).

Other Notable South Bay Wildlife Resources Outside the SBSP Restoration Project Area

The most prominent wildlife resources and patterns of wildlife distribution within the general South Bay area are as follows:

- Steelhead use estuarine habitats as rearing habitat for juveniles, and move through the study area on their migrations to and from upstream spawning areas;
- Large numbers of shorebirds forage on intertidal mudflats ringing the South Bay during low tide and roost (and, variably, forage) in salt ponds and other alternate habitats at high tide;

- California gulls nest on levees between salt ponds in the Mowry pond complex between Ponds M1 and M2 (and formerly between Ponds M4 and M5), and in the Newark pond complex between Ponds N1A and N2A (see Figure 3.6-5);
- Concentrations of Black-necked stilts and American avocets nest on levees between salt ponds, and on islands, within the Mowry and Newark pond complexes, and western snowy plovers historically nested on these levees (see Figure 3.6-5);
- Caspian terns nest on levees between Ponds N3A and N2A in the Newark pond complex, and in the 1990s nested between Ponds M3 and M4, and between M4 and M5, in the Mowry pond complex west/northwest of Mud Slough (see Figure 3.6-4). Forster's terns have recently nested on levees and islands in the vicinity of Ponds N2A, N1, N3, and N6 (and formerly in M4 and M5). Black skimmers have nested in Pond N2A in the Newark pond complex;
- Major shorebird roosts are present in salt ponds (and on associated levees) in the northern part of the Newark pond complex (Ponds NA1, NA2, and NA3), and in the ponds immediately south of SR 84 on the east side of the Bay (Ponds N1, N2, and N3) (see Figure 3.6-3);
- The largest harbor seal haul-out in the South Bay occurs along lower Mowry Slough. Other areas frequently used as haul-out sites are near Calaveras Point, at Dumbarton Point, on Greco and Bair Islands, and along Corkscrew Slough; and
- California clapper rail and salt marsh harvest mouse habitat in most areas is limited in extent and quality (*i.e.*, the tidal marshes are very narrow and have little to no escape cover) (see Figure 3.6-7). Relatively large marshes occur on Dumbarton Point, between Newark and Mowry Sloughs, at the Palo Alto Baylands, and on Greco and Bair Islands. However, even in these areas, the extent of high marsh habitat and upland transition zones (for refugia during the highest spring tides) is limited enough to constrain habitat quality for the salt marsh harvest mouse.

Special-Status Plant Species

The special-status plant species that occur in the South Bay in the vicinity of the SBSP Restoration Project are discussed in this section. The most current and historic pertinent information were reviewed to compile a list of species considered for occurrence within the SBSP Restoration Project Area. In addition, each species was queried under several data bases to determine both historic and current range, including the CDFG CNDDB (Rarefind 2007), CNPS Inventory (http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi), the Jepson Interchange for California floristics (http://ucjeps.berkeley.edu/interchange.html), the Consortium of California Herbaria (http://ucjeps.berkeley.edu/cgi-bin/get_consort), Calflora, and the USDA Plants Database (http://plants.usda.gov/index.html). These sources represent the most current, up to date data available regarding special-status plant distribution within California. The SBSP Restoration Project pond complexes themselves are not expected to support special-status plants: vascular plants are entirely absent from artificial, hypersaline ponds, and levees and remnant marshes provide peripheral halophytic habitat bearing little resemblance to the broad, relatively heterogeneous habitat of intact upper marsh. However, special-status plants may once have occurred in the natural salt pannes, sandy deposits, and slough channels of the former marsh, and habitat still exists in the general area of effect of the SBSP Restoration Project.

The majority of species, including all the rare and endemic plants of the SBSP Restoration Project Area, are associated with sub-habitats of the upper marsh (*e.g.*, salt panne, intertidal marsh ponds, high marsh ecotonal areas) or with other tidal wetland habitats. The potential for special-status plants to occur within the SBSP Restoration Project Area and vicinity was assessed in summer 2004. The assessment was based on the following factors: 1) the occurrence of species-specific hydrological requirements and microhabitat variables within the SBSP Restoration Project Area; 2) the occurrence of known associated species; and 3) the proximity and date of documented occurrences and published accounts of species distributions. A total of 47 special-status plant species were identified in the geographic area of this assessment. Of these 47, only 13 are known to occur in habitats similar to those found in the SBSP Restoration Project Area (Table 3.6-3).

No special-status plants have been documented within the boundaries of the Eden Landing or Ravenswood pond complexes (CDFG 2004a). Numerous occurrences of five species, including Congdon's tarplant, prostrate navarretia (*Navarretia prostrata*), alkali milk vetch (*Astragalus tener* var. *tener*), Contra Costa goldfields (*Lasthenia conjugens*), and San Joaquin spearscale (*Atriplex joaquiniana*), have been documented in the vicinity of the Alviso pond complex. However, these occurrences are located exclusively within the Pacific Commons Preserve, just north of Pond A22, except for Congdon's tarplant records adjacent to Stevens Creek in 2002 (Porcella, pers. comm. 2006) and at the Sunnyvale Baylands Park south of Pond A8 (CNDDB 2006).

Special-Status Wildlife Species

Special-status animal species that occur in the SBSP Restoration Project Area and adjacent habitats are shown in Figure 3.6-2. The legal status and likelihood of occurrence of these species are provided in Table 3.6-4. A number of special-status species occur in the Project Area as visitors, migrants, or foragers but are not known or expected to breed in the immediate Project Area. Animals that occasionally occur within the Project Area and breed in upland habitats in the greater South Bay Area, but occur only in the SBSP Restoration Project Area as uncommon to rare foragers, include the bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), Vaux's swift (*Chaetura vauxi*), California yellow warbler (*Dendroica petechia brewsteri*), bank swallow (*Riparia riparia*), and pallid bat (*Antrozous pallidus*). Species that occur in the Project Area regularly as foragers, but have "special status" only at nesting sites elsewhere in California, include the common loon (*Gavia immer*), American white pelican, Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), osprey (*Pandion haliaetus*), Barrow's goldeneye (*Bucephala islandica*), long-billed curlew, and elegant tern (*Sterna elegans*).

Expanded species accounts for most of these species can be found in the Goals Project Baylands Ecosystem Species and Community Profiles (Goals Project 2000) and in the Biology and Habitats Existing Conditions report (PWA and others 2004).

Table 3.6-3 Special-status Plant Species, Their Status, and Potential Occurrence in the South Bay Salt Ponds Project Area (According to the California Native Plant Society (CNPS)

NAME	STATUS	HABITAT/ DESCRIPTION	POTENTIAL FOR OCCURRENCE ON SITE
Federal or State Threatened or Endangered Species			
Contra Costa goldfields (*Lasthenia conjugens*)	FE, CNPS 1B	Saline/alkaline vernal pools, mesic areas within grassland. Known from Alameda, Solano, Monterey, Contra Costa, and Napa counties. Annual; blooms March through June.	Historically known from edges of salt ponds at the Bay shore near Mt. Eden and Newark. Two large colonies associated with grassy seasonal wetlands in the Warm Springs area and Pacific Commons Preserve in Fremont are within the South Bay, but there is no suitable habitat present in the SBSP Restoration Project Area. Otherwise occurs in disjunct populations in Monterey and North Bay areas
Mason's lilaeopsis (*Lilaeopsis masonii*)	SR, CNPS 1B	Exposed banks of tidal meanders and channels within brackish to freshwater marsh. Locally common in Suisun Marsh. Perennial; blooms April through November.	Not known to occur in the South Bay Project Area; historic and current records in Suisun Bay area only.
California seablite (*Suaeda californica*)	FE, CNPS 1B	Sandy, high-energy shorelines within salt marsh. Relictual populations in South Bay considered extirpated; known only from Morro Bay, San Luis Obispo county.	Extirpated from the South Bay Project Area; suitable habitat occurs within Eden Landing pond complex and Ravenswood pond complex on oyster hash/sand beaches
State Rare and CNPS Species			
Coastal marsh milk-vetch (*Astragalus pycnostachyus* var. *pycnostachyus*)	FSC, CNPS 1B	Coastal salt marshes, streamsides, and mesic coastal dunes in Marin and San Mateo counties. Perennial; blooms April to October.	Not known to occur in South Bay area; no suitable habitat in SBSP Restoration Project Area (extant populations associated with maritime salt marsh).
Alkali milk-vetch (*Astragalus tener* var. *tener*)	FSC, CNPS 1B	Alkaline soils in playas, vernal pools, and adobe clay areas within grassland. Alameda, Merced, Solano, and Yolo counties. Annual; blooms March to June.	A recently rediscovered population in seasonal wetlands at the Pacific Commons Preserve in Fremont. Considered extirpated from Santa Clara County. Currently no suitable habitat in SBSP Restoration Project Area.
San Joaquin saltbush (*Atriplex joaquiniana*)	FSC, CNPS 1B	Alkaline soils within chenopod scrub, meadows, playas, and grasslands in 14 central California counties. Annual; blooms April through October.	Potentially occurs in seasonal wetlands in Warm Springs vicinity, and known from Pacific Commons Preserve. Currently no suitable habitat present in SBSP Restoration Project Area.

Table 3.6-3 Special-status Plant Species, Their Status, and Potential Occurrence in the South Bay Salt Ponds Study Area (Continued)

NAME	STATUS	HABITAT/ DESCRIPTION	POTENTIAL FOR OCCURRENCE ON SITE
Congdon's tarplant (*Centromadiaa parryi* ssp. *congdonii*)	CNPS 1B	Moist, alkaline soils within grassland. Tolerates disturbance. Annual; blooms June through November. Known from Alameda, Monterey, San Luis Obispo, and Santa Clara counties.	Known from several locations in Newark, Fremont, Alviso, and Sunnyvale. Slight potential for occurrence in peripheral halophyte or disturbed upland zones in SBSP Restoration Project Area, but not currently associated with salt marsh.
Point Reyes bird's-beak (*Cordylanthus maritimus* spp. *palustris*)	FSC, CNPS 1B	Coarser substrates within salt marsh (high marsh pannes, sandy barrier beaches). Known from Marin County north to Oregon. Annual; blooms June through October.	Extirpated from the South Bay area. Currently no suitable habitat present in SBSP Restoration Project Area. Expected to occur and be suited for reintroduction in high salt marsh with low or sparse cover, such as vegetation gaps in high marsh panne-salt marsh edges
Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*)	CNPS 1B	High marsh zone in brackish and freshwater marshes. Known from Suisun Marsh (Sacramento, San Joaquin, Solano and Contra Costa counties) and Napa marshes. Perennial; blooms May through September.	Historic and current records from North Bay area only.
Prostrate navarretia (*Navarretia prostrata*)	FSC, CNPS 1B	Seasonal wetlands and vernal pools within grassland and coastal scrub. Ranges from Monterey County south to San Diego. Annual; blooms April through July.	In South Bay Area, known only from Pacific Commons Preserve in Fremont. Currently no suitable habitat present in SBSP Restoration Project Area.
Hairless popcorn-flower (*Plagiobothrys glaber*)	FSC, CNPS 1A	Formerly known from alkali meadows and coastal salt marshes and swamps. Extirpated throughout its range; last documented occurrence in 1954.	Presumed extinct.
Delta woolly-marbles (*Psilocarphus brevissimus* var. *multiflorus*)	CNPS 4	Dried beds of vernal pools and flats, especially in grasslands, in Alameda and Santa Clara counties north to Yolo County. Annual; blooms April to June.	Suitable habitat for Delta wooly-marbles occurs within vernal pool habitat adjacent to the SBSP Restoration Project Area. Currently no suitable habitat present in SBSP Restoration Project Area.

Table 3.6-3 Special-status Plant Species, Their Status, and Potential Occurrence in the South Bay Salt Ponds Study Area (Continued)

NAME	STATUS	HABITAT/ DESCRIPTION	POTENTIAL FOR OCCURRENCE ON SITE
Saline clover (*Trifolium depauperatum* var. *hydrophilum*)	FSC, CNPS 1B	Edges of salt marshes, alkali meadows, and vernal pools along the coast from Sonoma County south to San Luis Obispo, as well as in the inland counties of Solano and Colusa. Annual; blooms April through June.	Historic collection (type locality) from Belmont; not recorded since 1886 in the South Bay. Currently no high-quality habitat present in the immediate SBSP Restoration Project Area.
Suisun aster (*Symphiotrichum lentum*; syn *Aster lentus*).	CNPS 1B	Brackish and freshwater marshes and swamps	Suitable habitat exists in most brackish or fresh-brackish high marsh edges, wastewater discharges near Alviso have expanded suitable habitat of this robust, clonal, perennial species, which is likely dispersal limited.

Notes:
CNPS List 1A = Plants considered extinct
CNPS List 1B = Plants rare, threatened or endangered in California and elsewhere
CNPS List 4 = Plants of limited distribution watch list
FE = Federally-listed endangered
FSC = Federal Species of Concern
SR = California Rare

Table 3.6-4 Special-status Animal Species, Their Status, and Potential Occurrence in the South Bay Salt Ponds Project Area

NAME	STATUS	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE
Federal or State Threatened or Endangered Species			
Green sturgeon, Southern Distinct Population Segment (*Acipenser medirostris*)	FT	Spends majority of life in nearshore oceanic waters, bay, and estuaries; spawns in fresh water rivers.	Spawns in Sacramento River, but not known to spawn in South Bay. Expected to occur only as a rare and irregular visitor to estuarine habitats in the South Bay, if it occurs at all.
California tiger salamander (*Ambystoma californiense*)	FT, CSSC	Vernal or temporary pools in annual grasslands, or open stages of woodlands.	A population is present on National Wildlife Refuge (NWR) lands in the Fremont/Warm Springs area, though not in the immediate SBSP pond complexes.
Bald eagle (*Haliaeetus leucocephalus*)	SE, SP	Occurs mainly along seacoasts, rivers and lakes; nests in tall trees or in cliffs. Feeds mostly on fish.	Rare visitor, primarily during winter, to the Project Area. May occasionally forage, but does not nest, in the study area.
American peregrine falcon (*Falco peregrinus anatum*)	SE, SP	Forages in many habitats; nests on cliffs and similar human-made structures.	Regular forager (on other birds) in the study area, primarily during migration and winter. In the Alviso Complex, one pair nested on an electrical tower in 2006, and two pairs nested on towers in 2007.
California clapper rail (*Rallus longirostris obsoletus*)	FE, SE, SP	Salt and brackish marsh habitat usually dominated by pickleweed and cordgrass.	Resident in many tidal marshes and sloughs in the study area.
California least tern (*Sterna antillarum browni*)	FE, SE, SP	Nests along the coast on bare or sparsely vegetated flat substrates.	The South Bay is an important post-breeding staging area for California least terns. Recent breeding by small numbers has occurred at Hayward Regional Shoreline and Eden Landing Pond E8A Forages and roosts in a number of South Bay ponds, especially Alviso ponds in the vicinity of Moffett Federal Airfield.
California brown pelican (*Pelecanus occidentalis californicus*)	FE, SE, SP	Occurs in nearshore marine habitats and coastal bays. Nests on islands in Mexico and southern California.	Regular during nonbreeding season (summer and fall) in study area. Roosts on levees in the interiors of pond complexes, forages in salt ponds and Bay.
Salt marsh harvest mouse (*Reithrodontomys r. raviventris*)	FE, SE, SP	Salt marsh habitat dominated by pickleweed.	Occurs in pickleweed marshes within the study area.

Table 3.6-4 Special-status Animal Species, Their Status, and Potential Occurrence in the South Bay Salt Ponds Project Area (Continued)

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE
Steelhead – California Central Coast ESU (*Oncorhynchus mykiss*)	FT	Cool streams with suitable spawning habitat and conditions allowing migration, as well as marine habitats.	Known to be present in several South Bay creeks (including Coyote, Stevens, San Francisquito, and Alameda Creeks and the Guadalupe River) and associated slough channels within the study area. Suitable spawning habitat is not present in the study area, but this species moves through the area to spawn upstream.
California black rail (*Laterallus jamaicensis coturniculus*)	ST, SP	Breeds in fresh, brackish, and tidal salt marsh.	Non-breeding individuals winter in small numbers in tidal marsh within the study area, but the species is not currently known to breed in the South Bay.
Western snowy plover (*Charadrius alexandrinus nivosus*)	FT, CSSC	Nests on sandy beaches and salt panne habitats.	Resident within the study area. Greatest numbers at Eden Landing and Ravenswood ponds. Additional birds occur in the study area during winter.
Bank swallow (*Riparia riparia*)	ST	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	Observed in the study area as rare transient. No suitable breeding habitat in the study area.
California Species of Special Concern			
Fall-run chinook salmon – Central Valley ESU (*Oncorhynchus tshawytscha*)	CSSC	Cool rivers and large streams that reach the ocean and that have shallow, partly shaded pools, riffles, and runs.	Known to be present in several South Bay creeks (including Coyote Creek, Alameda Creek, and the Guadalupe River) and associated slough channels within the study area. Suitable spawning habitat is not present in the study area, but this species moves through the area to spawn upstream along some of these creeks.
Western pond turtle (*Clemmys marmorata*)	CSSC	Permanent or nearly permanent fresh or brackish water in a variety of habitats.	Uncommon along the inshore side of Pond A3W. May occur rarely in freshwater and brackish creeks and sloughs elsewhere in the study area.
Common loon (*Gavia immer*)	CSSC (nesting)	Nests in freshwater marshes, winters in coastal marine habitats.	Occasional winter visitor; does not breed in the study area.
American white pelican (*Pelecanus erythrorhnchos*)	CSSC (nesting)	Forages in freshwater lakes and rivers, nests on islands in lakes.	Common non-breeder, foraging primarily on salt ponds in the study area. Regular visitor from late summer to spring. Not known to breed on site.

Table 3.6-4 Special-status Animal Species, Their Status, and Potential Occurrence in the South Bay Salt Ponds Project Area (Continued)

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE
Double-crested cormorant (*Phalacrocorax auritus*)	CSSC (nesting)	Colonial nester on coastal cliffs, offshore islands, electrical transmission towers, and along interior lake margins. Feeds on fish.	Breeds on electrical transmission towers and on levees within the study area, and forages in ponds and other open-water habitats in the study area.
White-faced ibis (*Plegadis chihi*)	CSSC (nesting)	Forages in freshwater marshes, and to a lesser extent, brackish areas.	Occasional visitor in fall and winter. Has bred in heron rookery on Mallard Slough, but no current nesting known.
Barrow's goldeneye (*Bucephala islandica*)	CSSC (nesting)	Nests in freshwater marshes, winters in coastal marine habitats.	Uncommon winter visitor; does not breed in the study area.
Northern harrier (*Circus cyaneus*)	CSSC (nesting)	Nests and forages in marshes, grasslands, and ruderal habitats.	Breeds in small numbers in marsh in the study area, forages in a variety of habitats.
Sharp-shinned hawk (*Accipiter striatus*)	CSSC (nesting)	Nests in woodlands, forages in many habitats in winter and migration.	Observed on site as a migrant and winter resident. No breeding habitat in study area.
Cooper's hawk (*Accipiter cooperii*)	CSSC (nesting)	Nests in woodlands, forages in many habitats in winter and migration.	Observed on site as a migrant and winter resident. Breeds in limited numbers in upland habitats adjacent to the study area, within the South Bay, but not within the immediate SBSP Restoration Project pond complexes.
Osprey (*Pandion haliaetus*)	CSSC (nesting)	Nests in tall trees or cliffs on freshwater lakes and rivers and along seacoast; feeds on fish.	Occasional forager, primarily during the nonbreeding season. No breeding records from the vicinity of the study area.
Golden eagle (*Aquila chrysaetos*)	CSSC	Breeds on cliffs or in large trees or electrical towers, forages in open areas.	Occasional forager, primarily during the nonbreeding season. No nesting records within the study area.
Merlin (*Falco columbarius*)	CSSC	Uses many habitats in winter and migration.	Regular in low numbers during migration and winter. Does not nest in California.
Long-billed curlew (*Numenius americanus*)	CSSC (nesting)	Nests on prairies and short-grass fields; forages on mudflats, marshes, pastures, and agricultural fields.	Forages on mudflats and marshes, and roosts on levees, diked marshes, and ponds within the study area as a migrant and winter resident. Does not nest in the study area.
California gull (*Larus californicus*)	CSSC (nesting)	Nests on lakes inland and, around S. F. Bay, in salt ponds.	Common resident, breeding on several salt ponds in the study area. The colony in Pond A6 is the second largest colony in California. Forages throughout study area. Nuisance concern for this species linked to Adaptive Management.

Table 3.6-4 Special-status Animal Species, Their Status, and Potential Occurrence in the South Bay Salt Ponds Project Area (Continued)

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE
Black skimmer (*Rynchops niger*)	CSSC (nesting)	Nests on abandoned levees and islands in salt ponds and marshes.	A few pairs breed and forage in the study area, on islands in salt ponds.
Short-eared owl (*Asio flammeus*)	CSSC (nesting)	Nests on ground in tall emergent vegetation or grasses, forages over a variety of open habitats.	Uncommon. Has bred in small numbers within the study area, although current breeding status unknown. Most numerous in area in migration and winter.
Western burrowing owl (*Athene cunicularia hypugea*)	CSSC	Flat grasslands and ruderal habitats.	Nests in Pond A22 levee, and at several upland sites immediately adjacent to the SBSP Restoration Project Area pond complexes, and may forage within marshes to some extent.
Vaux's swift (*Chaetura vauxi*)	CSSC (nesting)	Nests in snags in coastal coniferous forests or, occasionally, in chimneys; forages aerially.	Forages over study area during spring. No nesting habitat within area.
Loggerhead shrike (*Lanius ludovicianus*)	CSSC (nesting)	Nests in dense shrubs and trees, forages in grasslands, marshes, and ruderal habitats.	Resident in low numbers within the study area.
California horned lark (*Eremophila alpestris actia*)	CSSC	Short-grass prairie, annual grasslands, coastal plains, and open fields.	Common in the study area during nonbreeding season. May nest in small numbers on salt pond levees, salt flats, and ruderal habitats within study area.
California yellow warbler (*Dendroica petechia brewsteri*)	CSSC (nesting)	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	Observed on site as a migrant. No nesting habitat within the immediate SBSP pond complexes, but nests in riparian habitat upstream from the Bay, including areas within the South Bay.
Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)	CSSC	Breeds primarily in fresh and brackish marshes in tall grass, tules, willows; low-density resident in salt marshes, which are used more in winter.	Common resident, breeding in freshwater and brackish marshes, and to a lesser extent in salt marshes; forages in all three marsh types during the nonbreeding season.
Alameda song sparrow (*Melospiza melodia pusillula*)	CSSC	Breeds in salt marsh, primarily in marsh gumplant and cordgrass along channels.	Common resident, breeding and foraging in tidal salt marsh.
Tricolored blackbird (*Agelaius tricolor*)	CSSC (nesting)	Breeds near freshwater in dense emergent vegetation.	May breed in extensive freshwater marshes around the periphery of the study area, such as at Coyote Hills. Occurs elsewhere in the study area as a nonbreeding forager.

Table 3.6-4 Special-status Animal Species, Their Status, and Potential Occurrence in the South Bay Salt Ponds Project Area (Continued)

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE
Salt marsh wandering shrew (*Sorex vagrans halicoetes*)	CSSC	Occurs in middle and high marsh zones with abundant driftwood and pickleweed.	May occur in salt marshes throughout the study area, although numbers have declined, and current status is unknown.
State Protected Species			
White-tailed kite (*Elanus caeruleus*)	SP (nesting)	Nests in tall shrubs and trees, forages in grasslands, marshes, and ruderal habitats.	Common resident; breeds at inland margins of the study site, where suitable nesting habitat occurs.

Notes:
FE = Federally listed Endangered
FT = Federally listed Threatened
FPD = Federally Proposed for Delisting
SE = State-listed Endangered
ST = State-listed Threatened
CSSC = California Species of Special Concern
SP = State Fully Protected Species

3.6.2 Regulatory Setting

Below are the pertinent regulations that are relevant to the biological resources of the SBSP Restoration Project Area.

Federal Regulations

Waters of the United States Regulations Overview

Areas meeting the regulatory definition of "Waters of the US" (jurisdictional waters) are subject to the jurisdiction of the Corps under provisions of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. These waters may include all waters used, or potentially used, for interstate commerce, including all waters subject to the ebb and flow of the tide, all interstate waters, all other waters (intrastate lakes, rivers, streams, mudflats, sandflats, playa lakes, natural ponds, etc.), all impoundments of waters otherwise defined as "Waters of the US," tributaries of waters otherwise defined as "Waters of the U. S.," the territorial seas, and wetlands (termed Special Aquatic Sites) adjacent to "Waters of the US" (33 CFR, Part 328, Section 328.3). Wetlands on non-agricultural lands are identified using the *Corps of Engineers Wetlands Delineation Manual Environmental Laboratory 1987*.

Federal Endangered Species Act (FESA)

The federal Endangered Species Act (FESA) protects listed fish and wildlife species from harm or "take" which is broadly defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Take can also include habitat modification or degradation that directly results in death or injury to a listed wildlife species. An activity can be defined as "take" even if it is unintentional or accidental. Listed plant species are provided less protection than listed wildlife species.

Listed plant species are legally protected from take under FESA if they occur on federal lands or if the project requires a federal action, such as a Section 404 fill permit.

USFWS has jurisdiction over federally listed threatened and endangered wildlife species under the FESA, while the National Marine Fisheries Service, or "NOAA Fisheries", has jurisdiction over federally listed, threatened and endangered, marine and anadromous fish. These agencies also maintain lists of species proposed for listing. Species on these lists are not legally protected under the FESA, but may become listed in the near future and are often included in their review of a project.

Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA)

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) governs all fishery management activities that occur in federal waters within the United States 200 nautical mile limit. The Act establishes eight Regional Fishery Management Councils responsible for the preparation of fishery management plans to achieve the optimum yield from US fisheries in their regions. These councils, with assistance from NOAA Fisheries, establish Essential Fish Habitat (EFH) in fishery management plans for all managed species. Federal agencies that fund, permit, or implement activities that may adversely affect EFH are required to consult with NOAA Fisheries regarding potential adverse effects of their actions on EFH, and respond in writing the NOAA Fisheries' recommendations.

Federal Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (16 USC Sec. 703) 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.

Marine Mammal Protection Act

The 1972 Marine Mammal Protection Act (16 USC Sec. 1361–1407) was enacted to conserve marine mammals, including cetaceans, pinnipeds, and other marine mammal species. With certain exceptions, the Act prohibits the taking and importation of marine mammals as well as products taken from them. Relevant to the SBSP Restoration Project, this Act prohibits harassment of marine mammals, including the harbor seal.

State Regulations/Agencies

California Department of Fish and Game Jurisdiction

Habitats potentially under the regulatory jurisdiction of CDFG are described under Division 2, Chapter 6, Section 1600–1607 of the Fish and Game Code of California. CDFG potentially extends the definition of stream to include "intermittent and ephemeral streams, rivers, creeks, dry washes, sloughs, blue-line streams, and watercourses with subsurface flows. Canals, aqueducts, irrigation ditches, and other means of water conveyance can also be considered streams if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife" (Environmental Services 1994). Such areas on site were determined

using methodology described in A Field Guide to Lake and Streambed Alteration Agreements, Sections 1600–1607 (Environmental Services 1994).

Under Section 1600–1607 of the Fish and Game Code of California, CDFG does not claim jurisdiction over saltwater habitats including diked, muted, and tidal salt marsh similar to that found within the SBSP Restoration Project Area.

Other sections of the Fish and Game Code of California protect various groups of wildlife species, including fish, crustaceans, mollusks, birds, mammals, reptiles, and amphibians.

San Francisco Bay Conservation and Development Commission

The San Francisco BCDC is a California state agency. BCDC jurisdiction in the Project Area extends over the Bay, up to mean high tide and to five ft above mean sea level in marshes; and over a 100-ft shoreline band inland from the line of mean high tide or the line five ft above mean sea level adjacent to marshes. BCDC also has certain waterway jurisdiction in the Project Area, along Coyote Creek (and branches) in Alameda and Santa Clara counties, to the easternmost point of Newby Island. BCDC does not have 100-ft shoreline band jurisdiction adjacent to its certain waterway jurisdiction. BCDC also has salt pond jurisdiction consisting of all areas which have been diked off from the Bay and have been used during the three years from August 1966 to August 1969 for the solar evaporation of Bay water in the course of salt production. The SBSP Restoration Project would require a BCDC permit or consistency determination for dredging and filling, shoreline improvements or substantial changes in use. BCDC is responsible for enforcing the McAteer-Petris Act, which requires that "maximum feasible public access, consistent with a project be included as part of each project to be approved by the BCDC." BCDC is also responsible for determining consistency with the federal Coastal Zone Management Act.

The federal Coastal Zone Management Act and the California Coastal Act require the BCDC to review federal projects, projects that require federal approval or projects that are supported by federal funds. The BCDC Bay Plan (Bay Plan) promotes Bay conservation along with shoreline development and public access. BCDC has adopted policies that specifically address public access and wildlife compatibility, where in some "cases public access would be clearly inconsistent with the project because of public safety considerations or significant use conflicts, including unavoidable, significant adverse effects on Bay natural resources."

BCDC jurisdiction in the Project Area extends over the Bay, to five ft above mean sea level in marshes and over a 100-ft shoreline band inland from the line of mean high tide. The SBSP Restoration Project would require a BCDC permit for dredging and filling and shoreline improvements.

San Francisco Bay Regional Water Quality Control Board

The RWQCB has primary authority for implementing provisions of the federal Clean Water Act and California's Porter-Cologne Water Quality Control Act. These statutes establish the process for developing and implementing planning, permitting, and enforcement authority for waste discharges to land and water. The *Water Quality Control Plan, San Francisco Bay Region* (Basin Plan) establishes

beneficial uses for surface and groundwater resources and sets regulatory water quality objectives that are designed to protect those beneficial uses (San Francisco Bay RWQCB 1995). Under the current Basin Plan, designated beneficial uses of the San Francisco Bay Area's surface waters include municipal and domestic supply; agricultural supply; industrial service supply; groundwater recharge; contact and non-contact recreation; warm freshwater fish habitat; cold freshwater fish habitat; wildlife habitat; migration of aquatic organisms; and spawning, reproduction, and/or early development of fish.

The Basin Plan provides a program of actions designed to preserve and enhance water quality and to protect beneficial uses. It meets the requirements of the USEPA and establishes conditions related to discharges that must be met at all times.

The implementation portion of the Basin Plan includes descriptions of specific actions to be taken by local public entities and industries to comply with the Basin Plan's policies and objectives. These include measures for urban runoff management and wetland protection.

The SBSP Restoration Project would be designed to comply with RWQCB permitting requirements. USFWS and CDFG would prepare and conform to a Storm Water Pollution Prevention Plan, as required under the State Water Resources Control Board implemented NPDES Permit program for construction activities and conform to a SWPPP, as required under the State Water Resources Control Board. The SWPPP would identify specific measures for reducing construction impacts such as erosion and sediment control measures.

The SBSP Restoration Project would involve construction activities that could adversely affect water quality and therefore Alternatives B and C would require acquisition of a Clean Water Act Section 401 water quality certification from the RWQCB.

The San Francisco Bay RWQCB also has established sediment screening criteria and testing requirements for the beneficial reuse of dredged material (*e.g.*, wetlands creation and upland disposal). All sediment used for creation of upland habitat would be screened to meet wetland cover standards set by the RWQCB.

California Endangered Species Act (CESA)

The California Endangered Species Act (CESA) prohibits the take of any plant or animal listed or proposed for listing as rare (plants only), threatened, or endangered. In accordance with the CESA, CDFG has jurisdiction over state-listed species (California Fish and Game Code 2070). Additionally, CDFG maintains lists of "species of special concern" that are defined as species that appear to be vulnerable to extinction because of declining populations, limited ranges, and/or continuing threats.

Regional/Local Regulations and Related Programs

San Francisco Estuary Invasive Spartina Project

The Invasive Spartina Project is in the process of implementing a coordinated, region-wide eradication program, comprising a number of on-the-ground treatment techniques to stave off a San Francisco Bay

invasion of nonnative cordgrass (*Spartina alterniflora* and its hybrids, as well as *S. densiflora, S. patens, and S. anglica*) (California Coastal Conservancy and USFWS 2003). The Invasive Spartina Project is focused within the nearly 40,000 acres of tidal marsh and 29,000 acres of tidal flats that comprise the shoreline areas of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma, and Sacramento counties. The purpose of the Invasive Spartina Project is to arrest and reverse the spread of invasive non-native cordgrass species in the Estuary in order to preserve and restore the ecological integrity of the Estuary's intertidal habitats and estuarine ecosystem.

Association of Bay Area Governments San Francisco Bay Trail Plan

The plan for the Bay Trail proposes development of a regional hiking and bicycling trail around the perimeter of San Francisco and San Pablo Bays. The Bay Trail Plan was prepared by the Association of Bay Area Governments (ABAG) pursuant to Senate Bill 100, which mandated that the Bay Trail provide connections to existing park and recreation facilities; create links to existing and proposed transportation facilities; and be planned in such a way as to avoid adverse effects on environmentally sensitive areas. The Bay Trail Plan proposes an alignment for what is planned to become a 500-mile recreational "ring around the Bay."

California Native Plant Society

The California Native Plant Society (CNPS), a non-governmental conservation organization, has developed lists of plant species of concern in California. Vascular plants included on these lists are defined as follows:

List 1A Plants considered extinct.

List 1B Plants rare, threatened, or endangered in California and elsewhere.

List 2 Plants rare, threatened, or endangered in California but more common elsewhere.

List 3 Plants about which more information is needed – review list.

List 4 Plants of limited distribution – watch list.

Although the CNPS is not a regulatory agency and plants on these lists have no formal regulatory protection, plants appearing on List 1B or List 2 are, in general, considered to meet CEQA's Section 15380 criteria and adverse effects to these species are considered significant.

Santa Clara Valley Water District

SCVWD manages drinking water and flood protection for Santa Clara County. To help protect the valley's creeks and rivers, SCVWD recently adopted a new ordinance (replacing Ordinance 82-3) that requires a project review and permitting process to minimize impacts to watercourses resulting from development or community activities. Anyone who plans a project within 50 ft of a creek or waterway, or within 50 ft of SCVWD property or easement, must first obtain a permit from SCVWD's Community Projects Review Unit. To protect groundwater resources, SCVWD Ordinance 90-1 requires permitting for any person digging, boring, drilling, deepening, refurbishing, or destroying a water well, cathodic

protection well, observation well, monitoring well, exploratory boring (45 ft or deeper), or other deep excavation that intersects the groundwater aquifers of Santa Clara County.

Alameda County Flood Control and Water Conservation District (ACFCWCD)

The Alameda County Public Works Agency is responsible for maintaining the infrastructure of Alameda County – from its roads and bridges to flood channels and natural creeks. Within the Public Works Agency, the ACFCWCD works specifically to protect county citizens from flooding while preserving the natural environment. The Grading and Permits Division enforces a number of ordinances which may require a permit such as the Watercourse Protection and Flood Plain Management ordinances. The SBSP Restoration Project would be designed to comply with local ordinances, and the Project is working collaboratively with Alameda County determine if any permits will be required.

Permits Required

The following permits/approvals may be required from the agencies indicated:

- Section 404 Permit, the Corps;
- Section 401 Water Quality Certification, San Francisco Bay RWQCB;
- BCDC Permit, BCDC;
- Biological Opinion (BO), USFWS;
- BO, Essential Fish Habitat consultation, and Marine Mammal Act Permit, NOAA Fisheries; and
- Construction Permit, SCVWD.

3.6.3 Environmental Impacts and Mitigation Measures

Overview

The proposed Project would have a number of effects, including both beneficial and adverse, on the biological resources of the SBSP Restoration Project Area. NEPA does not clearly define what constitutes a significant environmental effect, or provide clear guidance for determining whether an effect is significant under NEPA. CEQA defines "significant effect on the environment" as "a substantial, or potentially substantial, adverse change in the environment" (Pub. Res. Code §21068). Under CEQA Guidelines Section 15065, a project's effects on biotic resources are deemed significant if the project would:

- Substantially degrade the quality of the environment;
- Substantially reduce the habitat of a fish or wildlife species;
- Cause a fish or wildlife population to drop below self-sustaining levels;
- Threaten to eliminate a plant or animal community;
- Substantially reduce the number or restrict the range of an endangered, rare or threatened species; or
- Eliminate important examples of the major periods of California history or prehistory.

In addition to the Section 15065 criteria, Appendix G of the CEQA Guidelines presents other potential impacts to consider when analyzing the effects of a project. The following are applicable to the assessment of impacts stemming from the proposed Project:

- Have 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;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFG or USFWS;
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

CEQA Guidelines indicate that a substantial reduction in the habitat of a fish or wildlife species would be a significant impact. For species that use a single habitat type (*e.g.*, only deep salt-pond habitat, or cordgrass-dominated tidal salt marsh), determining whether the SBSP Restoration Project would result in a substantial reduction in habitat is fairly straightforward. However, many species in the study area use a variety of habitats, including salt ponds, bay waters and intertidal areas, water treatment plants, and other habitats. In addition, SBSP Restoration Project activities would not just result in a loss or gain of general habitat types such as "managed pond", but also a change in the conditions of those habitat types via species-targeted management (in the case of managed ponds) or carefully planned breaches and other measures to restore more extensive, more complex tidal marsh than currently exists in the South Bay. While the extent of managed pond habitat would be reduced as a result of conversion to tidal habitats, the remaining managed ponds would be actively or specifically managed for wildlife under Alternatives B and C. As a result, making significance determinations simply on the basis of habitat loss or gain is not straightforward in most cases, and predicted changes in the numbers of individuals (or, in some cases, in breeding success and productivity) have been used, instead of changes in or loss of habitat, to determine thresholds of significance.

To help predict what habitat changes would occur as a result of restoration, and what the effects of those changes might be on South Bay birds, PWA (2006) modeled habitat evolution in the South Bay under the three alternatives and PRBO (Stralberg and others 2006) performed modeling to predict bird population responses to changing habitat conditions under the three alternatives. PWA (2006) predicted the acreage of various habitats important to wildlife species in the South Bay, including shallow and deep subtidal, intertidal, and low and high tidal marsh, as well as the extent and size of tidal channels and marsh pannes within restored tidal marshes. The extent of these habitats was predicted at Year 0 and Year 50 for each of

the alternatives. Using PWA's tidal habitat predictions, predictions of the conditions within managed ponds provided by H.T. Harvey & Associates, and bird-habitat relationship data from six years (1999-2004) of PRBO's avian surveys in tidal marsh and salt pond habitats, Stralberg and others (2006) developed models to predict numbers of key bird species in the SBSP Restoration Project Area, and in the South Bay as a whole, at Year 50 under each of the three alternatives.

Both PWA's and PRBO's modeling results provide useful tools for predicting the effects of the three alternatives on biological resources in the South Bay. PWA's simple geomorphic analysis was intended to provide an overview of the potential magnitude of landscape-scale geomorphic impacts and the extent of mudflat and marsh anticipated in the whole South Bay landscape, 50 years in the future, for the alternatives identified in the restoration Project. However, the geomorphic assessment was carried out in isolation from any hydrodynamic modeling results. Uncertainties in the projections can be reduced with long-term monitoring and implementation of applied studies. PRBO (Stralberg and others 2006) pointed out that their models predict indices of abundance based on the assumption that habitat is limiting for the focal species and that the habitat was at carrying capacity when the survey data on which the models are based were collected. Therefore, they caution that these predictions should not necessarily be interpreted as actual population numbers. In addition, because their model only included foraging birds (excluding roosting birds), the abundance indices underestimate total numbers of birds. Stralberg and others (2006) also noted several sources of uncertainty that qualify their modeling results, including "the current carrying capacity of South Bay habitats, the availability of alternative habitats for birds using managed ponds, the extent to which habitat quality and availability are limiting bird population size and trajectory, and whether birds will indeed respond to change in availability of habitat in the manner that our habitat-based models assumed." While PRBO's modeling results (and PWA's, where applicable) are noted in the impact assessment sections that follow, potential sources of uncertainty in the impact assessments are also noted.

It is important to note that the baseline for determining the significance of potential impacts under NEPA and CEQA, for the purposes of this EIS/R, is the existing condition of the study area. Thus, conditions within the study area in 2006 serve as the baseline, against which predictions of changes in habitat or numbers of individuals are made. However, South Bay populations of many plants and animals may vary considerably from one year to the next, and thus a longer-term average (*e.g.*, in numbers of individuals of a particular species) is used where appropriate to establish baseline conditions and determine whether deviations from that condition would result in a significant impact. Furthermore, it should be noted that the SBSP Restoration Project has much loftier objectives than only avoiding significant impacts under NEPA and CEQA. The Project has a series of objectives developed by the stakeholders which the Project managers will work to achieve. Triggers for action are designed to ensure, to the greatest extent possible, that the Project not have significant impacts and achieve the Project Objectives. The discussion of impacts herein focuses on whether or not impacts would reach a level of significance under NEPA and CEQA.

Establishing thresholds of significance, determining the significance of impacts, and establishing adaptive management triggers for biological resources for the SBSP Restoration Project are complicated by several factors:

- The lack of a clear, quantifiable baseline (*i.e.*, status/abundance in fall 2006) for many potential species impacts makes it difficult to identify a quantitative threshold of significance. For example, interannual variability in shorebird numbers requires many years of bird surveys to establish a baseline quantitatively, yet the available data on South Bay birds may not accurately describe existing conditions for NEPA/CEQA baseline purposes. Surveys conducted by USGS, PRBO, SFBBO, and others provide a wealth of information on shorebird numbers in the South Bay. For example, Flyway Project surveys coordinated by PRBO from 1988 to 1993 provide useful "snapshots" of the numbers of shorebirds present in different subregions of San Francisco Bay at different seasons, representing the most comprehensive Bay-wide dataset on shorebird numbers prior to the initiation of the Project. Surveys of South Bay salt ponds conducted by PRBO from 1999 to 2001, which included both Project and Cargill ponds, provide an assessment of pre-ISP pond conditions and bird densities (Stralberg and others 2003). Monitoring of SBSP Restoration Project ponds by USGS since 2002 has provided indices of abundance by season for these ponds. However: (a) the most intensive, standardized surveys (those by PRBO and USGS) were conducted either prior to ISP implementation (PRBO) or while conditions in the ponds were changing due to Cargill's preparation for the sale of the ponds and due to ISP implementation (USGS); (b) most such surveys covered the ponds and did not include associated bay habitats such as mudflats and subtidal areas, which may be affected by the Project; and (c) shorebird numbers obtained from USGS's monitoring have generally been lower than those previously obtained from Flyway Project surveys for the South Bay as a whole, suggesting that USGS survey data from 2002 to 2006 may not accurately represent shorebird numbers in the entire South Bay.
- The inherent variability in South Bay plant and wildlife communities makes it difficult to determine whether a quantitative threshold of significance has been exceeded. For example, if the threshold of significance for Project impacts to small migratory shorebirds were set at 20 percent below baseline conditions, the interannual variability in shorebird numbers in the South Bay would result in numbers that, in some years, would drop below the threshold, even if the Project was not involved.
- A number of factors external to the SBSP Restoration Project will affect the biological resources using the South Bay. For example, global climate change and sea level rise may have much greater effects on numbers of migratory shorebirds present in the South Bay than would changes resulting from the Project. As restoration proceeds and key biological parameters (*e.g.*, shorebird numbers) are monitored, it will be challenging to distinguish trends (*e.g.,* declines in abundance of small migratory shorebirds) that actually result from Project activities from trends resulting from external factors, yet such a distinction will be important to avoid significant Project impacts.
- Because some biological resources are expected to decline in the absence of the Project, simply using fall 2006 conditions as the baseline for determining thresholds of significance may exaggerate impacts that are actually attributable to the SBSP Restoration Project. For example, the loss of outboard mudflats due to existing processes of sediment dynamics in the Bay, as well as sea level rise is expected to occur regardless of the alternative selected, this loss would cause a number of species to be affected (negatively and positively), even under the No Action Alternative (Alternative A). Separating the changes that are not related to the SBSP Restoration Project from those changes caused by the various alternatives is a considerable challenge.
- In some cases, the Project's restoration target differs from the EIS/R threshold. For example, the restoration target for small migratory shorebirds is "Maintain small shorebird numbers at pre-ISP

levels," yet these levels differ from the NEPA/CEQA baseline (fall 2006 numbers). While these differences do not necessarily affect the determination of the NEPA/CEQA threshold of significance for small migratory shorebirds, this difference does complicate the link between the adaptive management triggers and the threshold of significance in the monitoring and adaptive management process that would be used to avoid significant impacts.

In the summaries of thresholds of significance for biological resources impacts below, the term "substantial" is frequently used to indicate the level of impact (*e.g.*, a decline in numbers of a particular species or group) that would be considered significant under CEQA and NEPA. Neither NEPA nor CEQA guidelines provide a clear definition of the term "substantial" as it applies to the magnitude of an impact (*e.g.*, to a species's populations, habitat, or range) that would be considered significant. Therefore, in determining the threshold of significance for a particular species or group of species for the SBSP Restoration Project, both the magnitude of impacts to South Bay populations and the contribution of South Bay populations to larger-scale (*i.e.*, regional, flyway-level, continental, and range-wide) populations were considered. As a result, thresholds of significance may vary among different taxa (*e.g.*, percent declines in numbers that would be considered significant may vary among some impacts discussed below). Except where a specific percent decline is noted in a particular significance threshold, a decline of 10 to 20 percent in South Bay numbers, or five to 10 percent in flyway-level numbers (for birds), would generally be considered "substantial".

Thresholds of significance for potential Project impacts to biological resources are discussed below. The rationale for the significance thresholds can be found in the Program-Level Evaluation also below. If at any point during the 50-year SBSP Restoration Project, a numerical threshold is exceeded or a qualitative threshold is reached for a given impact, and that change has resulted from the SBSP Restoration Project, a significant impact would have occurred. However, as described in Section 2.3 and Appendix D, monitoring and adaptive management are integral components of the SBSP Restoration Project, and would be critical in preventing adverse effects from reaching a level of significance. The adaptive management triggers would be set to warn of potential impacts, and allow adaptive management to be undertaken to reverse or forestall such impacts, before such a point will have been reached. The rationale for each impact includes a description of how the threshold of significance was selected, indicates how the threshold of significance is related to the restoration target and the triggers, and illustrates how monitoring and adaptive management would be used to avoid a significant impact.

As explained above and in Section 3.1.2, while both CEQ Regulations for Implementing NEPA and the CEQA Guidelines were considered during the impact analysis, impacts identified in this EIS/R are characterized using CEQA terminology. Please refer to Section 3.1.2 for a description of the terminology used to explain the severity of the impacts.

Significance Criteria

In this section, the threshold of significance is briefly described for each potential biological resources impact. Then, potential impacts and related adaptive management information are discussed, first for the programmatic SBSP Restoration Project ("Program-Level Evaluation") and then for the Phase 1 projects ("Project-Level Evaluation").

Impact: Potential reduction in numbers of small shorebirds using San Francisco Bay, resulting in substantial declines in flyway-level populations.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on small shorebirds if it resulted in a substantial reduction in numbers (*i.e.*, a decline of 20 percent below baseline levels as a result of the SBSP Restoration Project) of the most abundant species (*i.e.*, semipalmated plover, western sandpiper, least sandpiper, dunlin, short-billed dowitcher [*Limnodromus griseus*], and long-billed dowitcher [*Limnodromus scolopaceus*]) in the South Bay, resulting in a substantial decline in flyway-level populations.

Impact: Loss of intertidal mudflats and reduction of habitat for mudflat-associated wildlife species.

Threshold of Significance

The threshold of significance for this impact is defined as measurable, long-term loss of intertidal mudflat area not compensated for by equivalent increases in productivity as a result of SBSP Restoration Project activities.

Impact: Potential habitat conversion impacts to western snowy plovers.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on Western snowy plovers if it resulted in a decline in the adult breeding-season population within San Francisco Bay (relative to the NEPA/CEQA baseline).

Impact: Potential reduction in the population size of breeding, pond-associated waterbirds (avocets, stilts, and terns) using the South Bay due to reduction in habitat, concentration effects, displacement by nesting California gulls, and other Project-related effects.

Threshold of Significance

The SBSP Restoration Project would have a significant impact if it resulted in a decline of 10 percent or greater (relative to the NEPA/CEQA baseline) in the number of breeding black-necked stilts, American avocets, Caspian terns, or Forster's terns breeding in the San Francisco Bay Area.

Impact: Potential reduction in the population size of non-breeding, salt-pond-associated birds (*e.g.*, phalaropes, eared grebes, and Bonaparte's gulls) as a result of habitat loss.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on salt-pond-specialist waterbirds (*i.e.*, eared grebes, Bonaparte's gulls, Wilson's phalaropes, and red-necked phalaropes) if it resulted in the loss of a substantial number of individuals (*i.e.*, a decline of 50 percent below baseline levels as a result of the SBSP Restoration Project) of these species from the South Bay, resulting in a substantial decline in flyway-level populations, due to a reduction in the extent of higher salinity ponds and the conversion of managed ponds to tidal habitats.

Impact: Potential reduction in foraging habitat for diving ducks, resulting in a substantial decline in flyway-level populations.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on diving ducks foraging in the South Bay if it resulted in a substantial reduction in numbers (*i.e.*, a decline of 20 percent below baseline levels as a result of the SBSP Restoration Project) of diving ducks using the South Bay, resulting in a substantial decline in flyway-level populations, due to the conversion of managed ponds to tidal habitats.

Impact: Potential reduction in foraging habitat for ruddy ducks, resulting in a substantial decline in flyway-level populations.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on ruddy ducks foraging in the South Bay if it resulted in a substantial reduction in numbers of individuals (*i.e.*, a real decline of 15 percent below baseline levels as a result of the SBSP Restoration Project) using the South Bay, resulting in a substantial decline in flyway-level populations, due to the conversion of managed ponds to tidal habitats.

Impact: Potential habitat conversion impacts on California least terns.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on California least terns if it resulted in a decrease in foraging habitat or prey availability for post-breeding dispersants in the South Bay, leading to a decline in the Bay Area breeding population relative to baseline levels.

Impact: Potential loss of pickleweed-dominated tidal salt marsh habitat for the salt marsh harvest mouse and salt marsh wandering shrew, and further isolation of these animals' populations, due to breaching activities and scour.

Threshold of Significance

The threshold of significance for this impact is defined as measurable, sustained loss of pickleweed-dominated tidal salt marsh resulting in substantial isolation of salt marsh harvest mouse and salt marsh wandering shrew populations due to the SBSP Restoration Project, without development of a commensurate amount of new contiguous marsh once the appropriate elevations are achieved within the restored ponds.

Impact: Potential construction-related loss of, or disturbance to, special-status, marsh-associated wildlife.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on marsh-associated species if it resulted in the mortality of, or the loss of active nests of, substantial numbers of state- or federally listed marsh-associated species, or abandonment of a primary harbor seal haul-out or pupping area, as a result of the SBSP Restoration Project.

Impact: Potential construction-related loss of, or disturbance to, nesting pond-associated birds.

Threshold of Significance

Loss of any individuals or nests of the federally listed western snowy plover would be significant given the low West Coast populations of this species. The loss of a substantial number of active nests and/or chicks of other pond-associated species, such as Forster's and Caspian terns, American avocets, and Black-necked stilts, due to breaching of ponds and other construction-related activities during the nesting season would also be a significant impact.

Impact: Potential disturbance to, or loss of, sensitive wildlife species due to ongoing monitoring, maintenance, and management activities.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on biological resources as a result of ongoing monitoring, management, and maintenance activities if these activities resulted, directly or indirectly (*e.g.*, by facilitating predation), in:

- The mortality of, or loss of active nests of, any western snowy plovers or California least terns;
- The mortality of, or the loss of active nests of, substantial numbers of state- or federally listed, marsh-associated species;
- Abandonment of a primary harbor seal haul-out or pupping area;
- The loss of substantial numbers of nests of non-listed pond-associated birds such as terns, avocets, and stilts; or
- Disturbance or harm to plant species of concern.

Impact: Potential effects of habitat conversion and pond management on steelhead.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on steelhead if it resulted in a decline in steelhead populations associated with South Bay spawning streams.

Impact: Potential impacts to estuarine fish.

Threshold of Significance

The SBSP Restoration Project would result in a significant impact to estuarine fish if it resulted in a substantial decline in South Bay populations of estuarine fish.

Impact: Potential impacts to piscivorous birds.

Threshold of Significance

The SBSP Restoration Project would result in a significant impact on piscivorous birds if it resulted in a substantial decline (relative to baseline levels) in South Bay populations of mergansers, pelicans, fish-eating grebes, herons, and egrets, resulting in a substantial decline in Pacific Flyway populations.

Impact: Potential impacts to dabbling ducks.

Threshold of Significance

The SBSP Restoration Project would have a significant impact on dabbling ducks if it resulted in a substantial decline (relative to baseline levels) in South Bay populations of dabbling ducks, resulting in a substantial decline in Pacific Flyway populations.

Impact: Potential impacts to harbor seals.

Threshold of Significance

The SBSP Restoration Project would result in a significant impact to harbor seals if it resulted in a substantial decline (relative to baseline levels) in South Bay populations.

Impact: Potential recreation-oriented impacts to sensitive species and their habitats.

Threshold of Significance

Recreation associated with the SBSP Restoration Project would have a significant impact if it resulted, directly or indirectly (*e.g.*, by facilitating predation), in:

- The abandonment of a primary harbor seal haul-out or pupping area;
- The mortality of, or loss of active nests of, western snowy plovers or California least terns;
- A reduction in California clapper rail populations;
- The loss of substantial numbers of nests of non-listed pond-associated birds (specifically, terns, avocets, and stilts); or
- Substantial, long-term declines in numbers of waterbirds in the South Bay due to recreational disturbance.

Impact: Potential impacts to special-status plants.

Threshold of Significance

The threshold of significance for this impact is defined as the loss of individuals of a state- or federally listed plant species, or loss of a substantial portion of the population of other special-status plants (*e.g.*, species considered rare by CNPS), as a result of SBSP Restoration Project activities without commensurate increases in numbers as a result of restoration of tidal and transitional habitats.

Impact: Colonization of mudflats and marshplain by non-native *Spartina* and its hybrids.

Threshold of Significance

The threshold of significance is defined as colonization of restored tidal habitats by non-native *Spartina* at a level (measured by percentage of the vegetated marsh dominated by non-native *Spartina*) that exceeds recently colonized marshes elsewhere in the South Bay.

Impact: Colonization by non-native *Lepidium*.

Threshold of Significance

The threshold of significance is defined as colonization of restored brackish marsh habitats by *Lepidium latifolium* at a level (measured by percentage of the vegetated marsh dominated by *Lepidium latifolium*) that exceeds recently colonized reference brackish marshes elsewhere in the South Bay.

Impact: Increase in exposure of wildlife to avian botulism and other diseases.

Threshold of Significance

The threshold of significance is defined as a substantial increase in the incidence of avian botulism or other wildlife diseases in the South Bay, or an increase in the number of individuals exposed to such diseases, relative to baseline conditions as a result of the SBSP Restoration Project.

Impact: Potential impacts to bay shrimp populations.

Threshold of Significance

The threshold of significance is defined as a substantial decrease in numbers of California bay shrimp within the South Bay as a result of the SBSP Restoration Project.

Program-Level Evaluation

SBSP Long-Term Alternatives

As described in Section 2.3 and Appendix D, monitoring and adaptive management are integral components of the SBSP Restoration Project, and would be critical in preventing adverse effects from reaching a level of significance. Because monitoring and adaptive management are integral to Alternatives B and C, the impacts analysis in this EIS/R for effects of restoring tidal action to 50 percent

and 90 percent of the ponds always include monitoring and adaptive management. However, PRBO's modeling predicted effects of tidal restoration in the absence of adaptive management, and therefore suggest substantial differences in the impacts of Alternatives A, B, and C. The PRBO modeling shows that substantial declines in numbers of some bird species may occur due to habitat changes, if restoration (*i.e.*, under Alternatives B or C) proceeds without monitoring and adaptive management.

In the absence of monitoring of an appropriate type and intensity, or adaptive management if evidence of potential impacts is noted, many of the impacts determined to be less than significant in the following sections would reach or exceed the threshold of significance. Such impacts would be particularly likely in the case of pond-associated species under Alternative C, due to the extent of habitat conversion proposed under that alternative, if adaptive management were not undertaken as described in Section 2.3 and Appendix D. The following discussions of potential effects of the SBSP Restoration Project on biological resources explicitly consider monitoring and adaptive management to be essential components of the Project.

SBSP Impact 3.6-1: **Potential reduction in number of small shorebirds using San Francisco Bay, resulting in substantial declines in flyway-level populations.**

Potential SBSP Restoration Project Effects. Several species of small shorebirds, including the semipalmated plover, western sandpiper, least sandpiper, dunlin, short-billed dowitcher, long-billed dowitcher, and others, occur in the San Francisco Bay Area, primarily during migration and in winter (roughly July through April). San Francisco Bay is one of the most important stopover and wintering areas on the West Coast for these species (Harrington and Perry 1995, Page and others 1999, Takekawa and others 2001). Within San Francisco Bay, the majority of these birds are typically found in the South Bay (Stenzel and others 2002).

In the study area, these small shorebirds forage primarily on intertidal mudflats at low tide (Warnock and Takekawa 1995, Warnock and others 1995 & 2002, Stralberg and others 2003, Athearn and Takekawa 2006). At high tide, these birds roost in alternate habitats, such as shallow salt ponds, salt flats, levees, and other locations (*e.g.*, water treatment plant settling ponds). Some individuals forage in these alternate habitat areas, especially during high tide (Warnock and others 2002, Athearn and Takekawa 2006). The proportion of individuals foraging in these alternate habitat areas likely depends on time of year (*e.g.*, with more individuals spending more time foraging during high tide when depositing fat during spring migration) and weather conditions (*e.g.*, if winter storms limit the availability of mudflats).

Restoration of managed ponds to tidal habitats is expected to increase the availability of intertidal mudflat foraging area at low tide in the short-term, as most of the breached ponds are sufficiently subsided that they would provide intertidal mudflat habitat for several decades before accreting enough sediment to become vegetated. However, in the long term, sedimentation patterns of the South Bay are expected to result in a loss of intertidal mudflat, both due to conversion to emerging fringe marsh (through sedimentation) and conversion to subtidal habitat due to scour (Table 3.6-5). This mudflat loss is predicted to occur even in the absence of the SBSP Restoration Project, but mudflat loss is expected to be greater if ponds are breached and tidal habitats restored (PWA 2006).

In addition, tidal restoration of managed ponds would reduce the availability of high-tide habitat for small shorebirds. The extent of shallow-water habitat that may be used by foraging small shorebirds (estimated as the extent of managed pond containing water less than 15 cm deep; see Table 3.6-5), would vary considerably among the alternatives. High-tide roosting habitat is unlikely to limit populations, as pond levees, islands, and other alternative habitats can support high densities of roosting birds. However, conversion of managed ponds to tidal habitats would reduce the numbers of sites where shorebirds can congregate at high tide, potentially resulting in increased predation, possibly increased susceptibility to disease, and increased disturbance (and associated increases in energy expenditure) by predators and humans.

Table 3.6-5 Total Acreage of Small Shorebird Foraging Habitat in the South Bay under Existing Conditions and at Year 50 under the Three Alternatives

TIME	ALTERNATIVE	POND HABITATS (AC)		MUDFLAT (AC)	MUDFLAT (KM^2)	PERCENT REDUCTION FROM EXISTING
		Pond Depth <15 cm Summer	Pond Depth <15 cm Winter			
Existing	N/A	1,200	1,880	12,400	50	
Year 50	A (No Action)	120	330	8,900	36	28%
	B	610	1,130	8,400	34	30%
	C	540	540	6,400	26	48%

Ponds that are not restored, and are instead configured and managed for foraging shorebirds, are expected to support considerably higher densities of foraging birds than are supported in the average pond currently managed under the ISP. What is less certain is the degree to which these birds depend on managed ponds for foraging, especially at high tide (versus just using this habitat facultatively in lieu of foraging for longer periods on intertidal mudflats at low tide), and the degree to which a reduced footprint of intensively managed ponds can sustainably support the high-tide foraging requirements of these small shorebirds.

The degree to which tidal marsh restoration may enhance foraging conditions for small shorebirds by increasing the productivity of mudflats and availability of mudflats and pannes within tidal marshes, and thus enhancing food availability for these shorebirds, is unknown, but it is expected that some such enhancement would occur. The invertebrates of intertidal estuarine mudflats are a detritus-based community, and the inputs of detritus to this community largely come from either the water column via the algal food chain, or from detrital vegetation that originates in the adjacent tidal marshes (Day and others 1989, Bertness 1999). Because tidal salt marshes are extraordinarily productive, they are often a major contributor of carbon to estuarine ecosystems (Day and others 1989, Hughes 2004). This carbon contribution can be as large as, or even larger than, that of the algal-based food chain, in part because the primary productivity of tidal marshes is generally much greater than that of the algal communities (Day and others 1977, Atwater and others 1979, Bertness 1999). The importance of these carbon contributions to the mudflat invertebrate community used by shorebirds was emphasized by Hughes (2004): "Saltmarshes are areas of high primary productivity and their greatest significance for coastal birds is probably as the base of estuarine food webs, because salt marshes export considerable amounts of organic

carbon to adjacent habitat, particularly to the invertebrates of mudflats." Recent research in northern San Francisco Bay indicates the algal primary productivity within the water column of a large, intact tidal marsh is much greater than in the nearby open water column, and that this greater productivity also plays a significant role in estuarine productivity by providing an abundant source of primary productivity and invertebrates (Schroeter and Moyle 2006). Thus, marsh restoration is likely to result in increased productivity in the benthic invertebrate food chain, potentially increasing the density of the invertebrate prey base available to the various bird and fish species that forage on intertidal mudflats (Harvey and others 1977, Day and others 1989, Hughes 2004).

There is also considerable uncertainty in how a reduction in habitat for these species would affect populations on the scale of the Bay Area, or the entire Pacific Flyway. Researchers have found that in some cases, habitat conditions can affect population regulation in shorebirds (Goss-Custard 1977, Goss-Custard and others 2001, Burton and others 2006), but in other cases, particularly in milder climates, shorebirds do not appear to be limited by foraging habitat (Duffy and others 1981). Population regulation in small shorebirds may be primarily a function of mortality and nest predation on the breeding grounds, followed by winter predation by raptors, which would be exacerbated by a reduction in habitat and increases in shorebird density (Page and Whitacre 1975, Warnock and others 1997, Yasue and others 2003).

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on small shorebirds if South Bay numbers of any of the most abundant species (*i.e.*, semipalmated plover, western sandpiper, least sandpiper, dunlin, short-billed dowitcher, and long-billed dowitcher) are reduced substantially, resulting in a substantial decline in flyway-level populations, due to the conversion of managed ponds to tidal habitats as a result of this Project. Local changes in the distribution of these species in the South Bay in response to the SBSP Restoration Project, or even larger-scale changes whereby numbers decline in the South Bay but are maintained on the scale of the Pacific Flyway due to the redistribution of birds, are not necessarily important to the maintenance of flyway-level populations. If individuals simply move to other locations in the Bay Area, or elsewhere in the flyway, as a result of SBSP Restoration Project activities, and the habitat in those other locations is suitable for these individuals so that flyway-level numbers are able to be sustained, the impact would not be significant.

Under the No Action Alternative, some existing levees and water-control structures would no longer be maintained and would be likely to fail, and some ponds would be managed as seasonal ponds (which would eventually become vegetated seasonal wetlands). The result of this No Action Alternative, in terms of small shorebird habitat, would be a decline in high-tide foraging habitat in managed ponds concurrently with the decline in intertidal mudflats predicted to occur regardless of whether the SBSP Restoration Project is implemented (Table 3.6-5). Based on the assumptions made regarding No Action conditions, PRBO's modeling predicts substantial declines in semipalmated plover, western sandpiper, least sandpiper, and dunlin numbers between Year 0 (existing conditions) and Year 50 in the absence of the SBSP Restoration Project (dowitcher predictions were not modeled).

The NEPA/CEQA baseline for the SBSP Restoration Project is set at fall 2006. With respect to this particular impact, using this baseline (*i.e.*, numbers of small shorebirds in the South Bay as of fall 2006)

as the threshold of significance for impacts sets a very high standard for the Project, for NEPA/CEQA purposes, for two reasons. First, numbers of small shorebirds using, and specifically foraging in, the SBSP Restoration Project Area have recently increased, possibly as a result of reductions in water depths in several ponds (Athearn and Takekawa 2006). Small shorebird numbers in the managed ponds of the SBSP Restoration Project Area increased by more than 450 percent in winter and 200 percent in spring between 2003 and early 2004, prior to implementation of ISP management, and 2006, after ISP water controls and management were implemented (Athearn and Takekawa 2006). While natural inter-annual variability may have contributed to this apparent increase, these results suggest that shorebird numbers in some South Bay ponds increased from pre-ISP levels due to implementation of the ISP. Some of these birds may have also shifted from adjoining salt ponds, including Cargill's Newark ponds, in response to increased prey availability in ponds where ISP management resulted in more shallow-water conditions. The SBSP Restoration Project's restoration target for small shorebirds is the maintenance of pre-ISP numbers of birds, which may therefore be a lower standard than the NEPA/CEQA baseline, if ISP implementation has resulted in local increases in shorebird numbers.

Second, in the absence of any SBSP Restoration Project, declines in shorebird numbers are expected to occur not only due to changes in management of ponds (or lack thereof), but also to mudflat loss resulting from sea level rise. Mudflat loss due to sea level rise is outside the control of this Project, and is expected to occur regardless of whether SBSP Restoration Project activities are initiated.

Nevertheless, CEQA requires that the effects of project alternatives be compared to baseline levels. In this case, baseline levels would be the numbers of each of the small shorebird species present in the South Bay in 2006. However, due to the interannual variability in shorebird numbers in the region, the actual baseline is better estimated as the mean number of shorebirds of a given species present in a given season over several years. Taking into account the possible recent increases in numbers of small shorebirds in the SBSP Restoration Project Area due to changes related to the ISP, the SBSP Restoration Project would consider a decline in South Bay numbers of 20 percent below baseline levels with a resulting decline in flyway-level populations, as a result of the SBSP Restoration Project to constitute a significant impact.

Adaptive Management Plan. The Adaptive Management Plan (Appendix D) would incorporate new information into decision-making on future Project phases as understanding of the ecosystem improves through on-going data collection and applied studies. Potential adverse environmental impacts can thus be avoided as decision makers better understand how restoration actions affect important physical, chemical, and biological attributes of the South Bay ecosystem. It is not advisable to merely predict the extent of tidal restoration that can occur before the significance threshold is reached or exceeded (and plan that amount of restoration); rather, monitoring and adaptive management would be critical to determine the extent of tidal restoration that can occur in the long term.

Although PRBO's modeling provides useful predictions of the potential effects of restoration activities on small shorebirds in the South Bay, there is still considerable uncertainty regarding these effects. Bird numbers may not decrease to the extent predicted by PRBO's modeling if numbers in the existing system are far below the system's carrying capacity (*i.e.*, if they are regulated by factors external to the South Bay), if reconfigured ponds are able to sustain high densities of foraging birds, if foraging birds benefit

from enhanced mudflat productivity following restoration as is expected (Hughes 2004), or if assumptions of the model are incorrect. Conversely, shorebird numbers may decrease even more than is predicted if mudflat availability decreases more than is predicted, if the densities that can be achieved and maintained in reconfigured ponds are lower than predicted, or if density-dependent effects of concentrating high-tide assemblages of shorebirds in fewer locations (*e.g.,* increase rates of predation, disease, and disturbance).

Determination of Baseline and Monitoring. Although there has been extensive study of shorebird numbers in the South Bay, available data, most of which were collected prior to implementation of the ISP or as pond conditions were changing during ISP implementation, may not accurately describe existing conditions for NEPA/CEQA baseline purposes. Surveys conducted by PRBO in 1988, 1989, and 1990 as part of the "Flyway Project" provided comprehensive estimates of the number of individuals of these species in the South Bay during fall, winter, and spring of those years, and provide an indication of inter-annual variability in numbers (Stenzel and Page 1989, Stenzel and others 1989, Kjelmyr and others 1991). SFBBO conducted similar window surveys from fall 1992 through spring 1993, winter 1995 through fall 1995, and in spring and fall 1996, although some areas were not surveyed due to limitations on access to Cargill's property (Hanson and Kopec 1994, Strong 2004). The monitoring conducted by USGS for the ISP (Athearn and Takekawa 2006) has not included Cargill property in Newark and Redwood City (until surveys of these areas were begun by SFBBO in 2005).

Although USGS's monitoring does provide indices of abundance by season for the ponds in the Eden Landing, Ravenswood, and Alviso pond complexes, numbers of shorebirds obtained from these surveys have been considerably lower than those obtained from the previous Flyway Project surveys. For example, USGS's mean counts of small shorebirds in the three pond complexes in spring ranged from approximately 52,000 in 2004 to 111,000 in 2006 (Athearn and Takekawa 2006), compared to a count for the entire South Bay of more than 550,000 on 16–18 April 1988 during Flyway Project surveys (Stenzel and Page 1988). Counts by USGS for the SBSP Restoration Project Area ponds and Flyway Project counts in other seasons are similarly disparate, indicating that USGS survey data from 2002 to 2006 should not serve as the baseline for shorebird numbers in the South Bay as a whole.

Also, until recently, no comprehensive surveys of South Bay birds have included potentially important alternate foraging and roosting areas such as the San Jose/Santa Clara WPCP, the Warm Springs lagoons, or the Coyote Creek Reach 1A waterbird pond. (Synoptic shorebird surveys of the entire Bay Area in November 2006 and 2007 did cover these areas.) Although the addition of the Cargill property to the ongoing surveys being conducted by USGS and SFBBO will provide additional information on South Bay waterbird numbers, the extent and nature of these surveys, with each survey conducted over a long period rather than a very brief span to avoid over or under-counting due to bird movements, is still not adequate to provide an accurate baseline.

Under the Adaptive Management Plan, a plan for monitoring the potential effects of the SBSP Restoration Project on small shorebirds would be developed prior to the initiation of Phase 1 of the Project. As part of this monitoring plan, the baseline for use in ongoing monitoring and adaptive management would be determined, most likely by the entity selected by the Project Management Team to

conduct the monitoring. For small shorebirds, the parameters to be modeled would include small shorebird densities in SBSP Restoration Project Area habitats and the proportion of small shorebirds in San Francisco Bay that occur in the South Bay itself.

Using previously collected data on foraging shorebird densities in salt ponds and on mudflats, modeled densities that take multiple habitat parameters into account simultaneously for a given area, and desired densities of shorebirds for a given area that would be necessary to allow the SBSP Restoration Project to continue to move along the restoration "staircase," target densities of foraging shorebirds in managed ponds and restored mudflats would be determined. Additional surveys would be conducted in winter and spring in specific locations (*i.e.*, reconfigured ponds where management targets small shorebirds, and mudflats in breached ponds) to determine densities of foraging birds in these habitats. The results of these surveys would be compared to the target densities of foraging shorebirds to determine whether the Project is maintaining shorebird numbers at the restoration target.

In addition, baseline numbers (*i.e.*, existing numbers of birds, which are used to estimate trends in future years) of small shorebirds would be estimated from past surveys and updated through ongoing monitoring via Bay-wide "window" surveys conducted at high tide in fall, winter, and spring. Multiple observers would survey the main high-tide roosting/foraging sites throughout the South Bay and key sites known to support high-tide concentrations elsewhere in the San Francisco Bay Area. The number and locations of these surveys, as well as timing and frequency of surveys, would be outlined in a monitoring plan. Using existing data from past Flyway Project surveys and data from the first few years of Bay-wide surveys, the number of small migratory shorebirds in the South Bay and in the Bay Area as a whole, as well as the proportion of small migratory shorebirds at the sampled San Francisco Bay locations that occur in the South Bay itself, would be estimated.

Adaptive Management Triggers. Once restoration activities commence, ongoing monitoring of shorebird densities in selected habitats and monitoring of abundance via Bay-wide surveys would be used to detect changes in numbers of small shorebirds using the South Bay. "Triggers" would be established to signal Project impacts that are approaching the threshold of significance, well before they reach that threshold. Two "triggers" would be used to determine whether the SBSP Restoration Project is having, or could soon have, potentially adverse effects on numbers of small shorebirds:

(1) Deviations from the target densities for foraging small shorebirds in managed ponds and on restored mudflats. If observed densities in these habitat types are lower than target densities, and it is known that increases have not occurred in other parts of the Project, this may indicate that the managed ponds and/or restored tidal mudflats are not providing the benefits to foraging shorebirds that were predicted. Such a shortfall may eventually translate into a decline in shorebird numbers, ultimately preventing the Project from reaching its objectives or continuing along the restoration staircase without a significant impact. Observation that the most recent three-year average of densities of foraging shorebirds for selected habitat types are below targets would "trip" this trigger.

(2) Apparent declines in the proportion of shorebirds using San Francisco Bay that occur in the South Bay. Declines in numbers within the entire San Francisco Bay Area may reflect factors external

to the SBSP Restoration Project that are adversely affecting shorebird numbers. However, because the South Bay has historically supported the highest numbers of small migratory shorebirds of any portion of the Bay, a decline in abundance in the South Bay, relative to the rest of the Bay Area, would indicate potential Project impacts. Observation that the most recent three-year average of the percentage of San Francisco Bay small migratory shorebirds that use the South Bay is below the baseline would trip this trigger.

These triggers require that the most recent three-year average, either of densities of foraging shorebirds in selected habitat types or of the percentage of the Bay's small migratory shorebirds using the South Bay, be below the baseline due to the naturally high levels of variability in shorebird numbers in the South Bay and in the greater Bay Area. For example, long-term monitoring of shorebird numbers at Bolinas Lagoon in Marin County has demonstrated that numbers may vary by 50 percent or more from one year to the next (see www.prbo.org); while longer-term changes in Bolinas numbers likely result from habitat changes, such dramatic short-term variability is presumably unrelated to habitat conditions in the lagoon. Therefore, observation of a decline below the baseline in just one or two years is expected to occur relatively frequently, and even a three-year average below the baseline does not necessarily indicate that the value of the South Bay has declined (as such a result may occur due to natural variability in numbers detected during surveys).

Adaptive Management. If monitoring results "trip a trigger," the first step in adaptive management would be to determine whether a change in numbers, rather than a re-distribution of birds, has truly occurred, and whether this change is likely a result of the SBSP Restoration Project. This focused evaluation would include a detailed analysis of all SBSP Restoration Project monitoring data (*i.e.*, changes in numbers at specific locations, such as areas historically supporting high densities; changes in roosting and foraging behavior and locations of birds at high and low tide; changes in numbers of other associated species; changes in habitat area, such as mudflats and high-tide foraging area; and results of applied studies [see Appendix D]), and all data available for other Bay Area locations and for major breeding, wintering, and staging/stopover areas throughout the Pacific Flyway. The purpose of this focused evaluation would be to determine whether the observed declines in numbers are likely actual declines (rather than being the result of naturally occurring, interannual variation or re-distribution) and are likely the result of habitat conversion as a result of the SBSP Restoration Project, or whether the declines are likely the result of other, external factors. A number of other factors, including effects of global climate change and sea level rise on breeding habitat and migratory stopover areas outside the Bay Area, may affect Pacific Flyway populations of these species to the extent that Bay Area numbers would decline. Focused research to shed light on specific issues or uncertainties may be initiated in response to a trigger. If it is determined that observed declines are likely unrelated to the SBSP Restoration Project, no adaptive management actions would be taken (though monitoring would continue). If it is determined that the apparent declines are likely actual declines and are likely the result of the SBSP Restoration Project, adaptive management actions would be undertaken to attempt to reverse the adverse effect (*e.g.*, by managing more ponds specifically to provide shorebird foraging habitat), or to plan future phases of restoration to provide increased foraging habitat for small shorebirds (*e.g.*, by limiting pond conversion or by restoring sustainable intertidal mudflat areas that would not become vegetated tidal marsh). If practicable adaptive management actions that attempt to prevent a significant decline in shorebird numbers have been

exhausted, and it is determined that further pond conversion would result in declines that reach the threshold of significance, further tidal restoration would be halted. The Project would also assess conditions, circumstances or scenarios under which the Project could move forward and avoid a significant impact.

It is important to note that Phase 1 of the SBSP Restoration Project is not expected to result in impacts to small migratory shorebirds of a magnitude even approaching the threshold of significance. Furthermore, it is anticipated that future phases of restoration would occur in such a manner that simultaneous restoration actions would not occur on such a large scale (with respect to a given potential impact) that the impact is expected to reach the threshold of significance. In addition, the triggers are fairly sensitive (in terms of not specifying statistically significant declines, or declines of a certain percentage), and the triggers do not require that the apparent declines in numbers actually occur as a result of the SBSP Restoration Project. Therefore, this system of monitoring and triggers is expected to signal a potential adverse effect of the Project on small shorebird numbers before numbers reach the significance threshold.

Both monitoring and management would be adaptive. Over the 50-year course of the SBSP Restoration Project, much would be learned (from applied studies, monitoring, and other research) about how small shorebirds use the South Bay, how these species are likely to respond to future restoration, and which monitoring methods can best detect the triggers. Therefore, the monitoring protocol and parameters, management triggers, and management actions would be periodically evaluated, and revised/adapted as necessary.

Alternative A No Action. Under the No Action Alternative, potential foraging habitat for small shorebirds would decline due to mudflat loss and the loss of managed pond foraging habitat (Table 3.6-5). PRBO's modeling has predicted that the following declines in abundance (relative to existing conditions) would occur under the No Action Alternative between Year 0 and Year 50, across all South Bay habitats: for semipalmated plover, 76 percent in winter; for western sandpiper, 68 percent during fall, 63 percent during winter, and 81 percent during spring; for least sandpiper, 14 percent in fall, 31 percent in winter, and 54 percent in spring; and for dunlin, 64 percent during winter and 81 percent during spring (Stralberg and others 2006). There would be no adaptive management to prevent these declines, thus, the No Action Alternative is expected to result in substantial declines in intertidal mudflat and managed pond foraging habitat of these shorebird species, and in the absence of focused management of the remaining managed ponds specifically for these species, there is a potential for substantial declines in small shorebird numbers. Because the No Action Alternative would not involve any monitoring of shorebird numbers (at least, as a part of the SBSP Restoration Project), accurate estimates of declines in abundance would not be known. However, these declines could potentially be substantial.

Under the No Action Alternative, the projected amount of intertidal mudflat at Year 50 is 8,900 acres (Table 3.6-5), a reduction of 28 percent from the baseline of 12,400 acres. Such mudflat loss would be largely due to predicted sea level rise and colonization of existing mudflats by marsh vegetation, which are unrelated to any impacts from this Project. Some scour would occur due to the uncontrolled tidal breaching of ponds, but that proportion is thought to be small. The effects of such mudflat loss on small shorebird numbers do not factor into the predicted impacts of the No Action Alternative. Nevertheless,

the loss of managed pond habitat due to uncontrolled breaching and conversion to vegetated seasonal wetlands is potentially within the control of the Project proponents, and the effects of such habitat changes on small shorebird numbers are potentially significant.

Alternative A Level of Significance: Potentially Significant

Alternative B Managed Pond Emphasis. Under Alternative B, approximately 50 percent of the SBSP Restoration Project Area would be managed as pond habitat for wildlife, with 50 percent restored to tidal habitats. Although shallow-pond habitat suitable for use by foraging small shorebirds would decline from existing conditions under this alternative, the magnitude of this decline would be much less than that under the No Action Alternative (Table 3.6-5). In addition, at least several of the ponds under Alternative B would be actively managed specifically to provide shallow-water foraging habitat for shorebirds, and through monitoring and adaptive management, the need for additional ponds to be managed specifically for use by shorebirds would be determined. Correspondingly, the decline in foraging habitat for small shorebirds under this alternative is expected to be considerably less than under the No Action Alternative. PRBO's modeling has predicted that the following changes in abundance (relative to existing conditions) would occur under Alternative B between Year 0 and Year 50, throughout the South Bay as a whole: for semipalmated plover, a decline of 37 percent in winter; for western sandpiper, declines of 27 percent during fall, 35 percent in winter, and 29 percent in spring; for least sandpiper, an 11 percent increase in fall, with predicted declines of eight percent in winter and 50 percent in spring; for dunlin, declines of 33 percent during spring and 35 percent during winter (Stralberg and others 2006). While these declines are considerably less than those predicted under the No Action Alternative, some of these predicted declines are substantial.

Under Alternative B, the projected amount of intertidal mudflat at Year 50 is 8,400 acres (Table 3.6-5), a reduction of 32 percent from the baseline of 12,400 acres. However, the No Action Alternative is expected to result in a 28 percent decline in mudflat acreage over 50 years, due largely to predicted sea level rise and colonization of existing mudflats by marsh vegetation. Thus, Alternative B is expected to result in only a slightly greater area of mudflat loss beyond that which would be expected to occur in the absence of a project. Therefore, most of the predicted loss of existing mudflat would be unrelated to any impacts of this Project. Only the increase in mudflat loss due to proposed breaching under Alternative B, and the effects of conversion of managed pond habitat to tidal habitat, factor into the predicted impacts of Alternative B.

If the declines in shorebird numbers predicted by PRBO's modeling for Alternative B were to occur, and no adaptive management to reverse these declines were implemented, impacts to small shorebirds could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of small shorebird populations to SBSP Restoration Project activities, and to adapt ongoing management and future restoration accordingly, with the goal of ensuring that declines do not reach a level of significance. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, less shallow water pond habitat would be available for small shorebirds than under Alternative B, but this habitat would still be greater in area than under the No Action Alternative (Table 3.6-5). However, mudflat loss is predicted to be considerably greater under Alternative C than under Alternatives A and B. PRBO's modeling has predicted that the following changes in abundance (relative to existing conditions) would occur under Alternative C between Year 0 and Year 50, across all South Bay habitats: for semipalmated plover, a decline of 57 percent in winter; for western sandpiper, declines of 48 percent during fall, 55 percent during winter, and 52 percent during spring; for least sandpiper, an increase of two percent in fall and declines of 33 percent in winter and 53 percent in spring; for dunlin, declines of 55 percent during winter and 58 percent during spring (Stralberg and others 2006). These declines are slightly less than those predicted under the No Action Alternative, but are still substantial.

Under Alternative C, the projected amount of intertidal mudflat at Year 50 is 6,400 acres (Table 3.6-5), a reduction of 48 percent from the baseline of 12,400 acres. However, the No Action Alternative is expected to result in a 28 percent decline in mudflat acreage over 50 years due to predicted sea level rise and colonization of existing mudflats by marsh vegetation. Therefore, most of the predicted loss of existing mudflat would not be related to this Project. Only the increase in mudflat loss due to proposed breaching under Alternative C, and the effects of conversion of managed pond habitat to tidal habitat, factor into the predicted impacts of Alternative C.

If the declines in shorebird numbers predicted by PRBO's modeling for Alternative C were to occur, and no adaptive management to reverse these declines were implemented, impacts to small shorebirds could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in abundance of small shorebirds, and to adapt ongoing management and future restoration accordingly, to ensure that declines do not reach a level of significance. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-2: **Loss of intertidal mudflats and reduction of habitat for mudflat-associated wildlife species.**

Potential SBSP Restoration Project Effects. Restoration of managed ponds to tidal habitats is expected to increase the availability of intertidal mudflat foraging area at low tide in the short-term, as most of the breached ponds are sufficiently subsided that they would provide large areas of intertidal mudflat habitat for several decades before accreting enough sediment for vegetation to colonize. However, in the long term, sedimentation patterns and sea level rise in the South Bay are expected to result in a loss of intertidal mudflat (PWA 2006). This mudflat loss is predicted to occur even in the absence of the SBSP Restoration Project, but mudflat loss is expected to be greater with the Project. Mudflat loss is expected to increase as ponds are breached and converted to tidal habitats since sediments from existing mudflats would be transported into the breached subsided ponds then colonized with vegetation (PWA 2006).

Numerous species of invertebrates, birds, and fish use intertidal mudflats, as described in the SBSP Restoration Project Existing Conditions Report. As a result, a decline in mudflat availability would be expected to result in declines in abundance of these species in the absence of any mitigating factors. However, as discussed previously, mudflat productivity is expected to increase with tidal restoration due to detrital input from restored tidal marshes. As a result, marsh restoration is likely to result in increased productivity in the benthic invertebrate food chain, potentially increasing the density of the invertebrate prey base available to the various bird and fish species that forage on intertidal mudflats (Harvey and others 1977, Day and others 1989, Hughes 2004). Such increases in productivity may offset, at least to some extent, adverse effects of mudflat loss on South Bay animals such as invertebrates, fish and birds. In addition, intertidal mudflats would be present along the sloughs and channels in restored marshes. Because a variety of factors (in addition to changes in outboard mudflat acreage) would affect many of these species, potential impacts to some animal species that use mudflats (*e.g.,* small shorebirds, diving ducks, and others) are addressed in other impact sections. However, potential Project impacts to larger shorebirds are discussed here since these species are so closely tied to intertidal mudflat foraging habitat.

As was described previously for small shorebirds (SBSP Impact 3.6-1), San Francisco Bay is one of the most important stopover and wintering areas on the West Coast for large shorebirds, including marbled godwits, willets, long-billed curlews, whimbrels, and black-bellied plovers (Harrington and Perry 1995, Page and others 1999, Takekawa and others 2001); American avocets and black-necked stilts are discussed separately under SBSP Impact 3.6-4 because they are resident, breeding species. Like small shorebirds, large shorebirds forage primarily on intertidal mudflats at low tide, and roost in alternate habitats, such as shallow salt ponds, salt flats, levees, and other locations (*e.g*., water treatment plant settling ponds), at high tide. However, these larger shorebirds are more strictly mudflat foragers. Although they forage in alternative habitats to a limited extent, they do not do so as frequently as smaller shorebirds do.

Because large shorebirds use alternate habitats such as managed ponds primarily for roosting, and roosting habitat on levees, islands, and artificial structures such as boardwalks is expected to be present in abundance even if ponds are restored, the SBSP Restoration Project is not expected to result in significant adverse effects on large shorebirds due to loss of pond habitat. However, conversion of managed ponds to tidal habitats would reduce the numbers of areas where shorebirds can congregate at high tide, potentially resulting in increased predation, possibly increased susceptibility to disease, and increased disturbance (and associated increases in energy expenditure) by predators and humans. These potential impacts to large shorebirds are expected to be minor, however, compared to potential impacts from the loss of mudflat foraging habitat.

The extent of mudflat loss that may occur in the South Bay is uncertain. Similarly, the effects such mudflat loss might have on the abundance of wildlife species using mudflats are unknown. If South Bay numbers of mudflat-associated species such as large shorebirds are regulated more by external factors (*e.g.,* limitations on breeding grounds) than local, South Bay factors. South Bay populations may not be at or near carrying capacity, and thus numbers may not track mudflat availability closely. Furthermore, some mudflat loss may be offset by increases in mudflat productivity due to marsh restoration. If monitoring demonstrates that these factors are not offsetting adverse effects of mudflat loss, the

restoration design for future phases can incorporate restoration of sustainable intertidal mudflat (*e.g.*, by removal of bayfront levees, creating enough wave action that sediment accretion is not adequate to support colonization by vegetation; see *Adaptive Management* below).

Determination of Threshold of Significance. The threshold of significance for this impact is defined as measurable, long-term loss of intertidal mudflat area not compensated for by equivalent increases in productivity as a result of factors within the control of the SBSP Restoration Project. A geomorphic assessment by PWA (2006) has predicted mudflat loss north of the Dumbarton Bridge due to sea level rise even if the existing pond footprint were to remain as it is (*i.e.*, without any breaching). Therefore, some of the mudflat loss predicted is beyond the control of this Project. Only the amount of mudflat loss that would occur due to scour or the increased sediment demand caused by breaching (which could potentially be controlled by the Project proponents) would factor into the impact assessment. Mudflat loss due to sea level rise and vegetation encroachment that would occur even in the absence of breaching does not factor into the assessment of significance.

Adaptive Management Plan. The Adaptive Management Plan (Appendix D) would incorporate new information into decision making on future Project phases as understanding of the ecosystem improves through on-going monitoring and experimentation. Potential adverse environmental impacts can thus be avoided as decision makers are provided with an improved understanding of how restoration actions affect important physical, chemical and biological attributes of the South Bay ecosystem.

The South Bay Geomorphic Assessment (SBGA, Appendix I) predicts a decline in intertidal mudflat habitat in all three alternatives in response to continued mudflat erosion and deposition trends, sea level rise, and Project implementation (PWA 2006). However, there is considerable uncertainty regarding both the magnitude and effects of such declines. Therefore monitoring and adaptive management are critical components of the SBSP Restoration Project to determine the extent of mudflat loss that can occur without affecting target species.

Determination of Baseline and Monitoring. The 2006 baseline is 12,400 acres of intertidal mudflat, as determined by habitat mapping based on the 2004 CIR IKONOS satellite imagery taken at a tide level of -0.9 ft Mean Lower Low Water (MLLW) (PWA and others 2005, PWA 2006). Predicted decreases for each alternative are described above.

Under the Adaptive Management Plan, a plan for monitoring the potential effects of the SBSP Restoration Project on mudflat area would be developed prior to the initiation of Phase 1 of the Project. As part of this monitoring plan, the baseline for use in ongoing monitoring and adaptive management would be determined, most likely by the entity selected by the PMT to conduct the monitoring. For mudflats, monitoring would consist of bathymetric and LiDAR surveys of restored ponds and outboard mudflat areas, likely at a frequency of every five years or so. These data would be reviewed and analyzed in conjunction with data on trends in birds (especially mudflat-associated species such as shorebirds), fish, vegetation, and other parameters to determine whether mudflat losses are adversely affecting other parameters.

Adaptive Management Triggers. Once restoration activities commence, ongoing monitoring of the extent of intertidal mudflat would be used to detect changes in the amount of this habitat in the South Bay. "Triggers" would be established to signal Project impacts that are approaching the threshold of significance, well before they reach that threshold. For this impact, the trigger would be a trend in mudflat area that is projected to fail to maintain abundance and diversity of native species that use mudflats. This projection would be determined by an interdisciplinary review of the aforementioned monitoring data.

Adaptive Management. If monitoring results "trip a trigger", the first step in adaptive management would be to determine whether the trend has truly occurred, and whether this change is likely a result of the SBSP Restoration Project. The findings of any relevant applied studies (see Appendix D) would be reviewed. A study session would be convened to review the findings as per the Adaptive Management Plan institutional structure. If the changes are deemed to be a result of the SBSP Restoration Project, and are (or are projected to be) substantial enough to necessitate management action, adjustments would be made to the phasing and future design of tidal restoration. These changes may include actions such as removing bayfront levees to actively target mudflat habitat in the restoration, or to phase the breaching in such a way as to match the supply and demand of mudflat habitat. If practicable adaptive management actions that attempt to prevent declines in mudflat habitat have been exhausted, and it is determined that further restoration would result in declines that reach the threshold of significance, further tidal restoration would be halted.

Alternative A No Action. Under the No Action Alternative, the projected amount of intertidal mudflat at Year 50 is 8,900 acres (Table 3.6-5), a reduction of 28 percent from the baseline of 12,400 acres. Much of this mudflat loss would occur north of the Dumbarton Bridge in response to ongoing mudflat erosion and sea level rise, as described in SBSP Impact 3.3-2 in Section 3.3, Hydrology. These losses are therefore not directly attributable to the unplanned breaching that will occur under Alternative A. In the far South Bay, south of the Dumbarton Bridge, slight mudflat gains are expected (on the order of 500 acres) under Alternative A when compared to baseline conditions. In the absence of the unplanned levee breaches, additional mudflat gains would be expected to occur over the 50-year horizon. The unplanned levee breaches under Alternative A are projected to reduce the historic rate of mudflat accretion within the far South Bay. Additional mudflat areas would be created along the numerous tidal channels that would be present within the restored marsh. Although these mudflats may be used differently by some wildlife species (*e.g.*, shorebirds) than broad, open tidal flats, they do still provide foraging habitat for a number of wildlife species. PRBO's modeling has predicted declines in numbers of willets across all South Bay habitats of 29 percent in fall and 48 percent in winter, relative to existing conditions, under Alternative A between Year 0 and Year 50 (Stralberg and others 2006). Much of these declines are predicted to result from the long-term reduction in mudflat area predicted for the South Bay in response to continued mudflat erosion and deposition trends, and sea level rise (PWA 2006). Under Alternative A, only a minor portion of the overall mudflat loss can be attributed to unplanned breaching of South Bay salt pond levees. Therefore, impacts would be less than significant.

Alternative A Level of Significance: Less than Significant

Alternative B Managed Pond Emphasis. Under Alternative B, the projected amount of intertidal mudflat at Year 50 is 8,400 acres (Table 3.6-5), a reduction of 32 percent from the baseline of 12,400 acres. As discussed for Alternative A and in SBSP Impact 3.3-2 in Section 3.3, Hydrology, the majority of the overall South Bay mudflat loss occurs as result of continuing geomorphic trends and sea level rise. The majority of the mudflat loss is projected to occur north of the Dumbarton Bridge in response to ongoing mudflat erosion and sea level rise, and these losses are not attributable to the Project.

In the far South Bay, in the absence of Alternative B, continued mudflat accretion and an increase in mudflat area would be expected over the 50-year horizon. Implementation of Alternative B is expected to arrest mudflat accretion, resulting in essentially no net change in the predicted acreage of mudflats for Alternative B when compared to baseline conditions. However, the Project would likely result in a change in the spatial distribution of mudflats due to changes in the overall trends of sediment deposition and erosion due to changes in far South Bay hydrodynamics. As discussed under Alternative A, additional mudflat areas that would be created along the numerous tidal channels that would be present within the restored marsh. PRBO's modeling has predicted an increase in numbers of willets across all South Bay habitats of 29 percent in fall and a decrease of 24 percent in winter, relative to baseline conditions, under Alternative B between Year 0 and Year 50 (Stralberg and others 2006).

Mudflat loss due to proposed breaching is predicted to be minor compared to the mudflat loss that would occur due to ongoing mudflat erosion, sea level rise and vegetation encroachment, and any losses attributed to the Project would be offset to some extent by the new mudflat areas that would be provided within breached ponds. Therefore, this impact would be less than significant. Nevertheless, the Adaptive Management Plan would be used to monitor changes in the extent of mudflats and implement action to ensure that declines do not reach a level of significance. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, the projected amount of intertidal mudflat at Year 50 is 6,400 acres (Table 3.6-5), a reduction of 48 percent from the baseline of 12,400 acres. As discussed for Alternatives A and B, the majority of the overall South Bay mudflat loss occurs as result of continuing geomorphic trends and sea level rise. The majority of the mudflat loss is projected to occur north of the Dumbarton Bridge in response to ongoing mudflat erosion and sea level rise, and these losses are not attributable to the Project.

In the far South Bay, implementation of Alternative C results would result in a loss of approximately 2,000 acres when compared to baseline conditions. Alternative C therefore reverses the historic trends on mudflat accretion in the far South Bay. Additional mudflat loss would occur in the mouth of Coyote Creek due to the tidal restoration of ponds along Coyote Creek, as described in SBSP Impact 3.3-2 in Section 3.3, Hydrology. As with Alternative B and C, new mudflat areas would be created along the numerous tidal channels that would be present within the restored marsh, reducing the estimate of mudflat loss attributed to the Project.

PRBO's modeling has predicted declines in numbers of willets across all South Bay habitats of 28 percent in fall and 46 percent in winter, relative to existing conditions, under Alternative C between Year 0 and Year 50 (Stralberg and others 2006).

If the mudflat declines presented in the SBGA (Appendix I) for Alternative C were to occur, and no adaptive management to reverse these declines were implemented, impacts to mudflats and associated biota could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in the extent of mudflats, and the effects of those changes. If mudflat losses resulting from the Project are excessive, the extent and location of future breaches would be modified accordingly, if necessary, to ensure that declines do not reach a level of significance. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-3: **Potential habitat conversion impacts to western snowy plovers.**

Potential SBSP Restoration Project Effects. The entire San Francisco Bay population of western snowy plovers currently breeds in the South Bay, where this species nests in and adjacent to a number of salt ponds. The Pacific coast population of this species is federally listed as threatened, and substantial losses in the San Francisco Bay population could be significant in the context of the Pacific Coast population. Western snowy plovers in the South Bay nest primarily in dry, salt panne habitat within ponds, but also (especially historically) on salt pond levees and islands within salt ponds. During the 2004 nesting season, most western snowy plover activity occurred in Ponds E6B, E8, and A22 (Strong and others 2004). During the 2005 nesting season, most activity occurred in Ponds E8A, A22, A8, and B12 (Tucci and others 2006). In 2006, most nesting again occurred at Eden Landing, although more nests were recorded at Pond A8 than in previous years (Robinson and others 2006). Eden Landing has historically supported more breeding western snowy plovers than any other location within San Francisco Bay.

A total of 99 adult western snowy plovers were recorded in San Francisco Bay during 2006 breeding-season "window" surveys (surveys conducted range-wide during late May or early June; Robinson and others 2006). This is a decline from the 124 adults recorded in 2005 and 113 adults recorded in 2004. Window surveys do not necessarily detect all breeding birds, however, they do provide a rough estimate of the breeding population, and a consistent index that can be used to track changes over time, since they have been conducted in a similar fashion since the 1970s (PRBO, unpublished data). Based on window survey data from San Francisco Bay and from other locations along the Pacific Coast, the nesting population in San Francisco Bay has represented between five percent and 10 percent of the Pacific Coast population of western snowy plovers between 2004 and 2006. These recent abundance estimates for San Francisco Bay are considerably lower than those recorded during the late 1970s (greater than 300 adults) and during the 1980s (greater than 200 adults). While the window survey data have a relatively high level of uncertainty, particularly in San Francisco Bay where access to all potential habitat may be difficult, the data suggest a substantial and continuing decline over the last 30 years. Concurrent with this decline in abundance has been a decline in the number of ponds used for nesting (Tucci and others 2006). The

causes of this decline are unknown, and are not likely related to habitat changes since habitat has not become less extensive (and has perhaps become more extensive since the 1970s, at least since implementation of the ISP). Avian predation may currently be a factor limiting reproductive success (Strong and others 2004, Tucci and others 2006), as numbers of breeding gulls and corvids have increased considerably in the South Bay in recent decades.

Although western snowy plovers in San Francisco Bay occasionally nest on levees and islands, the majority of nests are currently found on flats within dry or partially dry ponds (Feeney and Maffei 1991, Fischer 1998). In some areas that have been managed intensively for nesting shorebirds, nesting densities considerably higher than current densities in San Francisco Bay have been achieved. For example, at the Moss Landing Wildlife Area, 153 acres of salt ponds support an average of 70 to 80 breeding western snowy plovers each year (Eyster and others 2003). High densities of nesting western snowy plovers have also been achieved in a mixture of islands and salt flats in evaporation basins in the San Joaquin Valley (H.T. Harvey & Associates, unpublished data).

Restoration of managed ponds to tidal marsh would result in a loss of western snowy plover nesting habitat due to inundation and loss of suitable nesting substrate. A few ponds, particularly in Eden Landing, as well as Pond A22 and SF2, have long been used regularly for nesting by western snowy plovers. In the past, such regular use resulted from the type and consistency of management of these ponds for salt production (*e.g.,* the same ponds representing the same stage in the salt-making process provided conditions that were consistently suitable for use by nesting plovers). Currently, under the ISP, attempts are being made to manage a few ponds (*e.g.,* Ponds E6B, E8, and E8A) with optimal breeding conditions for western snowy plovers in mind. Other ponds are used more sporadically by this species, and in any given year there may be extensive habitat in the South Bay that is ostensibly suitable for nesting but is unoccupied by western snowy plovers. Without management of ponds targeted specifically for this species, such an apparent excess of potential nesting ponds is necessary to ensure that suitable nesting habitat is present in the South Bay, given that changes in precipitation, rate of evaporation, and pond management could make any given pond unsuitable in a given year. Western snowy plovers move around considerably among South Bay ponds, both between years and between nesting attempts within years, taking advantage of ponds with suitable nesting conditions. A reduction in the extent of suitable habitat could presumably occur without a decline in numbers of western snowy plovers if some ponds are managed specifically (and consistently) for nesting western snowy plovers.

Some SBSP Restoration Project activities (*e.g.,* at Ponds A16 and SF2) would involve the construction of numerous islands that would be specifically managed to provide island nesting habitat for western snowy plovers and other birds. Thus, with targeted management, it is expected that densities of western snowy plovers can be increased so that South Bay populations can be maintained or increased despite a reduction in the extent of managed ponds.

However, even if habitat availability is adequate to support the desired number of nesting plovers, concentration of nesting birds in fewer locations may result in increased predation pressure (*e.g.,* if individual gulls, corvids, foxes, or other predators key in on these locations), subject larger numbers of birds to disturbance by humans or predators at any given nesting area, and provide fewer options for

nesting birds in the event that pond conditions in preferred nesting areas are unsuitable (*e.g.,* due to high water levels in wet years).

In addition, breaching ponds where California gulls breed, either unintentionally under Alternative A or intentionally under Alternatives B or C, would result in the displacement of several large California gull colonies. These displaced gulls may select nesting sites on salt pond levees, on islands, or on salt pannes, all of which have been used as breeding habitat by western snowy plovers. Due to the larger size of California gulls, and the potentially overwhelming numbers of gulls that may be prospecting for new nesting sites, western snowy plovers may be displaced from currently used nesting areas. California gulls displaced to sites closer to nesting western snowy plovers may also prey upon plover eggs and chicks. Under Alternatives B or C, predator management would be undertaken as needed to minimize impacts of predators on nesting birds such as the western snowy plover. It is assumed that existing levels of predator management, including avian predator management currently conducted at Eden Landing, would continue under the No Action Alternative; however, given the steady decline in western snowy plover numbers over the past few decades, such levels of predator management may not be adequate to protect this species in the South Bay.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on western snowy plovers if it resulted in a decline in the adult breeding-season population within San Francisco Bay (relative to the NEPA/CEQA baseline). Because Bay Area populations are at a long-term low point, based on monitoring coordinated by PRBO Conservation Science since the 1970s, any further decline that results from the SBSP Restoration Project would be considered significant. The San Francisco Bay population has apparently been declining over the last several decades, and a decline after implementation of the SBSP would only be considered a significant impact if it resulted from Project activities rather than other factors. Ongoing monitoring of breeding distribution, abundance during the breeding season, and nesting success would be necessary to determine if any observed declines are related to habitat alteration as a result of the Project, or are related to other factors.

The extent to which ponds currently owned or controlled by Cargill would be used by nesting plovers in the future is also unknown. Historically, large numbers of western snowy plovers nested in the Newark and Coyote Hills ponds, both on levees and salt panne habitat (Page and Stenzel 1979). However, recent surveys have found very few plovers nesting in these ponds, likely due to changes in water management since Cargill's operation consolidation, resulting from the SBSP acquisition, and possibly due to encroachment by California gull colonies on former plover nesting areas (J. Albertson, pers. comm.). In 2006, only one nest (on Pond N1) was found on Cargill-managed ponds (C. Strong, pers. comm.). Thus, in the absence of changes in habitat or pond management in these ponds, it is unknown whether substantial numbers of western snowy plovers displaced from the SBSP Restoration Project Area by tidal restoration would use Cargill ponds (and use them successfully) for nesting.

Adaptive Management Plan. There is considerable uncertainty regarding the effects of the SBSP Restoration Project on western snowy plover numbers in the South Bay. Although the conversion of managed pond habitat to tidal habitats (under any of the three alternatives) would result in a decline in the extent of western snowy plover habitat, quantifying the predicted effect of such a habitat decline on

western snowy plover numbers is difficult. The extent of habitat offering dry salt pannes or island nesting habitat varies from year to year due to the timing and amount of precipitation (and consequently water depth) in seasonal ponds, and much seemingly suitable habitat in any given year is unoccupied by western snowy plovers. Nevertheless, substantial loss of western snowy plover habitat at restored ponds without enhancement of management at managed ponds would be expected to result in declines in plover numbers.

Enhancing managed pond habitat through targeted management for shallow water depths and the creation of artificial islands has been found to support high nesting densities of western snowy plovers at the Moss Landing Wildlife Area and in evaporation basins in the San Joaquin Valley (Eyster and others 2003, H.T. Harvey & Associates, unpublished data). Although the use of islands constructed specifically for plovers has not yet been tested in San Francisco Bay, the creation of nesting islands and the management of suitable water levels, nesting island conditions (*e.g.,* through vegetation management), and predators at Ponds E12, E13, SF2, and A16 in Phase 1, and targeted water-level management at other ponds (*e.g*., Ponds E6A, E6B, and possibly R1-R5), is expected to support high densities of nesting western snowy plovers. Additional ponds would be available for management as nesting western snowy plover habitat, either on islands or in seasonally managed ponds. The number of ponds managed for this species, and the manner in which they are managed (*e.g.,* with islands or salt pannes), would be informed by monitoring the results of ongoing plover habitat management at Eden Landing and the outcome of Phase 1 studies. Uncertainty regarding the extent of habitat managed for plovers, the manner in which it would be managed, and the densities achievable contribute to uncertainties in predicting Project impacts to this species.

The number of nesting western snowy plovers that can be supported in a reduced-pond landscape in the South Bay depends on a number of factors in addition to the acreage of suitable habitat. The intensity of pond, island, and predator management are important determinants of the densities and reproductive success of nesting plovers achievable in managed South Bay ponds. Intensive predator management has been important in maintaining high densities of nesting western snowy plovers in the Monterey Bay area, including the Moss Landing Wildlife Area (Eyster and others 2003, Neuman and others 2004), while vegetation management has been important in determining use of shallow-water managed habitats in the San Joaquin Valley (H.T. Harvey & Associates, unpublished data). Concentration of nesting plovers into relatively few ponds, as more ponds are restored to tidal habitats, increases the susceptibility of large proportions of the South Bay population to predation, disturbance by predators and by human activity, and nesting failure in the event of lapses in management or failure of pond infrastructure. The degree to which these factors would affect the nesting densities and reproductive success achievable in managed ponds is unknown.

Determination of Baseline and Monitoring. The baseline level for NEPA/CEQA purposes is the condition in 2006. However, due to inter-annual variability in plover numbers in the South Bay, a three-year average likely provides a more accurate baseline. Robinson and others (2006) estimated that approximately 100 adult western snowy plovers bred in San Francisco Bay in 2006; using window-survey estimates of 124 adults in 2005 and 113 adults in 2004, the 3-year mean of approximately 112 birds serves as the baseline for NEPA/CEQA purposes. In light of continuous, recent declines in western snowy

plover numbers over the past several decades, 2006 numbers are below this three-year average. If such declines continue before the SBSP Restoration Project is implemented, they would not have resulted from the Project, and the most recent three-year average should be used as the baseline.

Once SBSP Restoration Project activities commence, ongoing monitoring of western snowy plover numbers through comprehensive breeding-season surveys would be used to detect changes in numbers of breeding western snowy plovers using the South Bay. Because breeding success (not just numbers of adults) is important to the sustainability of western snowy plover populations in the South Bay, estimates of breeding success (*e.g.,* nest success, or the numbers of chicks surviving to near-fledging age as determined by sampling areas with the highest densities) would also be determined by monitoring.

Under the Adaptive Management Plan, a plan for monitoring the potential effects of the SBSP Restoration Project on western snowy plovers would be developed prior to the initiation of Phase 1 of the Project. Monitoring methods would follow those currently employed by SFBBO, in which multiple observers (primarily volunteers) conduct regular surveys of specific South Bay locations, recording the numbers of adults, nests, and chicks observed in each location. Such monitoring would occur throughout the nesting season (March into September).

Although 2006 survey numbers represent the baseline for NEPA/CEQA purposes, one of the objectives of the SBSP Restoration Project is to contribute to the recovery of the western snowy plover. The western snowy plover recovery plan (USFWS 2007) sets a goal of 500 breeding adults for the San Francisco Bay Region. Because western snowy plovers within the Bay Area breed almost exclusively in salt ponds within the South Bay, and the SBSP Restoration Project Area comprises approximately half of the salt pond acreage in the South Bay, one of the goals of the SBSP Restoration Project would be to provide habitat for approximately half of the recovery plan goal, or 250 breeding adults. Thus, while the NEPA/CEQA baseline for impact assessment is the number of breeding birds currently present in the South Bay, a long-term goal of the Project is to support considerably more plovers in the SBSP Restoration Project Area.

Adaptive Management Triggers. The Adaptive Management Plan includes "triggers" that would be established to signal Project impacts that are approaching the threshold of significance, before they reach that threshold. The SBSP Restoration Project would have a significant impact on western snowy plovers if it resulted in a decline (relative to baseline numbers) in the adult breeding-season population within San Francisco Bay. Due to natural inter-annual variability in western snowy plover numbers in the Bay Area, an apparent decline from the NEPA/CEQA baseline may be detected even in the absence of changes in habitat availability, habitat quality, or other factors subject to the control of the Project. In addition, there has been a long-term decline in Bay Area western snowy plover numbers since the 1970s (Page and others 1991, Strong and others 2004, Tucci and others 2006); if such declines were to continue, they may not be a result of the SBSP Restoration Project, and thus, those declines would not be considered a significant impact from the perspective of NEPA or CEQA for this Project.

Phase 1 activities would include the creation of numerous nesting islands in Ponds A16 and SF2, fewer islands in Ponds E12 and E13, and the management of these ponds for shallow water levels. These activities, which are expected to increase densities of nesting western snowy plovers within these ponds,

would complement ongoing management (per the ISP) of seasonal wetland habitat in other ponds (particularly Pond E6B) that currently support large numbers of nesting western snowy plovers, and possibly other ponds such as Ponds E6A and R1-R5. Because Phase 1 activities would also result in the conversion of ponds that support nesting plovers (*i.e.*, Pond E8A, A8) to tidal habitats, the net effect of Phase 1 activities on nesting western snowy plovers would be monitored, and habitat for this species (both in the Phase 1 ponds and in other ponds) would be managed adaptively to determine the optimal habitat type and management regime for successful plover nesting and ensure that numbers of nesting plovers do not reach the threshold of significance.

Furthermore, either Alternative B or Alternative C would include enhanced levels of predator management, as necessary. Increases in the numbers of avian predators such as corvids and California gulls may well be responsible for the long-term decline in western snowy plover numbers in the Bay Area, and tidal restoration would increase nesting habitat for the northern harrier. As a result, enhanced predator management may be extremely important in allowing for densities of western snowy plovers to be increased sustainably in the SBSP Restoration Project Area.

From a program-level perspective, the effects of initial Project activities on western snowy plover numbers would inform the extent to which further tidal restoration is feasible while still attempting to reach the Project's restoration targets for western snowy plovers, whether these targets should be revised in light of other Project objectives, or whether the design of future phases should be revised (*e.g.*, to include more ponds managed specifically for western snowy plovers) in light of initial monitoring results. Therefore, the adaptive management trigger should allow not only for the determination of whether the Project is potentially causing a significant impact to western snowy plovers under NEPA or CEQA, but also whether it is deviating from the Project goals for the species.

The Adaptive Management Plan would establish the means by which expected numbers of western snowy plovers would be predicted prior to specific phases of restoration. Following each restoration phase, ongoing monitoring of western snowy plover numbers would determine whether actual numbers deviate from the expected trajectory of plover abundance toward the restoration target. The primary adaptive management trigger would be a decline below this projected trajectory in any given year, or any decline in numbers below the recent three-year average (approximately 112 adult birds). In light of recent increases in populations of predatory corvids and California gulls, and declines in western snowy plover numbers over the past several decades, 2006 numbers are below this three-year average. If such declines continue before the SBSP Restoration Project is implemented, they would not have resulted from the Project, and the most recent three-year average should be used as the baseline for determining significance, and as the trigger (in any single year) for adaptive management. Increases in predatory/competitive species to population or activity levels that may threaten the maintenance of western snowy plover numbers in the South Bay would also serve as an adaptive management trigger.

Adaptive Management. If monitoring results in "tripping a trigger", the first step in adaptive management would be to determine whether the change detected is a result of the SBSP Restoration Project. This focused evaluation would include a detailed analysis of all SBSP Restoration Project monitoring data, including any relevant applied studies (see Appendix D), and western snowy plover window survey data

from the entire Pacific Coast population. Available data on predation and reproductive success of western snowy plovers within the Bay Area would also be analyzed. If it is determined that there are actual declines in the abundance of breeding western snowy plovers in San Francisco Bay, and these declines are likely the result of the SBSP Restoration Project, adaptive management actions would be undertaken to attempt to reverse the adverse effect, and/or to plan future phases of restoration to provide better habitat for western snowy plovers.

Adaptive management actions may include the construction of additional islands, the creation of islands of a different size and/or configuration (based on an analysis of use of existing islands), adjustment of water depths, adjustment of pond management to provide more salt panne habitat, and increased levels of predator management. Other means of providing nesting habitat would also be assessed. For example, "furrowed" ponds, in which the pond substrate is furrowed to create small islands and ridges surrounded by shallow water, have been successful in supporting high densities of nesting snowy plovers in the Owens Valley (N. Warnock, pers. comm.); creation and management of such habitat in South Bay ponds, and comparison of nesting plover densities among ponds providing different types of plover nesting habitat, would allow for effective management of plover habitat. If practicable adaptive management actions that attempt to prevent a decline in the abundance of breeding western snowy plovers have been exhausted, and it is determined that further pond conversion would result in declines that reach the threshold of significance, further tidal restoration would be halted.

Alternative A No Action. Under the No Action Alternative, potential breeding and foraging habitat for western snowy plovers would be lost as a result of uncontrolled levee breaching, which would eventually flood some ponds that currently provide shallow foraging habitat. Under this alternative, several current breeding sites would be lost, including Ponds E8A, E12, and E14. Ponds E6A, E6B, E8, and SF2 (all of which have been used somewhat regularly by nesting plovers) would still be managed under this alternative, and A22 would remain a seasonal pond. Western snowy plovers could still potentially breed at these locations.

Under the No Action Alternative, Pond A6 would be lost as breeding habitat for California gulls, which is expected to lead to the redistribution of nearly 20,000 breeding gulls to elsewhere in the South Bay. These gulls could potentially displace nesting western snowy plovers. Under the No Action Alternative, it is assumed that existing levels of predator management would continue. However, given the steady decline in western snowy plover numbers over the past few decades, such levels of predator management may not be adequate to protect this species in the South Bay, and a lack of additional Project-related funding would preclude the ability to respond to gull displacement or the increasing threat posed by gulls and corvids to nesting birds in the South Bay. As a result of increasing numbers of avian predators in the South Bay, the concentration of nesting plovers in fewer areas due to unintentional levee breaches, and a lack of funding for increased predator management, predation pressure on nesting western snowy plovers is expected to be considerable under this alternative.

Because ideal habitat for western snowy plovers in San Francisco Bay changes on an annual basis, depending on factors such as water levels and predator abundance, estimating the total acreage of habitat that would be lost, or the total number of nesting western snowy plovers that would be displaced, as a

result of the No Action Alternative is problematic. Some displaced western snowy plovers could potentially nest in other areas outside of the SBSP Restoration Project Area, such as the Oliver Salt Ponds north of the San Mateo Bridge, in ponds retained as active evaporation ponds by Cargill, or even beaches outside of the Bay system. PRBO's estimates of western snowy plover numbers in the South Bay at Year 50 under Alternative A range from 74 to 518 birds, depending on the achievable nesting densities (Stralberg and others 2006). Nevertheless, under the No Action Alternative, declines in the number of breeding western snowy plovers in San Francisco Bay are expected, and impacts would be potentially significant,

Alternative A Level of Significance: Potentially Significant

Alternative B Managed Pond Emphasis. Under Alternative B, potential breeding and foraging habitat for western snowy plovers would be lost as a result of conversion of some ponds into tidal habitats that are now used by nesting western snowy plovers. The exact acreage of habitat loss is not known, since the extent of ostensibly suitable habitat, and the subset of this habitat that is occupied, varies from year to year. Furthermore, since much seemingly suitable habitat in any given year is unoccupied, the effects on South Bay populations of the loss of potential nesting habitat in the ponds restored to tidal action are unknown. Under this alternative, most areas currently used during the breeding season would be retained as seasonal or shallow-water ponds for shorebirds, including A22, E6A, and E6B. In Phase 1, Ponds E12, E13, and SF2 would be enhanced with islands expected to provide nesting and foraging habitat for western snowy plovers. In addition, Pond A16, which is not currently used by western snowy plovers, would be enhanced with numerous islands that are expected to provide habitat for western snowy plovers. Enhancement of habitat with constructed islands has supported nesting western snowy plovers in managed ponds in the San Joaquin Valley (H.T. Harvey & Associates, unpublished data) and is expected to have similar results in the South Bay, though this has not yet been tested. Additional ponds could also be enhanced for nesting western snowy plovers, either via island creation or targeted water level management, which would be informed by monitoring results and the success of Phase 1 activities in supporting western snowy plovers.

The California gulls displaced from Pond A6 and other locations by tidal breaching have the potential to encroach on nesting sites for western snowy plovers. In addition, concentrations of nesting birds in fewer areas are likely to increase predation pressures on these birds. However, active predator management under Alternative B would be implemented as needed to offset these impacts. Because of island creation, active management of reconfigured ponds, and increased predator management, Alternative B is expected to support higher numbers of western snowy plovers than the No Action Alternative. Alternative B is likely to support higher numbers of nesting plovers than Alternative C as well, due to the greater extent of managed pond habitat in Alternative B. PRBO's estimates of western snowy plover numbers in the South Bay at Year 50 under Alternative B range from 135 to 945 birds, depending on the achievable nesting densities (Stralberg and others 2006).

There is considerable uncertainty as to the response of San Francisco Bay western snowy plover numbers to the changing landscape that would occur under Alternative B, including uncertainty about potential density-dependent predation and the degree to which island creation and pond management targeted at

nesting birds such as western snowy plovers can sustain high nesting densities. If western snowy plover numbers were to decline as a result of restoration under Alternative B, and no adaptive management to reverse these declines were implemented, impacts to this species could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of the western snowy plover breeding population in San Francisco Bay to SBSP Restoration Project activities, and to adapt ongoing management and future restoration accordingly, with the goal of ensuring that declines do not exceed the level of significance. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, potential breeding and foraging habitat for western snowy plovers would be lost as result of conversion of most ponds that are used by nesting western snowy plovers into tidal habitats. As discussed above, the exact acreage of habitat loss is not known, due to uncertainty in what currently constitutes suitable, occupied habitat. Under this alternative, the only areas currently used by nesting plovers that would be retained as seasonal or shallow-water ponds for shorebirds or would be enhanced with islands (*i.e.*, that could potentially provide western snowy plover nesting habitat), would be Ponds E11, E12, E13, and SF2. Loss of other ponds currently used by nesting plovers, such as Ponds A8, A22, E6B, E8, and E8A, would substantially reduce the acreage of suitable habitat available for western snowy plovers in San Francisco Bay. However, Ponds E12, E13, and SF2 would be enhanced with islands that are expected to provide nesting and foraging habitat for western snowy plovers. In addition, Pond A16, which is not currently used by western snowy plovers, would be enhanced with numerous islands that are expected to provide habitat for western snowy plovers. Additional ponds could also be enhanced for nesting western snowy plovers, either via island creation or targeted water level management, which would be informed by monitoring results and the success of Phase 1 activities in supporting western snowy plovers.

The California gulls displaced from Pond A6 and other locations by tidal breaching have the potential to encroach on nesting sites for western snowy plovers. In addition, concentration of nesting birds in fewer areas is likely to increase predation pressures on these birds. However, active predator management under Alternative C would be implemented as needed to offset these impacts. Because of island creation, active management of reconfigured ponds, and increased predator management, Alternative C could potentially support higher numbers of western snowy plovers than the No Action Alternative. However, due to the relatively smaller area of managed ponds, numbers of western snowy plovers would likely be lower under Alternative C than under Alternative B.

Island creation, active pond management, and predator management are expected to allow high densities of nesting plovers to be achieved, yet there is considerable uncertainty as to the response of San Francisco Bay western snowy plover numbers to the changing landscape that would occur under Alternative C. If western snowy plover numbers were to decline as a result of restoration under Alternative C, and no adaptive management to reverse these declines were implemented, impacts to this species could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in abundance, and to adapt ongoing management and future restoration accordingly, to

ensure that declines do not reach a level of significance. Under the Adaptive Management Plan, the most effective habitat management and predator management techniques identified through ongoing monitoring would be implemented, and future restoration (including determination of the maximum tidal restoration achievable without causing a significant impact to snowy plovers) would be planned to ensure that adequate habitat to allow successful nesting by western snowy plovers is available. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-4: **Potential reduction in the numbers of breeding, pond-associated waterbirds (avocets, stilts, and terns) using the South Bay due to reduction in habitat, concentration effects, displacement by nesting California gulls, and other Project-related effects.**

Potential SBSP Restoration Project Effects. American avocets, black-necked stilts, Forster's terns, and Caspian terns are waterbirds that nest and forage within the SBSP Restoration Project Area. These birds nest on islands within ponds and, in the case of stilts and avocets, on salt pond levees, in dry salt panne habitat, around marsh ponds, and in other bayside habitats such as water treatment plant settling ponds. avocets and stilts forage in salt ponds, marsh ponds, and alternative habitats such as water treatment plants; avocets also forage on intertidal mudflats when they are not inundated. The terns forage on fish, which they catch in the Bay, in lower-salinity ponds within the SBSP Restoration Project Area, and in artificial ponds, lagoons, and reservoirs throughout the South Bay.

Numbers of Forster's terns breeding in South San Francisco Bay averaged about 2,750 breeding birds from 1982 to 2003 (range = 1,628 to 4,312), although numbers declined somewhat over this period, with approximately 1,936 birds in 2004 (Strong and others 2004). Based on nest counts, numbers of adult Forster's terns breeding in the South Bay totaled nearly 1,550 in 2005 (Strong 2005) and more than 2,400 in 2006 (Strong 2006). The Pacific Coast population of this species has been estimated at about 8,100 (Spendelow and Patton 1998), and the North American population has been reported to be about 50,000 (Kushlan and others 2002). Thus, South San Francisco Bay has historically supported approximately 30 percent of the Pacific Coast Forster's terns, and about five percent of the North American total for this species, although that percentage may be lower in recent years. Breeding Forster's terns are scattered throughout the San Francisco Bay Area in small colonies. Larger concentrations (greater than 400 birds) are present at Eden Landing, Hayward Shoreline, the Moffett Federal Airfield area, and Knight Island in San Pablo Bay (Strong and others 2004). In 2006, more than half of all pairs (650 of 1,214 in all of the South Bay) nested on the levee between Ponds 6 and 7, west of Coyote Hills and north of SR 84. The number of adults nesting within ponds in the SBSP Restoration Project Area itself in recent years totaled approximately 890 in 2004 (Strong and others 2004), 647 in 2005 (Strong 2005), and 368 in 2006 (Strong 2006).

Strong and others (2004) reported breeding abundance of Caspian terns in the Bay Area between 1982 and 2003. During the 12 years in which all major colonies were surveyed, a mean of 1,968 individuals were present in the Bay Area, with a mean of 851 (43 percent of the Bay-wide total) in the South Bay.

However, large colonies formerly present at Bair Island and near Turk Island in the South Bay have been unoccupied since 1995 and 1988, respectively, and the 2003 South Bay total of 152 individuals represented just seven percent of the Bay-wide total of 2,236 birds. Nest counts of Caspian terns in the South Bay totaled 72 in 2005 (Strong 2005) and 84 in 2006 (Strong 2006). The Pacific Coast population of this species has been estimated at about 26,000 individuals (Shuford and Craig 2002), and the North American population has been reported at 66,000 to 70,000 birds (Kushlan and others 2002). Thus, San Francisco Bay supports approximately eight percent of Pacific Coast Caspian terns and three percent of all Caspian terns in North America. The majority of Caspian terns in the San Francisco Bay Area breeds at Brooks Island in the North Bay. Locations of small breeding colonies in the South Bay are shown in Figure 3.6-4.

Rintoul and others (2003) estimated South Bay breeding populations of up to 590 pairs of Black-necked stilts and 1380 pairs of American avocets. No other coastal site along the Pacific Coast supports such a high abundance of these two species. Morrison and others (2001) estimated the North American population of American avocets at approximately 450,000 and that of Black-necked stilts at about 150,000. Maximum reported counts for the Pacific Flyway were about 56,300 avocets and 16,000 stilts (Morrison and others 2001). Thus, the South Bay supports approximately four percent of Pacific Flyway Black-necked stilts, and greater than one percent of the North American population of Black-necked stilts, as well as approximately three percent of Pacific Flyway American avocets and less than one percent of this species's North American population. Breeding concentrations of these species in the South Bay are shown in Figure 3.6-5. Eden Landing has the greatest number of breeding stilts and avocets within the SBSP Restoration Project Area. The vast majority of American avocets in the South Bay breed in or adjacent to salt ponds, but Rintoul and others (2003) found that 21 percent of 137 black-neck stilt nests were in marshes, and 69 percent were around salt ponds. Both of these species breed extensively in the South Bay in areas outside the SBSP Restoration Project Area, including New Chicago Marsh in Alviso, the San Jose/Santa Clara WPCP sludge ponds, and ponds that are currently managed by Cargill in Newark and Redwood City.

Restoration of managed ponds to tidal marsh could result in a loss of nesting habitat for stilts, avocets, and terns due to inundation of dry nesting substrate, potentially leading to a decline in South Bay breeding populations. However, at any given time, extensive nesting substrate on levees, and some island substrate, is unoccupied by these birds, suggesting that some reduction in suitable nesting habitat can occur without resulting in a decline in numbers. In addition, some SBSP Restoration Project activities (*e.g.,* at Ponds A16, SF2, E12, and E13 in Phase 1, and possibly at other ponds subsequently) would involve the construction of numerous islands that would be specifically managed to provide nesting habitat for these birds. The extent of island nesting habitat that is available to these species is expected to be greater after implementation of Phase 1 activities than it is currently, and monitoring the results of Phase 1 activities would inform subsequent restoration and management activities to improve management for nesting birds within the SBSP Restoration Project Area.

Even if the availability of nesting habitat is adequate to support high numbers of nesting birds, concentration of nesting birds in fewer locations may result in increased predation pressure (*e.g.,* if individual gulls, corvids, foxes, or other predators key in on these locations), and subject larger numbers

of birds to disturbance by humans or predators at any given nesting area. In addition, breaching of ponds where California gulls breed, either unintentionally under Alternative A or intentionally under Alternatives B or C, would result in the displacement of several large California gull colonies. These displaced gulls may select nesting sites on salt pond levees or on islands, all of which may be used as breeding habitat by avocets, stilts, and terns. Due to the larger size of gulls, and the potentially overwhelming numbers of gulls that may be prospecting for new nesting sites, avocets, stilts, and terns may be displaced from currently used nesting areas. California gulls displaced to sites closer to nesting avocets, stilts, and terns may also prey upon eggs and chicks of these species. Under Alternatives B or C, predator management would be undertaken as needed to minimize impacts of predators on nesting birds; it is assumed that existing levels of predator management would continue under the No Action Alternative.

The SBSP Restoration Project could also potentially result in adverse effects on South Bay populations of nesting stilts, avocets, and terns by reducing foraging habitat. For example, shallow-water foraging habitat in managed ponds is expected to decrease from baseline levels under each of the three alternatives (Table 3.6-5), reducing the extent of high-tide foraging habitat available to stilts and avocets, while intertidal mudflat losses would further reduce foraging habitat for avocets (Table 3.6-5). Foraging habitat for terns within managed ponds would decline due to conversion to tidal habitats, although the increase in tidal foraging habitat, and the increases in fish populations expected to occur as a result of tidal restoration, may more than offset the loss of managed pond foraging habitat.

PRBO's modeling predicted declines (relative to existing conditions) in Black-necked stilt numbers in the South Bay during winter, ranging from one percent under Alternative B to nine percent under Alternative C and 16 percent under Alternative A (Stralberg and others 2006). This modeling also predicted declines in winter American avocet numbers in the South Bay ranging from 41 percent under Alternative B to 47 percent under Alternative C and 53 percent under Alternative A, and declines in winter numbers of Forster's terns ranging from 57 percent under Alternative B to 72 percent under Alternative A and 80 percent under Alternative C (Stralberg and others 2006). These models predicted changes in abundance based on predicted changes in winter foraging habitat for stilts and avocets; availability of breeding habitat was not included in the model parameters, and changes in breeding abundance were not predicted by this modeling. PRBO's modeling did not capture the increase in densities expected to occur as a result of island creation (*e.g.,* in Ponds A16, SF2, E11, and E12 in Phase 1), shallow-water management, and predator management Creation and management of shallow-water ponds with numerous islands or peninsulas for nesting have resulted in very high densities of nesting stilts and avocets at managed ponds in the San Joaquin Valley (Giroux 1985, H.T. Harvey & Associates 1996, Robinson and others 1997 1999).

Numbers of avocets and stilts may not decrease to the extent predicted by PRBO's modeling if numbers in the existing system are far below the system's carrying capacity, if reconfigured ponds are able to sustain very high densities of foraging and breeding birds as has been achieved elsewhere, or if increased predator management increases breeding success substantially relative to existing conditions. Likewise, tern numbers may not decline substantially if the creation of numerous nesting islands and restoration of tidal foraging habitat (with expected resulting increases in fish numbers) offsets potential adverse effects

of the loss of a few nesting islands in restored ponds, and the loss of foraging opportunities in managed ponds.

The intensity of pond, island, and predator management would be important determinants of the densities and reproductive success of nesting stilts, avocets, and terns achievable in managed South Bay ponds. Concentration of nesting birds into relatively few ponds, as more ponds are restored to tidal habitats, increases the susceptibility of large proportions of South Bay populations of these species to predation, disease, disturbance by predators and by human activity, and nesting failure in the event of lapses in management or failure of pond infrastructure. The degree to which these factors would affect the nesting densities and reproductive success achievable in managed ponds is unknown.

Black skimmers, California gulls, and double-crested cormorants nest in similar habitats and would potentially be affected in a manner similar to avocets, stilts, and terns. These three species are all currently listed as California Species of Special Concern by CDFG; however, the revised list of bird species of special concern, which has been approved by CDFG and will be considered "official" once it is published, no longer includes these species. The black skimmer breeds in low numbers in the Project Area; its southern California breeding populations are increasing substantially, and it has been documented as breeding in the South Bay only since 1994 (Layne and others 1996). Therefore, the Project could impact at most only a few nests, comprising a very low proportion of the total California breeding population of this species. The California gull is an abundant breeder in the South Bay (including areas outside the SBSP Restoration Project Area, such as the Mowry and Newark salt ponds), and due to its adverse impacts on other native species (via predation and encroachment on nesting areas), it is considered a nuisance species in the Project Area. The California gull is expected to remain an abundant species in the South Bay regardless of the Project alternative (since it nests in salt ponds outside the Project Area). A small colony of double-crested cormorants, with 128 nests in 2006 (Strong 2006), is currently present on the levee between Ponds A9 and A10. Elsewhere, the species nests on electrical transmission towers over salt ponds and tidal marsh in scattered locations in the South Bay. Although the Project may result in the loss of levee nesting habitat for a limited number of cormorants, this species's populations are increasing throughout much of its range, and the Project would affect only a very small proportion of the species's Bay Area, California, and global populations. For these reasons, Project impacts to nesting populations of the black skimmer, California gull, and double-crested cormorant are considered less than significant, and these species are not discussed further under this impact.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact if it resulted in a decline of 10 percent or greater (relative to the NEPA/CEQA baseline) in the number of breeding Black-necked stilts, American avocets, Caspian terns, or Forster's terns breeding in the San Francisco Bay Area.

Based on the most recent available population estimates, a decline of 10 percent in San Francisco Bay populations of these species would represent a decline in Pacific Flyway populations of less than one percent for Caspian terns, Black-necked stilts, and American avocets. A decline of 10 percent in numbers of Forster's terns in San Francisco Bay could represent more than three percent of the Pacific Coast population, although it would represent less than one percent of the North American population of

this species. Because the most recent available data on Caspian tern abundance (Strong and others 2004) indicate that only seven percent of Caspian terns nested in the South Bay in 2003, impacts to this species from the SBSP Restoration Project are expected to be less than significant.

The San Francisco Bay population of Forster's Terns has apparently been declining since the early 1980s, and a decline after implementation of the SBSP Restoration Project would only be considered a significant impact if it resulted from Project activities rather than other factors. Ongoing monitoring of breeding distribution and abundance, and nesting success, would be necessary to determine if any observed declines are related to habitat alteration as a result of the Project, or are related to other factors.

It should also be noted that stilts, avocets, and terns breed in San Francisco Bay in a number of areas outside of the SBSP Restoration Project Area, including Newark ponds managed by Cargill. In recent years, most of the terns nesting in the Bay have nested outside of the SBSP Restoration Project Area. The SBSP Restoration Project could result in a redistribution of birds, increasing the number breeding outside the SBSP Restoration Project Area and thus offsetting any declines within the South Bay. Population declines would only be considered significant on a Bay-wide scale; redistribution within the Bay without a resulting population decline would not be significant.

Enhancement and management of habitat for these species in managed ponds is expected to maintain South Bay numbers by increasing densities in fewer, but higher quality, nesting areas. In addition, many Forster's terns and Black-necked stilts may nest in restored tidal marsh. However, if Bay-wide numbers of these birds decline by 10 percent or more as a result of the Project (*e.g.*, due to an increase in nest predation as a result of concentration of nests in fewer areas), this would be a significant impact.

Adaptive Management Plan. There is considerable uncertainty regarding the effects of the SBSP Restoration Project on numbers of breeding avocets, stilts, and terns in the South Bay, and in San Francisco Bay in general. Although the conversion of managed pond habitat to tidal habitats (under any of the three alternatives) would result in a decline in the extent of managed pond foraging and breeding habitat for these species, quantifying the predicted effect of such habitat conversion on numbers of pond-associated breeding birds is difficult. Enhancement of managed pond habitat by targeted management for shallow water depths and the creation of artificial islands has been found to support high nesting densities of nesting stilts and avocets at managed ponds in the San Joaquin Valley (Giroux 1985, H.T. Harvey & Associates 1996, Robinson and others 1997, 1999). Furthermore, enhanced predator management under Alternatives B and C would help to control adverse effects that might result from concentrating breeding birds into fewer areas, and could potentially result in population increases (relative to current levels) if predation levels are currently limiting productivity substantially.

The intensity of pond, island, and predator management would be important determinants of the densities and reproductive success of nesting birds achievable in managed South Bay ponds. In addition, the extent to which nesting birds displaced by tidal restoration in the SBSP Restoration Project Area may redistribute to other locations in the Bay Area, rather than leave the Bay Area, is unknown.

Determination of Baseline and Monitoring. Tern numbers have been monitored in a number of locations in San Francisco Bay by SFBBO and others since the early 1980s (Strong and others 2004, Strong 2005

2006). The baseline level for NEPA/CEQA purposes is the condition in 2006. However, due to inter-annual variability in numbers in the South Bay, a three-year mean likely provides a more accurate baseline. Estimates of adult Forster's terns in the areas surveyed by SFBBO within the Bay totaled approximately 1,936 birds in 2004 (Strong and others 2004), nearly 1,550 in 2005 (Strong 2005), and more than 2,400 in 2006 (Strong 2006), producing a 3-year mean of approximately 1,960 birds. Estimates of adult Caspian terns in the entire Bay Area are not available for 2005 and 2006, but the mean from 2002 to 2004 was approximately 1,625 birds (Strong and others 2004). The population estimates for Black-necked stilts (up to 590 pairs) and American avocets (up to 1380 pairs) in the South Bay provided by Rintoul and others (2003), serve as the NEPA/CEQA baseline for numbers of breeding stilts and avocets in the South Bay, although these numbers are augmented by migrants and wintering birds that breed outside the region. Because the South Bay supports the majority of stilts and avocets breeding in the Bay Area, and stilts and avocets are concentrated in fewer areas within the South Bay (with scattered pairs and smaller concentrations in other areas), trends in populations in the Bay Area as a whole can be monitored at selected sites within the South Bay.

Under the Adaptive Management Plan, a plan for monitoring the potential effects of the SBSP Restoration Project on nesting pond-associated birds would be developed prior to the initiation of Phase 1 of the Project. Total numbers of nesting Forster's and Caspian terns in the San Francisco Bay Region would be monitored via comprehensive breeding-season surveys conducted annually per the methods currently employed by SFBBO (*i.e.*, periodic surveys of all major colonies would be conducted during the breeding season, roughly March through August for these species). While very small colonies may not be sampled each year, these surveys would attempt to include all major colonies (*e.g.,* more than 50 individuals).

Areas supporting high concentrations of stilts and avocets, such as portions of the Eden Landing and Newark pond complexes, Warm Springs and New Chicago marshes, and the locations of Phase 1 Project activities involving island creation, would be monitored via periodic surveys during the breeding season to determine the numbers of stilt and avocet nests in those areas. Data from the first few years of monitoring at these specific locations would be used to refine data from Rintoul and others (2003) in establishing the baseline for stilt and avocet numbers.

At minimum, qualitative estimates of reproductive success would be obtained by limited monitoring of the most significant tern colonies and stilt/avocet nesting concentrations to determine estimates of nest success. In the interest of efficiency, such estimates are expected to be crude (*i.e.*, based on few visits and estimates of the number of young reaching near-fledging age) unless low productivity is observed in a particular area, at which point more focused monitoring or adaptive management studies may be implemented.

Adaptive Management Triggers. The adaptive management plan includes "triggers" that would be established to signal Project impacts that are approaching the threshold of significance, before they reach that threshold. The SBSP Restoration Project would have a significant impact if it resulted in a decline of 10 percent or greater (relative to the NEPA/CEQA baseline) in the number of breeding Black-necked stilts, American avocets, Caspian terns, or Forster's terns breeding in the San Francisco Bay Region, as a

result of the SBSP Restoration Project. The results of Strong and others (2004) indicates that numbers of nesting terns can show inter-annual variation far exceeding 10 percent in individual colonies, in the South Bay, and in the Bay Area in general. As a result, an apparent decline from the NEPA/CEQA baseline may be detected even in the absence of changes in habitat availability, habitat quality, or other factors subject to the control of the Project. In addition, there has apparently been a long-term decline in Bay Area Forster's tern numbers since the early 1980s (Strong and others 2004); if such a decline were to continue, it may not be a result of the SBSP Restoration Project, and thus, such a decline would not be considered a significant impact from the perspective of NEPA or CEQA for this Project.

One adaptive management trigger for breeding pond-associated birds such as stilts, avocets, and terns would be any apparent decline in the most recent three-year average of either numbers or breeding success below baseline levels. Although inter-annual variability may signal a trigger even though no real decline has occurred, such a sensitive trigger would be necessary to help avoid impacts that reach the threshold for significance. Increases in predatory/competitive species to population or activity levels that may threaten the maintenance of numbers of breeding pond-associated birds in the South Bay would also serve as an adaptive management trigger.

Adaptive Management. If monitoring results "trip a trigger," the first step in adaptive management would be to determine whether the change detected is a result of the SBSP Restoration Project. This focused evaluation would include a detailed analysis of all SBSP Restoration Project monitoring data, including the results of any relevant applied studies (see Appendix D), and any other available, relevant survey or monitoring data from the San Francisco Bay Region or elsewhere along the Pacific Coast. Available data on predation and reproductive success within the Bay Area would also be analyzed. If it is determined that there are actual declines in the abundance or breeding success of breeding pond-associated birds in San Francisco Bay, and these declines are likely the result of the SBSP Restoration Project, adaptive management actions would be undertaken to attempt to reverse the adverse effect, and/or to plan future phases of restoration to provide better habitat for these birds. Adaptive management actions may include the construction of additional islands, the creation of islands of a different size and/or configuration (based on an analysis of use of existing islands), adjustment of water depths, adjustment of pond management to provide more shallow-water foraging habitat (for stilts or avocets) or deeper foraging habitat (for terns), and increased levels of predator management. If practicable adaptive management actions that attempt to prevent a further decline in the abundance of breeding pond-associated birds have been exhausted, and it is determined that further pond conversion would result in declines that reach the threshold of significance, further tidal restoration would be halted.

Alternative A No Action. Under the No Action Alternative, potential breeding and foraging habitat for these birds would be lost as a result of unintentional levee breaching and the resulting development of vegetated marsh in some ponds, as well as development of vegetated, non-tidal, seasonal wetlands in some other ponds. In the Eden Landing complex, Ponds E1C, E2C, E4C, and E5C would likely be managed as seasonal wetlands, and Ponds E11, E8, E6A, and E6B are expected to remain as managed ponds throughout the 50-year planning horizon. The remaining ponds may continue to provide nesting habitat for terns, stilts, and avocets for some time, but eventually most of the other ponds are likely to become tidal due to the expected failure of unmaintained levees, and considerable nesting habitat would

eventually be lost at Eden Landing. Most nesting habitat within the Ravenswood and Alviso pond complexes is likely to be maintained under the No Action Alternative, although in the Alviso pond complex, the levees around Ponds A5, A6, and A7 would likely not be maintained, resulting in the loss of some nesting habitat in those ponds.

In addition, Pond A6 would be lost as breeding habitat for California gulls, which is expected to lead to the redistribution of nearly 20,000 gulls breeding elsewhere in the South Bay. These displaced gulls could potentially displace nesting terns, stilts, and avocets in other areas. Under the No Action Alternative, it is assumed that existing levels of predator management would continue, but a lack of additional Project-related funding would preclude the ability to respond to gull displacement or the increasing threat posed by gulls and corvids to nesting birds in the South Bay. As a result of increasing numbers of avian predators in the South Bay, the concentration of nesting birds in fewer areas due to unintentional levee breaches, and a lack of funding for increased predator management, predation pressure on nesting terns, stilts, and avocets is expected to be considerable under this alternative.

The No Action Alternative is expected to result in a decline in foraging habitat for stilts, avocets, and terns within managed ponds, and PRBO's modeling predicted substantial declines in winter numbers of foraging individuals of these species. Foraging conditions for terns would be enhanced in tidal habitats due both to an increase in tidal habitat and the predicted increase in fish populations in the South Bay as a result of unintentional tidal restoration in breached ponds. Intertidal mudflats in recently breached ponds would provide foraging habitat for avocets, although in the long term, the extent of mudflats would decline under all alternatives, largely for reasons beyond the control of the Project. Restored tidal marshes may provide foraging habitat for Black-necked stilts. However, because tidal restoration would not be planned, features such as marsh pannes and ponds, which would provide foraging and potentially nesting habitat for stilts, would likely be limited.

Given the considerable inter-annual fluctuation in breeding abundance and distribution of terns, stilts and avocets in the South Bay, and the uncertainty related to the effect of displacement of California gull colonies on these birds, it is difficult to predict the magnitude of the impacts of the No Action Alternative on these pond-associated breeding birds. Nevertheless, given the importance of the Eden Landing complex to stilt and avocet numbers in the South Bay (Rintoul and others 2003) and the extent of potential pond habitat loss in that pond complex under the No Action Alternative, as well as the expected increases in predation pressure under this alternative, it is possible that population declines could reach the threshold of significance, and thus, impacts would be potentially significant.

Alternative A Level of Significance: Potentially Significant

Alternative B Managed Pond Emphasis. Under Alternative B, potential breeding and foraging habitat for stilts, avocets, and terns would be lost as result of conversion of some ponds into tidal habitats. Most of the Eden Landing and Alviso ponds that would be converted to tidal habitats, as well as Ravenswood Pond R1, support nesting Forster's terns, stilts, and/or avocets, and a Caspian tern colony in Pond A7 would also be displaced by conversion to tidal habitat. However, nesting stilts and avocets would continue to use levees, islands, and salt panne habitat in a number of other managed ponds. More importantly, Ponds A16, SF2, E12, and E13 would be enhanced in Phase 1 with numerous islands that

would be managed to provide nesting habitat for stilts, avocets, terns, and western snowy plovers. Additional nesting habitat could be created or enhanced in other ponds as restoration and management are informed by the outcome of the Phase 1 experiments. On the scale of the entire South Bay, the extent of island nesting habitat would increase under Alternative B.

The California gulls displaced from Pond A6 and other locations by tidal breaching have the potential to encroach on nesting sites for other pond-associated breeding birds. In addition, concentration of nesting birds in fewer areas is likely to increase predation pressures on these birds. However, active predator management under Alternative B would be implemented and sustained as needed to offset these impacts.

Because of island creation, active management of reconfigured ponds, and increased predator management, Alternative B is expected to support higher numbers of breeding pond-associated birds than the No Action Alternative. In addition, because tidal restoration would be carefully planned and implemented, habitat for these species within marshes (*e.g.,* in marsh pannes and ponds) is expected to be more extensive and of higher quality under Alternative B than in the unintentionally restored marshes under the No Action Alternative. Carefully planned breaching would also maximize the tidal channels that can be restored within these marshes, resulting in greater tidal foraging habitat and greater fish populations for terns than would be expected under the No Action Alternative.

As a result of more active pond management and increased tidal foraging habitat, PRBO's modeling predicted greater numbers of wintering stilts, avocets, and Forster's terns foraging in the South Bay under Alternative B than under the No Action Alternative. Winter abundance of these species was also predicted by PRBO's modeling to be greater under Alternative B than Alternative C due to the greater extent of managed pond foraging habitat under Alternative B. While these modeling results focused on winter abundance, similar patterns are likely to occur for breeding pond-associated birds.

If numbers of breeding stilts, avocets, and terns in San Francisco Bay were to decline substantially as a result of restoration under Alternative B (*e.g.*, due to adverse effects of concentrating breeding at fewer locations on rates of predation, disease, or productivity), and no adaptive management to reverse these declines were implemented, impacts to these species could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of tern, stilt, and avocet breeding populations in San Francisco Bay to SBSP Restoration Project activities with the goal of ensuring that declines do not exceed the threshold of significance. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, potential breeding and foraging habitat for terns, stilts, and avocets would be lost as a result of conversion of most ponds into tidal habitats. Impacts to tern nesting habitat would be similar to that described for Alternative B, as none of the ponds that would be restored to tidal habitat under Alternative C, but that would be managed under Alternative B, currently support tern colonies. Impacts to nesting stilts and avocets would be only slightly greater under Alternative C than Alternative B, as the ponds that would be restored to tidal habitat under Alternative C, but that would be managed under Alternative B, currently support few stilts and avocets.

Because of island creation, active management of reconfigured ponds, and increased predator management, Alternative C would likely support higher numbers of breeding pond-associated birds than the No Action Alternative. In addition, because tidal restoration would be carefully planned and implemented, habitat for these species within marshes (*e.g.,* in marsh pannes and ponds, and in sloughs for foraging terns) is expected to be more extensive and of higher quality under Alternative C than in the unintentionally restored marshes under the No Action Alternative.

As a result of more active pond management and increased tidal foraging habitat, PRBO's modeling predicted somewhat greater numbers of wintering stilts and avocets foraging in the South Bay under Alternative C than under the No Action Alternative; numbers of wintering Forster's terns were predicted to be similar between these two alternatives. While these modeling results focused on winter abundance, similar patterns are likely to occur for breeding pond-associated birds.

If numbers of breeding stilts, avocets, and terns in San Francisco Bay were to decline substantially as a result of restoration under Alternative C (*e.g.*, due to adverse effects of concentrating breeding at fewer locations on rates of predation, disease, or productivity), and no adaptive management to reverse these declines were implemented, impacts to these species could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of tern, stilt, and avocet breeding populations in San Francisco Bay to SBSP Restoration Project activities with the goal of ensuring that declines do not exceed the threshold of significance. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-5: **Potential reduction in the numbers of non-breeding, salt-pond-associated birds (*e.g.*, phalaropes, eared grebes, and Bonaparte's gulls) as a result of habitat loss.**

Potential SBSP Restoration Project Effects. Several species of waterbirds that may not otherwise occur in high numbers in the South Bay use South Bay salt ponds in considerable numbers. These salt pond specialists, which include the eared grebe, Wilson's phalarope, red-necked phalarope, and Bonaparte's gull, are closely associated, at least on the scale of San Francisco Bay, with high-salinity ponds. High-salinity ponds generally support high invertebrate biomass, but low species diversity (Carpelan 1957, Swarth and others 1982, Takekawa and others 2004). Brine shrimp have an optimum salinity range from 90 to 150 ppt (Larsson 2000), while water boatmen have an optimum salinity range of 35 to 80 ppt (Maffei 2000). Brine flies can occur in high densities in both mid- and high-salinity ponds. Eared grebes, phalaropes, and Bonaparte's gulls use primarily moderate- to high-salinity ponds, where they forage on brine shrimp and brine flies (Harvey and others 1992). While relatively small numbers of eared grebes breed in the South Bay, most individuals of all four of these species breed primarily outside of the SBSP Restoration Project Area, and occur in the Project Area only during winter or during spring and fall migration.

Substantial numbers of these birds have been recorded using South Bay salt ponds. However, in preparation for the transfer of SBSP Restoration Project-area ponds from Cargill to USFWS and CDFG, salinity in most ponds in the SBSP Restoration Project Area has been (or is being) reduced to a target of 40 ppt or lower. As a result, there has been an apparent decline in recent years in numbers of these species in the Project Area.

Up to 40,000 eared grebes have been recorded using the South Bay, making it one of the largest migration stop-over areas for the species, after Mono Lake and Great Salt Lake (Jehl 1988, Harvey and others 1992). The vast majority of eared grebes occurring in the South Bay forage in salt ponds, with few individuals using the open bay or other habitats. In contrast to seasonal abundance patterns at Mono Lake (Jehl 1988), with maximum counts during fall, eared grebe numbers in the South Bay peak during winter (Harvey and others 1992, Athearn and Takekawa 2006). Small numbers of eared grebes nested in the South Bay at Crittenden Marsh in the 1980s (Harvey and others 1992), but no recent nesting has been documented. While an impressive number of eared grebes have been recorded as using the South Bay salt ponds, the total number (at its peak in the South Bay) is likely less than two percent of the North American population, estimated at 4.1 million (Cullen and others 1999).

More recently, numbers of eared grebes using the South Bay have been much lower. Even prior to ISP implementation in the summer of 2004, USGS's maximum count of eared grebes over all ponds within the SBSP Restoration Project Area was 8,258 in 2003 and 6,274 in 2004 (USGS, unpublished data). Mean pre-ISP abundance on these ponds (number over all ponds per month) was approximately 5,500 birds in winter and 5,100 in spring of 2003, and 5,400 in winter and 2,400 in spring of 2004 (Athearn and Takekawa 2006). Following implementation of the ISP, numbers declined even further, with mean counts of approximately 4,700 in winter and 1,900 in spring of 2005 and 3,000 in winter and 900 in spring of 2006 (Athearn and Takekawa 2006). The post-ISP declines likely resulted from a reduction in the extent of high-salinity ponds, as most individuals counted after ISP implementation were on the few remaining batch ponds, such as Pond A15. In contrast, the maximum count between September 2005 and April 2006 on Cargill-managed ponds in the East Bay, where high-salinity pond habitat was more extensive, was 11,296 (SFBBO, unpublished data). Under ISP conditions within the SBSP Restoration Project Area, the South Bay likely supports less than one percent of the North American population, and most of these South Bay birds presently occur in Cargill-managed ponds.

The majority of Wilson's phalaropes, which forage primarily in wetland habitats, migrate through the Central Flyway in spring but use the Pacific Flyway in fall (Colwell and Jehl 1994). The majority of red-necked phalaropes migrate offshore in coastal marine waters, although many migrate through inland areas (Rubega and others 2000). The number of Wilson's phalaropes using South Bay salt ponds has, at least in the past, numbered in the tens of thousands, while the number of red-necked phalaropes using the South Bay has been estimated at up to 100,000 (Harvey and others 1992). The numbers of both species present in the South Bay exhibit considerable interannual variability, due to factors extrinsic to the Bay. In the San Francisco Bay Area, both phalarope species occur during spring and fall migration, but peak in abundance occurs during fall migration, in July and August. The North American population of Wilson's phalarope is estimated, with a high degree of uncertainty, at 1.5 million and that of red-necked phalarope is estimated at 2.5 million (Morrison and others 2001). Therefore, at its peak, the South Bay has

supported up to 4 percent of the North American populations of these species. However, since ISP implementation, numbers of phalaropes using the SBSP Restoration Project Area have been much lower. Synoptic data for the entire South Bay are not available, and monitoring of SBSP Restoration Project ponds by USGS may have missed peaks in abundance until the survey methodology was changed in 2006 to incorporate more frequent late summer surveys of ponds where phalaropes were concentrated. However, high counts of Wilson's phalaropes from these ponds were only 2,501 in 2003 and 237 in 2004, and high counts of red-necked phalaropes were 11,016 in 2003 and 2,564 in 2004 (USGS unpublished data). During summer 2003, the mean number of phalaropes per survey (both species combined) over all SBSP ponds was approximately 5,000 birds; this number dropped to approximately 1,200 in 2004 and 3,000 in 2005 (Athearn and Takekawa 2006). Approximately 87 percent of the phalaropes recorded during USGS's surveys were red-necked phalaropes, with 13 percent being Wilson's. Recent monthly surveys by SFBBO of Cargill-managed ponds in the South Bay recorded high counts of 832 Wilson's phalaropes during July 2006 and 5,125 red-necked phalaropes in August 2006.

To put these counts into the context of counts from non-salt pond habitats, 4,000 Wilson's phalaropes were at Crittenden Marsh in Mountain View on 17 August 2000, and 4,000 red-necked phalaropes were at the Sunnyvale WPCP on 13 August 2002 (Santa Clara County Bird Data, unpublished). While these counts were likely bolstered by birds attracted to salt ponds in the South Bay (prior to ISP implementation), they indicate that alternative habitats are likely important in providing habitat for phalaropes since ISP implementation has reduced the availability of high-salinity ponds in the South Bay. Such alternative habitats include Crittenden Marsh, the Sunnyvale and San Jose/Santa Clara WPCPs, the Reach 1A waterbird pond, and New Chicago Marsh. Given the very low recent counts of phalaropes in SBSP ponds, the South Bay may now support much less than one percent of the North American population.

The Bonaparte's gull breeds near ponds in Canada and Alaska, and winters on both coasts of North America, in coastal marine waters, bays, estuaries, and inshore waters. Numbers of Bonaparte's gulls using South Bay salt ponds is highly variable but in some years have been estimated at 10,000 birds (Harvey and others 1992). Such an estimate would represent a substantial proportion of North American population, which Burger and Gochfeld (2002) estimated conservatively at between 85,000 and 175,000. However, since implementation of the ISP, numbers of Bonaparte's gulls using the South Bay have been much lower. Although synoptic data for the entire South Bay are not available, maximum counts (in terms of number of Bonaparte's gulls on all ponds in a given survey) for ponds within the SBSP Restoration Project Area monitored by USGS were 2,809 Bonaparte's gulls in 2003 and 1,422 in 2004 (USGS, unpublished data). The maximum count from Cargill-managed ponds between September 2005 and April 2006 was 1,771 (SFBBO, unpublished data). Thus, under ISP conditions, managed ponds in the SBSP Restoration Project Area and the Cargill ponds likely support less than five percent of the North American population, with numbers likely split about evenly between SBSP ponds and Cargill-managed ponds. While South Bay numbers have typically been highest in salt ponds, this species also occurs at water treatment plants throughout the South Bay.

As mentioned previously, implementation of the ISP appears to have resulted in substantial declines in abundance of these salt-pond-specialist birds. For example, PRBO's modeling of existing conditions

(based on estimated ISP salinities) predicts totals of approximately 650 Wilson's phalaropes and 1,100 red-necked phalaropes (in fall), and 2,000 eared grebes (in winter). Because the salinity of some of the ISP ponds (*e.g.,* in the Ravenswood pond complex) has not yet been reduced to target levels of 40 ppt, and some ponds are intended to be managed for higher salinities under the ISP (*e.g.,* Ponds A12, A13, and A15), the SBSP Restoration Project would further reduce the availability of habitat for salt-pond-specialist birds compared to baseline conditions. However, some of the ponds that are not restored, and are instead managed for waterbirds, could potentially be managed for salt-pond-specialist species (*e.g.,* at Ponds E12 and E13 in Phase 1).

Currently, about 590 acres of pond habitat with salinity greater than 40 ppt is available for salt-pond-specialist birds during summer, and about 518 acres are available during winter. Under the No Action Alternative, no habitat greater than 40 ppt would be available, unless management of the ponds that would be maintained was shifted to include some high-salinity ponds (Table 3.6-6). Under Alternative B, about 496 acres of this habitat would be available, and under Alternative C, about 160 acres would be available.

Table 3.6-6 Total Acreage of Moderate- and High-salinity Ponds (greater than 40 ppt) Predicted in the South Bay under Existing Conditions and at Year 50 under the Three Alternatives.

TIME	ALTERNATIVE	MODERATE/HIGH-SALINITY POND HABITAT (AC)	
		Summer	Winter
Existing	N/A	590	520
Year 50	A (No Action)	0	0
	B	500	500
	C	160	160

Although these "salt pond specialists" are adapted for foraging primarily in the high-biomass environment of high-salinity ponds, they do use low-salinity aquatic habitats for foraging. For example, the water treatment plants and the Reach 1A waterbird pond where phalaropes and Bonaparte's gulls often occur in numbers have low salinities, and elsewhere in these species' ranges they make some use of lower-salinity habitats.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on salt-pond-specialist waterbirds (*i.e.*, eared grebes, Bonaparte's gulls, Wilson's phalaropes, and red-necked phalaropes) if it resulted in the loss of a substantial number of individuals of these species from the South Bay, resulting in a decline in flyway-level populations, due to the conversion of managed ponds to tidal habitats as a result of this Project.

Whereas historical numbers of these species using South Bay salt ponds were relatively high, numbers are much lower under existing ISP conditions, which serve as the NEPA/CEQA baseline for the SBSP Restoration Project. Based on the most recent survey results for the SBSP Restoration Project Area (USGS unpublished data, Athearn and Takekawa 2006), the numbers of salt-pond-specialist birds in the SBSP Restoration Project Area represent very small proportions (perhaps two to three percent for

Bonaparte's gulls but less than one percent for phalaropes and eared grebes) of the Pacific Flyway populations of these species, and even relatively large, local declines in numbers in the South Bay, in terms of percent of current numbers, would not be substantial in terms of flyway-level populations. As mentioned above, Cargill-managed ponds in the South Bay may support substantial numbers of at least some of these species. Because these ponds are used as salt concentrators, salinity is expected to remain high in these ponds. Although the ultimate fate of these ponds is not currently known, they would provide habitat for salt-pond associated birds for the foreseeable future.

In light of the currently low numbers of these species present in the South Bay, and the use of alternate habitats such as water treatment plants by phalaropes and Bonaparte's gulls in the South Bay, only truly substantial declines in South Bay numbers would be expected to influence flyway-level populations. Therefore, for NEPA/CEQA purposes, the threshold of significance for this impact would be a decline in South Bay numbers of eared grebes, phalaropes, and Bonaparte's gulls to levels more than 50 percent below baseline (*i.e.*, 2006) levels as a result of the SBSP Restoration Project.

Adaptive Management Plan. The conversion of high-salinity managed pond habitat to tidal habitats (under any of the three alternatives) or to low-salinity managed pond would result in a decline in the extent of salt pond foraging habitat for these species. However, quantifying the extent of high-salinity pond that would occur under each of the three alternatives is difficult, even under the No Action Alternative. While the management of some ponds (*e.g.,* portions of Ponds E12 and E13 in Phase 1) as high-salinity ponds can be predicted now (which was the basis for Table 3.6-6), there is some potential for managers to manage additional ponds specifically as high-salinity ponds, under the ISP, if declines in salt-pond-specialist species are too great. Even in a reduced-pond landscape, management of some ponds specifically for higher salinities and suitable water depths for foraging, and even management of water levels in lower-salinity ponds to increase prey availability for these species, is expected to provide habitat for salt-pond-specialist species in the SBSP Restoration Project Area.

Because numbers of these species have already been reduced substantially (relative to historical numbers) by ISP implementation, fairly extensive salt pond habitat for these species remains in the Cargill-managed ponds, some pond management for salt-pond-specialist species would continue in the SBSP Restoration Project Area, and phalaropes and Bonaparte's gulls are known to use other habitats (*e.g.,* water treatment plants) in the South Bay, it is unknown whether any of the three alternatives would result in declines that reach the threshold of significance. Nevertheless, monitoring and adaptive management would be implemented to prevent significant impacts to these species.

Determination of Baseline and Monitoring. Although there has been extensive study of waterbird numbers in the South Bay, available data, most of which were collected prior to implementation of the ISP or as pond conditions were changing during ISP implementation, may not accurately describe existing conditions for NEPA/CEQA baseline purposes. Previous surveys have not included areas such as Cargill-managed ponds (until September 2005) or alternate habitats such as water treatment plants that support high proportions of the salt-pond-specialist species currently occurring in the South Bay. Until survey modifications were made in 2006, USGS's surveys of the South Bay salt ponds have not adequately censused phalarope numbers due to the relatively brief period in which this species's late

summer/fall passage through the South Bay occurs. Also, the amount of inter-annual variability in numbers of salt-pond-specialist species in the South Bay, and the limited dataset collected since the ISP was implemented in 2004, precludes the use of 2005 and 2006 USGS monitoring results at face value as the baseline for these species' abundance in the South Bay.

Under the Adaptive Management Plan, a plan for monitoring the potential effects of the SBSP Restoration Project on salt-pond-specialist bird species would be developed prior to the initiation of Phase 1 of the Project. As part of this monitoring plan, the method for estimating the baseline for use in ongoing monitoring and adaptive management would be determined, most likely by the entity selected by the Project Management Team to conduct the monitoring. "Baseline" numbers of salt-pond-specialist species would be estimated from past surveys and updated through ongoing monitoring, with several years' worth of surveys allowing for an estimate of inter-annual variability. Such monitoring is expected to occur via focused surveys targeting seasonal peaks (*i.e.*, late summer/early fall for phalaropes, fall and winter for eared grebes and Bonaparte's gulls) and geographic concentrations (*e.g.,* high-salinity ponds and other areas known to support large proportions of South Bay numbers of these species) for these birds.

Adaptive Management Triggers. The adaptive management trigger for potential impacts to salt-pond-specialist bird species would be observation that the most recent three-year average of monitoring results is more than 25 percent below NEPA/CEQA baseline levels, or any given year in which monitoring results indicate that numbers are at least 50 percent below baseline levels.

Adaptive Management. If the trigger is tripped, all available monitoring data for the South Bay, Bay Area, and entire Pacific Flyway would be analyzed to determine whether declines are likely the result of the SBSP Restoration Project, or the result of external factors (*e.g*., population regulation on the breeding grounds). In addition, data from any relevant applied studies would be reviewed (see Appendix D). If declines are likely the result of the SBSP Restoration Project, the Adaptive Management Plan calls for applied studies of habitat use and effects of human disturbance, and appropriate adjustments of restoration design and/or management (*e.g.,* managing for more high-salinity habitat or for different water levels to increase accessibility of food to these birds) to reverse declines. If practicable adaptive management actions that attempt to prevent a decline in the abundance of these birds using the South Bay have been exhausted, and it is determined that further pond conversion would result in declines that reach the threshold of significance, further tidal restoration would be halted.

Alternative A No Action. Under the No Action Alternative, high-salinity pond habitat for salt-pond-specialist waterbirds is expected to decline considerably, relative to existing conditions (Table 3.6-6). It is expected that most of the ponds that do not become tidal due to unintentional breaching, or that are not converted to seasonal wetlands (which would likely become largely vegetated) would be managed as low-salinity ponds to facilitate meeting discharge requirements. As a result, it is possible that no ponds would be managed specifically as high-salinity ponds under the No Action Alternative. However, the magnitude of this alternative's effects on salt-pond-specialist species is highly uncertain. Managers may elect to manage some ponds specifically as high-salinity ponds, some of the seasonal wetland habitats that form in unmanaged ponds may be used by these species (*e.g.,* as New Chicago Marsh is currently used by phalaropes), and these species may use low-salinity ponds to some extent. Because existing numbers of

salt-pond-specialist species in the SBSP Restoration Project Area are currently so low, declines under the No Action Alternative may not even reach the threshold of significance. Nevertheless, PRBO's modeling predicted declines (relative to existing conditions) in the South Bay between Year 0 and Year 50 under Alternative A of approximately 42 percent for eared grebes in winter, 76 percent for red-necked phalaropes in fall, and 78 percent for Wilson's phalaropes in fall (Stralberg and others 2006). Therefore, impacts would be potentially significant.

Alternative A Level of Significance: Potentially Significant

Alternative B Managed Pond Emphasis. Under Alternative B, high-salinity pond habitat for salt-pond-specialist waterbirds would decline by approximately 55 percent in the SBSP Restoration Project Area. PRBO's modeling predicted declines (relative to existing conditions) in the South Bay between Year 0 and Year 50 under Alternative B of approximately 28 percent for eared grebes in winter, 63 percent for red-necked phalaropes in fall, and 31 percent for Wilson's phalaropes in fall (Stralberg and others 2006). However, the ponds that are not restored to tidal habitats would be managed for birds under this alternative, and at least some of these ponds would be managed for high-salinity conditions (*e.g.,* Ponds E12 and E13 in Phase 1). Declines in salt-pond-specialist birds under this alternative are therefore expected to be considerably less than under the No Action Alternative. Because existing numbers of salt-pond-specialist species in the SBSP Restoration Project Area are currently so low, and some managed pond habitat would be managed specifically for higher-salinity conditions for these birds, declines under Alternative B may not reach the threshold of significance.

If the declines in numbers of salt-pond-specialist waterbirds predicted by PRBO's modeling for Alternative B were to occur, and no adaptive management to reverse these declines were implemented, impacts to these species could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of salt-pond-associated waterbird populations to SBSP Restoration Project activities with the goal of ensuring that declines do not exceed the level of significance. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, potential foraging habitat for salt-pond-specialist waterbirds would decline by approximately 87 percent in the SBSP Restoration Project Area. PRBO's modeling predicted declines (relative to existing conditions) in the South Bay between Year 0 and Year 50 under Alternative B of approximately 41 percent for eared grebes in winter, 90 percent for red-necked phalaropes in fall, and 66 percent for Wilson's phalaropes in fall (Stralberg and others 2006). However, the ponds that are not restored to tidal habitats would be managed for birds under this alternative, and at least some of these ponds would be managed for high-salinity conditions (*e.g.,* Ponds E12 and E13 in Phase 1). Declines in salt-pond-specialist birds under this alternative may be less than under the No Action Alternative, depending on the extent to which managed ponds under either alternative support salt-pond-specialist species and the extent to which seasonal wetlands, which would form in some of the ponds that are not actively under the No Action Alternative, are used by these species. Due to the reduced pond footprint compared to Alternative B, Alternative C is expected to support fewer salt-pond-specialist birds. Nevertheless, because existing numbers of salt-pond-specialist

species in the SBSP Restoration Project Area are currently so low, and some managed pond habitat would be managed specifically for higher-salinity conditions for these birds, declines under Alternative A may not reach the threshold of significance.

If the declines in numbers of salt-pond-specialist waterbirds predicted by PRBO's modeling for Alternative C were to occur, and no adaptive management to reverse these declines were implemented, impacts to these species could potentially be significant. However, as described above, an Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of salt-pond-associated waterbird populations to SBSP Restoration Project activities with the goal of ensuring that declines do not exceed the level of significance. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-6: **Potential reduction in foraging habitat for diving ducks, resulting in declines in flyway-level populations.**

Potential SBSP Restoration Project Effects. Diving ducks, such as lesser and greater scaup, bufflehead, canvasbacks, and other species, occur in the South Bay primarily during the nonbreeding season (note that ruddy ducks are addressed in SBSP Impact 3.6-7). These species forage in relatively shallow aquatic habitats in the South Bay, including shallow subtidal habitats, intertidal habitats (when flooded at high tide), and low-salinity managed ponds. Small numbers of lesser scaup breed in vegetated, nontidal wetlands in the San Francisco Bay Area, but this species occurs most abundantly as a migrant and winter resident.

Accurso (1992), using data from winter aerial surveys of the San Francisco Bay Region, found that most diving ducks in the region were found in North Bay open-water habitats, followed by Central Bay open-water habitats. The South Bay salt pond survey area held 11 percent of the Bay's diving ducks in 1988–1989 and eight percent in 1989–1990. Open waters of the South Bay supported slightly more diving ducks (14 percent and 11 percent in the same years). Relatively few scaup and scoters were found in South Bay salt ponds (Table 3.6-7). Canvasbacks were most abundant in North Bay salt ponds, but were also relatively abundant in South Bay salt ponds (Table 3.6-7). Up to 50 percent of all bufflehead were found in South Bay salt ponds (Table 3.6-7).

Table 3.6-7 Percent of Diving Ducks Counted During Surveys of San Francisco Bay that were Found in the South Bay, 1988-1990 (Accurso 1992).

DIVING DUCKS	SOUTH BAY SALT PONDS		SOUTH BAY OPEN WATER	
	1988–1989	1989–1990	1988–1989	1989–1990
Scaup spp.	3	1	18	13
Canvasback	17	17	2	2
Bufflehead	50	46	2	2
Scoter spp.	<1	<1	16	14

Although less than three percent of scaup in the San Francisco Bay Region in 1989, and one percent in winter 1990, were found in South Bay salt ponds (Accurso 1992), more recent data from mid-winter waterfowl surveys found that South Bay salt ponds supported 16 to 30 percent of all scaup in the Bay (J. Buffa, unpubl. data). Surveys by USGS of the SBSP Restoration Project ponds suggest recent increases in numbers of scaup in these ponds. Mean abundance (in terms of total number of birds/survey over all ponds) in winter increased from approximately 6,000 in 2003 to 9,000 in 2004, more than 10,000 in 2005, and more than 13,000 in 2006; this increase has occurred primarily in the Alviso ponds (Athearn and Takekawa 2006). A reduction in salinity in some ponds due to ISP management could be responsible for the increase since 2004, although this is unknown.

Within San Francisco Bay, a mean of 76 percent of all canvasbacks recorded on mid-winter waterfowl surveys from 1988 to 2006 have occurred in salt ponds, either in the North Bay or South Bay (J. Buffa, unpubl. data). Historically, the North Bay has supported most canvasbacks in the Bay Area. Surveys by USGS of the SBSP ponds recorded mean abundance (in terms of total number of birds/survey over all ponds) in winter of more than 1,000 in 2003, 600 in 2004, 700 in 2005, and 1,300 in 2006 (Athearn and Takekawa 2006).

Accurso (1992) found that most diving ducks occurred in water less than six m deep, although some ducks occurred in much deeper waters (all depths are given relative to mean lower low water). In all open water areas, diving ducks showed a preference (comparing habitat use to habitat availability) for waters less than three m deep, but in the North Bay, Suisun Bay, and the Central Bay, this preference extended to depths up to five m. In the Central Bay and South Bay open-water habitats, diving ducks occurred in densities roughly proportional to habitat availability up to a depth of 10 m. Scoters occurred in slightly deeper water (occurring less in waters less than two m), and canvasbacks occurred preferentially in waters less than three m in depth.

Takekawa (unpubl. data) studied diving behavior of lesser scaup and greater scaup equipped with VHF radio-tags. Median foraging depth of lesser scaup was 2.3 m, and that of greater scaup was 2.7 m (based on observed tidal height). In the areas that these birds were foraging in, median MLLW depth was 1.1 m and 1.3 m, respectively. Variability (measured as interquartile range) was less using observed tidal height than MLLW, indicating that these birds chose foraging habitat based on current depth rather than based on a specific location that varies in depth with tidal state. While the median foraging depths were less than three m, analysis of habitat use versus habitat availability showed that both scaup species used habitats from -0.5 m to six m MLLW preferentially, and used water greater than six m MLLW substantially less often. Based on the available data, we consider open-water habitat from zero to six m MLLW, and pond habitat greater than one m deep, to be suitable foraging habitat for diving ducks.

The SBSP Restoration Project could potentially affect numbers of diving ducks in the South Bay in several ways. By converting managed ponds that currently provide foraging habitat for diving ducks to tidal habitats, the Project would result in a loss of managed pond habitat. This conversion is expected to adversely affect habitat for bufflehead, which occur in the South Bay primarily in managed ponds and make relatively little use of tidal waters. However, subtidal habitat in sloughs and larger channels within

restored ponds would provide foraging habitat for species such as canvasbacks and scaup, potentially offsetting the effects of the loss of managed pond habitat.

The extent of pond habitat greater than one meter in depth, and subtidal habitats zero to six m deep, are shown in Table 3.6-8 for predicted winter conditions under existing conditions and each of the three alternatives. Under the No Action Alternative, potential diving duck habitat in managed ponds is predicted to decline by 67 percent compared to existing conditions. Habitat would decline by 20 percent under Alternative B, and by 86 percent under Alternative C. Conversely, shallow subtidal habitat, which provides diving duck foraging habitat in the bay and associated sloughs, is expected to increase over existing conditions under all Alternatives (Table 3.6-8). Under the No Action Alternative, shallow subtidal habitat is expected to increase by six percent, while under Alternatives B and C, shallow subtidal habitat is expected to increase 16 percent and 17 percent respectively. The total extent of open-bay habitat, which includes some deep-water habitat that may be used (to a lesser extent than shallow-subtidal habitat) by foraging diving ducks and that is used by rafting diving ducks would decrease slightly (three percent) under the No Action Alternative, while remaining at existing levels for Alternatives B and C (Table 3.6-8).

Table 3.6-8 Acreage of Potential Diving Duck Foraging Habitat in the South Bay under Existing Conditions and at Year 50 under the Three Alternatives (in winter).

TIME	ALTERNATIVE	HABITAT TYPES		
		> 1m Pond Habitat (ac)	Shallow Subtidal (ac)	Total Potential Open Bay Foraging Habitat (ac)
Existing	N/A	1,700	13,000	25,800
Year 50	A (No Action)	555	13,800	25,000
	B	1,361	15,100	25,700
	C	242	15,200	25,700

Although Accurso (1992) found more canvasbacks and bufflehead in South Bay salt ponds than in South Bay open-water habitats, scaup were more abundant in open-water habitats (Table 3.6-7), suggesting that scaup numbers should be affected less than the other species by pond conversion. However, canvasbacks in the South Bay frequently forage at the mouths of tidal sloughs and could potentially benefit from tidal restoration; PRBO's modeling predicts increases in this species under each of the three alternatives.

It is not known whether numbers of diving ducks in the South Bay are currently limited by habitat availability. While many waterfowl populations may be regulated by variable reproductive success during the breeding season (Austin and others 1998, Mowbray 2002), mortality during winter and other factors also play a role in population regulation (Kessel and others 2002). The effect of the SBSP Restoration Project on diving ducks is expected to vary among species, and would depend largely on the degree to which a reduction in SBSP Restoration Project pond habitat would result in a reduction in duck numbers, the degree to which diving ducks associated with managed ponds would shift to Cargill-managed ponds, the degree to which diving ducks would benefit from restored subtidal habitat in sloughs, and potential benefits of tidal restoration on these species' food (primarily aquatic vegetation and invertebrates such as mollusks).

In addition, density-dependent effects, which are particularly difficult to quantify, may occur. Such effects may include increases in rates of predation, disease, or competition due to increases in diving duck densities. Increases in adverse effects of human disturbance due to recreation (*e.g.,* biking, walking, or kayaking), and particularly mortality and disturbance by waterfowl hunting, would also be expected to occur. Such disturbance could affect proportionately more ducks as tidal restoration reduces the number of managed ponds.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on diving ducks foraging in the South Bay if it resulted in the loss of substantial numbers of individuals of these species from the South Bay, resulting in a decline in flyway-level populations, due to the conversion of managed ponds to tidal habitats. Redistribution of diving ducks from ponds to open waters of the South Bay, or to other areas within San Francisco Bay, would not necessarily constitute a significant impact.

Because the South Bay salt ponds are used by less than five percent of Pacific Flyway populations of scaup, canvasbacks, bufflehead, and scoters, declines would have to be substantial to be considered significant. The SBSP Restoration Project would consider a decline of 20 percent below baseline (*i.e.*, 2006) levels, as a result of the SBSP Restoration Project, to constitute a significant impact.

Adaptive Management Plan. Impacts of conversion of managed ponds to tidal habitats on numbers of diving ducks in the South Bay are difficult to assess, and particularly to quantify, for a number of reasons. As discussed previously, density-dependent mortality due to predation or disease may occur, although such effects are difficult to quantify. PRBO's modeling considered only the potential changes in numbers within the ponds and marshes, but did not attempt to quantify the effects of changes in the extent of intertidal and subtidal habitat areas within the Bay itself on diving duck abundance. Bird numbers may not decrease to the extent predicted by PRBO's modeling if numbers in the existing system are far below the system's carrying capacity (*i.e.*, if they are regulated by factors external to the South Bay), if diving ducks shift to the open bay or other managed ponds (*e.g.,* Cargill ponds) in the South Bay as SBSP ponds are converted to tidal habitats, if foraging conditions within tidal habitats are enhanced by tidal restoration, or if assumptions of the models are incorrect.

Due to the uncertainty regarding the potential effects of the SBSP Restoration Project on diving ducks in the South Bay, monitoring and adaptive management would be implemented to document potential changes in diving duck numbers and change management and future restoration accordingly, with the intent of avoiding significant impacts to these species.

Determination of Baseline and Monitoring. The baseline level for NEPA/CEQA purposes is the condition in 2006. However, due to considerable inter-annual variability in numbers in the South Bay, a three-year mean likely provides a more accurate baseline. Mid-winter waterfowl surveys, conducted by USFWS since 1970, have established a record of numbers of diving ducks in San Francisco Bay. These data include numbers of diving ducks in salt pond vs. bay habitats for different regions of the Bay. For purposes of comparing numbers in any given year to the baseline statistically, the baseline would consist of the mean abundance of each species in the South Bay as a whole for the 3-year period 2004 to 2006.

Under the Adaptive Management Plan, diving duck numbers would continue to be monitored using these mid-winter aerial surveys (see Appendix F of Steere and Shaefer 2001).

Adaptive Management Triggers. The adaptive management trigger for potential impacts to diving ducks would be observation that the most recent three-year average of total numbers of diving ducks in the South Bay is below NEPA/CEQA baseline levels.

Adaptive Management. If the adaptive management trigger is tripped, all available monitoring data for the South Bay, Bay Area, and entire Pacific Flyway would be analyzed to determine whether declines are likely the result of the SBSP Restoration Project, or the result of external factors. In particular, relative changes in the percentage of winter diving ducks in the North vs. South Bay, or in the Bay vs. salt ponds, would provide information on the potential effects of salt pond restoration on diving duck numbers. Data from any relevant applied studies would be reviewed (see Appendix D). If declines are likely the result of the SBSP Restoration Project, the Adaptive Management Plan calls for applied studies of habitat use and effects of human disturbance, and appropriate adjustments of restoration design and/or management (*e.g.,* managing for more deep-water, low-salinity habitat to increase availability and accessibility of food to these birds) to reverse declines. If practicable adaptive management actions that attempt to prevent a decline in the abundance of these birds using the South Bay have been exhausted, and it is determined that further pond conversion would result in declines that reach the threshold of significance, further tidal restoration would be halted.

Alternative A No Action. Under the No Action Alternative, potential foraging habitat for diving ducks would decline by approximately 67 percent in South Bay salt ponds (Table 3.6-8). Habitat conditions in open-water habitat in the South Bay are expected to change negligibly, resulting in a net decrease in potential foraging habitat for diving ducks of three percent. Habitat change in salt ponds could lead to a decrease in diving duck numbers. PRBO's modeling has predicted South Bay-wide declines of approximately 52 percent in scaup numbers between Years 0 and 50 under the No Action Alternative (Stralberg and others 2006). However, these models did not include diving duck numbers in the Bay itself, and there is considerable uncertainty regarding the applicability of these models to diving duck numbers in the South Bay as a whole. Because the No Action Alternative would not involve any monitoring of diving duck numbers (at least, as a part of the SBSP Restoration Project), accurate estimates of declines in abundance would not be known. However, based on predicted habitat loss, declines in diving ducks using the South Bay could be substantial, and therefore impacts would be potentially significant.

Alternative A Level of Significance: Potentially Significant

Alternative B Managed Pond Emphasis. Under Alternative B, potential foraging habitat for diving ducks would decline by approximately 20 percent in South Bay salt ponds (Table 3.6-8). Habitat conditions in open-water habitat in the South Bay are expected to change negligibly, resulting in a net decrease in potential foraging habitat for diving ducks of less than one percent. Habitat change in salt ponds could lead to a decrease in diving duck numbers. PRBO's modeling has predicted South Bay-wide declines of approximately 32 percent in scaup numbers between Years 0 and 50 under Alternative B (Stralberg and others 2006). However, these models did not include diving duck numbers in the Bay

itself, and there is considerable uncertainty regarding the applicability of these models to diving duck numbers in the South Bay as a whole. Overall, impacts to South Bay numbers of diving ducks are expected to be less under Alternative B than under Alternatives A or C, since more actively managed pond habitat would be available under this alternative.

If the declines in numbers of diving ducks predicted by PRBO's modeling for Alternative B were to occur, and no adaptive management to reverse these declines were implemented, impacts to these species could potentially be significant. Therefore, the Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of diving duck populations to SBSP Restoration Project activities with the goal of ensuring that declines do not exceed the level of significance. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, potential foraging habitat for diving ducks would decline by approximately 86 percent in South Bay salt ponds (Table 3.6-8). Habitat conditions in open-water habitat in the South Bay are expected to change negligibly, resulting in a net decrease in potential foraging habitat for diving ducks of less than one percent. Habitat change in salt ponds could lead to a decrease in diving duck numbers. PRBO's modeling has predicted South Bay-wide declines of approximately 55 percent in scaup numbers between Years 0 and 50 under Alternative C (Stralberg and others 2006). However, these models did not include diving duck numbers in the bay itself, and there is considerable uncertainty regarding the applicability of these models to diving duck numbers in the South Bay as a whole. Alternative C would likely result in greater impacts to diving ducks associated with salt ponds (*e.g.,* bufflehead) than Alternative A due to the lower extent of managed pond under Alternative C, and the likelihood that as restoration proceeds toward 90 percent tidal, most managed ponds would be managed for migratory shorebirds and nesting birds rather than for deep-water conditions that are preferred by diving ducks.

If the declines in numbers of diving ducks predicted by PRBO's modeling for Alternative C were to occur, and no adaptive management to reverse these declines were implemented, impacts to these species could potentially be significant. Therefore, the Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of diving duck populations to SBSP Restoration Project activities with the goal of ensuring that declines do not exceed the level of significance. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-7: **Reduction in foraging habitat for ruddy ducks, resulting in declines in flyway-level populations.**

Potential SBSP Restoration Project Effects. Although small numbers of ruddy ducks breed in the South Bay, this species occurs in the Project Area primarily during migration and winter. In contrast with

most of the diving ducks addressed in SBSP Impact 3.6-6, ruddy ducks are diving ducks that, in the South Bay, forage primarily in salt ponds, with relatively few individuals using tidal habitats in the South Bay. Accurso's winter aerial surveys found approximately 67 percent of the ruddy ducks in the entire San Francisco Bay Area in South Bay salt ponds, with only two percent in open watertidal habitats in the South Bay, in 1988–1999; in 1989–1990, approximately 55 percent of the Bay's ruddy ducks were in South Bay salt ponds, with only two percent in South Bay open watertidal habitats (Accurso and others 1992).

Mid-winter waterfowl survey data found a mean of 92 percent of ruddy ducks in the Bay Area using salt ponds (range 69 to 100 percent; Accurso and others 1992; J. Buffa, unpubl. data). Recent surveys of South Bay salt ponds by USGS determined that mean abundance of ruddy ducks (in terms of total number of birds/survey over all ponds) in winter increased from approximately 20,000 in 2003 to 41,000 in 2006; this increase has occurred primarily in the Alviso ponds (Athearn and Takekawa 2006). A reduction in salinity in some ponds due to ISP management could be responsible for the increase since 2004, although this is unknown.

The North American population of ruddy ducks is estimated at 400,000 to 500,000, of which about 130,000 migrate through the Pacific Flyway (Trost and Drut 2005). San Francisco Bay is an important wintering area for ruddy ducks. Based on estimates of abundance from recent USGS surveys (Athearn and Takekawa 2006) and data from Pacific Flyway population index values from 1990 to 2004 (Trost and Drut 2005), South Bay salt ponds may be used by up to 30 percent of Pacific Flyway ruddy ducks, and up to 10 percent of the North American population of this species.

Because ruddy ducks in the South Bay make little use of tidal waters, the SBSP Restoration Project would likely result in declines in ruddy duck numbers within the South Bay due to conversion of managed ponds to tidal habitats. As indicated in Table 3.6-8, potential diving duck habitat in managed ponds under the No Action Alternative is predicted to decline by 67 percent compared to existing conditions. Habitat would decline by 20 percent under Alternative B, and by 86 percent under Alternative C. Some ruddy ducks displaced from South Bay salt ponds that are restored to tidal habitats would likely simply shift to other areas, including other managed ponds within the SBSP Restoration Project Area (where habitat may not necessarily be limiting numbers), Cargill salt ponds, or ponds and lakes elsewhere in the South Bay. Others may be displaced from the South Bay entirely, but may shift to other Bay Area locations or use other central California locations during migration and winter. However, given the importance of San Francisco Bay to Pacific Flyway numbers of ruddy ducks, and the relatively high percentage of Bay Area ruddy ducks that occur in South Bay salt ponds, a decline in the extent of salt pond in the South Bay may result in flyway-level declines in ruddy duck numbers.

In addition, density-dependent effects may occur. Such effects may include increases in rates of predation, disease, or competition due to increases in diving duck densities. Increases in adverse effects of human disturbance due to recreation (*e.g.,* biking, walking, or kayaking), and particularly mortality and disturbance by waterfowl hunting, would also be expected to occur. Such disturbance could affect proportionately more ducks as tidal restoration reduces the number of managed ponds.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on ruddy ducks foraging in the South Bay if it resulted in the loss of substantial numbers of individuals of these species from the South Bay, resulting in a decline in flyway-level populations, due to the conversion of managed ponds to tidal habitats. Redistribution of diving ducks from South Bay salt ponds to other areas within San Francisco Bay or elsewhere in the Pacific Flyway would not necessarily constitute a significant impact.

The SBSP Restoration Project would consider a decline in ruddy duck numbers of 15 percent below baseline (*i.e.*, 2006) levels, as a result of the SBSP Restoration Project, to constitute a significant impact.

Alternative A No Action. Under the No Action Alternative, potential foraging habitat for ruddy ducks would decline by approximately 67 percent in South Bay salt ponds (Table 3.6-8). PRBO's modeling has predicted South Bay-wide declines of approximately 67 percent in ruddy duck numbers between Years 0 and 50 under the No Action Alternative (Stralberg and others 2006). Because this species is unlikely to shift habitat use to tidal waters (as may occur with other diving ducks), substantial impacts to numbers of this species are likely, and therefore impacts would be potentially significant.

Alternative A Level of Significance: Potentially Significant

Alternative B Managed Pond Emphasis. Under Alternative B, potential foraging habitat for ruddy ducks would decline by approximately 20 percent in South Bay salt ponds (Table 3.6-8). PRBO's modeling has predicted South Bay-wide declines of approximately 49 percent in ruddy duck numbers between Years 0 and 50 under Alternative B (Stralberg and others 2006). Because this species is unlikely to shift habitat use to tidal waters (as may occur with other diving ducks), substantial impacts to numbers of this species are likely, although impacts would likely be less than under Alternatives A and C due to the greater extent of managed pond under Alternative B. Therefore, impacts to ruddy ducks would be potentially significant.

Alternative B Level of Significance: Potentially Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, potential foraging habitat for ruddy ducks would decline by approximately 86 percent in South Bay salt ponds (Table 3.6-8). PRBO's modeling has predicted South Bay-wide declines of approximately 68 percent in ruddy duck numbers between Years 0 and 50 under Alternative B (Stralberg and others 2006). Alternative C would likely result in greater impacts to ruddy ducks than Alternatives A and B, and because this species is unlikely to shift habitat use to tidal waters (as may occur with other diving ducks), substantial impacts to numbers of this species are likely to occur. Therefore, impacts to ruddy ducks would be potentially significant.

Alternative C Level of Significance: Potentially Significant

SBSP Impact 3.6-8: **Potential habitat conversion impacts on California least terns.**

Potential SBSP Restoration Project Effects. California least terns have bred in the vicinity of the SBSP Restoration Project Area in small numbers in the past, but now occur in the South Bay primarily as post-breeding dispersants. In the South Bay, recent breeding has occurred only at Hayward Regional Shoreline, where eight pairs nested in 2005 and 15 pairs in 2006 (Strong 2006), and in Pond E8A, where at least 5 pairs nested in 2007. Most California least terns in the San Francisco Bay Area currently nest in Alameda, and most foraging during the breeding season (*e.g.,* to feed chicks) occurs outside the study area. This species currently uses the South Bay primarily as a post-breeding staging area in late summer. Ponds north of Moffett Federal Airfield are used most extensively (Ponds AB1, A2E, and AB2), but California least terns have been documented at many ponds throughout the SBSP Restoration Project Area. Salt ponds are used both for foraging (in lower-salinity ponds supporting fish) and for roosting (on levees, islands, and artificial structures such as boardwalks). Although large foraging concentrations are noted in salt ponds, this species frequently forages on the Bay as well. For example, on 14 July 2004, 50 of 58 California least terns observed foraging (as opposed to roosting) in the SBSP Restoration Project Area were doing so on the Bay (Steve Rottenborn, pers. obs.). No comparative studies have been conducted to quantify the relative use of open water versus pond habitat in the South Bay, and thus, the degree to which California least terns rely on South Bay salt ponds for foraging is unknown.

If California least terns do rely heavily on South Bay salt ponds for foraging habitat, the loss of this habitat would lead to a redistribution of foraging birds in the San Francisco Bay Area. If other foraging sites are less productive than South Bay salt ponds, this redistribution could lead to decreased post-fledging survival of juveniles or adults from Bay Area populations. San Francisco Bay is the northernmost breeding location for this species, and the Alameda colony is an important colony for this federally endangered species. As a result, impacts to this colony could be significant on a range-wide level.

Foraging habitat for California least terns in deep-water managed ponds is expected to decline under all alternatives due to the conversion of some deep-water managed ponds to tidal or seasonal habitats. However, tidal restoration is expected to benefit prey fish populations for the California least tern, and miles of sloughs that would provide foraging habitat for this species are proposed to be restored by the Project. Furthermore, it is highly unlikely that this species's Bay Area populations are limited by South Bay foraging habitat, due to the relatively low breeding abundance of the species and the extensive nature of foraging habitat. California least terns "displaced" from current South Bay foraging locations would likely find alternative foraging areas, either within the South Bay or elsewhere in the Bay Area. The degree to which a reduction in foraging habitat in ponds would be offset by increases in habitat and prey abundance in the bay and in restored sloughs, and the question of whether the SBSP Restoration Project would have considerable impacts on the species at all, is unknown.

It is expected that ample roosting habitat for California least terns would continue to be present on islands, levees, and boardwalks in the South Bay, regardless of the restoration alternative. However, if California least terns continue to roost or forage in managed ponds in a reduced-pond landscape, birds

could potentially be subjected to increased predation, or disturbance by humans or predators, by being concentrated in fewer locations.

South Bay salt ponds have been used historically for sporadic and limited nesting attempts by California least terns. These include attempts on levees at Ponds E10/E11 at Eden Landing (last reported 1985), Ponds N5/N7 (last reported 1983) and N1A in the Newark salt ponds, and Pond R3 in the Ravenswood Complex (Hurt 2004; Wetlands Research Associates 1994a). Nesting within the SBSP Restoration Project Area had not occurred since the 1980s until 2007, when at least 5 pairs were observed nesting on salt pannes in Pond E8A. Due to the sporadic nature of historical breeding by California least terns in the SBSP Restoration Project Area, it is unknown whether breeding at Pond E8A or elsewhere within the Project Area would continue even in the absence of the Project. If least terns were to continue to nest in the Project Area, the conversion of ponds supporting nesting least terns to tidal habitats or deeper-water managed ponds could result in the loss of occupied breeding habitat. However, given the absence of nesting least terns from the SBSP Restoration Project Area for more than 25 years; the sporadic use of Project-area ponds by nesting least terns in the past; the very small number of least terns that nested in Pond E8A in 2007; and the extent of suitable nesting habitat that will be provided on nesting islands created by the SBSP Restoration Project and in areas managed for snowy plover nesting habitat, impacts to least tern nesting habitat will be less than significant.

Nesting least terns, including adults as well as nests, eggs, and young, could be directly impacted by a variety of SBSP Restoration Project activities, including tidal breaching, pond reconfiguration and management, recreation-oriented disturbance, and maintenance and monitoring activities. The displacement of nesting California gulls due to tidal restoration at gull nesting locations could also result in the loss of least tern nests, eggs, or young to predation or encroachment by displaced gulls. These impacts are addressed in SBSP Impacts 3.6-11, 3.6-12, and 3.6-18.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on California least terns if it resulted in a decrease in foraging habitat or prey availability in the South Bay, leading to any decline in Bay Area breeding populations relative to baseline levels. For the reasons mentioned previously, Project impacts on least tern nesting habitat are not expected to be significant.

Adaptive Management Plan. Although Bay Area nesting populations of California least terns are unlikely to decline as a result of the SBSP Restoration Project, there is some uncertainty as to whether the reduced-pond landscape that would be present under the Project alternatives could continue to support current numbers of staging California least terns. Because this species is federally listed as endangered, and because of the importance of the Bay Area population to larger West Coast breeding numbers, it is important that numbers of California least terns in the Bay Area continue to be monitored, and that adaptive management be implemented in the event that the SBSP Restoration Project appears to be causing a decline in Bay Area numbers.

Determination of Baseline and Monitoring. The baseline level for NEPA/CEQA purposes is the condition in 2006. However, due to considerable inter-annual variability in numbers in the South Bay, a three-year mean likely provides a more accurate baseline. Baseline numbers of breeding California least terns in the

Bay Area have been well established by ongoing monitoring conducted annually by USFWS and others. Such monitoring of breeding locations to determine numbers of breeding birds would continue. In addition, least tern numbers at post-breeding staging areas would be monitored during ongoing monthly bird surveys in the South Bay.

Adaptive Management Trigger. A decline (relative to the baseline) in California least tern breeding abundance in the Bay Area, as a result of the SBSP Restoration Project, would constitute a significant impact. In order to identify potential Project impacts on this species before they reach the threshold for significance, one adaptive management trigger for potential impacts to California least terns would be a decline below baseline levels in any given year, as determined by annual monitoring of numbers at breeding colonies. Any substantial declines in least tern numbers at post-breeding staging areas in the South Bay, either in monthly bird survey monitoring data or in incidental reports (*e.g.*, from birders), would also serve as an adaptive management trigger.

Adaptive Management. If a trigger is tripped, all available monitoring data for the South Bay, Bay Area, and entire population of California least terns would be analyzed to determine whether declines are likely the result of the SBSP Restoration Project, or the result of factors external to the Project. If there is evidence to suggest that declines are the result of the SBSP Restoration Project (*e.g.,* if a decline in breeding numbers is noted the year following the conversion of favored staging ponds to tidal habitats), the Adaptive Management Plan calls for applied studies of post-breeding habitat use. Based on the results of these studies, changes in management of existing ponds (*e.g.,* to make them shallower or deeper, or lower-salinity, in order to increase prey fish numbers and availability) and possibly adjustments in restoration design (*e.g.,* to avoid conversion of favored ponds to tidal habitats) would be considered to reverse declines. If practicable adaptive management actions that attempt to prevent a decline in the abundance of these birds using the South Bay have been exhausted, and it is determined that further pond conversion would result in declines that reach the threshold of significance, further tidal restoration would be halted.

Alternative A No Action. Under the No Action Alternative, potential foraging habitat for California least terns within South Bay salt ponds would decline. Although a number of ponds in the Alviso pond complex, where most post-breeding staging currently takes place, are used by least terns, the ponds north of Moffett Federal Airfield are currently used most extensively by roosting and foraging birds. These ponds are likely to be converted to tidal marsh via accidental breaches under the No Action Alternative. A reduction in managed pond foraging habitat would occur under this alternative. Conversely, subtidal foraging habitat is expected to increase due to unintended breaching. Given the extent of potential foraging habitat in the San Francisco Bay Area, it is likely that California least terns would find continue to find ample foraging and roosting sites in the South Bay, and that Bay Area populations would not decline substantially.

Potential nesting habitat for California least terns would likely decline as a result of unintended breaching of pond levees; Pond E8A, the only location in the Project Area where least terns have nested in recent years, would likely be converted to tidal habitats as a result of this breaching. However, loss of nesting habitat within the SBSP Restoration Project Area is not expected to have a substantial effect on Bay Area

populations of least terns given the very limited and sporadic breeding by this species in the Project Area. Therefore, impacts would be less than significant.

Alternative A Level of Significance: Less than Significant

Alternative B Managed Pond Emphasis. Under Alternative B, potential foraging habitat for California least terns within South Bay salt ponds would decline in some areas, such as at Eden Landing, but the primary ponds used for post-breeding foraging north of Moffett Federal Airfield would be retained as managed ponds. These ponds would likely provide foraging and roosting habitat similar to current conditions. Overall, managed pond foraging habitat for California least terns would decline under this alternative, while subtidal foraging habitat, and fish populations, are expected to increase due to tidal restoration. Because breach locations in restored marshes would be selected intentionally to take advantage of remnant slough systems, Alternative B is expected to result in more extensive channel networks than those that might form incidentally under the No Action Alternative. As a result, larger, higher-order channels (which may provide foraging habitat for California least terns), and more complex channel networks (which serve as nursery habitat for fish) would be present under Alternative B than under the No Action Alternative. Given the increase in subtidal habitat and fish populations expected under Alternative B, and the extent of potential foraging habitat in the San Francisco Bay Area, it is likely that California least terns would find continue to find ample foraging and roosting sites in the South Bay, and that Bay Area populations would not decline substantially.

However, there is some uncertainty as to the response of California least terns to the changing landscape that would occur under Alternative B. Therefore, the Adaptive Management Plan would be used to monitor changes in abundance to determine actual responses of California least tern populations to SBSP Restoration Project activities with the goal of ensuring that declines do not exceed the level of significance.

Pond E8A, the only location in the Project Area where least terns have nested in recent years, would be converted to tidal habitats under Alternative B. However, numerous nesting islands that would provide potential least tern nesting habitat would be created in other ponds. Conversion of nesting habitat within the SBSP Restoration Project Area is not expected to have a substantial effect on Bay Area populations of least terns given the very limited and sporadic breeding by this species in the Project Area, as well as the nesting islands that would be constructed. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, loss of managed pond foraging and roosting habitat for California least terns, as well as the increase in subtidal foraging habitat and fish populations, are expected to be greater than under Alternatives A and B. As noted previously, the degree to which the loss of managed pond habitat (and effects of concentrating California least terns at only a few managed ponds) would adversely affect California least terns in the Bay Area, especially in light of the benefits of tidal restoration, is unclear. While it is unlikely that Bay Area populations would decline substantially under Alternative C, monitoring and adaptive management would be used to monitor

changes in abundance to ensure that declines do not reach a level of significance, in light of uncertainty regarding the Project's effects on California least terns.

Pond E8A, the only location in the Project Area where least terns have nested in recent years, would be converted to tidal habitats under Alternative C. However, numerous nesting islands that would provide potential least tern nesting habitat would be created in other ponds. Conversion of nesting habitat within the SBSP Restoration Project Area is not expected to have a substantial effect on Bay Area populations of least terns given the very limited and sporadic breeding by this species in the Project Area, as well as the nesting islands that would be constructed. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-9: **Potential loss of pickleweed-dominated tidal salt marsh habitat for the salt marsh harvest mouse and salt marsh wandering shrew, and further isolation of these species' populations, due to breaching activities and scour.**

Potential SBSP Restoration Project Effects. Tidal restoration would require direct alteration of habitats (*e.g.*, levee breaching, levee lowering, and installation of pond water-control structures) that would affect levees and small amounts of tidal marsh. Additionally, tidal marsh restoration would re-create larger tidal prisms within existing channels, which would be expected to result in an increased level of erosion of existing tidal marshes. In the long term, there would be an overwhelmingly positive benefit to tidal marsh-associated species from tidal restoration, as thousands of acres of new marsh would be created, albeit over an extended time period. However, there is very little pickleweed-dominated tidal salt marsh in the SBSP Restoration Project Area, and the existing narrow corridors of habitat between larger blocks of habitat are necessary for dispersal of mice and shrews among core habitat areas. Therefore, even the limited habitat present in these corridors has high value as dispersal habitat. Within the Project Area, there are 275 acres, 92 acres, and 638 acres of pickleweed-dominated habitat in the Alviso, Ravenswood and Eden Landing pond complexes, respectively. These areas combined with the associated peripheral habitat zones, comprise the only habitat within the Project site for the salt marsh harvest mouse, and these areas are already isolated.

Isolation of core pickleweed-dominated marshes by the erosion of portions of these narrow corridors would adversely affect the dispersal capability of the salt marsh harvest mouse and salt marsh wandering shrew. Reduction in habitat quality within these narrow corridors would be further exacerbated by the effects of frequent flooding. However, such effects are expected to be short-term (within the 10+ years) effects. Furthermore, because tidal restoration would be phased, new pickleweed-dominated habitat is expected to form from early phases of restoration before later breaching actions and associated scour occur. In the long term, tidal restoration is expected to result in substantial increases in habitat connectivity via marsh establishment. Such Project benefits are expected to occur before short-term reductions in dispersal capability have substantial effects on populations in core habitat areas.

While a number of bird species (including the California clapper rail) also use existing tidal marshes, they are more mobile than the salt marsh harvest mouse and salt marsh wandering shrew and thus are expected to be able to disperse among core habitat units even if short-term marsh loss due to breaching and erosion occur. For this reason, there would be no substantial adverse effects of temporary loss of marsh due to scour on California clapper rails and other marsh birds.

For marsh-associated species such as the salt marsh harvest mouse, salt marsh wandering shrew, and California clapper rail, the SBSP Restoration Project is expected to result in considerable increases in habitat in the long term, thereby augmenting populations far beyond the minor, local impacts that may occur during construction. Monitoring of California clapper rail and salt marsh harvest mouse habitat and numbers would occur as part of the Adaptive Management Plan (see Appendix D), both to satisfy regulatory requirements and to monitor the success of the SBSP Restoration Project with respect to these species.

Determination of Threshold of Significance. The threshold of significance for this impact is defined as measurable, sustained loss of pickleweed-dominated tidal salt marsh resulting in significant isolation of salt marsh harvest mouse and salt marsh wandering shrew populations due to the SBSP Restoration Project, without development of a commensurate amount of new marsh once the appropriate elevations are achieved within the restored ponds. If major pickleweed-dominated marshes become isolated by the erosion of substantial portions of existing habitat corridors, and tidal restoration does not result in a long-term increase in salt marsh in an extent adequate to offset the short-term losses, this impact would be significant.

Alternative A No Action. Under the No Action Alternative, small losses of pickleweed-dominated tidal marsh would occur at a number of locations throughout the SBSP Restoration Project Area due to erosion and scour from uncontrolled breaching. The timing and locations of breaching and habitat loss are not known. Because such breaches would be unintentional, the locations and extent of habitat loss would not be controlled at all, and thus salt marsh harvest mouse and wandering shrew dispersal in any given area may be adversely affected (in the short term) more than under Alternatives B or C. However, these unintentional breaches would not all occur at once, and new pickleweed-dominated habitat is expected to form in areas that breach earliest before later breaching actions and associated scour occur. In the long term, uncontrolled breaching of levees would ultimately result in substantial increases in tidal marsh habitat, a significant beneficial effect for tidal marsh-associated wildlife. This increase in habitat would offset any minor short-term impacts to pickleweed dominated tidal marsh and the dispersal or habitat of marsh-associated species. Therefore, impacts would be less than significant.

Alternative A Level of Significance: Less than Significant

Alternative B Managed Pond Emphasis. Under Alternative B, small losses of pickleweed-dominated tidal marsh would occur at a number of locations throughout the Project Area. Total direct impacts to existing wetlands from Phase 1 are expected to be approximately 15 acres. Future phases are expected to have a similar level of direct impact. Indirect impacts from marsh scour at the programmatic level could be as much as 200 to 400 acres over the life of the Project. These impacts will be less than significant/beneficial since the Project goal is to restore 7,500 -13,400 acres of tidal habitat (most of

which will be marsh). The marsh habitat restored by the Project will be many times larger than the impacts to existing marsh. Furthermore, because tidal restoration would be phased, new pickleweed-dominated habitat is expected to form from early phases of restoration before later breaching actions and associated scour occur. Therefore, implementation of the Project would result in substantial increases in tidal marsh habitat over the long term, a significant beneficial effect for tidal marsh-associated wildlife. Such Project benefits are expected to occur before short-term reductions in dispersal capability have substantial effects on populations of salt marsh harvest mice and salt marsh wandering shrews in core habitat areas. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative B Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative C Tidal Habitat Emphasis. Under Alternative C, short-term losses of pickleweed-dominated tidal marsh would occur in a greater number of locations than Alternative B. However, implementation of this alternative would result in substantially greater increases in tidal marsh habitat, and because tidal restoration would be phased, new pickleweed-dominated habitat is expected to form from early phases of restoration before later breaching actions and associated scour occur. Such Project benefits are expected to occur before short-term reductions in dispersal capability have substantial effects on populations of salt marsh harvest mice and salt marsh wandering shrews in core habitat areas. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative C Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

SBSP Impact 3.6-10: **Potential construction-related loss of or disturbance to special-status, marsh-associated wildlife.**

Potential SBSP Restoration Project Effects. Construction related to the implementation of the SBSP Restoration Project could potentially disturb some special-status wildlife species, and in some cases, could lead to the loss of individuals. Wildlife species that occur in tidal marsh habitats in the Project Area include special-status species such as the salt marsh harvest mouse, salt marsh wandering shrew, California clapper rail, salt marsh common yellowthroat, Alameda song sparrow, and northern harrier. Although the harbor seal is not considered a Species of Special Concern by CDFG, this species is protected under the Marine Mammal Protection Act, and is somewhat sensitive to human disturbance.

Tidal restoration would require direct alteration of habitats (*e.g.*, levee breaching and installation of pond water-control structures) that would affect levees and small amounts of tidal marsh. Such activities could potentially result in direct injury or mortality of marsh-associated species and their nests, eggs, and young, although such direct effects are expected to be minor due to the limited nature of direct impacts. In addition, restoration activities associated with both tidal restoration and enhancement of managed ponds (*e.g.*, grading, island and berm construction, water-control structure installation and maintenance) would involve the movement of heavy equipment, loud noise, and human presence in and adjacent to existing marsh habitats. These activities may result in the disturbance of wildlife within those habitats,

possibly causing individuals to flee areas adjacent to construction activities or abandon their nests or territories in these areas. This would be a short-term adverse effect.

The SBSP Restoration Project incorporates measures to avoid and minimize construction-related impacts to marsh species; it is anticipated that a number of measures to avoid and minimize such impacts to federally listed species would be required by the BO for this Project. For example, work in and adjacent to tidal marsh habitat or within 500 ft (and possibly more, depending on the nature of the construction and location of the haul-out, subject to coordination with the National Marine Fisheries Service) of a known harbor seal haul-out would be conducted outside of the bird nesting season or the harbor seal pupping season to the extent practicable. Work in areas that could cause disturbance, injury, or mortality (*e.g.*, accidental crushing of individuals or nests) would be limited to the period September 1 through January 31, to the extent practicable. This condition would minimize potential impacts to nesting birds and pupping harbor seals, although if work occurs within tidal salt marsh at any time of year, there is a potential for accidental crushing of California clapper rails, salt marsh harvest mice, or salt marsh wandering shrews. If seasonal avoidance is not practicable, pre-construction surveys would be conducted for California clapper rails and habitat assessments for salt marsh harvest mice, to determine if there is a potential for the species to occur in the vicinity of the disturbance, and the appropriate response, in consultation with USFWS and CDFG.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on marsh-associated species if it resulted in the mortality of, or the loss of active nests of, substantial numbers of state or federally listed, marsh-associated species, or abandonment of a primary harbor seal haul-out or pupping area, as a result of construction for the SBSP Restoration Project. Loss of a few individuals or nests of the salt marsh harvest mouse, salt marsh wandering shrew, or California clapper rail would be less than significant under CEQA/NEPA because the Project is expected to result in considerable increases in habitat in the long term, thereby augmenting populations far beyond the local impacts that may occur during construction.

Because of the low numbers of areas where large numbers of harbor seals congregate in the South Bay, the disturbance of a primary haul-out or pupping area as a result of SBSP Restoration Project construction (*e.g.*, due to noise or the activities of workers and equipment) would be a significant impact. In the long term, the Project is expected to have a net benefit to harbor seals through enhancement of fish populations and the restoration of miles of tidal sloughs and channels that would serve as foraging areas and provide new haul-out sites.

For other special-status species (*e.g.*, state species of special concern such as the salt marsh common yellowthroat, Alameda song sparrow, and northern harrier), construction-related disturbance is expected to have little impact on the South Bay population, both due to the small numbers of individuals and nests that could potentially be impacted and the greater populations of these species (relative to the rarer salt marsh harvest mouse, salt marsh wandering shrew, and California clapper rail). In addition, measures implemented to minimize impacts to marsh-nesting birds (*e.g.*, seasonal avoidance of areas occupied by the California clapper rail), would also minimize impacts to these species. Finally, tidal restoration is expected to result in substantial benefits to these marsh-associated species through long-term

augmentation of habitat. Therefore, construction-related impacts to these species are considered less than significant.

Alternative A No Action. Under the No Action Alternative, no construction-related impacts would occur.

Alternative A Level of Significance: No Impact

Alternative B Managed Pond Emphasis. Under Alternative B, construction would occur at a number of locations throughout the SBSP Restoration Project Area. However, with implementation of measures to avoid and minimize impacts (*i.e.*, seasonal avoidance and pre-construction surveys), impacts on marsh-associated species are expected to be limited and short term. In addition, implementation of the Project would result in substantial increases in tidal marsh habitat, a significant beneficial effect for tidal marsh-associated wildlife. This increase in habitat would more than offset any minor short-term construction-related impacts to these species. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, construction would occur at a greater number of locations throughout the Project Area than under Alternative B, potentially resulting in greater disturbance of marsh-associated wildlife species. However, with implementation of measures to avoid and minimize impacts (*i.e.*, seasonal avoidance and pre-construction surveys), impacts are expected to be limited and temporary. In addition, implementation of the SBSP Restoration Project would result in substantial increases in tidal marsh habitat, a significant beneficial effect for tidal marsh-associated wildlife. This increase in habitat would more than offset any minor short-term construction-related impacts to these species. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-11: **Potential construction-related loss of, or disturbance to, nesting pond-associated birds.**

Potential SBSP Restoration Project Effects. Construction related to the implementation of the SBSP Restoration Project could potentially disturb some wildlife species, and in some cases, could lead to the loss of individuals. In addition to wildlife species that occur in tidal marsh habitats (addressed under SBSP Impact 3.6-10), birds that nest in managed pond habitats may be adversely affected by construction activities. Such species include the Double-crested cormorant, Caspian tern, Forster's tern, California least tern, black skimmer, California gull, American avocet, Black-necked stilt, and western snowy plover. Impacts to pond-associated nesting bird species due to large-scale habitat changes are addressed in SBSP Impact 3.6-4.

Because these species occasionally nest on levees, tidal restoration activities such as breaching, and pond enhancement activities such as berm construction, island construction, and installation of water-control structures could result in the direct alteration of levees and islands upon which these birds nest. Levee

breaching would also result in the flooding of ponds, which could destroy nests placed on dried pond bottoms, or on islands or internal berms and levees, due to tidal flooding. Construction activities would also involve the movement of heavy equipment, loud noise, and human presence in and adjacent to existing nesting habitat. These activities may result in the disturbance of birds nesting within ponds, potentially resulting in the abandonment of nests, eggs, or young, or facilitating predation on eggs or young by causing adults to flee.

To minimize such impacts, several measures are incorporated into the Project. Work in and adjacent to potential bird nesting habitat would be conducted outside of the avian nesting season to the extent practicable. Work in these areas that could cause disturbance or direct take (*e.g.*, accidental crushing of individuals or nests) would be limited to the period September 1 through January 31, to the extent practicable. This condition would minimize potential impacts to nesting birds. If seasonal avoidance is not possible, pre-construction surveys would be conducted for nesting birds. If any nesting pond-associated waterbirds are detected in areas that could be disturbed by Project-related construction activities, Project implementation would be delayed or redesigned to minimize potential impacts to actively nesting birds, or other measures may be taken to avoid impacts in consultation with USFWS and CDFG.

Determination of Threshold of Significance. Loss of any individuals or nests of the federally listed western snowy plover or California least tern would be significant given the small populations of these species on the West Coast. Breaching of ponds and other construction-related activities during the nesting season could also result in the loss of active nests and/or mortality of chicks of other pond-associated species, such as Forster's and Caspian terns, American avocets, and Black-necked stilts. Although the loss of a few nests of these species might not be considered a significant impact due to the regional abundance of these species, these species often nest in colonies or in large densities in particular ponds, and the loss of substantial numbers of nests or individuals would be considered significant. Impacts to the black skimmer, California gull, and Double-crested cormorant are considered less than significant for reasons discussed under SBSP Impact 3.6-4.

Alternative A No Action. Under the No Action Alternative, no construction-related impacts would occur. However, uncontrolled breaching could lead to flooding of nest sites, likely putting nests at a higher level of risk than if such breaching were controlled.

Alternative A Level of Significance: No Impact

Alternative B Managed Pond Emphasis. Under Alternative B, construction would occur at a number of locations throughout the SBSP Restoration Project Area. However, with implementation of measures to avoid and minimize impacts (*i.e.*, seasonal avoidance and pre-construction surveys), impacts are expected to be minor. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, construction would occur at a greater number of locations throughout the Project Area than under Alternative B. However, with implementation

of measures to avoid and minimize impacts (*i.e.*, seasonal avoidance and pre-construction surveys), impacts are expected to be minor. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-12: **Potential disturbance to or loss of sensitive wildlife species due to ongoing monitoring, maintenance, and management activities.**

Potential SBSP Restoration Project Effects. Management, maintenance, and monitoring are expected to occur throughout the life of the SBSP Restoration Project (see Section 2.3). Many of these activities would be directed toward the monitoring of, or management for, particular resources of concern, and thus the net effect of these activities would be beneficial. However, these activities do have the potential to adversely affect biological resources, at least in the short term. Specifically, monitoring and management activities have the potential to cause disturbance to breeding species and even site, nest, or colony abandonment. These activities may inadvertently contribute to low population numbers.

Monitoring activities would include surveys of managed ponds, restored marshes, and other locations as described in the Adaptive Management Plan (Appendix D), and activities associated with applied studies. While most such monitoring locations would be in the SBSP Restoration Project Area, some monitoring (*e.g.,* of shorebird numbers at Cargill ponds and other locations in the Bay Area, and salmonid spawning streams for steelhead) may occur outside the Project Area. Monitoring would entail surveys for birds and harbor seals conducted on foot, by car, and possibly by boat and airplane; monitoring of harvest mouse populations by trapping within restored marshes; vegetation mapping from aerial photos and ground-truthing; monitoring of fish through counts (*e.g.,* of salmonids) and sampling with nets (for estuarine fish), and monitoring for other, non-biological impacts as outlined in the Adaptive Management Plan. Although trapping for harvest mice and fish would involve handling of individuals, and could potentially result in minor mortality, most monitoring of biological resources would be passive. Impacts would primarily be minor and short term (*e.g.,* flushing individual birds or seals along the survey route).

Following the breaching of levees around a pond restored to tidal action, the only management activities that may occur within restored tidal habitats are predator management and invasive plant management. Therefore, management and maintenance activities associated with the SBSP Restoration Project would occur primarily in managed ponds and in recreational access areas such as trails. Examples of such activities, which are described in greater detail in Section 2.3, include:

- Raising or lowering water levels within ponds via inlet and outlet structures (or via limited pumping, if necessary);
- Controlling vegetation on nesting islands, in areas designed as open-water habitat, and along trails via mechanical control, spraying with saltwater, spraying with approved herbicides, or other means;
- Predator management, including trapping of mammals and nuisance birds;
- Periodic augmentation of sediment on nesting islands; and

- Maintenance of levees, berms, trails, boat launches, interpretive features, gates, and water-control structures.

Predator management would occur on an as-needed basis to protect special-status and sensitive species, such as western snowy plovers, California clapper rails, salt marsh harvest mice, and tern colonies from predators such as California gulls, northern harriers, American crows, common ravens, red foxes, striped skunks, feral cats, and raccoons. Such management would result in adverse effects to the predators themselves via displacement (*e.g.,* trapping and relocating predators such as northern harriers) or culling. However, predator management would be focused on specific areas where predation problems are occurring, and culling would be limited to certain species; target mammalian predators that are captured would be euthanized, while target avian predators would be either euthanized (*e.g.*, crows and ravens) or relocated (*e.g.*, raptors). Furthermore, most of these predators are common, widespread, and increasing in number, and habitat for marsh breeders such as the northern harrier is expected to increase under this Project. Although predator management is expected to reduce populations where implemented in specific problem areas, substantial impacts to regional populations of these predator species are not expected.

Control of invasive vegetation, especially smooth cordgrass and its hybrids, would occur as needed within existing and restored tidal marshes. Invasive cordgrass control would be performed per the methods employed by the Invasive Spartina Project, although some methods may be modified as cordgrass control techniques become refined. Invasive vegetation management would occur primarily in vegetated tidal marshes.

Maintenance and management related to the SBSP Restoration Project could potentially disturb foraging, roosting, and breeding wildlife species, and in some cases, could lead to the direct loss of individuals. Work involving vehicles or heavy equipment could result in the loss of individuals or nests located within work areas (*e.g.,* on levees, berms, islands, or vegetated areas), and loud noise and human presence in and adjacent to nesting areas may result in the disturbance of birds nesting within ponds or marshes, potentially resulting in the abandonment of nests, eggs, or young, or facilitating predation on eggs or young by causing adults to flee. Improper management of water levels could lead to the formation of landbridges to nesting bird colonies, which could facilitate mammalian predation, or could flood nests placed on pond bottoms, islands, berms, or levees.

The SBSP Restoration Project incorporates measures to minimize impacts from monitoring, maintenance, and management, and it is anticipated that a number of measures to avoid and minimize such impacts to federally listed species would be required by the BO for this Project. Activities that are sufficiently loud or obtrusive enough to cause disturbance of nesting birds or pupping harbor seals, or direct take (*e.g.*, accidental crushing of individuals or nests), would be limited to the period September 1 through February 1, to the extent practicable, minimizing potential impacts. If seasonal avoidance is not possible, habitat assessments and/or pre-construction surveys would be conducted for nesting birds, salt marsh harvest mice, and other sensitive species. If any nesting pond-associated waterbirds are detected in areas that could be disturbed by Project-related construction activities, Project implementation would be delayed or redesigned to minimize potential impacts to actively nesting birds, or other measures may be taken to avoid impacts in consultation with USFWS and CDFG. In cases of emergency repairs (*e.g.,* to levees or water-control structures) or management (*e.g.,* if predator management becomes necessary during the bird

nesting season), such activities would incorporate any measures recommended by USFWS and CDFG to minimize impacts. Otherwise, particularly obtrusive activities such as levee, berm, and island refurbishment, or the maintenance of long-term levees that provide flood protection, would occur between September 1 and February 1 unless pre-construction habitat assessments and surveys determine that no sensitive species would be adversely affected. As part of adaptive management, monitoring, maintenance and management activities would be evaluated for their impacts on species and would be adjusted to reduce impacts.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on biological resources as a result of ongoing monitoring, management, and maintenance activities if these activities resulted, directly or indirectly (*e.g.*, by facilitating predation or as a result of disturbance), in:

- The mortality of, or loss of active nests of, any western snowy plovers or California least terns;
- The mortality of, or the loss of active nests of, substantial numbers of state- or federally listed, marsh-associated species;
- Abandonment of a primary harbor seal haul-out or pupping area; or
- The loss of substantial numbers of nests of non-listed pond-associated birds (specifically terns, avocets, and stilts).

Loss of a few individuals or nests of the steelhead, salt marsh harvest mouse, salt marsh wandering shrew, or California clapper rail would be less than significant under CEQA/NEPA because the Project is expected to result in considerable increases in habitat in the long-term, thereby augmenting populations far beyond the minor, local impacts that may occur during monitoring, management, and maintenance activities. However, because of the low numbers of western snowy plovers and California least terns currently present in the South Bay, and potential adverse effects of the restoration Project on nesting habitat for these species, any loss of western snowy plovers or California least terns as a result of monitoring, management, and maintenance activities would be significant.

Alternative A No Action. Under the No Action Alternative, there would be no increase in monitoring relative to existing levels. Although some ponds would continue to be managed, necessitating some management and maintenance, there would be a net decrease in management and maintenance activities, relative to existing conditions, under this alternative. Continued maintenance and management of some ponds would have a net benefit on biological resources by maintaining desirable conditions within those ponds. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative A Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative B Managed Pond Emphasis. Under Alternative B, monitoring would increase relative to existing conditions, as described in the Adaptive Management Plan (Appendix D). For reconfigured ponds, management and maintenance activities would be more intensive than they are currently, due to the need to maintain islands, internal berms, and water levels with greater vigilance. As a result, impacts to biological resources from monitoring, management, and maintenance activities could potentially be higher under Alternative B than Alternative A. However, management and maintenance activities that are

currently occurring would no longer occur at ponds where tidal habitats are restored under Alternative B. Thus, with incorporation of impact avoidance and minimization measures into the Project, as described above, substantial impacts to biological resources as a result of monitoring, maintenance, and management activities are not anticipated. Rather, maintenance and management would have a net benefit on biological resources by maintaining desirable conditions, and the results of monitoring would inform adaptive management and the design of future phases of restoration. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative B Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative C Tidal Habitat Emphasis. Under Alternative C, monitoring would increase relative to existing conditions, as described in the Adaptive Management Plan (Appendix D). At reconfigured ponds, management and maintenance activities would be more intensive than they are currently, due to the need to maintain islands, internal berms, and water levels with greater vigilance. Due to the limited number of managed ponds under this alternative, management and maintenance activities would occur at considerably fewer locations than under Alternatives A or B. However, as more birds are concentrated in fewer locations, such monitoring could have proportionately greater effects in the absence of impact-avoidance measures. With incorporation of impact-avoidance and minimization measures into the Project, as described above, substantial impacts to biological resources as a result of monitoring, maintenance, and management activities are not anticipated. Rather, maintenance and management would have a net benefit on biological resources by maintaining desirable conditions, and the results of monitoring would inform adaptive management and the design of future phases of restoration. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative C Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

SBSP Impact 3.6-13: **Potential effects of habitat conversion and pond management on steelhead.**

Potential SBSP Restoration Project Effects. The federally listed threatened steelhead, California Central Coast ESU, is known to spawn in non-tidal portions of several South Bay creeks, including Coyote, Stevens, San Francisquito, and Alameda Creeks and the Guadalupe River. This anadromous species makes use of tidal habitats during its migrations between oceanic and freshwater, non-tidal habitats. Tidal brackish channels provide habitat for juveniles during the process of smoltification (*i.e.*, physiological adaptation to the saltwater environment). As a result, steelhead are expected to use channels within tidal marshes in the South Bay, potentially anywhere in the study area but particularly along the sloughs leading to and from spawning streams.

Although estuarine habitat use by steelhead has not been studied in the South Bay, the SBSP Restoration Project is expected to have a net benefit to steelhead by increasing estuarine habitat. Such habitat is likely to be especially important as rearing habitat for juveniles. However, it is possible that adult steelhead migrating upstream or downstream, or juveniles foraging in estuarine habitats, could enter managed ponds and become trapped. If such fish are able to tolerate the conditions within the ponds and eventually

return to tidal sloughs via pond outlets, the impact on such fish would likely not be substantial. However, managed ponds may have more shallow water, higher salinity, lower DO, or increased predation pressure (due to more limited plant cover or concentrations of fish in smaller areas) than tidal habitats. As a result, entrainment in managed ponds may impair the health of, or cause mortality of, steelhead.

Currently, there are a number of "intake" ponds that receive water directly from sloughs and channels, and could thus take in steelhead. Such ponds occurring along steelhead spawning streams, include Ponds A7, A9, A17, and E1C. Alternatives B and C of the SBSP Restoration Project would involve fewer managed ponds than exist currently, and thus, entrainment should not increase relative to existing conditions as a result of the Project. Nevertheless, to minimize impacts to steelhead from entrainment in managed ponds, fish screens would be placed over all pond intake structures located along sloughs that lead directly to known spawning creeks for steelhead.

There is also some potential for steelhead to become temporarily "stranded" in restored marshes. For example, steelhead may enter marshes during high tides, and become trapped in marsh ponds or pools (*e.g.,* pools that form within borrow ditches, behind borrow ditch blocks). Such fish could potentially be subject to increased predation by being concentrated in small areas, but they are unlikely to perish due to low water quality or lack of food before another high tide enables them to "escape" back into channels. Overall, marsh restoration is expected to have a net benefit on steelhead by providing numerous channels that will serve as rearing habitat for juveniles. Most marshes that are actively restored, as opposed to forming unintentionally via accidental breaches (*e.g.,* under the No Action Alternative), are expected to be well drained, with complex channel networks that would provide extensive foraging habitat and cover for steelhead without the threat of entrapping them.

Although SBSP Restoration Project effects on steelhead are expected to be beneficial overall, the Adaptive Management Plan (Appendix D) includes a description of monitoring and adaptive management activities concerning this species.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on steelhead if it resulted in declines in steelhead numbers. However, SBSP Restoration Project effects on steelhead are expected to be beneficial overall.

Alternative A No Action. Under the No Action Alternative, no new water-control structures would be added, but no fish screens would be added to existing structures. Thus, at least in the short term, any entrainment of steelhead currently occurring would continue in the ponds that are being actively managed. In the Eden Landing pond complex, Ponds E1C, E2C, E4C, and E5C would likely be managed as seasonal wetlands, and Ponds E10, E11, E8, E6A, and E6B are expected to remain as managed ponds for the 50-year planning horizon. Most of the remaining ponds are eventually likely to become tidal due to the expected failure of unmaintained levees, providing considerable estuarine foraging habitat for steelhead in the Eden Landing complex. In the Alviso pond complex, the levees around Ponds A5, A6, and A7 would likely not be maintained, and thus important estuarine habitat within these ponds (which are located along Alviso Slough, a steelhead spawning stream that drains the Guadalupe River,) would be provided. However, the quality of habitat in these restored marshes is likely to be lower under the No Action Alternative than under Alternatives B or C. Active, intentional restoration under the latter

alternatives would involve breaches at strategic locations to take advantage of remnant slough networks, and would incorporate tidal ditch blocks to facilitate the development of complex channel networks. Unintentional breaching under the No Action Alternative would not necessarily optimize the subtidal habitats that could occur in restored marshes, in part because the lack of ditch blocks would result in existing borrow ditches capturing much of the tidal prism in breached ponds. Thus, while the net effect of Alternative A on steelhead would be beneficial, this effect would not be as beneficial as under Alternatives B or C. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative A Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative B Managed Pond Emphasis. Under Alternative B, approximately 50 percent of the SBSP Restoration Project Area would be managed as pond habitat for birds, with 50 percent restored to tidal habitats. Minor impacts to steelhead may occur due to entrapment within managed ponds, and possibly within restored marshes. However, the number of individuals that might be adversely affected by entrapment is expected to be very low, and Alternative B would have a net benefit to steelhead both by increasing the extent of subtidal habitat within restored marshes, reducing the number of ponds with intake structures, and providing fish screens for at least some of the intake structures along spawning streams. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative B Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative C Tidal Habitat Emphasis. Under Alternative C, approximately 10 percent of the SBSP Restoration Project Area would be managed as pond habitat for birds, with 90 percent restored to tidal habitats. Minor impacts to steelhead may occur due to entrapment within managed ponds, and possibly within restored marshes. However, the number of individuals that might be adversely affected by entrapment is expected to be very low, and Alternative C would have a net benefit to steelhead both by increasing the extent of subtidal habitat within restored marshes, reducing the number of ponds with intake structures, and providing fish screens for at least some of the intake structures along spawning streams. Overall, the net benefit to steelhead from Alternative C is expected to be greater than that for Alternatives A and B. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative C Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

SBSP Impact 3.6-14: **Potential impacts to estuarine fish.**

Potential SBSP Restoration Project Effects. More than 100 species of fish have been recorded in the tidal waters of the South Bay (Tom Laine, pers. comm.). Surveys of South Bay tidal sloughs by USGS (Takekawa and others 2005) in 2004 and 2005 recorded a total of 16 fish species in Alviso Slough, Coyote Creek, Stevens Creek, Alameda Creek, and at Coyote Hills. Northern anchovies and topsmelt were by far the most abundant species caught; the American shad (*Alosa sapidissima*), bat ray

(*Myliobatus californica*), leopard shark (*Triakis semifasciata*), striped bass (*Morone saxatilis*), staghorn sculpin, shiner surfperch (*Cymatogaster aggregata*), and yellowfin goby were also recorded.

Fish community composition and abundance within the salt ponds of the South Bay are primarily a function of salinity, with more diverse communities and greater abundance in lower-salinity ponds, and generally no fish surviving salinities greater than 100 ppt. Carpelan (1957) found that in the Alviso salt ponds he studied, the primary fish species were topsmelt and threespine stickleback (*Gasterosteus aculeatus*). Lonzarich and Smith (1997) more recently studied fish assemblages in Alviso Ponds A9 through A12, finding topsmelt, threespine stickleback, and longjaw mudsucker to be common in low to mid-salinity ponds (35 to 90 ppt). Surveys in Eden Landing and Alviso ponds by USGS (Takekawa and others 2005) recorded 13 fish species in salt ponds; these results are similar to those of Lonzarich and Smith (1997), with longjaw mudsucker, rainwater killifish, topsmelt, and yellowfin goby being the most abundant fish, although very few sticklebacks were caught by USGS.

In the South Bay, managed ponds support lower diversity of native fishes than tidal habitats, and only a few species are present in managed ponds in large numbers. Conversely, many of the fish recorded in the South Bay use tidal channels and mudflats at high tide when they are inundated. These tidal habitats are particularly important as nursery habitat for juvenile fish. Thus, these tidal channels and mudflats are productive foraging habitats for estuarine fish in this system (Harvey 1988), and conversion of managed ponds to tidal habitats is expected to result in substantial increases in estuarine fish populations in the South Bay.

The potential for adverse effects of restoration on estuarine fish is primarily from low water quality in discharges from managed ponds. During implementation of the ISP, USFWS and CDFG have had some difficulty with low DO concentrations in pond discharges. Reduction in DO has resulted in fish kills within managed ponds, particularly during very warm periods, and low-DO discharges have the potential to kill aquatic life in receiving waters. However, through adaptive management, USFWS and CDFG have developed methods for minimizing low DO discharges. The conversion of managed ponds to tidal habitats via the SBSP Restoration Project would further reduce this potential impact.

Although SBSP Restoration Project effects on estuarine fish are expected to be beneficial overall, the Adaptive Management Plan (Appendix D) includes a description of monitoring and adaptive management activities concerning estuarine fish. It should be noted that such adaptive management is not required by CEQA or NEPA due to the net beneficial nature of Project effects.

Determination of Threshold of Significance. The SBSP Restoration Project would result in a significant impact to estuarine fish if it resulted in a substantial decline in South Bay populations of estuarine fish. However, impacts are expected to be beneficial under all alternatives.

Alternative A No Action. Under the No Action Alternative, there would be some loss of managed pond habitat used by fish due to unintentional breaches and conversion of some ponds to unmanaged seasonal wetlands. In addition, low water quality in discharges from ponds that remain managed could potentially adversely affect fish (though this effect would not be as great as it is currently, as there would be fewer managed ponds than currently exist). However, such impacts are expected to be minor, as managed ponds

currently provide important habitat for relatively few fish species, and pond managers are becoming increasingly adept at avoiding problems of low water quality discharges from managed ponds. Minor impacts to some species may occur due to entrapment within managed ponds. However, overall, estuarine fish are expected to benefit considerably from the increase in tidal habitat that would occur due to unintentional breaching of ponds. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative A Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative B Managed Pond Emphasis. Adverse impacts to estuarine fish under Alternative B would be similar to those described under Alternative A, and are expected to be minor. However, Alternative B would have even greater benefits to estuarine fish since planned tidal restoration would likely result in more extensive channel networks, higher-order sloughs, and overall greater habitat diversity and extent than would occur in marshes that develop in ponds breached unintentionally. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative B Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative C Tidal Habitat Emphasis. Adverse impacts to estuarine fish under Alternative C would be similar to those described under Alternative A, and are expected to be minor. Alternative C would have even greater benefits to estuarine fish than both Alternatives A and B since tidal restoration would be planned (rather than unintentional as in Alternative A), and since the extent of tidal habitat would be substantially greater under Alternative C than Alternative B. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative C Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

SBSP Impact 3.6-15: **Potential impacts to piscivorous birds.**

Potential SBSP Restoration Project Effects. Several species of piscivorous (*i.e.*, fish-eating) waterbirds occur in the South Bay. In addition to terns, gulls, and cormorants (which are addressed under SBSP Impacts 3.6-4 and 3.6-8), piscivorous species in the South Bay include the pied-billed grebe, western grebe (*Aechmophorus occidentalis*), Clark's grebe (*Aechmophorus clarkii*), American white pelican, brown pelican, large waders (*i.e.*, herons and egrets), and mergansers. Several of these species, including green herons (*Butorides virescens*), great egrets (*Ardea alba*), snowy egrets, and black-crowned night-herons, nest in marshes in the Project Area. Great blue herons nest on artificial structures such as electrical towers, and in Eden Landing on an old duck club building in Pond E6B and on Archimedes screws), and pied-billed grebes nest in nontidal ponds in the South Bay. The other piscivorous species addressed in this section occur in the SBSP Restoration Project Area as nonbreeders.

The piscivorous birds of the South Bay forage in a variety of habitats and locations where prey fish are available. The low-salinity salt ponds that support fish, tidal sloughs and channels, edges of intertidal

mudflats, nontidal ponds and channels, and artificial lakes such as Shoreline Lake provide the highest-quality foraging areas, and large "frenzies" of feeding activity may be observed at these locations, presumably when conditions result in large fish concentrations. Brown pelicans usually plunge-dive for fish and therefore require water several feet deep, but American white pelicans and cormorants swim while feeding and can thus feed in shallower water. Although double-crested cormorants, western and Clark's grebes, and brown pelicans forage to varying degrees within the open waters of the Bay, American white pelicans do not, instead preferring nontidal waterbodies (Cogswell 2000; Harvey 1988; Harvey and others 1988).

Swarth and others (1982) reported that loons and western and Clark's grebes were much more abundant on the Bay than in the salt ponds west of the Coyote Hills (Swarth and others 1982), noting that piscivorous species were more common in the Alviso ponds than in the Coyote Hills ponds. Approximately 94 percent of the pelicans and Double-crested cormorants recorded by Swarth and others (1982) were in low-salinity ponds, though most of the cormorants used these ponds only for roosting (primarily on wooden pilings and platforms within the ponds). Although cormorants may take advantage of local concentrations of fish within salt ponds, most apparently feed in the Bay (Ainley 2000b; Anderson 1970). Herons and egrets forage primarily in sloughs and marshes, with only some birds moving to salt ponds at high tide (Anderson 1970; Swarth and others 1982). However, where temporary concentrations of fish are present (generally in low-salinity ponds in fall), these waders occur in large concentrations. Takekawa and others (2001) reported that piscivores were more abundant in natural baylands than in salt ponds in the North Bay during all seasons, while Stralberg and others (2003) determined that the species richness of large waders tended to be higher in the tidal salt marsh than in salt ponds, although piscivore abundance was higher in salt ponds.

Tidal restoration associated with the SBSP Restoration Project is likely to benefit nesting egrets and herons by providing more marsh habitat, which is expected to include some isolated stands of tall marsh vegetation along sloughs similar to that used, or formerly used, for nesting at Artesian Slough and near the Warm Springs marshes. As a result, nesting habitat availability for these species would increase due to the Project.

The effects of the SBSP Restoration Project on foraging piscivores depends on the Project's effects on both abundance and availability of prey fish. Low-salinity salt ponds may concentrate fish, thus facilitating their capture by piscivorous birds. As a result, conversion of some low-salinity ponds to tidal habitats would reduce foraging habitat in managed ponds. However, as noted in the discussion of estuarine fish (SBSP Impact 3.6-14), tidal restoration is expected to result in a considerable increase in the abundance of native estuarine fish in the South Bay, and the tidal sloughs and channels that would develop in restored marshes are expected to be used heavily by foraging piscivores. The SBSP Restoration Project is expected to have a net benefit to most piscivorous species, as the minor impacts from the loss of managed ponds would be far outweighed by the increase in fish abundance and tidal foraging habitat.

The most important piscivorous species addressed in this section that may decline substantially due to the loss of managed pond habitat is the American white pelican, which does not forage heavily in tidal

habitats. PRBO's modeling predicted declines in the abundance of this species in the South Bay of 75 percent in Alternative A, 55 percent in Alternative B, and 81 percent in Alternative C (Stralberg and others 2006). The maximum count of American white pelicans in the SBSP Restoration Project ponds on monthly surveys conducted by USGS since 2002 was 2,188 in October 2003. Given recent estimates of the North American population by Evans and Knopf (1993), this high count represents approximately one percent of the continental population.

Determination of Threshold of Significance. The SBSP Restoration Project would result in a significant impact on piscivorous birds if it resulted in a substantial decline (relative to baseline levels) in South Bay populations of mergansers, pelicans, fish-eating grebes, herons, and egrets, resulting in a substantial decline in Pacific Flyway populations.

Alternative A No Action. Under the No Action Alternative, conversion of some low-salinity ponds to tidal habitats through unintentional breaching, and to vegetated seasonal wetlands as a result of cessation of management, would reduce foraging habitat for piscivorous birds in managed ponds. However, the tidal habitats that develop in breached ponds would provide foraging habitat for some piscivores, and would result in increases in prey fish abundance. Tidal marshes that develop within these ponds may also provide nesting habitat for herons and egrets. Alternative A would thus likely result in a net benefit to most piscivorous species.

Pond-associated piscivores, such as the American white pelican, would likely decline in the SBSP Restoration Project Area as a result of the decline in managed pond habitat under Alternative A. However, some redistribution of foraging birds (*e.g.,* to Cargill-managed ponds) is expected, and losses from the South Bay are not expected to result in substantial declines on the scale of West Coast or continental populations. Therefore, impacts would be less than significant.

Alternative A Level of Significance: Less than Significant

Alternative B Managed Pond Emphasis. Compared to Alternative A, Alternative B is expected to result in greater benefits to piscivorous bird species that use tidal channels, sloughs, and open subtidal habitats since planned tidal restoration would likely result in more extensive channel networks, higher-order sloughs, and overall greater habitat diversity and extent than would occur in marshes that develop in ponds breached unintentionally. Alternative B would also include more actively managed ponds than Alternative A, providing more potential foraging habitat for pond-associated piscivores such as the American white pelican. Some redistribution of foraging birds (*e.g.,* to Cargill-managed ponds) is expected, and losses from the South Bay are not expected to result in substantial declines on the scale of West Coast or continental populations. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Alternative C would have even greater benefits to piscivorous bird species that use tidal channels, sloughs, and open subtidal habitats than both Alternatives A and B since tidal restoration would be planned (rather than unintentional as in Alternative A), and since the extent of tidal habitat would be substantially greater under Alternative C than Alternative B. Alternative C

may result in greater declines (at least on the scale of the SBSP Restoration Project Area) than Alternative B in pond-associated piscivores such as the American white pelican. However, some redistribution of foraging birds (*e.g.,* to Cargill-managed ponds) is expected, and losses from the South Bay are not expected to result in substantial declines on the scale of West Coast or continental populations. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-16: **Potential impacts to dabbling ducks.**

Potential SBSP Restoration Project Effects. Dabbling ducks are more abundant as breeders in the South Bay, but less abundant during the nonbreeding season, than diving ducks (which were addressed under SBSP Impact 3.6-6). For example, winter surveys in 1987 to 1990 revealed approximately 57,000 dabbling ducks (ducks that feed without submerging their entire bodies) and 220,000 diving ducks (Goals Project 1999) in the Bay Area. Though not nearly as important to nesting waterfowl in the Bay Area as the Suisun Bay (Goals Project 1999; Harvey and others 1992), the bayland habitats of the South Bay provide breeding habitat for several dabbling duck species, including the mallard, gadwall, cinnamon teal, northern pintail, and northern shoveler. The South Bay is important to dabbling ducks primarily as a foraging area for migrant and wintering ducks. All of the breeding species are present in much greater abundance during the nonbreeding season than during summer, and they are joined by large numbers of American wigeon and green-winged teal during migration and winter.

Dabbling ducks forage in a variety of habitats in the South Bay, including mudflats, shallow subtidal habitats, tidal sloughs and marsh channels, marsh ponds, managed and muted tidal marsh, seasonal wetlands, managed ponds, and water treatment plants. In these areas, dabbling ducks feed on a variety of aquatic plants and invertebrates. Because these species do not typically dive for food, dabbling ducks usually forage in water less than 30 cm deep (Page 2001). Within salt ponds, salinity is also important for these birds. The plants on which many dabbling ducks feed cannot tolerate high salinities, and thus dabbling duck abundance tends to be highest on lower salinity ponds (20 to 63 ppt) ponds, with few in ponds greater than 154 ppt (Accurso 1992).

The most abundant dabbling ducks wintering in the South Bay are the northern shoveler, American wigeon (*Anas americana*), northern pintail, mallard, and gadwall (US Geological Survey Unpublished Preliminary Data). Shovelers are both abundant and flexible in habitat use in the South Bay, although they do not use tidal habitats frequently (Swarth and others 1982). The northern shoveler was the third most abundant species recorded at the Coyote Creek Reach 1A waterbird pond during monitoring from 1992 to 2003, comprising 81 percent of the waterfowl recorded there (Strong 2003), and counts of 4,750 (19 Dec 1999) at the San Jose-Santa Clara WPCP and 5,500 (20 December 1996) at the Sunnyvale WPCP have been recorded (Santa Clara County Bird Data Unpublished). Swarth and others (1982) found shovelers to be much more abundant on salt ponds than in tidal habitats, with 16,500 shovelers counted on two salt ponds during a census in early November. In contrast, these observers found American wigeon to be much more abundant on the Bay than in salt ponds. Northern pintails were common in both habitats.

Stralberg and others (2003) found that dabbling duck species richness in the South Bay tended to be higher in marshes than in salt ponds. PRBO's modeling (Stralberg and others 2006) has predicted that numbers of gadwalls in the South Bay are expected to increase substantially under Alternative A, with larger increases under Alternatives B and C. Stralberg and others (2006) predict that abundance of mallards and northern shovelers would remain relatively stable under Alternative A but would increase under Alternatives B and C. In contrast, northern pintail abundance in the South Bay was predicted by this modeling to decline 55 percent under Alternative A, 31 percent under Alternative B, and 46 percent under Alternative C.

Because large numbers of dabbling ducks use shallow managed ponds in the South Bay for foraging and roosting, conversion of ponds to tidal habitats is expected to have some effect on South Bay numbers of these birds. However, most dabbling ducks are expected to take advantage of the extensive foraging habitat, roosting habitat, and cover provided by tidal channels and sloughs, and marsh ponds, and tidal restoration would also increase nesting habitat availability in high marsh. There is some potential for density-dependent mortality due to disease (such as botulism; see SBSP Impact 3.6-22), predation, and disturbance by predators and humans as the ducks that use managed ponds are concentrated into fewer areas as a result of pond conversion. However, tidal restoration should result in dispersion of dabbling ducks over the entire SBSP Restoration Project Area, ameliorating such adverse effects of concentration. Overall, tidal restoration is expected to more than offset these adverse effects, and the net effect of tidal restoration is expected to be beneficial.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on dabbling ducks if it resulted in a substantial decline (relative to baseline levels) in South Bay populations of dabbling ducks, resulting in a decline in Pacific Flyway populations.

Alternative A No Action. Under the No Action Alternative, managed pond habitat would be lost due to unintentional breaching and conversion of some managed ponds to vegetated seasonal wetlands. However, the tidal marshes that develop in the breached ponds, and the seasonal wetlands, are both expected to provide nesting and foraging habitat for dabbling ducks. The benefits of Alternative A to dabbling ducks are likely to outweigh any adverse effects of density-dependent mortality at managed ponds, or loss of managed pond habitat. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative A Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative B Managed Pond Emphasis. Compared to Alternative A, Alternative B is expected to result in greater benefits to dabbling ducks since planned tidal restoration would likely result in more extensive channel networks, higher-order sloughs, more marsh ponds, and overall greater habitat diversity and extent than would occur in marshes that develop in ponds breached unintentionally. Alternative B would also include more actively managed ponds than Alternative A, providing more and higher quality pond habitat for dabbling ducks. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative B Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative C Tidal Habitat Emphasis. The benefits of tidal restoration to dabbling ducks under Alternative C would likely be greater than under both Alternatives A and B since tidal restoration would be planned (rather than unintentional as in Alternative A), and since the extent of tidal habitat would be substantially greater under Alternative C than Alternative B. If large numbers of dabbling ducks concentrate in a few managed ponds under this alternative (even if large numbers are spread out over the marshes as well), this concentration of birds would increase the potential for disease outbreaks (see SBSP Impact 3.6-22). However, such a potential impact is expected to be offset by the more expected benefits of restoration. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative C Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

SBSP Impact 3.6-17: **Potential impacts to harbor seals.**

Potential SBSP Restoration Project Effects. Pacific harbor seals are currently the only marine mammals that are permanent residents of San Francisco Bay. Harbor seals forage in nearshore marine habitats on variety of fishes and invertebrates. Kopec and Harvey (1995) studied diet at several haul-out sites in 1991 to 1992, and found that in the South Bay, major diet items included yellowfin goby (*Acanthogobius flavimanus*), staghorn sculpin (*Leptocottus armatus*), and white croaker (*Genyonemus lineatus*).

More than 10 sites around the Bay may be used by seals at any given time (Lidicker and Ainley 2000), and any undisturbed intertidal habitat accessible to the open Bay could potentially be used by harbor seals. Within the South Bay, Mowry Slough is the most important haul-out and pupping location (Green and others 2004), but mudflats and adjacent pickleweed marsh at various locations, including Guadalupe Slough near the northeastern end of Pond A3N, the mouth of the Alameda Flood Control Channel, Newark Slough, Bair Island, and Greco Island, are currently used or have been important haul-outs historically (Bell Unpublished; Fancher and Alcorn 1982; Kopec and Harvey 1995).

As discussed in other impact sections, harbor seals could potentially be adversely affected by the SBSP Restoration Project due to mudflat loss (SBSP Impact 3.6-2), due to disturbance of haul-outs, including pupping locations, during construction (SBSP Impact 3.6-10), during monitoring, management, and maintenance activities (SBSP Impact 3.6-12), and by recreational activities (SBSP Impact 3.6-18), and due to bioaccumulation of mercury (SBSP Impact 3.4-4). Because of the low numbers of areas where large numbers of harbor seals congregate in the South Bay, the disturbance of a primary haul-out or pupping area as a result of SBSP Restoration Project construction would be a significant impact. However, as indicated in other impact sections, the Project incorporates measures to avoid impacts to primary haul-out areas, particularly during the pupping season.

Mercury bioaccumulation increases at increasing trophic levels and with increasing food web complexity. This is driven by the biomagnification of methymercury. Methylmercury binds strongly to the sulfur atoms of protein residues. Large organisms such as harbor seals eat smaller organisms for their protein,

and so retain any associated methylmercury in the prey items; adaptive management procedures for mercury are outlined in Section 3.4.

In the long term, the Project is expected to have a net benefit to harbor seals through enhancement of prey fish populations and the restoration of miles of tidal sloughs and channels that would serve as foraging areas and provide new haul-out sites. Although SBSP Restoration Project effects on harbor seals are expected to be beneficial overall, the Adaptive Management Plan (Appendix D) includes a description of monitoring and adaptive management activities concerning this species.

Determination of Threshold of Significance. The SBSP Restoration Project would result in a significant impact to harbor seals if it resulted in a substantial decline (relative to baseline levels) in South Bay populations. However, impacts are expected to be beneficial under all alternatives.

Alternative A No Action. Under the No Action Alternative, unintentional breaching would convert some managed ponds to tidal habitats, increasing estuarine fish abundance and augmenting foraging and haul-out habitat for harbor seals. These beneficial effects are expected to outweigh any adverse effects resulting from disturbance by O&M activities or bioconcentration of mercury from breached ponds. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative A Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative B Managed Pond Emphasis. Adverse impacts to harbor seals under Alternative B would be similar to those described under Alternative A, and are expected to be minor. However, Alternative B would have even greater benefits to harbor seals since planned tidal restoration is expected to result in greater increases in fish abundance and harbor seal foraging and haul-out habitat. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative B Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative C Tidal Habitat Emphasis. Adverse impacts to harbor seals under Alternative C would be similar to those described under Alternative A, and are expected to be minor. Alternative C would have even greater benefits to harbor seals than both Alternatives A and B since tidal restoration would be planned (rather than unintentional as in Alternative A), and since the extent of tidal habitat would be substantially greater under Alternative C than Alternative B. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative C Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

SBSP Impact 3.6-18: **Potential recreation-oriented impacts to sensitive species and their habitats.**

Potential SBSP Restoration Project Effects. Improved recreational access to baylands within the South Bay is an important objective of the SBSP Restoration Project (see Section 1.3.1). Such access is not only important to the quality of life of human South Bay residents and visitors, but from the standpoint of

biological resources, it would likely also be necessary to maintain public support for funding of future phases of restoration by this Project. New trails would be built, increasing access for pedestrians and bicyclists, and several new kayak launching areas would be established, increasing boat-based use of tidal sloughs in the Project Area. Increased recreational use and the maintenance of trails and recreational facilities have the potential to disturb wildlife, trample vegetation, decrease nesting success, increase predation, increase the introduction of non-native species, and decrease habitat quality (*e.g.*, see Korschgen and Dahlgren [1992] for a summary of the effects of human disturbance on waterfowl). Ultimately, such impacts could result in decreases in the abundance of breeding, foraging, and roosting wildlife.

Human disturbance of nesting birds can result in abandonment of nests and chicks, resulting in decreased reproductive success, and to increased predation, particularly of eggs and young (Rodgers and Smith 1995, Carney and Sydeman 1999, USFWS 2001, Ruhlen and others 2003, Lafferty and others 2006). Disturbance can also lead to decreased abundance or behavioral alteration of non-breeding birds (Burger and Gochfeld 1991, Schummer and Eddleman 2000, Lafferty 2001, Burger and others 2004).

Public access in the vicinity of nesting California clapper rails has the potential to disturb breeding pairs, although there are situations where rail activity in close proximity to public trails (*e.g.,* Palo Alto Baylands, Laumeister Tract, and Greenbrae boardwalk) is high (Steve Rottenborn, pers. obs.). Rails in these areas with public use seem to have become somewhat accustomed to people, although dogs would likely cause greater disturbance of these birds. Current regulations restricting access of dogs on refuge and state-managed lands in the SBSP Restoration Project Area would not be changed under the Project. Clapper rails along levee trails may be subject to higher predation risk because they may avoid high cover along levees during high tides (instead swimming within the flooded marsh or using areas of sparser cover) due to human presence on the levee. There is no information available regarding the effects of boat-based disturbance on California clapper rails in tidal marshes, although boats could disturb nesting rails or inhibit foraging by rails along sloughs where boats are present. Disturbance of rails could potentially lead to abandonment of nests and chicks, resulting in decreased reproductive success (Albertson 1995).

Nesting western snowy plovers may also be adversely affected by increased human use of the SBSP Restoration Project Area. Disturbance could lead to direct inadvertent crushing of nests (which are very cryptic), and could lead to the separation of chicks from attending adults and subsequent abandonment of chicks (Ruhlen and others 2003, Lafferty and others 2006). Disturbance could also lead to reduced egg viability or nest abandonment, particularly if disturbance causes plovers to remain off the nest for more than a few minutes. Recreation could have these same effects on other nesting birds, such as stilts, avocets, and terns.

Increased recreational use of levee trails could potentially reduce habitat quality in managed ponds for nesting, roosting, and foraging waterbirds. Although some species and individuals habituate to human activity, others would maintain some distance between areas they select for nesting, foraging, or roosting and trails or interpretive areas. The intervening distance is essentially unused by these individuals, reducing the actual extent of habitat available. Effects of human disturbance may be particularly

important to waterbirds using managed ponds. Creation of nesting islands and management for target water depths and salinities is expected to increase the densities of birds that can be supported at managed ponds. However, the concentration of pond-associated birds in fewer areas, as restoration proceeds and the number and extent of managed ponds is reduced, could potentially subject more individuals to human disturbance. The presence of dogs would be particularly disturbing to waterbirds, including the western snowy plover. Current regulations restricting access of dogs on refuge and state-managed lands in the SBSP Restoration Project Area would not be changed under the Project, and enforcement of these regulations would be necessary to prevent disturbance by dogs.

Effects of human disturbance along levee trails is expected to be less for marsh species than for pond-associated birds; flush distances (*i.e.*, distances at which birds flush when approached) for waterbirds in managed ponds seem to be much greater than for birds using vegetated marshes, likely because of the greater security provided by the vegetative cover in marshes (Steve Rottenborn, pers. obs.). Flush distances for western snowy plovers nesting in South Bay salt ponds may be 600 ft or more (C. Robinson, pers. comm.).

Trulio and Sokale (2002, 2006) found no statistical difference in abundance or diversity of waterbirds, especially shorebirds, foraging on mudflats adjacent to trails versus at disturbance-free control sites in the San Francisco Bay Area. Researchers collected data on the response of foraging waterbirds to recreational trail use at three sites: Bothin Marsh in Mill Valley, Redwood Shores in Redwood City, and Shoreline at Mountain View. Bird use of intertidal mudflat habitat near trails and at control sites adjacent to levees without official trails was monitored during four surveys per month for 24 months. Bird abundance and species richness were substantially different among locations, but not between impact and control sites, between weekdays and weekends, or as a function of human use. Although abundance and richness at Redwood Shores were greater at control sites than at impact sites, there was no trend at Bothin Marsh, and at Shoreline, abundance and richness were greater at impact sites. Thus, variability related to location and other biotic and abiotic factors apparently played a much larger role than human presence in determining where birds foraged on mudflats around San Francisco Bay. The authors proposed that this study indicates that non-motorized trail use on raised levees tangential to mudflat habitat does not have a significant effect on the numbers, species richness, or behavior of foraging shorebirds. Studies of public access effects on nesting birds, waterfowl, tidal habitat species (especially clapper rails), and harbor seals are needed to reduce uncertainties relative to these key species.

Many planned new trail locations are levees that are currently used by pedestrians, such as along Stevens Creek, or along the railroad tracks north of Coyote Creek (reference to figure displaying public access features). Thus, recreational access may not increase substantially on some new trails. Some trails are proposed to be available to the public seasonally, allowing them to be closed to public access during seasons in which biological resources are particularly sensitive (*e.g.,* the avian breeding season or harbor seal pupping season). Biological monitoring results outlined in the Adaptive Management Plan would allow land managers to determine whether sensitive species are present, when breeding is occurring, and whether recreational access should be permitted or prohibited along a given trail at a given time.

Both land-based and boat-based disturbances can cause harbor seals to leave haul-outs (Allen and others 1984). In the SBSP Restoration Project Area, it is possible that increased boating access could increase disturbance to the pupping area at the mouth of Mowry Slough and to foraging seals within restored sloughs.

Waterfowl hunting locations and intensity are not expected to change after implementation of the SBSP Restoration Project. However, in a reduced-pond landscape, waterfowl hunting in managed ponds could potentially disturb larger concentrations of non-target wildlife. Thus, waterfowl hunting would impact a greater proportion of managed pond habitat as more ponds are restored to tidal habitats.

Educational materials and interpretive features (including signs) would include guidelines for recreational use of SBSP Restoration Project facilities with respect to avoidance and minimization of adverse effects on biological resources. Adverse impacts would be offset to some degree by the potential positive effects of increased public awareness of and interest in ecological issues in the South Bay, resulting from increased wildlife viewing and interpretive signs. These positive effects, however, are difficult to quantify.

There is no expectation that recreational activities associated with this Project could result in impacts to other wildlife species, such as fish and small mammals, approaching the level of significance. While fish may be occasionally disturbed by human activities in or near their aquatic habitats, the physical and visual separation of most land-based public access areas and aquatic habitats most heavily used by fish, as well as the low density of kayaks and other water-based public access on the scale of all the aquatic habitats in the South Bay, would limit such disturbance considerably. Furthermore, occasional disturbance of a few individual fish is expected to have only a temporary effect, and effects of a long-term nature (*e.g.*, that would prevent fish from using certain areas) are expected to be extremely localized, if they occur at all. Thus, no population-level effects on fish are expected. Similarly, terrestrial mammals that could potentially be disturbed by human activities are either (a) small species such as salt marsh harvest mice and salt marsh wandering shrews that are expected to stray out of salt marsh areas only rarely, and that are unlikely to be disturbed by humans due to the dense vegetative cover of salt marshes, or (b) regionally abundant species. Thus, again, no population-level effects of recreation disturbance on these species are expected.

The Stevens Creek to Sunnyvale Bay Trail Spine occurs in an area with a known breeding population of western pond turtles. As a result, the Project includes symbolic fencing (post and cable) along the south side of the trail and educational signage to inform trail users of the presence of this breeding population and to discourage actions such as the release of non-native pet turtles that could adversely affect the western pond turtles at this location. Dogs would not be allowed on this trail except for trained dogs used in hunting. These measures, which are incorporated into the Project, would preclude a significant impact to this western pond turtle population. It should be noted that potential effects of the Project, including public access, on western pond turtles using the Northern Channel is not a “staircase” issue; thus, study of these effects was not included in the list of Phase 1 applied studies in Appendix D. However, the Project will encourage outside researchers to examine the potential effects of the Project on western pond turtles. It should be noted that potential effects of the Project, including public access, on western pond turtles

using the Northern Channel is not a "staircase" issue; thus, study of these effects is not included in the list of Phase 1 applied studies in Appendix D. However, the Project will encourage outside researchers to examine the potential effects of the Project on western pond turtles, as well as other "non-staircase" issues.

In addition to signage and other educational features that would discourage public activities that could result in adverse effects on wildlife, other measures have been incorporated into the planning of recreational features to limit adverse effects on wildlife. Nesting islands and other habitat specifically managed for nesting western snowy plovers would be set back at least 300 ft from public trails, boardwalks, and electrical towers and at least 600 ft from areas where people are likely to congregate, such as wildlife observation platforms. Monitoring of the effects of recreation on wildlife would inform the Project as to which activities are resulting in particularly high disturbance of wildlife, and of particularly sensitive species occurring or nesting in close proximity to public access areas, thus informing future restoration and public access features and possibly indicating whether temporary closures of certain areas are necessary.

Determination of Threshold of Significance. Recreation associated with the SBSP Restoration Project would have a significant impact if it resulted, directly or indirectly (*e.g.*, by facilitating predation), in:

- The abandonment of a primary harbor seal haul-out or pupping area;
- The mortality of, or loss of active nests of, the western snowy plover or California least tern;
- A reduction in California clapper rail populations;
- The loss of substantial numbers of nests of non-listed pond-associated birds (specifically, terns, avocets, and stilts); or
- Substantial, long-term declines in numbers of waterbirds in the South Bay due to recreational disturbance.

Adaptive Management Plan. The Adaptive Management Plan provides for the monitoring of the number and locations of breeding western snowy plovers, pupping harbor seals, winter waterfowl and California clapper rails, breeding pond-associated birds, shorebirds, and other selected waterbird species using the South Bay. This information would be used in adaptive management of recreational access in two ways. First, monitoring results would inform land managers as to the locations and breeding status of sensitive species at any given time; this information would then be used to determine when to close or open seasonal trails. Second, these monitoring results would provide some information as to potential adverse effects of public access on sensitive biological resources, so that public access can be modified if necessary to reduce or avoid impacts.

Determination of Baseline and Monitoring. The baselines (or methods for determining the baselines) for some individual wildlife species or groups are described in the Adaptive Management Plan and in other impact sections. In addition, the baseline for abundance, diversity, breeding success, and/or behavior of select species or groups at areas with varying levels of public access can be obtained during monitoring for other impacts, and ongoing monitoring would determine whether any adverse effects of public access are occurring.

Adaptive Management Triggers. Triggers for some individual wildlife species or groups are described in the Adaptive Management Plan and in other impact sections. For species or guilds without specific population targets, substantial or statistically significant changes in abundance, species richness, breeding success, or behavior at sites with high public use, compared to control sites with more limited use or access, would trip a trigger.

Adaptive Management. If monitoring results trip a trigger, the first step in adaptive management would be to determine if the observed effect is likely the result of increased human disturbance. This determination may involve review of data on relevant applied studies (see Appendix D) or initiation of additional applied studies of behavioral responses of specific species to human disturbance or different types and levels of disturbance. If it is determined that there are actual negative effects of recreational access on wildlife in the SBSP Restoration Project Area, adaptive management actions would be undertaken to attempt to reverse the adverse effect and/or to plan future phases of restoration to minimize this effect. Adaptive management actions would include seasonal closures of certain trails to some or all human access, providing edge conditions (*e.g.,* fencing) to prevent off-trail use, and erecting educational signage to discourage violation of access restrictions and guidelines. The last step in adaptive management, if no other measures are effective in minimizing disturbance of a particularly sensitive species or area and disturbance is severe, would be to prohibit a public use. If species goals are met, public access could potentially be increased.

Alternative A No Action. Under the No Action Alternative, no additional recreation access would be planned. Although unintentional breaching of unmanaged pond levees may increase the potential for boating within restored sloughs, the benefits of such tidal restoration to tidal species would outweigh any adverse effects from disturbance associated with increased boating. Therefore, impacts would be less than significant.

Alternative A Level of Significance: Less than Significant

Alternative B Managed Pond Emphasis. Alternative B would result in increased recreational access. At Eden Landing, this would include year-round trails along the inland side of the salt ponds, and extending west to Pond E8, and seasonal trails around Ponds E12, E13, and extending out to the mouth of Mt. Eden Creek, where a viewing platform would be installed. In addition, a kayak launch site would be added in Mt. Eden Creek, and a salt works interpretive station would be added at the west end of Pond E12. At Alviso, new year-round trails would be added along Guadalupe Slough and north of Moffett Federal Airfield. Designation of a seasonal trail along Stevens Creek would be part of the Project, but a year-round trail already occurs in this location. Interpretive/viewing stations would be added on the south and east sides of Pond A16. Kayak launch sites would be provided in Guadalupe Slough and Alviso Slough. At Ravenswood, year-round trails would be added around the north side of R3, the east side of SF2, and from Bayfront Park out to the Bay. Interpretive/viewing stations would be added at Bayfront Park and on the east side of Pond SF2.

Seasonal trails at these locations would be managed to avoid impacts to wildlife (*e.g.*, if the trail is near sensitive breeding birds, it would be closed during the breeding season). Impacts from trails and kayak launching areas on wildlife are expected to be minor if users respect guidelines for use of these facilities.

However, there is uncertainty as to the amount of use of these trails, the degree to which wildlife would tolerate or habituate to such recreational use, and the degree to which users would adhere to guidelines for recreational use of SBSP Restoration Project facilities with respect to avoidance and minimization of adverse effects (including restrictions related to dogs). For this reason, impacts of recreational access would be addressed in the Adaptive Management Plan (Appendix D). Under the Adaptive Management Plan, potential effects of human disturbance would be monitored, and adaptive management would be implemented to prevent impacts from reaching a significant level. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Alternative C would result in increased recreational access similar to that provided under Alternative B. At Eden Landing, the only difference from Alternative B is the addition of a year-round trail around the north and west sides of Pond E6C, and between Ponds E1C and E5C. At Alviso, additional year-round trails would be designated along the railroad tracks west of the Warm Springs and Island Ponds, into the new tidal marsh northwest of New Chicago Marsh, and between Ponds AB2 and A3W. A new seasonal trail would be added out to the mouth of Guadalupe Slough. At Ravenswood, there would be fewer public access trails than under Alternative B, and the configuration of the trails would be slightly different, extending around the southwest end of Pond SF2 rather than the eastern end.

Because Alternative C has the potential to include more trails than, but provide much less managed pond habitat than, Alternative B, Alternative C has the potential to result in greater wildlife disturbance for pond-associated birds. However, because of the extensive tidal restoration that would occur under Alternative C, broad expanses of tidal habitats far removed from land-based human activity would be present, and thus recreational impacts would affect tidal-associated wildlife proportionately less than under Alternative B.

With respect to avoidance and minimization of adverse effects (including restrictions related to dogs), there is uncertainty regarding the future usage of these trails, degree to which wildlife would tolerate or habituate to such recreational use, and degree to which users would adhere to guidelines for recreational use of SBSP Restoration Project facilities. For this reason, impacts of recreational access would be addressed during the implementation of the Adaptive Management Plan (Appendix D). Under the Adaptive Management Plan, potential effects of human disturbance would be monitored, and adaptive management would be implemented to prevent impacts from reaching a significant level. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-19: **Potential impacts to special-status plants.**

Potential SBSP Restoration Project Effects. No threatened or endangered plants are known or are expected to occur in the SBSP Restoration Project Area. No special-status plants have been documented within the boundaries of the Eden Landing or Ravenswood pond complexes (CDFG 2004a). Occurrences of five species (Congdon's tarplant, prostrate navarretia, alkali milk vetch, Contra Costa goldfields, and San Joaquin spearscale) have been documented within the Pacific Commons Preserve and the Warm Springs Unit of the Refuge in Fremont, and Congdon's tarplant has been recorded adjacent to Stevens Creek in 2002 (Porcella, pers. comm. 2006), in Alviso, and at the Sunnyvale Baylands Park not far south of Pond A8 (CNDDB 2006). These areas are near but not within the SBSP Restoration Project Area. Because no special-status plants are known to occur within the impact areas for the SBSP, no adverse impacts to special-status plants are expected.

In the long term, the SBSP Restoration Project is expected to improve conditions for most of the special status plants listed above, as well as others that occur primarily in upper tidal marsh habitat. Under Alternatives B and C, upland transition zone habitats would be created at the upper edge of some marshes by importing fill to produce broad, gently sloping areas adjacent to flood control levees or adjoining upland habitat. These unique marsh-associated habitats, including the upland ecotone and natural salt panne areas within upper salt marshes, require thoughtful restoration design. These upland transition zones represent an important habitat type largely absent from the South Bay, and would provide the opportunity for the re-introduction of special-status plant species. Examples of species that may be introduced to historic (extirpated) portions of their ranges within the SBSP Restoration Project Area include: California seablite (*Suaeda californica*) which could occur within oyster shell hash/sand beaches; Contra Costa goldfields (*Lasthenia conjugens*) which could occur along tidal salt marsh/grassland ecotones and high marsh panne-salt marsh edges; and Northern salt marsh bird's-beak (*Cordylanthus maritimus* var. *palustris*) which could occur in high salt marsh with low or sparse cover, such as vegetation gaps in high marsh panne-salt marsh edges.

In addition, tidal habitat restoration could eventually include the development of mature tidal marsh features (*e.g.*, shell ridges, microtopographic differences, salt panne, etc.) that could support special-status plant species. In the unlikely event that special-status plant species are discovered during surveys, the following mitigation measures would be instated to eliminate any significant impact of the Project on these plant species: 1) special-status plant species will be avoided to the maximum extent feasible and all special-status plant populations will be clearly marked and avoided during construction; 2) if avoidance of special-status plant species populations is not feasible, soil will be collected and re-deposited in the area (for temporary impacts) or placed adjacent to impacted areas in suitable habitat (for annual species) or plants will be relocated to suitable habitat (for perennial species).

Whether or not special-status plants would colonize restored tidal and transitional habitats on their own, or would have to be introduced to these areas, is unknown, but overall, Project impacts on special-status plants have the potential to be beneficial.

Determination of Threshold of Significance. The threshold of significance for this impact is defined as the loss of individuals of a federally or state listed plant species, or loss of a substantial portion of the

population of other special-status plants (*e.g.*, species considered rare by CNPS), as a result of SBSP Restoration Project activities without commensurate increases in numbers as a result of restoration of tidal and transitional habitats.

Alternative A No Action. There are no known populations of special-status plants likely to be affected by the No Action Alternative. Under this alternative, potential habitat for special-status plants could be enhanced through the uncontrolled breaching of existing salt pond levees and subsequent restoration of tidal marsh. However, because such restoration is uncontrolled, the high marsh/upland transition habitat and beach habitat used by special-status plants in the Bay Area are not expected to develop, at least not to the level of quality that would be achieved through directed restoration under Alternatives B and C. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative A Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative B Managed Pond Emphasis. There are no known populations of special-status plants likely to be affected by Alternative B. Under this alternative, approximately 50 percent of the Project Area would be managed as pond habitat, with 50 percent restored to tidal habitats. Upland transition zone habitats created at the upper edge of some marshes, and mature tidal marsh features (*e.g.*, shell ridges, microtopographic differences, salt panne, etc.) that may develop in some marshes, are expected to provide suitable habitat for special-status plant species. Therefore, Alternative B represents a potential net benefit for special-status plant species, and impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative B Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative C Tidal Habitat Emphasis. There are no known populations of special-status plants likely to be affected by Alternative C. Under this alternative, 10 percent of the Project Area would be managed as pond habitat, with 90 percent restored to tidal habitats. As with Alternative B, Alternative C represents a net benefit for special-status plant species. However, Alternative C provides a greater potential net benefit to special status plant species, as more upland transitional habitat would be created and more tidal restoration also increases the future habitat complexity. Also under Alternative C, larger blocks of habitat restoration create a greater potential for the development of mature tidal marsh features (*e.g.*, shell ridges, microtopographic differences, salt panne, etc.) that could support special-status plant species. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative C Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

SBSP Impact 3.6-20: **Colonization of mudflats and marshplain by non-native *Spartina* and its hybrids.**

Potential SBSP Restoration Project Effects. The SBSP Restoration Project offers the opportunity to restore and enhance large acreages of tidal wetlands dominated by native species in the South Bay.

However, tied to the opportunities presented by restoration is the concern that the restoration could provide new substrate for the spread of smooth cordgrass, a highly invasive plant species, and its hybrids formed with native Pacific cordgrass. Smooth cordgrass and its hybrids are considered one of the three most significant invasive-species threats to San Francisco Bay (Grossinger and others 1998), and a cause of significant concern for restoration managers. The SBSP Restoration Project's Opportunities and Constraints Report identified the invasion of newly restored marshes by smooth cordgrass and its hybrids as a primary biological constraint (PWA and others 2004). The invasion of restored wetlands by smooth cordgrass and its hybrids could compromise the primary biological objectives of the SBSP Restoration Project: to create habitats that support special-status species, to maintain current migratory bird species, and to increase native species diversity and abundance.

Intentional and unintentional breaching of levees and subsequent increases in tidal habitat could inadvertently help spread non-native *Spartina*, resulting in a potentially significant impact. However, the SBSP Restoration Project is operating under the assumption that invasive *Spartina* would be controlled by the Invasive *Spartina* Project prior to implementation of the SBSP Restoration Project. Thus, under this assumption, impacts under all alternatives are expected to be less than significant. The Project is currently working with the Invasive Spartina Project to develop a set of best management practices for tidal marsh restoration to minimize the risk of spreading invasive Spartina and its hybrids. At a minimum, best management practices to clean equipment and supplies to prevent the spread of seeds and plant material of non-native *Spartina* and other invasive plants will be implemented during construction, restoration, and maintenance activities. In addition, discussion of potential impacts in this section is presented in the event that smooth cordgrass and its hybrids are not controlled before the Project is implemented. If not controlled, smooth cordgrass and its hybrids may quickly invade restored areas (Ayres and Strong 2004). Restoration sites on salt ponds offer unvegetated areas where seedlings can grow unhindered by competition, and often in conditions sheltered from wave action. Given these ideal circumstances for establishment, smooth cordgrass and its hybrids are likely to rapidly colonize restored salt ponds (Ayres and Strong 2004) and become a dominant plant species in the restored tidal marshes if the species is not controlled.

Smooth cordgrass and its hybrids have the ability to invade and alter tidal wetland habitat composition, structure, and function. Smooth cordgrass and its hybrids alter the physical characteristics of marshes, colonize important shorebird and California clapper rail foraging areas, and compete with the native Pacific cordgrass both in growth rate and via cross-pollination. The effects of smooth cordgrass and its hybrids include complicated biotic (population and genetic) and physical (availability of new suitable habitat) variables (Baye 2004). Invasion by smooth cordgrass and its hybrids affects the food web via alterations to detritus, algal production, wrack deposition, and alterations to disturbance patterns that in turn degrades habitat structure for benthic invertebrate populations. These invertebrates form the basis of the food web for native wetland animals and shorebird and wading bird foraging areas (Callaway 1990; Callaway and Josselyn 1992).

Research has also found that smooth cordgrass and its hybrids grow lower into channels than the native Pacific cordgrass, which can reduce the extent of mudflat edge and possibly result in the loss of channels to vegetation encroachment and subsequent sedimentation. These physical impacts could possibly impact

California clapper rail foraging and nesting as compared to the native Pacific cordgrass (Josselyn and others 1993; Sayce 1988). Establishment of smooth cordgrass and its hybrids in the restored ponds and bay mudflats may reduce feeding areas for shorebirds (Buchanan 2003; Evans 1986; Stralberg and others 2004; White 1995), and could possibly degrade California clapper rail foraging habitat over the long-term (California Coastal Conservancy and USFWS 2003; Grossinger and others 1998). However, the potential long-term effects of smooth cordgrass and its hybrids on California clapper rail and salt marsh harvest mouse populations in San Francisco Bay are not well understood. The ability of smooth cordgrass and its hybrids to invade extensive mudflats and degrade foraging habitat due to decreased access to open mudflats is of concern for shorebirds (Stralberg and others 2004). Smooth cordgrass and its hybrids also grow at higher elevations than the native Pacific cordgrass, thereby encroaching into pickleweed habitat. As a result, this species may threaten the habitat important to the salt marsh harvest mouse and salt marsh wandering shrew as well.

Determination of Threshold of Significance. The NEPA/CEQA baseline for the SBSP Restoration Project is set at fall 2006 to consider the ISP actions that have taken place. With respect to this particular impact, using this baseline (*i.e.*, amount of non-native *Spartina* present as of fall 2006) as the threshold of significance is not appropriate given the ongoing eradication efforts of the Invasive *Spartina* Project.

Nevertheless, CEQA requires that the effects of Project alternatives be compared to baseline levels. The SBSP Restoration Project would have a significant impact if colonization of restored tidal habitats by non-native *Spartina* (measured by percentage of the vegetated marsh dominated by non-native *Spartina*) exceeds recently colonized marshes elsewhere in the South Bay. Because the SBSP Restoration Project is operating under the assumption that invasive *Spartina* would be controlled by the Invasive *Spartina* Project prior to implementation of the SBSP Restoration Project, impacts are expected to be less than significant.

Adaptive Management Plan. The Adaptive Management Plan would incorporate new information into decision making on future Project phases as understanding of the ecosystem improves through on-going monitoring. Due to uncertainties regarding the degree to which smooth cordgrass and its hybrids would invade restored tidal habitats, and the degree to which such invasion would adversely affect other biological resources in the SBSP Restoration Project Area, monitoring and adaptive management would be implemented to minimize this impact.

Determination of Baseline and Monitoring. The existing extent and abundance of smooth cordgrass and its hybrids as determined by the Invasive *Spartina* Project, serves as the NEPA/CEQA baseline for this impact on the scale of the entire South Bay. However, within ponds to be restored by the Project, the baseline abundance of smooth cordgrass and its hybrids is presumed to be zero since these ponds have not yet been converted to tidal habitats. Development of restoration sites into monocultures of invasive cordgrass would inhibit the SBSP Restoration Project's attainment of habitat goals for marsh species. The restoration target for areas restored to tidal action would be the development of a habitat mosaic (including vegetation, mudflat, channels, marsh ponds and transition areas) on a trajectory toward a reference marsh and/or other successful marsh restoration sites in South San Francisco Bay within or before the timeframe anticipated. Tidal marsh habitat acreage (*e.g.*, vegetation, mudflat, channel, panne,

transition zones, etc.) as a percent of the total restoration area, would be collected via remote imagery with limited ground-truthing). Habitat mapping would take place every five years, beginning five years after the restored area has reached vegetation colonization elevation.

Once 30 percent vegetation cover has been achieved for a given restored pond, species composition data would be collected (in years corresponding to the habitat mapping) in a variety of zones (*e.g.*, low marsh, high marsh, upland transition) within each restored marsh. However, to truly eradicate the species, it is necessary that qualitative ground-truthing be performed annually to detect smooth cordgrass and its hybrids prior to the collection of species composition data as currently outlined in the monitoring plan for tidal marsh habitat development. It is imperative that early monitoring efforts are focused on this issue to ensure that no significant impacts result from the SBSP Restoration Project. Field identifications of smooth cordgrass and its hybrids would be confirmed using genetic analysis at the U.C. Davis *Spartina* Lab or similar facility.

Adaptive Management Trigger. For smooth cordgrass and its hybrids, the adaptive management trigger would be any confirmed presence in a restored pond.

Adaptive Management. If presence is detected, the next step would be to confirm via genetic analysis the hybrid nature of the *Spartina*, if necessary. If confirmed, the SBSP Restoration Project would proceed with eradication efforts based on the best available methodology as determined by the broader baywide effort. Since the ongoing effort already has a comprehensive monitoring program to assess the efficacy of various management techniques, this adaptive management program would defer to the methods recommended in the Invasive *Spartina* Project's most recent monitoring reports if the need for management actions arise.

It is important to note that both monitoring and management would also be adaptive. Over the 50-year course of the SBSP Restoration Project, much will be learned about the status of smooth cordgrass and its hybrids in San Francisco Bay, and the efficacy of eradication efforts. Therefore, the monitoring protocol and parameters, management triggers, and management actions would be periodically evaluated, and revised/adapted as necessary.

Alternative A No Action. Under the No Action Alternative, some existing levees and water-control structures would no longer be maintained and would fail, and some ponds would be managed as seasonal ponds (which would eventually become vegetated seasonal wetlands). The potential uncontrolled nature of levee breaching under the No Action Alternative could lead to locations and timing of tidal restoration that are counterproductive to the efforts of the Invasive *Spartina* Project. Additionally, the lack of monitoring under the No Action Alternative would increase the burden on existing eradication efforts in identifying potential areas of concern. Therefore, if invasive *Spartina* is not controlled by the Invasive *Spartina* Project, impacts resulting from Alternative A could be significant. However, if invasive *Spartina* is controlled by the Invasive *Spartina* Project as the Project has assumed, this impact should not be substantial. Therefore, impacts would be less than significant.

Alternative A Level of Significance: Less than Significant

Alternative B Managed Pond Emphasis. Under Alternative B, approximately 50 percent of the Project Area would be managed as pond habitat for birds, with 50 percent restored to tidal habitats. Currently, the Project is assuming that the Invasive Spartina Project would have smooth cordgrass and its hybrids controlled prior to Project implementation. The Invasive Spartina Project's projections for controlling smooth cordgrass and its hybrids differ for each of the SBSP pond complexes and realistically, smooth cordgrass and its hybrids may not be controlled in some areas adjacent to SBSP pond complexes. From a biological perspective, breaching should be delayed in areas where smooth cordgrass and its hybrids are present until we have an indication of the likelihood and timing of successful eradication. However, if successful eradication is deemed unlikely, or if eradication is progressing very slowly, the SBSP PMT would need to evaluate whether the risks of allowing smooth cordgrass colonization of the restored SBSP ponds are outweighed by the benefits of tidal restoration.

If invasive *Spartina* is not controlled by the Invasive *Spartina* Project, and no adaptive management measures were implemented, effects of Alternative B on the spread of smooth cordgrass and its hybrids could be significant. Although the Project assumes that the Invasive Spartina Project would have smooth cordgrass and its hybrids controlled prior to Project implementation, the Adaptive Management Plan (Appendix D) describes the process by which changes in abundance of smooth cordgrass and its hybrids in the SBSP Restoration Project Area would be monitored, and adaptive management efforts that may be implemented in response to monitoring, to prevent colonization by smooth cordgrass and its hybrids from reaching a level of significance. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, only 10 percent of the SBSP Restoration Project Area would be managed pond habitat, while 90 percent of the Project Area would be restored to tidal habitats. If invasive *Spartina* is not controlled by the Invasive *Spartina* Project, and no adaptive management measures were implemented, effects of Alternative B on the spread of smooth cordgrass and its hybrids could be significant. Because the Project assumes that the Invasive Spartina Project would have smooth cordgrass and its hybrids controlled prior to Project implementation, this impact is less than significant. However, as in Alternative B, there is a mechanism in place (see *Adaptive Management* section below) that would be used to monitor changes in abundance of smooth cordgrass and its hybrids in the SBSP Restoration Project Area. These efforts have the goal of ensuring that colonization does not reach a level of significance. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-21: **Colonization by non-native *Lepidium.***

Potential SBSP Restoration Project Effects. Without tidal restoration in the far South Bay (*e.g.*, Alviso pond complex), continued sedimentation may result in increased colonization by non-native *Lepidium latifolium* as the tidal prism continues to decrease and brackish marsh expands. Breaching of levees and subsequent increases in tidal prism could reduce the amount of brackish marsh habitat available for

colonization by *Lepidium*. However, large areas of created upland transition zone habitat would also provide new areas for potential *Lepidium* colonization.

There has been little study of the effects of *Lepidium* colonization on native plant and animal communities. Because *Lepidium* colonization occurs primarily in infrequently flooded, brackish marshes, it competes for resources with native brackish-marsh species such as bulrushes. Spautz and Nur (2004) studied the impacts of *Lepidium latifolium* on tidal marsh birds in San Francisco Bay. Saltmarsh common yellowthroats were substantially more abundant in *Lepidium*-infested areas. Other species, such as song sparrows, marsh wrens, and California black rails, were not substantially more or less abundant in areas with *Lepidium*, although potential benefits (*e.g.,* higher territory densities and lower probability of flooding due to high tides) and adverse effects (higher depredation rates and lower nest success) on song sparrows were suggested, at least in some marshes. While *Lepidium* likely benefits, or at least provides nesting habitat, foraging habitat, and cover for, brackish marsh passerine birds it is likely not used heavily by California clapper rails and salt marsh harvest mice, and thus would be detrimental to these rarer species that are the focus of the proposed tidal restoration.

Best management practices to clean equipment and supplies to prevent the spread of seeds and plant material of non-native *Lepidium* and other invasive plants will be implemented during construction and restoration activities, and during maintenance activities such as driving on levees and mowing.

Determination of Threshold of Significance. Because there is currently no attempt being made to control *Lepidium* in the South Bay, the threshold of significance is defined as colonization of restored brackish marsh habitats by *Lepidium latifolium* at a level (measured by percentage of the vegetated marsh dominated by *Lepidium latifolium*) that exceeds recently colonized brackish marshes elsewhere in the South Bay.

Adaptive Management Plan. The Adaptive Management Plan would incorporate new information into decision making on future Project phases as understanding of the ecosystem improves through ongoing monitoring.

Determination of Baseline and Monitoring. The existing extent and abundance of *Lepidium* serves as the NEPA/CEQA baseline for this impact on the scale of the entire South Bay. However, within ponds to be restored by the Project, the baseline abundance of *Lepidium* is presumed to be zero since these ponds have not yet been converted to tidal habitats. The restoration target for areas restored to tidal action would be the development of a habitat mosaic (including vegetation, mudflat, channels, marsh ponds and transition areas) on a trajectory toward a reference marsh and/or other successful marsh restoration sites in South San Francisco Bay within or before the timeframe anticipated. Tidal marsh habitat acreage (*e.g.*, vegetation, mudflat, channel, panne, transition zones, etc.) as a percent of the total restoration area, would be collected via remote imagery with limited ground-truthing). Habitat mapping would take place every five years, beginning five years after the restored area has reached vegetation colonization elevation.

Once 30-percent level of vegetation cover has been achieved for a given restored pond, species composition data would be collected (in years corresponding to the habitat mapping) in a variety of zones (*e.g.*, low marsh, high marsh, upland transition) within each restored marsh. However, it is possible that

preliminary habitat mapping and ground-truthing may detect *Lepidium* at levels that meet the adaptive management trigger (see below) prior to the collection of species composition data as currently outlined in the monitoring plan for tidal marsh habitat development. It is imperative that early monitoring efforts are focused on this issue to ensure that no significant impacts result from the SBSP Restoration Project.

Adaptive Management Trigger. For *Lepidium*, the adaptive management trigger would be when percent cover exceeds 10 percent cover within a specific habitat zone (*e.g.*, brackish marsh or upland transition zones) of a restored pond. The presumption is that percent of cover in recently colonized brackish marshes elsewhere in the South Bay is greater than 10 percent, and thus this trigger would identify potential problems before this impact reaches a level of significance.

Adaptive Management. If monitoring results trip a trigger, the first step in adaptive management would be to determine whether infestation of the restored areas in question is on a trajectory to reach or exceed the percent cover by *Lepidium* in recently colonized brackish marshes elsewhere in the South Bay. If so, the Project would proceed with eradication efforts. *Lepidium* would be controlled so that the percent cover is limited (ideally remaining below 10 percent) within its restored habitat zones. It is important to note that both monitoring and management would also be adaptive. Therefore, the monitoring protocol and parameters, management triggers, and management actions would be periodically evaluated, and revised/adapted as necessary.

Alternative A No Action. Under the No Action Alternative, some existing levees and water-control structures would no longer be maintained and would fail, and some ponds would be managed as seasonal ponds (which would eventually become vegetated seasonal wetlands). The potential uncontrolled nature of levee breaching under the No Action Alternative could lead to locations and timing of tidal restoration that may provide new areas for potential *Lepidium* colonization. Additionally, no monitoring for potential *Lepidium* colonization would take place under the No Action Alternative. However, it is anticipated that the increased salinity and tidal scour associated with additional tidal prism resulting from levee breaching would offset any potential new brackish marsh areas that would be susceptible to *Lepidium* colonization. Therefore, impacts would be less than significant.

Alternative A Level of Significance: Less than Significant

Alternative B Managed Pond Emphasis. Under Alternative B, approximately 50 percent of the SBSP Restoration Project Area would be managed as pond habitat for birds, with 50 percent restored to tidal habitat. Breaching of levees and subsequent increases in tidal prism could reduce the amount of brackish marsh habitat available for colonization by *Lepidium*. However, large areas of created upland transition zone habitat would also provide new areas for potential *Lepidium* colonization. If *Lepidium* invades restored marshes extensively and no adaptive management measures are implemented, effects of Alternative B on the spread of *Lepidium* could be significant. As described below (see *Adaptive Management*), there is a mechanism in place that would be used to monitor changes in abundance of *Lepidium* in SBSP Restoration Project Area. These efforts have the goal of ensuring that colonization does not reach a level of significance. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, only 10 percent of the SBSP Restoration Project Area would be managed pond habitat, while 90 percent of the area would be restored to tidal habitat. This increase in tidal restoration should reduce the amount of brackish marsh in the Project Area compared to Alternative B. However, Alternative C would also be creating more upland transition areas to tidal marsh, and therefore creating a greater potential for colonization by *Lepidium*. If *Lepidium* invades restored marshes extensively and no adaptive management measures are implemented, effects of Alternative C on the spread of *Lepidium* could be significant. As in Alternative B, there is a mechanism in place (see *Adaptive Management* section below) that would be used to monitor changes in abundance of *Lepidium* in SBSP Restoration Project Area. These efforts have the goal of ensuring that colonization does not reach a level of significance. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-22: **Potential increase in exposure of wildlife to avian botulism and other diseases.**

Potential SBSP Restoration Project Effects. Of the wildlife diseases that could potentially affect species in the South Bay, those affecting birds are of greatest concern because of the ease with which they may be transmitted (due to birds' mobility) and the large numbers of individuals that can potentially be exposed to diseases in flocks or colonies. Avian botulism, the avian disease with the greatest potential to affect large numbers of birds, is caused by a toxin produced by the bacterium *Clostridium botulinum*. This pathogen requires a protein source, warm temperatures, and anoxic or low-oxygen conditions to reproduce, and is generally harbored by soil in the environment (SFBBO 1987). Botulism is a neurological disease that results in paralysis, often leading affected birds to show symptoms that include an inability to fly or to hold their heads above water.

In the South Bay, outbreaks of avian botulism have generally been linked to wastewater discharges into marshes, unusually warm temperatures, unusually low rainfall, flooding events, presence of the botulinum bacteria, and several other environmental variables. (SFBBO 1987, City of San Jose 2002, 2005). In a study of avian botulism by SFBBO (1987), mechanisms proposed to facilitate outbreaks in the South Bay included:

- The sludge-bed theory, in which botulism outbreaks occur as a result of the warm and often anaerobic conditions created in sludge ponds and lagoons associated with water treatment plant facilities;
- The microenvironment theory, which suggests that shallow ponds of water, formed from mudflats temporarily isolated from water exchange during low tide, facilitated outbreaks because they were associated with invertebrate die offs, which are often consumed in large quantities by foraging birds;
- The bird carcass theory, which suggests that botulism outbreaks were caused by the spread of the bacteria through infected carcasses as maggots and invertebrates ingested the bacteria, and then ingested by foraging birds.

Current efforts to control outbreaks focus on detecting and removing sick and dead animals to eliminate transmission of the bacteria through the environment.

Beginning in 1982, the City of San Jose/Santa Clara WPCP began contracting with SFBBO to perform annual monitoring for avian botulism as a condition of its National Pollutant Discharge Elimination System permit. Annual monitoring occurs between May and November by boat and on foot along Artesian Slough, Mallard Slough, and Coyote Creek. During the past five years of monitoring, outbreaks of botulism were detected in 2001 and 2004 (City of San Jose 1998 – 2005). In 2001, the SFBBO noted that multiple outbreaks occurred throughout the Santa Clara Valley and that 1,200 dead birds from the region were submitted to outside agencies. In 2004, another outbreak was detected in September and the SFBBO reported that 808 dead birds were recovered along with 187 sick birds from the study area.

Other avian diseases with the potential to impact birds using the South Bay Salt Ponds have had only minor effects to date compared to those associated with avian botulism. West Nile Virus has been detected in several species that use South Bay habitats, including American coots, mallards, and snowy and great egrets (www.westnile.ca.gov). Although counties in the South Bay have a variable rate of positive detection for those birds tested for West Nile Virus (ranging from five percent in San Mateo County to 58 percent in Santa Clara County), the majority of the species testing positive are landbirds that are uncommon in the aquatic and wetland habitats of the SBSP Restoration Project Area. Aspergillosis is a fungal infection that usually affects the respiratory system of birds. This affliction has been documented at a low intensity in several species in the South Bay, particularly gulls that forage around landfills (City of San Jose 1999 – 2005).

The SBSP Restoration Project could potentially exacerbate existing occurrences of these diseases, particularly avian botulism, if it increased the incidence of conditions such as warm water temperatures and anoxic or low-oxygen conditions. Such conditions may be present in shallow managed ponds with poor water circulation, necessitating careful management of water circulation; marshes that are poorly drained may also harbor such conditions. The Adaptive Management Plan (Appendix D) includes a description of monitoring and adaptive management activities concerning water quality. The Project could also potentially increase the occurrence of disease outbreaks by concentrating larger numbers of birds into smaller areas (*e.g.*, fewer ponds).

Determination of Threshold of Significance. The threshold of significance is defined as a substantial increase in the incidence of avian botulism or other wildlife diseases in the South Bay, or an increase in the number of individuals exposed to such diseases, relative to baseline conditions as a result of the SBSP Restoration Project.

Alternative A No Action. Under the No Action Alternative, the number and acreage of managed ponds would be reduced as a result of unintentional breaching. However, the number of ponds in which avian botulism might be cultivated may increase, as the ponds that are no longer managed may have poor water circulation, enhancing the conditions that could result in an avian botulism outbreak. Furthermore, poorly drained marshes that may develop as a result of unplanned breaches may also foster conditions conducive to an outbreak. With limited funding for monitoring and pond maintenance (*e.g.*, to maintain adequate water circulation), there is some potential for impacts of avian botulism on waterbirds in the South Bay to

be substantial, although USFWS and CDFG staff would be expected to note any evidence of avian botulism (*i.e.*, afflicted birds) and respond to such outbreaks as necessary. Therefore, impacts would be potentially significant.

Alternative A Level of Significance: Potentially Significant

Alternative B Managed Pond Emphasis. Under Alternative B, approximately 50 percent of the SBSP Restoration Project Area would be managed as pond habitat for birds, with 50 percent restored to tidal habitats. The managed ponds could potentially harbor conditions conducive to botulism outbreaks, and concentration of pond-associated birds into a smaller pond footprint could facilitate the spread of any such disease among individuals. However, ensuring adequate circulation of water within managed ponds and implementation of other measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for such outbreaks. Restoration of well-drained tidal marshes through careful planning would also minimize the potential for conditions in tidal marshes that are conducive to botulism outbreaks. It is assumed that observers conducting regular bird monitoring surveys for the SBSP Restoration Project, as well as USFWS and CDFG staff, would note any evidence of avian botulism (*i.e.*, afflicted birds) and respond to such outbreaks as necessary. Therefore, impacts would be less than significant.

Alternative B Level of Significance: Less than Significant

Alternative C Tidal Habitat Emphasis. Under Alternative C, only 10 percent of the SBSP Restoration Project Area would be managed pond habitat, while 90 percent of the area would be restored to tidal habitats. As described above for Alternative B, managed ponds could potentially harbor conditions conducive to botulism outbreaks, and concentration of pond-associated birds into a smaller pond footprint could facilitate the spread of any such disease among individuals. However, ensuring adequate circulation of water within managed ponds and implementation of other measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for such outbreaks. Restoration of well-drained tidal marshes through careful planning would also minimize the potential for conditions in tidal marshes that are conducive to botulism outbreaks. It is assumed that observers conducting regular bird monitoring surveys for the SBSP Restoration Project, as well as USFWS and CDFG staff, would note any evidence of avian botulism (*i.e.*, afflicted birds) and respond to such outbreaks as necessary. Therefore, impacts would be less than significant.

Alternative C Level of Significance: Less than Significant

SBSP Impact 3.6-23: **Potential impacts to bay shrimp populations.**

Potential SBSP Restoration Project Effects. The epifaunal invertebrate community in the South Bay is dominated by several species of shrimps and crabs. Two native caridean shrimps, the California bay shrimp and blacktail bay shrimp (*C. nigricauda*), are common in tidal sloughs and in the Bay itself. The California bay shrimp supports the only commercial fishery remaining in the South Bay aside from the

limited harvest of brine shrimp that occurs in salt ponds. Two to four boats are involved in shrimping in the South Bay each year, catching approximately 75,000 pounds valued between $154K and $312K per year (Hansen 2003), although shrimping activity and success have declined in recent decades (Tom Laine, pers. comm.). Most shrimping activity occurs between the Dumbarton Bridge and Calaveras Point, with limited activity above Calaveras Point in Coyote Creek (Hansen 2003).

According to Hatfield (1985), adult California bay shrimp spawn in the ocean in March and April. The planktonic larvae are carried into San Francisco Bay by tides, and by currents into the Suisun and South Bays. Juvenile bay shrimp arrive in the South Bay in May, and use shallow waters having lower salinities as nurseries. These juveniles migrate up sloughs to brackish water, seeking out waters with salinities of 3–19 ppt, preferring 10–15 ppt (Baxter and others 1999). Thus, they use the Guadalupe, Alviso, and Coyote Slough systems, and likely other South Bay tributaries as well, for feeding and growth through the summer. As they mature, the shrimp migrate to deeper, more saline Bay waters until they migrate out of the Bay to spawn in the ocean in winter (Baxter and others 1999; Kinnetic Laboratories 1987). California bay shrimp are present in the South Bay year round, but they are most abundant in September through October and least abundant in March through April (Hansen 2003). Bay shrimp are sensitive to changes in salinity and water quality, and may abandon sloughs in the far South Bay for deeper, more saline waters during periods of high freshwater runoff. Recent changes in salinity may have altered the distribution of bay shrimp, as this species has declined in abundance in the far South Bay in recent decades (Tom Laine, pers. comm.).

CDFG has conducted a fishery survey for shrimp and crabs within San Francisco Bay since 1980, with monthly surveys in deeper subtidal areas and some beach seine sampling (CDFG data and Life Science! 2004). These surveys include data from three open waterstations (Stations 102, 101, and 140) located near the San Mateo and Dumbarton Bridges, and two beach seine stations (171 and 172) also located in the South Bay. California bay shrimp comprised 79.5 percent, 58.8 percent, and 78.7 percent of shrimp captures at Stations 101, 102, and 140, while blacktail bay shrimp comprised 12.8 percent, 34.2 percent, and 14.0 percent of captures. Other shrimp species, including blackspotted bay shrimp (*Crangon nigromaculata*), oriental shrimp (*Palaemon macrodactylus*), stout coastal shrimp (*Heptacarpus brevirostris*), miniature spinyhead (*Mesocrangon munitella*), ridgetail prawn (*Exopalaemon carinicauda*), and visored shrimp (*Betasus longidactylus*), were all represented but were much less abundant in the South Bay.

The SBSP Restoration Project is expected to have a net benefit to bay shrimp by increasing (to Bay levels) the salinities in some freshwater sloughs and channels in the South Bay and increasing the amount of estuarine habitat. Such habitat is likely to be especially important as nurseries for juveniles. However, some managed ponds (*e.g.*, those managed specifically for small shorebirds) may have higher salinity and lower DO than some existing ponds. Releases of water from these ponds when conditions are not optimal could result in localized areas of low DO and high salinity that may impair the health of, or cause mortality of, bay shrimp. Overall, the Project has the potential to substantially enhance the shrimp populations, which in turn could also provide economic benefits by revitalizing the shrimping industry.

Although SBSP Restoration Project effects on bay shrimp are expected to be beneficial overall, the Adaptive Management Plan (Appendix D) includes a description of monitoring and adaptive management activities concerning water quality and releases to the Bay.

Determination of Threshold of Significance. The SBSP Restoration Project would have a significant impact on bay shrimp if it resulted in substantial decrease in numbers of bay shrimp within the South Bay as a result of the SBSP Restoration Project. However, SBSP Restoration Project effects on bay shrimp are expected to be beneficial overall.

Alternative A No Action. Under the No Action Alternative, in the Eden Landing pond complex, Ponds E1C, E2C, E4C, and E5C would likely be managed as seasonal wetlands, and Ponds E10, E11, E8, E6A, and E6B are expected to remain as managed ponds for the 50-year planning horizon. Most of the remaining ponds are eventually likely to become tidal due to the failure of unmaintained levees, providing considerable estuarine habitat in the Eden Landing complex. In the Alviso pond complex, the levees around Ponds A5, A6, and A7 would likely not be maintained, and thus important estuarine habitat within these ponds (which are located along Alviso Slough, which drains the Guadalupe River) would be provided. However, the quality of habitat in these restored marshes is likely to be lower under the No Action Alternative than under Alternatives B or C. Active, intentional restoration under the latter alternatives would involve breaches at strategic locations to take advantage of remnant slough networks, and would incorporate tidal ditch blocks to facilitate the development of complex channel networks. Unintentional breaching under the No Action Alternative would not necessarily optimize the subtidal habitats that could occur in restored marshes, in part because the lack of ditch blocks would result in existing borrow ditches capturing much of the tidal prism in breached ponds. Thus, while the net effect of Alternative A on bay shrimp would be beneficial, the benefit would not be as great as under Alternatives B or C. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative A Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative B Managed Pond Emphasis. Under Alternative B, approximately 50 percent of the SBSP Restoration Project Area would be managed as pond habitat for birds, with 50 percent restored to tidal habitats. Some of the managed ponds could potentially support high-salinity and/or low-oxygen conditions. Releases of water from these ponds when conditions are not optimal could result in localized areas of low DO and high salinity that may impair the health of, or cause mortality of, bay shrimp. However, ensuring adequate circulation of water within managed ponds and implementation of other measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for such adverse effects. Alternative B would have a net benefit to bay shrimp by increasing (to Bay levels) the salinities in some freshwater sloughs and channels in the South Bay and increasing the amount of estuarine habitat. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative B Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alternative C Tidal Habitat Emphasis. Under Alternative C, approximately 10 percent of the SBSP Restoration Project Area would be managed as pond habitat for birds, with 90 percent restored to tidal

habitats. Some of the managed ponds could potentially support high-salinity and/or low-oxygen conditions. Releases of water from these ponds when conditions are not optimal could result in localized areas of low DO and high salinity that may impair the health of, or cause mortality of, bay shrimp. However, ensuring adequate circulation of water within managed ponds and implementation of other measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for such adverse effects. Overall, the net benefit to bay shrimp from Alternative C is expected to be greater than that for Alternatives A and B. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alternative C Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Project-Level Evaluation

Phase 1 Impact 3.6-1: **Potential reduction in number of small shorebirds using San Francisco Bay, resulting in substantial declines in flyway-level populations.**

Potential program-level impacts to western sandpipers and dunlin are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-1 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions are described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, Eden Landing Ponds E8A, E8X, E9, E12, and E13 would not be managed, and eventually most or all of these ponds are likely to become tidal due to the failure of unmaintained levees. In the Ravenswood and Alviso complexes, Ponds SF2, A8, and A16 would continue to be managed as they currently are under the ISP, and their levees maintained and repaired as needed to maintain them as managed ponds (rather than allowing tidal action to be restored via unintentional breaches). While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6.

In the very short term, under the No Action Alternative, these ponds would continue to provide foraging habitat for small shorebirds similar to that currently provided. As Eden Landing Ponds E8A, E8X, E9, E12, and E13, and Alviso Pond A6, breach, mudflat habitat present within these unintentionally breached ponds would provide low-tide foraging habitat. In the long term, most of the areas within the unintentionally restored tidal habitats would be vegetated and thus unavailable to small shorebirds. Pond A6 may continue to provide intertidal mudflats. Ponds A8 and SF2 would continue to provide shorebird

foraging habitat. However, management of A16 (which currently does not provide much foraging habitat for small shorebirds due to water depth) and SF2 under the No Action Alternative is unlikely to support the high densities of shorebirds that would be expected to forage in these ponds under the proposed Phase 1 actions.

As described for Alternative A for SBSP Impact 3.6-1 above, the long-term effects of the No Action Alternative on small shorebirds would be potentially significant at a programmatic level due to the large number of managed ponds that could potentially be lost to unintentional breaching, and the long-term decline of intertidal mudflat expected within the Bay. However, considering only the ponds where Phase 1 activities are proposed, the No Action Alternative would result in the loss of pond foraging habitat for shorebirds at relatively few ponds. It is expected that most (or all) of the small shorebirds that might forage in Ponds E8A, E8X, E9, E12, E13, and A6 could find alternative foraging habitat elsewhere in the South Bay if these ponds were breached unintentionally. Furthermore, most of the long-term decline in mudflat availability within the Bay is not considered in the assessment of the No Action Alternative on the ponds where Phase 1 activities are proposed. Rather, only the mudflat loss that would occur due to unintentional breaching within the Phase 1 ponds (which could potentially be controlled by the Project proponents) would factor into the predicted impacts of the Phase 1 No Action Alternative. This amount has not been predicted, but is presumed to be minor. Therefore, impacts to small shorebirds resulting from the Phase 1 No Action Alternative are not expected to be significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds.

During most years, Pond E8A is mostly dry during summer, and thus provides little or no foraging habitat for western sandpipers and dunlin in fall, but it contains shallow water that provides some foraging habitat during winter and early spring. Pond E9 contains a limited extent of shallow-water habitat during summer, and thus provides limited habitat for foraging small shorebirds during fall migration, but Pond E9 is deeper during winter and provides little foraging habitat for small shorebirds in winter and spring. Although Phase 1 actions would result in short-term increases in tidal mudflat habitat for foraging shorebirds in these ponds, the long-term expectation for Ponds E8X, E8A, and E9 is the development of tidal salt marsh, most of which would eventually be vegetated and thus would not provide high-quality foraging habitat for shorebirds. There would be an attempt to construct marsh ponds/pannes in the existing levee footprint between Ponds E8A and E9. There is also an expectation that some marsh ponds/pannes would develop in the restored marsh that would also provide some habitat for these birds.

Ponds E12 and 13 currently provide shallow-water habitat (and thus foraging habitat for small shorebirds) in winter and spring but are mostly dry in fall. Phase 1 actions would include reconfiguration and management of these two ponds as a small-scale salt pond system. Cells within these ponds would be managed for shallow depths to provide suitable foraging conditions for small shorebirds, and would vary in salinity to allow the study of salinity effects on the densities of small shorebirds and their prey. Thus, Ponds E12 and E13 would not only be managed intensively to provide extensive, high-quality foraging habitat for western sandpipers and dunlin, but Phase 1 would also include an experiment that would inform ongoing and future management specifically for these species in other ponds. In addition, islands would be constructed to provide shoreline habitat and high-tide roosting habitat for these shorebirds. While Phase 1 would result in a net loss of shallow water foraging habitat for western sandpipers and dunlin, as measured by area, in the long term, the targeted management of Ponds E12 and E13 specifically for shorebirds is expected to more than offset this loss by providing high-quality foraging habitat that is maintained year round. Also, if marsh ponds/pannes are successfully constructed in the restored marsh, these would provide some high-tide habitat as well.

Alviso. Phase 1 actions at Alviso would include opening of Ponds A8 and A6 to tidal action, and management of Pond A16 as a shallow pond for shorebirds. Pond A6 currently provides shallow-water foraging habitat for shorebirds in winter and spring (at least in wet years), though it is dry in summer and thus provides little foraging habitat for small shorebirds during that season. Ponds A5, A7, and A8 provide shallow water foraging habitat during much of the year, although in very wet years, shallow-water habitat in these ponds can be limited in winter and early spring. Opening Pond A8 to tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. Thus, substantial shallow water foraging habitat that is currently available for shorebirds in Ponds A5, A6, A7, and A8 would be lost as a result of Phase 1 actions. Although Phase 1 actions would result in short-term increases in tidal mudflat habitat for foraging shorebirds in Pond A6, no such habitat is expected to be present in Ponds A5, A7, and A8, and the long-term expectation for Pond A6 is the development of tidal salt marsh, most of which would eventually be vegetated and thus would not provide high quality foraging habitat for shorebirds. Pond A16 would be reconfigured and managed specifically to provide shallow water foraging habitat for shorebirds. Shallow water levels would be maintained year round to allow for shorebird foraging, and numerous islands would be created that would provide shoreline foraging habitat and high-tide roosting habitat. In addition, the management of one or more other Alviso pond complex ponds that would not be affected by Phase 1 actions would be modified to provide extensive shallow-water habitat for shorebirds. The management of Pond A16 specifically for shorebirds and the management of shallow water levels in one or more non-Phase 1 ponds in Alviso are expected to more than offset the loss of habitat in Ponds A6, A5, A7 and A8.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. This pond currently provides shallow-water habitat in winter and/or spring, but it is mostly dry in summer and provides little foraging habitat for western sandpipers and dunlin during that season. The entire pond would be enhanced for shorebirds over current conditions by targeted management of water levels year round. Islands would also be created to provide shoreline foraging habitat and high-tide roosting habitat. Conditions are expected to improve for small shorebirds in the Ravenswood complex. The potential to create additional tidal marsh habitat along the bay side of Pond

SF2 is being considered for a later phase of the Project. Therefore, this area would have no constructed nesting islands so as to not conflict with any future shift in the levee location.

Net Phase 1 Effects. The reconfiguration and management of Ponds E12, E13, A16, and SF2 for foraging shorebirds is expected to enhance foraging habitat for small shorebirds within these ponds considerably. In the short term, the mudflat habitat present within breached ponds would provide high-quality low-tide foraging habitat as well. In the long term, most of the areas within the restored tidal habitats would be vegetated and thus unavailable to small shorebirds, but the management of habitat within Ponds E12, E13, A16, and SF2, and possibly the management of other ponds specifically for these species, would more than offset any long-term, adverse effects of the loss of managed pond habitat due to tidal restoration on small shorebirds. Therefore, impacts would be less than significant (CEQA) and beneficial (NEPA).

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-2: **Loss of intertidal mudflats and reduction of habitat for mudflat-associated wildlife species.**

Potential program-level impacts to mudflats and mudflat-associated species such as large shorebirds are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-2 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the three SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, Eden Landing Ponds E8A, E8X, E9, E12, and E13 would not be managed, and eventually most or all of these ponds are likely to become tidal due to the failure of unmaintained levees. In the Ravenswood and Alviso complexes, Ponds SF2, A8, and A16 would continue to be managed as they currently are under the ISP, and their levees maintained and repaired as needed to maintain them as managed ponds (rather than allowing tidal action to be restored via unintentional breaches). While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6.

Most of the long-term decline in mudflat availability within the Bay is not considered in the assessment of the No Action Alternative. Only the mudflat loss that would occur due to unintentional breaching within the Phase 1 ponds (which could potentially be controlled by the Project proponents) would factor into the

predicted impacts of the Phase 1 No Action Alternative. This amount has not been predicted, but is presumed to be minor relative to the mudflat loss that would occur due to sea level rise and vegetation encroachment even in the absence of uncontrolled breaching (and on the scale of the programmatic action). Therefore, impacts to intertidal mudflats and associated species resulting from the Phase 1 No Action Alternative would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing that would affect mudflat availability would include the conversion of Ponds E8A, E8X, and E9 to full tidal action. Opening these ponds to tidal action would result in short-term increases in tidal mudflat habitat in these ponds. It would take years for sediment accumulation in these ponds to achieve elevations suitable for colonization by vegetation, and during the intervening period between breaching and vegetation establishment, these ponds would provide extensive intertidal mudflat. The long-term expectation for Ponds E8X, E8A, and E9 is the development of extensive tidal salt marsh. Opening these ponds to tidal action could potentially reduce the extent of existing mudflat in the Bay through scour (due to increased tidal prism) and because these ponds would serve as sinks for sediment eroded from existing mudflats. However, any reduction in existing mudflats due to Phase 1 activities in Eden Landing ponds is expected to be minor, and may be offset by the mudflats that would be present along channels within the restored marsh.

Alviso. Phase 1 actions at Alviso that would affect mudflat availability would include opening of Ponds A8 and A6 to tidal action. Phase 1 actions would result in short-term increases in tidal mudflat habitat in Pond A6, but the long-term expectation for Pond A6 is the development of tidal salt marsh.

Opening Pond A8 to muted tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. The increased tidal prism may scour and re-suspend sediments in Alviso Slough. It is anticipated that deposition inside Pond A8 would occur, but not in sufficient quantities to convert it to intertidal mudflat habitat. If at some point Pond A8 is made fully tidal, then the progression from subtidal to intertidal mudflat to tidal marsh would be expected to occur. However, that is not expected under Phase 1, and therefore Pond A8 would remain subtidal habitat.

Opening these ponds to tidal action could potentially reduce the extent of existing mudflat in the Bay through scour (due to increased tidal prism), and because Pond A6 would serve as a sink for sediment eroded from existing mudflats. However, any reduction in existing mudflats due to Phase 1 activities in Alviso ponds is expected to be minor, and may be offset by the mudflats that would be present along channels within the restored marsh.

Ravenswood. Phase 1 activities in the Ravenswood pond complex (*i.e.*, reconfiguration of Pond SF2) are not expected to affect the extent of intertidal mudflats.

Net Phase 1 Effects. Overall, Phase 1 activities would result in considerable increases in the extent of intertidal mudflat in the short term. In the long term, the loss of mudflat due to scour and resuspension of sediment from existing mudflats as a result of Phase 1 activities is expected to be minor, and is likely to be offset by the intertidal mudflat available along channels within restored tidal habitats. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-3: **Potential habitat conversion impacts to western snowy plovers.**

Potential program-level impacts to western snowy plovers are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-3 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the three SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, Eden Landing Ponds E8A, E8X, E9, E12, and E13 would not be managed, and eventually most or all of these ponds are likely to become tidal due to the failure of unmaintained levees. In the Ravenswood and Alviso complexes, Ponds SF2, A8, and A16 would continue to be managed as they currently are under the ISP, and their levees maintained and repaired as needed to maintain them as managed ponds (rather than allowing tidal action to be restored via unintentional breaches). While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6.

In most years, Pond E8A is mostly dry during summer, and it and E8X are very shallow during winter, and thus provide good foraging and breeding habitat for western snowy plovers. Pond E8A was the most important pond for juvenile foraging during the 2005 breeding season (Tucci and others 2006), and large numbers of plovers were present in this pond during the 2006 breeding season as well (Robinson and others 2006). Although a number of plovers were observed foraging along the levee between Ponds E8A and E9, as well as in Pond E8X, in 2006, Ponds E9 and E8X have not typically been important breeding locations for this species. Ponds E12 and E13 currently provide shallow-water habitat in winter and spring and are mostly dry in fall. Pond E12 was one of the most important breeding ponds for western snowy plovers in 2005 and 2006 (Tucci and others 2006, Robinson and others 2006). Limited numbers of western snowy plovers use Alviso-complex ponds in most years. In 2006, 10 nests were found in Pond A8, though this pond received little or no use by nesting plovers in the previous decade or so. No nesting

has been documented in Ponds A5, A6, or A7 in recent years, although Pond A6 was used for nesting before the large California gull colony became established there. Pond SF2 currently provides suitable foraging and nesting habitat for western snowy plovers.

In the very short term, under the No Action Alternative, these ponds would continue to provide habitat for western snowy plovers similar to that currently provided. However, as Ponds E8A, E8X, E9, E12, and E13 breach, western snowy plover nesting and foraging habitat within these ponds would be lost. Ponds A8 and SF2 would continue to provide potential western snowy plover nesting and foraging habitat.

Because western snowy plovers in the South Bay are opportunistic breeders, moving around extensively throughout the South Bay to take advantage of ponds providing suitable conditions, effects of the Phase 1 No Action Alternative must be considered in the context of the entire Phase 1 Project Area, not just on the scale of individual ponds or pond complexes. Overall, the loss of suitable snowy plover habitat within Ponds E8A, E8X, E9, E12, and E13 as a result of unintentional breaching could result in substantial declines in numbers of breeding western snowy plovers in the South Bay, particularly since under the No Project Alternative, no additional breeding habitat for this species would be created or enhanced, and opportunities for intensive, focused management of other ponds for this species are presumed to be limited (due to limited funding).

Furthermore, under the No Action Alternative, Pond A6 would be lost as breeding habitat for California gulls, which is expected to lead to the redistribution of nearly 20,000 breeding gulls to other locations in the South Bay. These gulls could potentially displace nesting western snowy plovers. Under the No Action Alternative, it is assumed that existing levels of predator management would continue. However, given the steady decline in western snowy plover numbers over the past few decades, such levels of predator management may not be adequate to protect this species in the South Bay, and a lack of additional Project-related funding would preclude the ability to respond to gull displacement or the increasing threat posed by gulls and corvids to nesting birds in the South Bay. As a result of increasing numbers of avian predators in the South Bay, the concentration of nesting plovers in fewer areas due to unintentional levee breaches, and a lack of funding for increased predator management, predation pressure on nesting western snowy plovers is expected to be considerable under this alternative, and impacts would be potentially significant.

Phase 1 No Action Level of Significance: Potentially Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. Ponds E12 and E13 would also have several islands created in them that would provide potential nesting and foraging habitat for western snowy plovers and other shorebirds.

In most years, Pond E8A is mostly dry during summer, and it and E8X are very shallow during winter, and thus provide good foraging and breeding habitat for western snowy plovers. Pond E8A was the most important pond for juvenile foraging during the 2005 breeding season (Tucci and others 2006), and large numbers of plovers were present in this pond during the 2006 breeding season as well (Robinson and others 2006). Although a number of plovers were observed foraging along the levee between Ponds E8A and E9, as well as in Pond E8X, in 2006, Ponds E9 and E8X have not typically been important breeding locations for this species. The long-term expectation for Ponds E8X, E8A, and E9 is the development of tidal salt marsh, most of which would eventually be vegetated. Marsh ponds/pannes would be constructed within these restored marshes, and such ponds may provide foraging habitat for adult and fledged juvenile western snowy plovers. However, the restored tidal habitats in these ponds would not provide suitable nesting and brooding habitat for this species.

Ponds E12 and E13 currently provide shallow-water habitat in winter and spring and are mostly dry in fall. Pond E12 was one of the most important breeding ponds for western snowy plovers in 2005 and 2006 (Tucci and others 2006, Robinson and others 2006). These ponds would be retained as potential foraging and nesting habitat for western snowy plovers, through the creation of nesting islands and management for shallow-water foraging habitat for western snowy plovers and other small shorebirds in these ponds. However, given the large number of western snowy plovers that nested in Pond E12 in 2006 (22 nests), it is unknown whether the islands that would be created in these ponds would be adequate to offset the loss of a majority of this pond to shallow-water habitat in Phase 1.

Currently, under the ISP, attempts are being made to manage a few ponds (*e.g.,* Ponds E6B, E8, E8A, and E8X) with optimal breeding conditions for western snowy plovers in mind. Phase 1 would result in a substantial loss of nesting and foraging habitat for western snowy plovers at Eden Landing due primarily to the conversion of Pond E8A to tidal habitat. Management of Pond E12 primarily as shallow-water habitat would reduce the extent of plover nesting habitat in this pond as well, although the provision of nesting islands, and careful management of water levels, would continue to provide habitat for nesting and foraging western snowy plovers in this pond. If numbers of western snowy plovers in the Eden Landing pond complex decline following the implementation of Phase 1 activities, monitoring would reveal such declines, and other ponds in this complex would be managed adaptively to increase nesting habitat.

Alviso. Phase 1 actions at Alviso would include opening of Ponds A8 and A6 to tidal action, and management of Pond A16 as a shallow pond for shorebirds. Limited numbers of western snowy plovers use Alviso-complex ponds in most years. In 2006, 10 nests were found in Pond A8, though this pond has received little or no use by nesting plovers in the previous decade or so. No nesting has been documented in Ponds A5, A6, or A7 in recent years, although Pond A6 was used for nesting before the large California gull colony became established there. Opening Pond A8 to tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. Pond A6 would change from primarily dry habitat to open water, and eventually, tidal salt marsh. Phase 1 actions would therefore lead to the loss of foraging and nesting habitat for western snowy plovers in these ponds due to flooding of Pond A8 to a depth unsuitable for use by breeding western snowy plovers.

The loss of Pond A6 as breeding habitat for nearly 20,000 California gulls, which would occur due to unintentional breaching under Alternative A or intentionally under Alternatives B or C, is expected to lead to the redistribution of these birds to other nesting sites within the South Bay. These sites could include levees and islands which could currently, or may in the future, provide nesting habitat for western snowy plovers. It is not known to what extent this redistribution of nesting California gulls would impact western snowy plovers in the South Bay, although Phase 1 would include predator management as needed to minimize any adverse effects of gull predation or encroachment on other nesting birds.

Phase 1 would include the construction of numerous nesting islands in Pond A16, and management of this pond to provide shallow water foraging habitat for small shorebirds such as the western snowy plover. Although this pond is not currently used by western snowy plovers, and use of constructed nesting islands in the South Bay by plovers has not yet been tested, enhancement of habitat in Pond A16 is expected to encourage the use of this pond by foraging and breeding western snowy plovers. If habitat enhancement at Pond A16 does not offset the loss of breeding habitat for nesting plovers due to conversion of Pond A8 to subtidal habitat, additional ponds in the Alviso pond complex could be managed for this species, or water levels in ponds such as A22 (which is currently used for nesting) and A23 could be managed specifically to target suitable snowy plover habitat conditions.

Ravenswood. Phase 1 would include the construction of numerous nesting islands in Pond SF2, management of portions of this pond to provide shallow water foraging habitat for small shorebirds such as the western snowy plover, and management for approximately one-third of this pond as seasonal salt panne habitat for snowy plovers. This pond currently provides suitable foraging and nesting habitat for western snowy plovers. The entire pond would be enhanced for shorebirds over current conditions by targeted management of water levels year round, and numerous nesting islands would provide suitable nesting habitat for western snowy plovers and additional shoreline foraging habitat.

Net Phase 1 Effects. Phase 1 would result in a loss of nesting habitat for the western snowy plover in Ponds A8 and E8A. Any nesting that currently occurs in Ponds E8X and E9 (which are not typically used, at least in substantial numbers, by nesting plovers) would no longer occur after these ponds are breached. Conversion of Ponds E12 and E13 from seasonal ponds to primarily shallow-water ponds with a few nesting islands would reduce nesting habitat there. Conversely, the construction of numerous nesting islands in Ponds A16 (where plovers do not currently nest) and SF2 (where small numbers of plovers nest, at least in some years) would increase the extent of plover habitat in those two ponds. The net effect of Phase 1 activities on this species (*i.e.*, whether a net decline in numbers breeding in the South Bay occurs as a result of Phase 1 activities) depends on whether birds displaced from Ponds A8, E8A, and E9 are able to simply redistribute elsewhere in the South Bay and breed successfully, and whether the increase in densities expected in Ponds A16 and SF2 as a result of island construction and focused pond management would outweigh the loss of habitat in Ponds E8A, E8X, and E9 and the reduction in habitat in Ponds E12 and E13.

Because the net effects of Phase 1 actions on numbers of nesting western snowy plovers are uncertain, monitoring and adaptive management would be implemented, as described previously under the program-level effects section, to ensure that Phase 1 does not have a significant impact on this species. If

monitoring results "trip the trigger" for this species, management of Phase 1 ponds such as Ponds A16, SF2, E12, and E13 may be adjusted, and other non-Phase 1 SBSP Restoration Project ponds such as the R1-R5 complex would be managed specifically to provide more extensive and/or higher quality nesting habitat for western snowy plovers.

Adaptive management actions may include the construction of additional islands, the creation of islands of a different size and/or configuration (based on an analysis of use of existing islands), adjustment of water depths, adjustment of pond management to provide more salt panne habitat, and increased levels of predator management. Other means of providing nesting habitat would also be assessed. For example, "furrowed" ponds, in which the pond substrate is furrowed to create small islands and ridges surrounded by shallow water, have been successful in supporting high densities of nesting snowy plovers in the Owens Valley (N. Warnock, pers. comm.); creation and management of such habitat in South Bay ponds, and comparison of nesting plover densities among ponds providing different types of plover nesting habitat, would allow for effective management of plover habitat. With monitoring and adaptive management of pond conditions as necessary, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-4: **Potential reduction in the numbers of breeding, pond-associated waterbirds (avocets, stilts, and terns) using the South Bay due to reduction in habitat, concentration effects, displacement by nesting California gulls, and other Project-related effects.**

Potential impacts to terns, stilts, and avocets are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-4 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the Phase 1 No Action Alternative are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the three SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, Eden Landing Ponds E8A, E8X, E9, E12, and E13 would not be managed, and eventually most or all of these ponds are likely to become tidal due to the failure of unmaintained levees. In the Ravenswood and Alviso complexes, Ponds SF2, A8, and A16 would continue to be managed as they currently are under the ISP, and their levees maintained and repaired as needed to maintain them as managed ponds (rather than allowing tidal action to be restored via unintentional breaches). While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6.

In most years, Pond E8A is mostly dry during summer, and it and E8X are very shallow during winter, thus providing foraging and breeding habitat for stilts and avocets. Although numbers of nesting stilts and avocets in this area are not available, counts made by USGS (unpublished data) during May, the peak of the breeding season, totaled 138 and 212 American avocets at Pond E8A in 2005 and 2006, respectively. Fewer Black-necked stilts (21 in 2005 and two in 2006) use Pond E8A, and relatively few American avocets and Black-necked stilts breed at Pond E9 (USGS unpublished data). Small numbers of Forster's terns also nest in Pond E8A, where 29 Forster's tern nests were recorded in 2005 and five nests in 2006 (Strong 2005, 2006). Forster's terns historically nested in Pond E9, but have not been recorded there since 2003 (Strong 2004). Caspian terns have not been recorded nesting in these ponds. Ponds E12 and E13 currently provide shallow-water habitat in winter and spring and are mostly dry in fall. These ponds are currently used by relatively few nesting stilts and avocets (Rintoul and others 2003), and are not used as nesting or foraging habitat by terns.

Fairly low numbers of stilts currently nest in Ponds A5, A6, A7, and A8; avocets are more abundant, and 208 avocet nests were recorded in A8 in 2006 (Strong 2006). Forster's terns and black skimmers have nested in recent years on islands in A8, and small numbers of Forster's and Caspian terns nest on small islands in Pond A7. Estimates of tern nests in these areas from 2005 and 2006, respectively, include 14 and 30 Caspian tern nests at Pond A7, and 43 and 61 Forster's tern nests at Pond A8 (Strong 2005, 2006). Four narrow islands in Pond A16 currently provide nesting habitat for moderate numbers of Forster's terns, American avocets, and Black-necked stilts, as well as a few pairs of black skimmers in several recent years. Twenty-two American avocet nests, six Black-necked stilt nests, and 132 Forster's tern nests were found in A16 in 2006 (Strong 2006), and 168 Forster's tern nests were counted here in 2005 (Strong 2005). Pond SF2 is currently dry through much of the summer; it is not used by substantial numbers of stilts or avocets, and is not used as a nesting site by terns.

In the very short term, under the No Action Alternative, these ponds would continue to provide habitat for nesting pond-associated waterbirds similar to that currently provided. As Ponds E8A, E8X, E9, E12, E13, and A6 breach, potential nesting habitat within these ponds would be lost. However, relatively few stilts, avocets, and terns nest within these ponds, and the effects of conversion of these managed ponds to tidal habitats due to unintentional breaching may not be substantial. Although Ponds A8 and A16, which do support large numbers of nesting waterbirds (and SF2, which supports few), would continue to be managed, the islands within these ponds that currently support nesting birds may not be replenished (or may be replenished at a smaller scale) after they erode, due to funding limitations, under the No Action Alternative. As a result, numbers of nesting pond-associated birds are likely to decline within these Phase 1 ponds under the No Action Alternative. Because Ponds A8 and A16 in particular support large numbers of nesting birds, and because opportunities for the creation or enhancement of nesting habitat for these species in other ponds are presumed to be limited (due to limited funding), a decline in habitat quality in Ponds A8 and A16 could result in substantial losses of nesting waterbirds.

Furthermore, under the No Action Alternative, Pond A6 would be lost as breeding habitat for California gulls, which is expected to lead to the redistribution of nearly 20,000 breeding gulls to other locations in the South Bay. These gulls could potentially displace other nesting waterbirds. Under the No Action Alternative, it is assumed that existing levels of predator management would continue. Such levels of

predator management may not be adequate to protect nesting waterbirds in the South Bay, and a lack of additional Project-related funding would preclude the ability to respond to gull displacement or the increasing threat posed by gulls and corvids to nesting birds in the South Bay. As a result of increasing numbers of avian predators in the South Bay, the concentration of nesting waterbirds in fewer areas due to unintentional levee breaches, and a lack of funding for increased predator management, predation pressure on nesting stilts, avocets, and terns is expected to be considerable under this alternative, and impacts would be potentially significant.

Phase 1 No Action Level of Significance: Potentially Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. Multiple islands constructed in Ponds E12 and E13 would provide potential nesting habitat for terns, stilts, and avocets.

As mentioned above, Ponds E8A and E8X provide foraging and breeding habitat for moderate numbers of stilts and avocets. Small numbers of Forster's terns also nest in Pond E8A, but Caspian terns have not been recorded nesting in these ponds. The long-term expectation for Ponds E8X, E8A, and E9 is the development of tidal salt marsh, most of which would eventually be vegetated and thus would not provide nesting habitat for Caspian terns or American avocets. Marsh ponds and pannes would be constructed within these areas, and islands within these marsh ponds or within the high mature marsh may provide nesting habitat for Black-necked stilts, and possibly Forster's terns.

Ponds E12 and E13 are currently used by relatively few nesting stilts and avocets (Rintoul and others 2003), and are not used as nesting or foraging habitat by terns. The construction of nesting islands and management of shallow water foraging habitat of varying salinities would enhance nesting and foraging conditions for stilts and avocets, and would provide nesting habitat for terns that forage outside these ponds.

Phase 1 would result in the loss of nesting and foraging habitat for stilts, avocets, and Forster's terns at Eden Landing due to conversion of Ponds E8A, E8X, and E9 to tidal habitats. However, with the exception of American avocets in Pond E8A, these impacts would affect relatively few birds. The enhancement of habitat at Ponds E12 and E13, through the provision of nesting islands and management of suitable foraging habitat for avocets and stilts, would offset much of the habitat loss that would result from Phase 1 activities at Ponds E8A, E8X, and E9.

Alviso. Phase 1 actions at Alviso would include opening of Ponds A8 and A6 to tidal action, and reconfiguration of Pond A16 with numerous nesting islands and management of this pond for shallow water levels. Fairly low numbers of stilts currently nest in Ponds A5, A6, A7, and A8; avocets are more

abundant, and 208 avocet nests were recorded in A8 in 2006 (Strong 2006). Forster's terns and black skimmers have nested in recent years on islands in A8, and small numbers of Forster's and Caspian terns nest on small islands in Pond A7. Proposed Phase 1 activities would flood Ponds A5, A7, and A8 to depths that would eliminate existing island nesting habitat, and Pond A6 would provide little to no nesting habitat for these species after conversion to tidal habitat.

Four narrow islands in Pond A16 currently provide nesting habitat for moderate numbers of Forster's terns, American avocets, and Black-necked stilts, as well as a few pairs of black skimmers in several recent years. Phase 1 would include the construction of numerous nesting islands in this pond, far exceeding the extent and number of nesting islands currently present throughout the entire Alviso complex, and enhancing the value of Pond A16 to nesting pond-associated birds considerably relative to its present condition. The construction of these nesting islands is expected to offset adverse effects of tidal restoration activities in the Pond A5–A8 cluster in terms of the number of pairs of stilts, avocets, and terms that would be supported by Phase 1 activities.

Pond A6 contains the second-largest California gull colony in the state, with more than 9,700 breeding pairs in 2006. The loss of Pond A6 as breeding habitat for these birds is expected to lead to the redistribution of these birds to other nesting sites within the South Bay. These sites could include levees and island that could currently, or in the future, provide nesting habitat for terns, stilts, or avocets. It is not known to what extent this redistribution of nesting California gulls would impact these birds in the South Bay, although Phase 1 would include predator management as needed to minimize any adverse effects of gull predation or encroachment on other nesting birds.

Although many of the California gulls displaced from Pond A6 by conversion to tidal habitat are expected to redistribute to other parts of the Bay Area, some may be lost from the South Bay (*i.e.*, due to mortality or emigration) as a result. However, as discussed under SBSP Impact 3.6-4, this impact to California gulls would be less than significant, and potentially beneficial overall, due to the adverse effect that this large, only recently established, colony of California gulls has on rarer, more sensitive species in the South Bay.

Ravenswood. Phase 1 would include the construction of numerous nesting islands in Pond SF2, and management of this pond to provide shallow water foraging habitat for shorebirds. This pond is currently dry through much of the summer; it is not used by substantial numbers of stilts or avocets, and is not used as a nesting site by terns. The entire pond would be enhanced for shorebirds over current conditions by targeted management of water levels year round, and numerous nesting islands would provide suitable nesting habitat for terns (which would be expected to forage primarily outside this pond), stilts, and avocets. Thus, the value of Pond SF2 to nesting pond-associated birds would be enhanced considerably relative to its present condition.

Net Phase 1 Effects. Overall, the loss of nesting habitat in ponds that would be converted to tidal habitats in Phase 1 is expected to impact relatively small numbers of breeding avocets, stilts, and terns through loss of nesting and foraging habitat. These adverse effects would be more than offset by the creation of numerous nesting islands in Ponds A16 and SF2, and smaller numbers of islands in Ponds E12 and E13. Furthermore, any adverse effect that may result from the encroachment of displaced California

gulls (due to breaching of Pond A6) on other pond-associated nesting birds would be addressed by gull management. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-5: **Potential reduction in the numbers of nonbreeding, salt-pond-specialist birds (*e.g.*, phalaropes, eared grebes, and Bonaparte's gulls) as a result of habitat loss.**

Potential program-level impacts to salt-pond-associated waterbirds are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-5 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action Alternative are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, Eden Landing Ponds E8A, E8X, E9, E12, and E13 would not be managed, and eventually most or all of these ponds are likely to become tidal due to the failure of unmaintained levees. In the Ravenswood and Alviso complexes, Ponds SF2, A8, and A16 would continue to be managed as they currently are under the ISP, and their levees maintained and repaired as needed to maintain them as managed ponds (rather than allowing tidal action to be restored via unintentional breaches). While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6.

In most years, Pond E8A is mostly dry during summer, and it and E8X are very shallow during winter; recent USGS surveys indicate that these ponds are used by limited numbers of phalaropes. Pond E9 contains no foraging habitat during summer, but is deeper during winter and provides suitable foraging habitat for waterbird in winter and spring. This pond supports moderate numbers of phalaropes (*e.g.*, 674 red-necked phalaropes in Pond E9 in April 2005), and limited numbers of other salt-pond specialists (USGS unpublished data). Ponds E8A and E9 were used by higher numbers of salt-pond specialists before implementation of the ISP in 2004. For example, USGS (unpublished data) recorded up to 3451 eared grebes in E9 in 2003 and 985 in 2004, but no more than 95 eared grebes in this pond in 2005 or 2006. Similarly, a maximum of 820 Bonaparte's gulls were counted in Pond E8A in 2003, but no Bonaparte's gulls were counted here in 2004, 2005, or 2006. Therefore, baseline numbers of salt-pond-specialist birds in Ponds E8A, E8X, and E9 appear to be low. Ponds E12 and E13 currently provide shallow-water habitat in winter and spring and are mostly dry in fall. Monitoring conducted by USGS since 2002 indicates that only low numbers of salt-pond-specialist species occur in these ponds.

Pond A6 is dry for much of the year, and currently supports low numbers of salt-pond-specialist waterbirds. Ponds A5, A7, and A8 supported fairly high numbers of these birds prior to implementation of the ISP, but numbers in 2005 and 2006 were much lower (USGS unpublished data). For example, high counts of phalaropes at all three ponds exceeded 1,000 birds in 2003 (*e.g.,* 6,102 red-necked phalaropes at Pond A5 in 2003), but the maximum count for 2005 and 2006 was 668 red-necked phalaropes at Pond A8 in 2005 (USGS unpublished data). Pond SF2 currently provides shallow-water habitat in winter and/or spring, but it is mostly dry in summer; recent surveys by USGS have detected very few salt-pond-associated birds (USGS unpublished data).

Over the next few years under the No Action Alternative these ponds would continue to provide habitat for salt-pond-specialist waterbirds similar to that currently provided. As Ponds E8A, E8X, E9, E12, E13, and A6 breach, potential foraging habitat within these ponds would be lost. However, relatively few salt-pond-specialist waterbirds forage in these ponds, and the effects of conversion of these managed ponds to tidal habitats due to unintentional breaching may not be substantial, as the salt-pond-specialist waterbirds that currently use these ponds would likely be able to find foraging habitat in other ponds. Continued management of Ponds A8, A16, and SF2 would likely not change these ponds' use by salt-pond-specialist waterbirds appreciably, as these ponds are also used by relatively low numbers of these species. Therefore, impacts would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds.

In most years, Pond E8A is mostly dry during summer, and it and E8X are very shallow during winter; recent USGS surveys indicate that these ponds are used by limited numbers of phalaropes. Pond E9 supports moderate numbers of phalaropes (*e.g.*, 674 red-necked phalaropes in Pond E9 in April 2005), and limited numbers of other salt-pond specialists (USGS unpublished data). Ponds E8A and E9 were used by higher numbers of salt-pond specialists before implementation of the ISP in 2004. Therefore, baseline numbers of salt-pond-specialist birds in Ponds E8A, E8X, and E9 appear to be low. The long-term expectation for Ponds E8X, E8A, and E9 is the development of tidal salt marsh, most of which would eventually be vegetated and thus would not provide high quality foraging habitat for salt-pond-specialist waterbirds. However, marsh ponds and pannes constructed within the restored marsh may be used as foraging habitat by phalaropes.

Ponds E12 and 13 currently provide shallow-water habitat in winter and spring and are mostly dry in fall. Monitoring conducted by USGS since 2002 indicates that only low numbers of salt-pond-specialist species occur in these ponds. Phase 1 actions would include reconfiguration and management of these two

ponds as a small-scale salt pond system. Shallow-water conditions in most cells would provide suitable foraging habitat for phalaropes, and deeper water in a large mixing basin would provide suitable depths for eared grebes and red-necked phalaropes. Salinity in some cells would be raised substantially, enhancing the quality of this habitat for salt-pond-specialist waterbirds.

Phase 1 would result in a loss of foraging habitat for salt-pond-specialist waterbirds in Ponds E8A and E9, but an enhancement of habitat in Ponds E12 and 13. Because post-ISP use of Ponds E8A and E9 (as well as Ponds E12 and E13) by salt-pond-specialist birds is fairly low, overall, Phase 1 would likely result in no net loss of salt-pond-associated waterbird foraging habitat at Eden Landing.

Alviso. Phase 1 actions at Alviso would include opening of Pond A6 to tidal action, muted tidal action in Pond A8, and management of Pond A16 as a shallow pond for shorebirds. Pond A6 is dry for much of the year, and currently supports low numbers of salt-pond-specialist waterbirds. As a result, conversion of Pond A6 to tidal habitats (which are not expected to be used substantially by salt-pond-specialist birds) is not expected to adversely affect South Bay numbers of these species. Ponds A5, A7, and A8 supported fairly high numbers of these birds prior to implementation of the ISP, but numbers in 2005 and 2006 were much lower (USGS unpublished data). Opening Pond A8 to muted tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. Salinities in these ponds would likely not change appreciably as a result of Phase 1 actions, and the increased depth may enhance conditions for foraging eared grebes. Such deep-water habitat in Ponds A5, A7, and A8 is likely to be seasonal if the notch at Pond A8 is closed in the wet season; water levels may need to be drawn down so as to provide flood storage capacity for the Lower Guadalupe River Project.

Pond A16 would be reconfigured and managed specifically to provide shallow-water foraging habitat for shorebirds in Phase 1. Shallow water levels would be maintained year round to allow for shorebird foraging, and numerous islands would be created that would provide shoreline foraging habitat and high-tide roosting habitat. Phalaropes and Bonaparte's gulls would likely use Pond A16 after implementation of Phase 1 in numbers commensurate with current use (and possibly even higher, as shallow water may increase food availability relative to existing conditions). This pond is currently used by few Bonaparte's gulls or phalaropes, but is used by moderate numbers of eared grebes (the maximum count for 2006 was 1,743; USGS unpublished data). A reduction in water depth within this pond may reduce habitat quality for eared grebes, but habitat quality for phalaropes and Bonaparte's gulls in this pond is not expected to change appreciably due to Phase 1 activities. Overall, Phase 1 actions are likely to have little net effect on the abundance of salt-pond-specialist species in the Alviso pond complex.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat with numerous islands, primarily for foraging shorebirds. This pond currently provides shallow-water habitat in winter and/or spring, but it is mostly dry in summer; recent surveys by USGS have detected very few salt-pond-associated birds (USGS unpublished data). The entire pond would be enhanced for shorebirds over current conditions by targeted management of water levels year round, potentially benefiting phalaropes, and possibly Bonaparte's gulls.

Net Phase 1 Effects. Overall, Phase 1 Project effects on salt-pond-specialist birds are likely to be negligible, as adverse effects from the loss of habitat in Ponds E8A, E8X, and E9 (which are currently

used by only low numbers of these birds) is expected to be offset by enhancement of habitat in Ponds E12, E13, and SF2, and changes in conditions in the Alviso pond complex due to Phase 1 activities are not expected to result in substantial changes in the abundance of salt-pond-specialist birds. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-6: **Potential reduction in foraging habitat for diving ducks, resulting in declines in flyway-level populations.**

Potential program-level impacts to diving ducks are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-6 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action Alternative are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the three major restoration areas: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, Eden Landing Ponds E8A, E8X, E9, E12, and E13 would not be managed, and eventually most or all of these ponds are likely to become tidal due to the failure of unmaintained levees. In the Ravenswood and Alviso complexes, Ponds SF2, A8, and A16 would continue to be managed as they currently are under the ISP, and their levees maintained and repaired as needed to maintain them as managed ponds (rather than allowing tidal action to be restored via unintentional breaches). While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6.

Currently, Ponds E8A, E8X, and E9 are used by low to moderate numbers of bufflehead, and low numbers of other diving ducks, from late fall to early spring (USGS unpublished data). Recent high counts of diving ducks were 176 in 2005 and 331 in 2006 at E8A, and 230 in 2005 and 864 in 2006 at E9; most of these were bufflehead. Ponds E12 and 13 currently provide shallow-water habitat in winter and spring. Pre-ISP, these ponds supported substantial numbers of scaup during winter (*e.g.,* 2074 at E13 in 2003), but in 2005 and 2006 no more than 250 diving ducks, mostly bufflehead, have been counted in either of these ponds. Alviso Ponds A6, A8, and A16 are currently used during winter by a limited number of diving ducks, primarily bufflehead (USGS unpublished data); diving duck numbers in these ponds are likely limited by the availability of deep-water habitat. Pond SF2 currently provides shallow-water habitat in winter and/or spring, and recent surveys by USGS have documented low abundance of diving ducks (USGS, unpublished data).

In the very short term, under the No Action Alternative, these ponds would continue to provide habitat for salt-pond-specialist waterbirds similar to that currently provided. As Ponds E8A, E8X, E9, E12, E13, and A6 breach, potential foraging habitat for diving ducks within these ponds would be lost. However, relatively few diving ducks forage in these ponds, and the effects of conversion of these managed ponds to tidal habitats due to unintentional breaching may not be substantial, as the diving ducks that currently use these ponds would likely be able to find foraging habitat in other ponds, or in the Bay. Continued management of Ponds A8, A16, and SF2 would likely not change these ponds' use by diving ducks appreciably. Therefore, impacts would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed primarily for shallow-water foraging habitat for small shorebirds.

Currently, Ponds E8A, E8X, and E9 are used by low to moderate numbers of bufflehead, and low numbers of other diving ducks, from late fall to early spring (USGS unpublished data). The long-term expectation for Ponds E8X, E8A, and E9 is the development of tidal salt marsh, most of which would eventually be vegetated and thus would not provide high-quality foraging habitat for diving ducks. In particular, bufflehead are likely to make little use of these areas following tidal restoration. However, diving ducks such as scaup and canvasbacks are expected to forage along the lower reaches of the larger sloughs that would be present within these restored tidal marshes, and thus may increase from their currently very low abundance within these particular ponds.

Ponds E12 and 13 currently provide shallow-water habitat in winter and spring. Pre-ISP, these ponds supported substantial numbers of scaup during winter (*e.g.,* 2074 at E13 in 2003), but in 2005 and 2006 no more than 250 diving ducks, mostly bufflehead, have been counted in either of these ponds. Phase 1 actions would include reconfiguration and management of these two ponds as a small-scale salt pond system. Most cells within these ponds would be managed for shallow conditions suitable for shorebird foraging habitat, and thus would not be deep enough to support foraging diving ducks. However, the deeper mixing basin is expected to provide suitable foraging habitat for diving ducks, including bufflehead.

Phase 1 would result in a loss of foraging habitat for diving ducks in Ponds E8A and E9, but an enhancement of habitat in Ponds E12 and 13, and likely an enhancement of habitat for canvasbacks and scaup at the mouths of restored sloughs. Due to the low numbers of diving ducks currently present in the Eden Landing Phase 1 Project ponds, Phase 1 is expected to have little effect on diving duck abundance overall.

Alviso. Phase 1 actions at Alviso would include opening of Pond A6 to tidal action, muted tidal action in A8, and management of Pond A16 as a shallow pond, primarily for shorebirds. These ponds are currently used during winter by a limited number of diving ducks, primarily bufflehead (USGS unpublished data); diving duck numbers in these ponds are likely limited by the availability of deep-water habitat. Opening Pond A8 to tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. Such deep-water habitat in Ponds A5, A7, and A8 is likely to be seasonal if the notch at Pond A8 is closed in the wet season (*i.e.*, depths may be shallower during the wet season); water levels may need to be drawn down so as to provide flood storage capacity for the Lower Guadalupe River Project. Nevertheless, Phase 1 actions would lead to substantial increases in foraging habitat for diving ducks in these ponds. Initially, the breaching of Pond A6 would create additional high-tide foraging habitat for diving ducks as well. However, the long-term expectation for Pond A6 is the development of tidal salt marsh, most of which would eventually be vegetated and thus would not provide high quality foraging habitat. Nevertheless, the mouths of the larger sloughs that develop in Pond A6 are expected to be used by diving ducks. Pond A16 would be reconfigured and managed specifically to provide shallow-water foraging habitat for shorebirds. Shallow water levels would be maintained year round to allow for shorebird foraging, and numerous islands would be created that would provide shoreline foraging habitat and high-tide roosting habitat. This pond is currently used by relatively few diving ducks, and habitat quality for diving ducks would not change substantially in this pond as a result of Phase 1 activities. Overall, Phase 1 activities are expected to result in a considerable increase in diving duck foraging habitat at Alviso.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. This pond currently provides shallow-water habitat in winter and/or spring, and recent surveys by USGS have documented low abundance of diving ducks (USGS, unpublished data). Phase 1 activities would include the construction of numerous islands in this pond, and management of water levels primarily for shallow-water habitat. Thus, Phase 1 activities are expected to have little effect on the availability or quality of habitat for diving ducks in Pond SF2.

Net Phase 1 Effects. The increase in diving duck foraging habitat that would occur in the Alviso pond complex as a result of Phase 1 activities is expected to more than offset any reduction in habitat that occurs at Eden Landing, where use of Phase 1 Project ponds by diving ducks is currently low. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-7: **Potential reduction in foraging habitat for ruddy ducks, resulting in declines in flyway-level populations.**

Potential program-level impacts to ruddy ducks are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-7 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level

effects are addressed for each of the three major restoration areas: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, Eden Landing Ponds E8A, E8X, E9, E12, and E13 would not be managed, and eventually most or all of these ponds are likely to become tidal due to the failure of unmaintained levees. In the Ravenswood and Alviso complexes, Ponds SF2, A8, and A16 would continue to be managed as they currently are under the ISP, and their levees maintained and repaired as needed to maintain them as managed ponds (rather than allowing tidal action to be restored via unintentional breaches). While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6.

Surveys by USGS since October 2002 have documented very few ruddy ducks in Ponds E8A, E8X, E9, E12, and E13. Although 661 ruddy ducks were recorded in Pond E9 during surveys in March 2006, and 288 individuals were in that pond in April 2006, most other counts in all these ponds since 2002 have been in the single digits (with no ruddy ducks present in any of these ponds on most surveys, even during fall and winter) (USGS unpublished data). Surveys by USGS since October 2002 have documented very few ruddy ducks in Ponds A6 and A8 (USGS unpublished data), where ruddy duck numbers are likely limited by the availability of deep-water habitat. Pond A16 supported very few ruddy ducks prior to ISP implementation (*i.e.*, a total of 185 individuals from October 2002 through September 2004), but numbers increased (with a high of 1,405 in October 2005) following ISP implementation (USGS unpublished data). Pond SF2 provides shallow-water habitat in winter and/or spring, and recent surveys by USGS have documented low abundance of ruddy ducks (USGS, unpublished data).

In the very short term, under the No Action Alternative, these ponds would continue to provide habitat for ruddy ducks similar to that currently provided. As Ponds E8A, E8X, E9, E12, E13, and A6 breach, potential foraging habitat for ruddy ducks within these ponds would be lost. However, relatively small numbers of ruddy ducks forage in these ponds, and the effects of conversion of these managed ponds to tidal habitats due to unintentional breaching may not be substantial, as the ruddy ducks that currently use these ponds would likely be able to find foraging habitat in other ponds. Continued management of Ponds A8, A16, and SF2 would likely not change these ponds' use by ruddy ducks appreciably. Therefore, impacts would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed primarily for shallow-water foraging habitat for small shorebirds.

Surveys by USGS since October 2002 have documented very few ruddy ducks in Ponds E8A, E8X, E9, E12, and E13. Therefore, the conversion of Ponds E8X, E8A, and E9 to tidal salt marsh, which would not be used by ruddy ducks, is expected to have little effect on ruddy duck numbers in the South Bay. Reconfiguration and management of Ponds E12 and E13 as a small-scale salt pond system in Phase 1 could produce ruddy duck foraging habitat in the deeper mixing basin, but activities at these ponds are expected to have little effect on the currently very low use of these ponds by ruddy ducks.

Due to the low numbers of ruddy ducks currently present in the Eden Landing Phase 1 Project ponds, Phase 1 is expected to have little effect on the overall abundance of this species.

Alviso. Phase 1 actions at Alviso would include opening of Pond A6 to tidal action, muted tidal action in A8, and management of Pond A16 as a shallow pond, primarily for shorebirds. Surveys by USGS since October 2002 have documented very few ruddy ducks in Ponds A6 and A8 (USGS unpublished data); ruddy duck numbers in these ponds are likely limited by the availability of deep-water habitat. Opening Pond A8 to tidal action would result in deeper water in this pond, which would likely benefit ruddy ducks, while the vegetated tidal marsh expected to develop in Pond A6 following breaching would not provide ruddy duck habitat. Ruddy duck numbers in Ponds A5 and A7 were relatively low from October 2002 through September 2004, with totals of 1,126 in A5 and 365 in A7 during this entire period (USGS unpublished data). However, numbers have increased considerably in these ponds since implementation of the ISP, with high counts of 8,097 in A5 in January 2005 and 1,999 in A7 in February 2005 (USGS unpublished data). Phase 1 actions would increase the depths of A5 and A7 somewhat. This change would be unlikely to result in declines in ruddy duck numbers, and numbers may increase due to the greater availability of deep-water habitat in these ponds following Phase 1 actions.

As at Ponds A5 and A7, Pond A16 supported very few ruddy ducks prior to ISP implementation (*i.e.*, a total of 185 individuals from October 2002 through September 2004), but numbers increased (with a high of 1,405 in October 2005) following ISP implementation (USGS unpublished data). In Phase 1, Pond A16 would be reconfigured and managed specifically to provide shallow-water foraging habitat for shorebirds. The shallow water levels that would be maintained year round in Pond A16 would not provide high-quality foraging conditions for ruddy ducks, and thus Phase 1 actions might cause a decline in use of this pond relative to current conditions. However, overall, Phase 1 activities are likely to result in a slight increase in ruddy duck foraging habitat at Alviso due to the increase in relatively deep water in Pond A8.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. This pond provides shallow-water habitat in winter and/or spring, and recent surveys by USGS have documented low abundance of ruddy ducks (USGS, unpublished data). A total of 20 were recorded during USGS surveys from October 2002 through September 2004, but none have been recorded in SF2 since then (USGS unpublished data). Phase 1 activities would include the construction of numerous islands in this pond, and management of water levels primarily for shallow-water habitat. Thus,

Phase 1 activities are expected to have little effect on the availability or quality of habitat for ruddy ducks in Pond SF2.

Net Phase 1 Effects. Overall, the increase in ruddy duck numbers expected to occur due to the increase in deep-water habitat in Pond A8 in Phase 1 may outweigh declines expected in A16. Phase 1 activities are likely to have relatively little effect on ruddy duck numbers in other Phase 1 ponds, and overall, there would likely be little effect on, and possibly a slight increase in, ruddy duck numbers. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-8: **Potential habitat conversion impacts on California least terns.**

Potential impacts to California least terns are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-8 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

As described for Alternative A for SBSP Impact 3.6-8 above, any reduction in managed pond foraging habitat that would occur under the No Action Alternative is not expected to result in declines in Bay Area California least tern numbers, as tidal foraging habitat would increase due to unintentional breaching in some ponds, and there is ample alternative foraging and roosting habitat elsewhere in the South Bay.

The only location within the SBSP Restoration Project Area where least terns have nested in recent years is Pond E8A, which is included in the proposed Phase 1 activities. Within Pond E8A, potential nesting habitat for California least terns would be lost as a result of the expected, though unintended, breaching of pond levees under the No Action Alternative. However, loss of nesting habitat within the SBSP Restoration Project Area is not expected to have a substantial effect on Bay Area populations of least terns given the very limited and sporadic breeding by this species in the Project Area. Therefore, impacts would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds.

The only location within the SBSP Restoration Project Area where least terns have nested in recent years is Pond E8A, where at least five pairs nested in 2007. Due to the sporadic nature of historical breeding by California least terns in the SBSP Restoration Project Area, it is unknown whether breeding at Pond E8A or elsewhere within the Project Area would continue even in the absence of the Project. If least terns were to continue to nest at Pond E8A, the conversion of this pond to tidal habitats would result in the loss of occupied breeding habitat. However, any least terns displaced from Pond E8A by Phase 1 activities would be expected to find ample alternative nesting habitat, either in the SBSP Restoration Project Area (*e.g.*, in other Eden Landing ponds that will be managed as snowy plover habitat, or Project-area ponds where nesting islands will be created) or within the Alameda colony that has served as the primary least tern colony in the Bay. Given the absence of nesting least terns from the SBSP Restoration Project Area for more than 25 years; the sporadic use of Project-area ponds by nesting least terns in the past; the very small number of least terns that nested in Pond E8A in 2007; and the extent of suitable nesting habitat that will be provided on nesting islands created by the SBSP Restoration Project and in areas managed for snowy plover nesting habitat, impacts to least tern nesting habitat as a result of Phase 1 activities will not result in substantial impacts to the Bay Area population of the species.

Eden Landing is not currently used as a post-breeding staging area by California least terns as much as are ponds north of Moffett Federal Airfield, but substantial numbers have been recorded here on occasion. In most years, Ponds E8A, E8X, and E9 receive little use by California least terns, as Pond E8A usually contains limited water, and water in E8X is generally too saline to support large numbers of fish in late summer, when post-breeding staging by California least terns occurs. However, July 2006 surveys by USGS (unpublished data) recorded 112 California least terns using Pond E8A and 53 using Pond E9. Opening these ponds to tidal action would reduce pond foraging habitat for these birds (particularly in Pond E9, as Pond E8A is not suitable for foraging in most years), but would enhance fish populations and provide subtidal foraging habitat for California least terns in sloughs. Ponds E12 and E13 are not used for foraging by California least terns, and Phase 1 activities are not expected to affect California least tern habitat at these two ponds appreciably. Overall, Phase 1 activities are expected to have little effect on potential foraging habitat for California least terns at Eden Landing.

Alviso. Phase 1 actions at Alviso would include opening of Ponds A8 and A6 to tidal action, and management of Pond A16 as a shallow pond for shorebirds. Alviso Ponds east of Guadalupe Slough are not regularly used as foraging habitat by California least terns, although California least terns have been documented in low numbers at Ponds A5 and A7, and other ponds in this area (USGS unpublished data; Santa Clara County Bird Data unpublished). Pond A6 is currently dry during the late summer when South Bay habitats are used by California least terns, and Pond A16 is rarely used by California least terns.

Phase 1 actions would likely lead to increases in foraging habitat for California least terns in Ponds A5, A7, and A8, by increasing average water depth, and thus providing more extensive deep, open-water habitat. This type of operation would limit benefits for diving ducks and terns. Initially, the breaching of

Pond A6 would create additional foraging habitat as well, as California least terns may forage over intertidal flats when they are inundated at high tide. After Pond A6 develops into vegetated tidal marsh, foraging may still occur in larger sloughs on the site, and the development of tidal marsh would enhance fish populations in this part of the Bay. Phase 1 activities at Pond A16 are not expected to change its currently low use by foraging California least terns appreciably, although the islands that would be constructed in this pond may be used by roosting California least terns. Overall, Phase 1 would lead to an increase in potential California least tern foraging habitat, and likely an increase in fish abundance, at Alviso.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. This pond is currently mostly dry in summer and thus provides no suitable post-breeding foraging habitat for California least terns. Management of Pond SF2 for shallow-water habitat and provision of islands could potentially improve foraging and roosting habitat for this species, although there is no expectation that Pond SF2 would provide high quality foraging habitat for California least terns.

Net Phase 1 Effects. If California least terns continue to nest in Pond E8A, then conversion of this pond to tidal habitats would result in a loss of occupied least tern nesting habitat. However, this effect is expected to have little or no impact on Bay Area populations of least terns, as ample nesting habitat would be available in other areas, especially given that 2007 was the first year in more than 25 years that the species nested in the Project Area. In addition, the construction of numerous islands in Ponds A16 and SF2 (with smaller numbers in Ponds E12 and E13) would increase the extent of available roosting and potential nesting habitat. Overall, Phase 1 actions are expected to result in a slight increase in potential foraging habitat for California least terns, primarily as a result of deep-water conditions in Ponds A5, A7, and A8 (areas near the species's primary South Bay staging area). Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-9: **Potential loss of pickleweed-dominated tidal salt marsh habitat for the salt marsh harvest mouse and salt marsh wandering shrew, and further isolation of these species' populations, due to breaching activities and scour.**

Potential construction-related impacts to pickleweed-dominated tidal marsh are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-9 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

As described for Alternative A for SBSP Impact 3.6-9 above, small losses of pickleweed-dominated tidal marsh may occur at ponds where uncontrolled breaching occurs, due to erosion and scour. Because such breaches would be unintentional, the locations and extent of habitat loss would not be controlled at all, and thus salt marsh harvest mouse and wandering shrew dispersal in any given area may be adversely affected in the short term. However, in the long term, uncontrolled breaching of levees would ultimately result in increases in tidal marsh habitat, a beneficial effect for tidal marsh-associated wildlife. This increase in habitat would offset any minor short-term impacts to pickleweed dominated tidal marsh and the dispersal or habitat of marsh-associated species. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Actions

Total direct impacts to existing wetlands from Phase 1 are expected to be approximately 15 acres. Indirect impacts of up to 100 acres from increased tidal scour are expected. The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would involve installation of water-control structures in pickleweed-dominated tidal marsh adjacent to the northern portion of Whale's Tail Marsh and along Mt. Eden Creek. Salt marsh harvest mice have been captured in marshes in both of these areas, and salt marsh wandering shrews are potentially present in both areas as well. Although impacts to these species could potentially occur through breaching and marsh scour, impacts would be minor and limited to small areas of marsh adjacent to planned water-control structures on existing levees. At Ponds E8A, E8X, and E9, a total of five external breaches and associated pilot channels would be excavated, for a total short-term impact of up to two acres of marsh. Tidal scour is also expected to occur in the existing marshes along the restored Mt. Eden Creek as well as OAC as a result of increased tidal prism after breaching. At Ponds E12 and E13, a new water intake structure at the northeast corner of Pond E12 and a new outlet structure and pilot channel at the western end of Pond E12 would result in a total impact not to exceed 0.5 acre. These minor impacts would have little effect on salt marsh harvest mouse or salt marsh wandering shrew dispersal and would be more than offset by the restoration of up to 630 acres of tidal salt marsh habitat in Ponds E8A, E8X, and E9.

Alviso. Phase 1 actions in Alviso involve the installation or replacement of water-control structures at Pond A16 in freshwater marsh habitat along Artesian Slough and connecting to Pond A15 to the west, as well as a new structure in freshwater marsh habitat in Alviso Slough upstream of the marina at Pond A8. The Pond A16 action is not expected to directly impact pickleweed dominated tidal marsh. However, the muted tidal action proposed for Pond A8 would affect the pickleweed habitat in Alviso Slough. First, marsh loss from increases in tidal prism is expected to be minor, and would largely affect the brackish marshes upstream from the pickleweed dominated tidal marsh habitat. However, the salinity in Alviso

Slough would increase as a result of the Pond A8 action, resulting in the conversion of some of the brackish marshes to pickleweed. These changes would likely result in a small net increase in overall acres of pickleweed in Alviso Slough.

At Pond A6, levee breaches and pilot tidal channels through pickleweed marsh at four locations (two on Alviso Slough and two on Guadalupe Slough) would impact a total of up to two acres of tidal marsh habitat. No trapping has been undertaken in the marshes adjoining Pond A6, but habitat here is appropriate for the salt marsh harvest mouse and wandering shrew. Although impacts to salt marsh harvest mice and wandering shrews could occur, impacts would be minor. These potential minor impacts would be greatly offset by the creation of up to 360 acres of tidal salt marsh habitat in Ponds A6, and the increase in salinity in Alviso Slough itself.

Ravenswood. Phase 1 actions at Ravenswood involve the creation of two water-control structures along the eastern edge of Pond SF2. The narrow strip of tidal marsh bordering Pond SF2 to the east is suitable for salt marsh harvest mice and wandering shrews, although no individuals have been trapped here. Although impacts to salt marsh harvest mice and wandering shrews could occur, impacts would be minor (up to 0.5 acre) and limited to two small areas of marsh adjacent to planned water-control structures on existing levees.

Net Phase 1 Effects. Although breaching activities and scour may result in impacts to a few individuals of the salt marsh harvest mouse and salt marsh wandering shrew populations, and may result in temporary loss of a few acres of habitat for these species, the net effect of Phase 1 actions on these species would be overwhelmingly beneficial due to the restoration of extensive habitat areas in nearly 1,000 acres of restored tidal habitat. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-10: **Potential construction-related loss of or disturbance to special-status, marsh-associated wildlife.**

Potential construction-related impacts to marsh-associated wildlife are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-10 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

To minimize impacts to special-status marsh-associated wildlife, work in and adjacent to tidal marsh habitat or within 500 ft (and possibly more, depending on the nature of the construction and location of the haul-out, subject to coordination with the National Marine Fisheries Service) of a known harbor seal haul-out would be conducted outside of the bird nesting season to the extent practicable. Work in these

areas that could cause disturbance or direct take (*e.g.*, accidental crushing of individuals or nests) would be limited to the period September 1 through February 1, to the extent practicable. This condition would minimize potential impacts to nesting birds and pupping harbor seals, although if work occurs within tidal salt marsh at any time of year, there is a potential for accidental crushing of California clapper rails or salt marsh harvest mice. If seasonal avoidance is not possible, pre-construction surveys would be conducted for California clapper rails and salt marsh harvest mice, and if these species are detected, Project implementation would be delayed or redesigned to minimize potential impacts.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, no construction-related impacts would occur.

Phase 1 No Action Level of Significance: No Impact

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would involve installation of water-control structures adjacent to the northern portion of Whale's Tail Marsh, and along Mt. Eden Creek. No primary harbor seal haul-outs are known from these areas, and thus, no impacts are expected to this species. California clapper rails are occasionally detected in the northern part of Whale's Tail Marsh, and the strip marsh along Pond E10 serves as a potential corridor for rail movement between Hayward and Whale's Tail Marsh populations. Thus, impacts to small areas of potential rail habitat adjacent to planned water-control structure modifications and possible disturbance of rails during construction could occur. Salt marsh harvest mice have been captured in northern Whale's Trail Marsh and along Mt. Eden Creek. Although impacts to salt marsh harvest mice and wandering shrews could occur, impacts would be minor and limited to small areas of marsh adjacent to planned water-control structures on existing levees, as discussed in SBSP Impact 3.6-10. Any potential minor impacts to marsh-associated wildlife due to construction activities would be greatly offset by the creation of up to 630 acres of tidal salt marsh habitat in Ponds E8A, E8X, and E9. Such habitat restoration would increase the extent of habitat for all special-status marsh-associated wildlife species substantially.

Alviso. Phase 1 actions in Alviso involve the installation or replacement of water-control structures at Pond A16 in freshwater marsh habitat along Artesian Slough and connecting to Pond A15 to the west, as well as a new structure in freshwater marsh habitat in Alviso Slough upstream of the marina for Pond A8. Marshes adjacent to construction areas at Ponds A16 and A8 receive little to no use by harbor seals, and California clapper rails are rarely recorded in the freshwater/brackish conditions in marshes at the locations of water-control structure construction at these ponds. Therefore, little to no effect on these species is expected by Phase 1 activities at Ponds A16 and A8. Harbor seals occur more frequently around Pond A6. However, the primary haul-out site is located across the mouth of Coyote Slough from Pond

A6, and is not expected to be adversely affected by any breaching activities at Pond A6. Tidal marsh habitat around Pond A6 is marginal for California clapper rails due to its narrow nature, but there is a possibility that individuals could occur adjacent to Pond A6. Avoidance and minimization measures would minimize impacts to California clapper rails.

No trapping has been undertaken in the marshes adjoining Pond A6, but habitat here is appropriate for the salt marsh harvest mouse and wandering shrew. Although impacts to salt marsh harvest mice and wandering shrews could occur during breaching, as discussed in SBSP Impact 3.6-10, impacts would be minor and limited to small areas of marsh adjacent to planned water-control structures and at breach locations. These potential minor impacts would be greatly offset by the creation of up to 260 acres of tidal salt marsh habitat in Pond A6. Such habitat restoration would increase the extent of habitat for all special-status marsh-associated wildlife species substantially.

Ravenswood. Phase 1 actions at Ravenswood involve the creation of two water-control structures along the eastern edge of Pond SF2. The narrow strip of tidal marsh bordering Pond SF2 to the east is not considered to be high quality California clapper rail habitat, and there are no major harbor seal haul-outs in this area. No trapping surveys for salt marsh harvest mice or wandering shrews have been conducted here, but the habitat is suitable. Although impacts to salt marsh harvest mice and wandering shrews could occur, impacts would be minor and limited to small areas of marsh adjacent to planned water-control structures on existing levees.

Net Phase 1 Effects. Construction activities may result in impacts to a few individuals of the salt marsh harvest mouse, salt marsh wandering shrew, and California clapper rail, the temporary loss of a few acres of habitat for these species, and the disturbance of these species, the harbor seal, and other marsh-associated wildlife species. However, given the current limited extent of habitat for tidal salt marsh species in the South Bay, the net effect of Phase 1 actions on marsh-associated wildlife species would be overwhelmingly beneficial due to the restoration of extensive habitat areas in nearly 1,000 acres of restored tidal habitat. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-11: **Potential construction-related loss of, or disturbance to, nesting pond-associated birds.**

Potential construction-related impacts to nesting pond-associated birds are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-11 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

To minimize such impacts, several impact avoidance and minimization measures are incorporated into the Project. Work in and adjacent to potential bird nesting habitat would be conducted outside of the avian nesting season to the extent practicable. Work in these areas that could cause disturbance or direct take (*e.g.*, accidental crushing of individuals or nests) would be limited to the period September 1 through February 1, to the extent practicable. This condition would minimize potential impacts to nesting birds. If seasonal avoidance is not possible, pre-construction surveys would be conducted for nesting birds. If any nesting pond-associated waterbirds are detected in areas that could be disturbed by Project-related construction activities, Project implementation would be delayed or redesigned to minimize potential impacts to actively nesting birds, or other measures may be taken to avoid impacts in consultation with USFWS and CDFG.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, no construction-related impacts would occur.

Phase 1 No Action Level of Significance: No Impact

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would involve installation of water-control structures within and adjacent to Ponds E12, E13, E8A, E8X, and E9, and the construction of internal berms and some islands in Ponds E12 and E13. As discussed under Phase 1 Impact 3.6-4 above, these ponds and adjacent areas are used by moderate numbers of breeding, pond-associated birds. However, with implementation of minimization measures (*e.g.,* seasonal avoidance of nesting birds and pre-construction surveys) described above, impacts to nesting birds as a result of construction-related disturbance are expected to be minimal, if any impacts occur at all.

Alviso. Phase 1 actions in Alviso involve two breaches on the east side and two breaches west sides of Pond A6, the installation of water-control structures, on the east side of Pond A8, and at Pond A16 along Artesian Slough and connecting to Pond A15 to the west. In addition, the internal levee within Pond A6 would be lowered, and there would be substantial grading within Pond A16. As discussed under Phase 1 Impact 3.6-4 above, these ponds are currently used by moderate numbers of breeding pond-associated birds. With implementation of minimization measures described above, impacts to nesting birds as a result of construction-related disturbance are expected to be minimal, if any impacts occur at all.

The large colony of California gulls in Pond A6 would be displaced as a result of conversion of this pond to tidal habitat, as discussed under Phase 1 Impact 3.6-4 above. However, construction at this pond would not occur when the colony is active.

Ravenswood. Phase 1 actions at Ravenswood involve the creation of two water-control structures along the eastern edge of Pond SF2, and the construction of internal berms and numerous islands within the pond. This pond is occasionally used by western snowy plovers, although relatively few nesting birds use this pond. With implementation of minimization measures described above, no impacts to nesting birds are expected.

Net Phase 1 Effects. Construction activities may result in impacts to a few individuals or nests of nesting pond-associated birds, but with implementation of impact minimization measures, any adverse effects on these birds are likely to be minimal. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-12: **Potential disturbance to or loss of sensitive wildlife species due to ongoing monitoring, maintenance, and management activities.**

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, there would be no increase in monitoring relative to existing levels. Although some ponds would continue to be managed, necessitating some management and maintenance, there would be a net decrease in management and maintenance activities, relative to existing conditions, under this alternative. Therefore, impacts would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Potential impacts to sensitive wildlife as a result of monitoring, maintenance, and management activities are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-12 above for a general discussion of this impact and the threshold of significance). Phase 1 actions were described in Section 2.5. Many of the monitoring, maintenance, and management activities would be beneficial overall, as they would help monitor and maintain desired conditions within the Project Area. However, these activities do have the potential to adversely affect biological resources, at least in the short term.

The SBSP Restoration Project incorporates measures to minimize impacts from monitoring, maintenance, and management, and it is anticipated that a number of measures to avoid and minimize such impacts to federally listed species would be required by the BO for this Project. Activities that are sufficiently loud or obtrusive enough to cause disturbance of nesting birds or pupping harbor seals, or direct take (*e.g.*, accidental crushing of individuals or nests), would be limited to the period of September 1 through

February 1, to the extent practicable, minimizing potential impacts. If seasonal avoidance is not possible, habitat assessments and/or pre-construction surveys would be conducted for nesting birds, salt marsh harvest mice, and other sensitive species. If any nesting pond-associated waterbirds are detected in areas that could be disturbed by Project-related construction activities, Project implementation would be delayed or redesigned to minimize potential impacts to actively nesting birds, or other measures may be taken to avoid impacts in consultation with USFWS and CDFG. In cases of emergency repairs (*e.g.,* to levees or water-control structures) or management (*e.g.,* if predator management becomes necessary during the bird nesting season), such activities would incorporate any measures recommended by USFWS and CDFG to minimize impacts. Otherwise, particularly obtrusive activities such as levee, berm, and island refurbishment, would occur between September 1 and February 1 unless pre-construction habitat assessments and surveys determine that no sensitive species would be adversely affected.

Net Phase 1 Effects. Potential impacts to sensitive wildlife from monitoring, maintenance, and management activities are discussed overall, rather than separately, for Phase 1 activities in each pond complex. Maintenance and management activities at each of the three SBSP pond complexes are expected to be similar, as managed ponds with islands, berms, levees, water-control structures, and other infrastructure would be present in each of the three complexes. Similarly, monitoring for the SBSP Restoration Project as a whole would occur throughout the SBSP Restoration Project Area.

Some specific studies (*e.g.,* the effects of salinity on densities of shorebirds and their prey in Ponds E12 and E13; the effects of island construction, size, and density on nesting bird densities in Ponds SF2 and A16; the effects of management for shallow water levels on shorebird densities in Ponds SF2 and A16; the effects of meHg at Pond A8; and other studies, as described in Section 2.5) would focus on the effects of specific Phase 1 activities. Thus, some monitoring specific to these Phase 1 studies has the potential to adversely affect sensitive wildlife as was described in detail for SBSP Impact 3.6-12. However, such impacts are expected to be similar over all complexes, and thus would not be described separately here.

With incorporation of impact avoidance and minimization measures into the Project, as described above, substantial impacts to biological resources as a result of monitoring, maintenance, and management activities are not anticipated. Rather, maintenance and management would have a net benefit on biological resources by maintaining desirable conditions, and the results of monitoring would inform adaptive management and the design of future phases of restoration. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-13: **Potential effects of habitat conversion and pond management on steelhead.**

Potential impacts to steelhead are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-13 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No

Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Eden Landing. Under the No Action Alternative, no new water-control structures would be added, but no fish screens would be added to existing structures. Thus, at least in the short term, any entrainment of steelhead currently occurring in the Eden Landing Phase 1 ponds (which is unlikely) would continue in the ponds that are being actively managed. In the Eden Landing pond complex, Ponds E8A, E9, E8X, E12, and E13 are eventually likely to become tidal due to the expected failure of levees, providing new estuarine foraging habitat for steelhead in the Eden Landing complex.

The quality of habitat in these restored marshes is likely to be lower under the No Action Alternative than under Phase 1 actions. Active, intentional restoration under the latter alternatives would involve breaches at strategic locations to take advantage of remnant slough networks, and would incorporate tidal ditch blocks to facilitate the development of complex channel networks. Unintentional breaching under the No Action Alternative would not necessarily optimize the subtidal habitats that could occur in restored marshes, in part because the lack of ditch blocks would result in existing borrow ditches capturing much of the tidal prism in breached ponds. Thus, while the net effect of No Action on steelhead would be potentially beneficial, this effect would not be as beneficial as under the Phase 1 actions. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Eden Landing Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alviso. Under the No Action Alternative, no new water-control structures would be added, but no fish screens would be added to existing structures. Thus, at least in the short term, any entrainment of steelhead currently occurring in the Alviso Phase 1 ponds would continue in the ponds that are being actively managed. While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6. Based on the location of A6 (at the mouth of Alviso Slough, which drains the Guadalupe River, a steelhead spawning stream), these aquatic habitats are expected to be used by steelhead. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alviso Landing Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Ravenswood. Under the No Action Alternative, no new water-control structures would be added, but no fish screens would be added to existing structures. Thus, there would be no change in the impacts of pond management at SF2 to steelhead, though it is unlikely that such management at SF2 adversely affects steelhead at all.

Ravenswood Phase 1 No Action Level of Significance: No Impact

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. Water-control structures would not be substantially different from those currently present at these ponds. In addition, steelhead do not use Mt. Eden Creek or OAC for spawning or access to spawning areas, and very few juvenile steelhead are expected to occur in Bay waters adjacent to these ponds. If steelhead occur in the vicinity of these ponds at all, they are more likely to benefit from the use of tidal marshes restored in Ponds E8A, E8X, and E9 than they are to be adversely affected by intake of water into Ponds E12 and E13. Overall, Phase 1 actions should have little to no effect on steelhead at Eden Landing.

Alviso. Phase 1 actions at Alviso would include opening of Pond A6 to tidal action, and management of Pond A16 as a shallow pond for shorebirds. Opening Pond A8 to muted tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. Such deep-water habitat in Ponds A5, A7, and A8 is likely to be seasonal if the notch at Pond A8 is closed in the wet season; water levels may need to be drawn down so as to provide flood storage capacity for the Lower Guadalupe River Project. Phase 1 actions would include the creation of one new water-control structure along Alviso Slough. Steelhead use Alviso Slough to migrate between marine waters and upstream spawning areas, and migrating fish could potentially enter Pond A7 through its intake structure, and potentially enter and exit Pond A8 through the notch that would be constructed there. Steelhead do not spawn along the streams draining into Guadalupe Slough, on which the Pond A5 intake structure is located, but it is possible that steelhead could enter Pond A5 through that structure as well; this structure already exists, and thus any ability of steelhead to enter Pond A5 through this structure is a baseline condition.

However, few steelhead are expected to be adversely affected by entrapment in Ponds A5, A7, and A8. Adults on their upstream migration are expected to follow Alviso Slough upstream, past these ponds, rather than entering the ponds. Furthermore, if the water-control structures in these ponds are closed during the wet season to provide flood storage capacity, these structures would likely be closed when adult steelhead are migrating upstream through Alviso Slough. Downstream-migrating adults and juveniles could potentially enter these ponds, if these fish were present in Alviso Slough when the water-control structures were open (after the rainy season). Because these ponds would be managed to provide muted tidal flow in and out of Pond A8, poor water quality is not expected to be an issue with these ponds, and thus any steelhead entering these ponds are not expected to incur elevated mortality rates. Any fish that enter through the open structures could exit the same way, and thus entrapment of steelhead within these ponds is likely to result in a very low-level effect, if it occurs at all. The creation of tidal salt marsh at Pond A6 is likely to benefit juvenile steelhead, which may forage in tidal channels here.

The intake to Pond A16 would be located through Pond A17 at the existing structure along Coyote Slough. Because steelhead use Coyote Slough while migrating between marine habitats and spawning areas upstream along Coyote Creek, there is some potential for steelhead to enter this intake and become entrained in Pond A16. Pond A16 would be managed for shallow-water conditions, and thus conditions within this pond may reduce survival for any steelhead that become trapped here. As a result, a fish screen would be installed at the intake to Pond A16, thus preventing (or at least minimizing) Phase 1 Project impacts to steelhead.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. Although steelhead are expected to migrate through the Bay past this pond, they are unlikely to be specifically attracted to the intake to this pond, and actions here are not likely to affect steelhead.

Net Phase 1 Effects. Phase 1 activities at Eden Landing and Ravenswood are expected to have little to no effect on steelhead, and any potential adverse effect from entrainment in Alviso would be minimized by the installation of a fish screen on the intake to Pond A16 and offset by the benefits of tidal restoration at Pond A6. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-14: **Potential impacts to estuarine fish.**

Potential impacts to estuarine fish are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-14 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Eden Landing. Under the Phase 1 No Action Alternative, estuarine fish are expected to benefit considerably from the increase in tidal habitat that would occur due to unintentional breaching of Ponds E8A, E8X, E9, E12, and E13. Although there would be some loss of managed pond habitat used by fish due to such unintentional breaches, managed ponds currently provide important habitat for relatively few fish species. Until these ponds breach, low water quality in discharges from these ponds could potentially adversely affect fish, although such impacts are expected to be minor, as pond managers are becoming increasingly adept at avoiding problems of low-water-quality discharges from managed ponds. Minor impacts to some species may occur due to entrapment within managed ponds, until the ponds are breached. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Eden Landing Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alviso. Under the Phase 1 No Action Alternative, estuarine fish are expected to benefit from the increase in tidal habitat that would occur due to unintentional breaching of Pond A6, which currently supports few fish since it is mostly dry. Low water quality in discharges from Ponds A8 and A16 could potentially adversely affect fish, although such impacts are expected to be minor (and no different from current conditions), as pond managers are becoming increasingly adept at avoiding problems of low-water-quality discharges from managed ponds. Minor impacts to some species may occur due to entrapment within managed ponds. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alviso Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Ravenswood. Pond SF2 is mostly dry much of the year, and management of this pond currently has little effect on estuarine fish. Under the No Action Alternative, there would be no change in the impacts of pond management at SF2 to estuarine fish.

Ravenswood Phase 1 No Action Level of Significance: No Impact

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. Currently, Ponds E12, E13, and E8X are seasonal ponds that do not provide important habitat for fish, and Ponds E8A and E9 likely support few estuarine fish. The creation of tidal salt marsh in Ponds E8A, E8X, and E9 would enhance habitat for estuarine fish considerably due to the restoration of extensive tidal channel networks. Water quality in discharges from Ponds E12 and E13 would be monitored to minimize adverse effects of low-quality discharges on biota in receiving waters, and only small numbers of fish would be adversely affected by entrainment within the intake of Ponds E12 and E13. Thus, the beneficial effects of tidal restoration in Ponds E8A, E8X, and E9 would far outweigh any minor adverse effect due to management of Ponds E12 and E13.

Alviso. Phase 1 actions at Alviso would include opening of Pond A6 to tidal action, management of Pond A8 for muted tidal conditions, and management of Pond A16 as a shallow pond for shorebirds. Currently, these ponds support very few fish. The increase in water depth in Ponds A5, A7, and A8, and the greater connectivity of Pond A8 to Bay waters, would enhance the quality of habitat in these ponds for fish, and the creation of tidal salt marsh with extensive channel networks in Pond A6 would also benefit estuarine fish. The quality of fish habitat in Pond A16 may be reduced somewhat relative to existing conditions, as this pond would be managed primarily for shallow-water conditions. Water quality in discharges from

Pond A16 would be monitored to minimize adverse effects of low-quality discharges on biota in receiving waters, and only small numbers of fish are expected to be adversely affected by entrainment within the intake of Pond A16, particularly because a fish screen would be installed on the intake to this pond. Thus, the beneficial effects of Phase 1 actions in Ponds A6 and A8 (as well as Ponds A5 and A7) would far outweigh any minor adverse effect due to management of Pond A16 as shallow-water habitat.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. Currently, this pond is dry during summer months, and supports few fish. Phase 1 actions are not likely to result in substantial changes in the quality of habitat for estuarine fish in this pond.

Net Phase 1 Effects. Phase 1 activities at Ravenswood are expected to have little effect on estuarine fish, while those at Eden Landing and Alviso would be overwhelmingly beneficial by increasing the extent and quality of subtidal habitat via tidal marsh restoration. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-15: **Potential impacts to piscivorous birds.**

Potential impacts to piscivorous birds are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-15 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood. Project effects on piscivorous birds are expected to track effects on estuarine fish fairly (see Phase 1 Impact 3.6-14) closely.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, conversion of some low-salinity ponds to tidal habitats through unintentional breaching, and to vegetated seasonal wetlands as a result of cessation of management, would reduce foraging habitat for piscivorous birds in managed ponds. However, the tidal habitats that develop in breached ponds would provide foraging habitat for some piscivores, and would result in increases in prey fish abundance. Tidal marshes that develop within these ponds may also provide nesting habitat for herons and egrets. Management of Pond SF2 at Ravenswood is expected to have little effect on piscivorous birds. Therefore, impacts would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. Currently, Ponds E12, E13, E8A, and E8X are seasonal ponds that do not provide important habitat for fish or piscivores, and Pond E9 supports low numbers of piscivorous birds (Athearn and Takekawa 2006). The creation of tidal salt marsh in Ponds E8A, E8X, and E9 would enhance fish numbers considerably due to the restoration of extensive tidal channel networks, and would thus improve the quality of foraging habitat for piscivorous birds, especially waders. Phase 1 actions would result in foraging habitat for piscivorous birds in Ponds E12 and E13 that is similar to current conditions. Thus, the overall effects of tidal restoration at Eden Landing to piscivorous birds would be beneficial.

Alviso. Phase 1 actions at Alviso would include opening of Pond A6 to tidal action, management of Pond A8 for muted tidal conditions, and management of Pond A16 as a shallow pond for shorebirds. Currently, Ponds A5 and A7 are used regularly by American white pelicans, although Ponds A6 and A8 are used by few piscivorous birds. Opening Pond A8 to muted tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. Deeper water habitat within Ponds A5, A7, and A8 is expected to enhance habitat for fish, and thus improve foraging conditions for piscivores relative to existing conditions, although depths are expected to be less during the wet season, when the A8 notch may be closed. The conversion of Pond A6 to tidal salt marsh would benefit South Bay estuarine fish populations and improve quality and availability of foraging habitat for piscivorous birds, especially waders. Habitat modification in Pond A16, which is not currently used heavily by piscivores, is not expected to substantially affect piscivorous birds, although the islands to be created within this pond may be used by roosting piscivores.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. This seasonal pond is currently used by very few piscivorous birds. Although maintenance of shallow-water conditions year round may improve foraging conditions for piscivorous birds somewhat, this pond is not expected to be used by large numbers of piscivores. Thus, habitat modification in Pond SF2 is not expected to substantially affect piscivorous birds, although the islands to be created within this pond may be used by roosting piscivores.

Net Phase 1 Effects. Phase 1 activities at Ravenswood are expected to have little effect on piscivorous birds. Phase 1 activities at Eden Landing and Alviso are expected to be beneficial by increasing fish populations and improving the extent and quality of foraging habitat via tidal marsh restoration and increases in the depth of Ponds A5, A7, and A8. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-16: **Potential impacts to dabbling ducks.**

Potential impacts to dabbling ducks are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-16 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Eden Landing. Under the No Action Alternative, managed pond habitat would be lost due to unintentional breaching and conversion of Ponds E8A, E8X, E9, E12, and E13 to vegetated seasonal wetlands. However, the tidal marshes that develop in the unintentionally breached ponds, and the seasonal wetlands that would form in some ponds prior to breaching, are both expected to provide nesting and foraging habitat for dabbling ducks. Overall, the Phase 1 No Action Alternative at Eden Landing is expected to have beneficial effects on dabbling ducks. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Eden Landing Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alviso. Under the No Action Alternative, managed pond habitat in A6 would be lost due to unintentional breaching. However, this pond currently supports low numbers of dabbling ducks because it is mostly dry, and the tidal habitats that develop in this pond after unintentional breaching are expected to provide foraging habitat for dabbling ducks. Habitat quality for dabbling ducks in those Phase 1 ponds that would continue to be managed (*i.e.*, A8 and A16) is not expected to change appreciably, compared to current conditions, under the Phase 1 No Action Alternative. Overall, the Phase 1 No Action Alternative at Alviso is expected to have beneficial effects on dabbling ducks. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alviso Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Ravenswood. Pond SF2 is currently used by very few dabbling ducks. Under the No Action Alternative, SF2 would continue to be managed much as it is currently. Thus, the Phase 1 No Action Alternative at Ravenswood is not expected to have substantial effects on dabbling ducks.

Ravenswood Phase 1 No Action Level of Significance: No Impact

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. Currently, these ponds support low to moderate numbers of foraging northern shovelers in winter, but only low numbers of other species, and no high-quality breeding habitat. Phase 1 actions would likely result in foraging habitat for dabbling ducks in Ponds E12 and E13 that is similar to current conditions during winter. However, because these ponds would be managed for shallow-water conditions year round, they may provide better foraging habitat in late summer and fall, when wintering waterfowl are arriving but rains have not yet filled seasonal ponds, than exists under current conditions.

Ponds E8A, E8X, and E9 currently support low numbers of dabbling ducks. Stralberg and others (2003) found that dabbling duck species richness in the South Bay tended to be higher in marshes than in salt ponds, and use of Ponds E8A, E8X, and E9 by dabbling ducks is expected to increase as a result of tidal restoration. Dabbling ducks are expected to take advantage of the extensive foraging habitat, roosting habitat, and cover provided by tidal channels and sloughs, and marsh ponds, and tidal restoration would also increase nesting habitat availability in high marsh. Phase 1 actions at Eden Landing would result in enhancement of habitat for dabbling ducks.

Alviso. Phase 1 actions at Alviso would include opening of Ponds A8 and A6 to tidal action, and management of Pond A16 as a shallow pond for shorebirds. Opening Pond A8 to tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. Currently, Ponds A5 and A7 provide good foraging habitat for dabbling ducks during winter, with regular counts of greater than 1,000 birds in each pond (Athearn and Takekawa 2006), although Pond A8 is used by relatively few dabbling ducks. Increasing the depth of water in Ponds A5, A7, and A8 may reduce suitability of these ponds for use by foraging dabbling ducks, which generally forage in shallow water. However, dabbling ducks are still expected to use these ponds to some extent, and water depths are expected to be less during the wet season, when dabbling duck numbers in the South Bay are highest, if the A8 notch is closed to provide flood storage. In addition, Pond A6 (which currently receives little use by dabbling ducks) would be enhanced by tidal restoration, and would provide foraging habitat, nesting habitat, and cover following tidal restoration. Habitat modification in Pond A16 would likely benefit dabbling ducks by providing roosting and nesting habitat on islands, and by maintaining shallow water foraging habitat.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. This pond is currently used by very few dabbling ducks. Winter habitat conditions would likely be similar to current conditions. However, because this pond would be managed for shallow-water conditions year round, it would provide better foraging habitat in late summer and fall, when wintering waterfowl are arriving but rains have not yet filled seasonal ponds, than exists under current conditions. Numerous islands would also be created in this pond, providing roosting and nesting habitat.

Overall, conditions are expected to improve for dabbling ducks in the Ravenswood pond complex as a result of Phase 1 activities.

Net Phase 1 Effects. Phase 1 activities at Ravenswood and Eden Landing are expected to benefit dabbling ducks overall by improving habitat conditions. In Ponds E12, E13, and SF2, habitat would improve somewhat by the maintenance of shallow-water foraging habitat year round, while in Ponds E8A, E8X, and E9, foraging habitat for dabbling ducks should improve as a result of tidal restoration. Although the increase in water depth in Ponds A5, A7, and A8, may adversely affect dabbling duck abundance to some extent, this impact may only occur seasonally, and is expected to be offset by tidal restoration at Pond A6 and management of shallow-water conditions in Pond A16. Nesting habitat would be enhanced in most ponds relative to existing conditions due to tidal restoration (which would eventually provide nesting habitat in the high marsh) and the construction of nesting islands (islands with some vegetation are expected to be used for nesting). Overall, Phase 1 effects on dabbling ducks are expected to be beneficial. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-17: **Potential impacts to harbor seals.**

Potential impacts to harbors seals are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-17 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Effects of Phase 1 actions on harbor seals related to construction-related disturbance, recreation-related disturbance, monitoring-related disturbance, loss of mudflat habitat, and changes in mercury availability are addressed in separate sections. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Eden Landing. Under the No Action Alternative, unintentional breaching of Ponds E8A, E8X, E9, E12, and E13 would convert these ponds to tidal habitats, increasing estuarine fish abundance and potentially augmenting foraging and haul-out habitat for harbor seals. Overall, the Phase 1 No Action Alternative at Eden Landing is expected to have beneficial effects on harbor seals. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Eden Landing Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alviso. Under the No Action Alternative, unintentional breaching of Pond A6 would convert this pond to tidal habitats, increasing estuarine fish abundance and potentially augmenting foraging and haul-out

habitat for harbor seals. Any minor effects on harbor seals of activities in those Phase 1 ponds that would continue to be managed (*i.e.*, A8 and A16) are not expected to change appreciably, compared to current conditions, under the Phase 1 No Action Alternative. Overall, the Phase 1 No Action Alternative at Alviso is expected to have beneficial effects on harbor seals. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alviso Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Ravenswood. Under the No Action Alternative, SF2 would continue to be managed much as it is currently, and any minor effects (*e.g.*, from discharge water quality) on harbor seals that currently occur due to management of Pond SF2 are not expected to change appreciably, compared to current conditions, under the Phase 1 No Action Alternative. Thus, the Phase 1 No Action Alternative at Ravenswood is not expected to have substantial effects on harbor seals. Therefore, impacts would be less than significant.

Ravenswood Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. Currently, there are no major harbor seal haul-outs or pupping areas at, or adjacent to, Eden Landing. The creation of tidal salt marsh in Ponds E8A, E8X, and E9 would expand subtidal foraging habitat and increase the availability of potential haul-out locations for harbor seals along OAC, and increase prey fish populations as well.

Alviso. Phase 1 actions at Alviso would include opening of Ponds A8 and A6 to tidal action, and management of Pond A16 as a shallow pond for shorebirds. There is a major harbor-seal pupping area and haul-out at Mowry Slough, a few miles north of Pond A6, and moderate numbers of seals haul out across Coyote Slough from A6 (near Calaveras Point). Phase 1 actions are not expected to have any negative effects on harbor seals at Alviso. Rather, tidal restoration in Pond A6 would expand subtidal foraging habitat, increase the availability of potential haul-out locations for harbor seals, and increase prey fish populations. Phase 1 activities at Ponds A8 and A16 are not expected to have substantial effects on harbor seals.

Ravenswood. Phase 1 actions at Pond SF2 would have no effect on harbor seals, which do not use the mudflats off this pond heavily.

Net Phase 1 Effects. Phase 1 activities at Ravenswood are not expected to affect harbor seals, either positively or negatively. Phase 1 actions at Eden Landing and, especially, Alviso are expected to benefit harbor seals, as tidal restoration in Ponds E8A, E8X, E9, and A6 would expand subtidal foraging habitat,

increase the availability of potential haul-out locations for harbor seals, and increase prey fish populations. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Phase 1 Impact 3.6-18: **Potential recreation-oriented impacts to sensitive species and their habitats.**

Potential recreation-oriented impacts to sensitive species and their habitats are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-18 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, no additional recreation access would be planned. Although unintentional breaching of unmanaged pond levees may increase the potential for boating within restored sloughs, the benefits of such tidal restoration to tidal species would outweigh any adverse effects from disturbance associated with increased boating. Therefore, impacts would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would involve the installation of a kayak/boat launch, a year-round access trail to the west end of Pond E12, a salt works interpretive station at the end of this year-round trail, a seasonal trail to the mouth of Mt. Eden Creek, a viewing platform at the end of this trail, and a seasonal loop trail around Ponds E13 and E14. Because the trails around Ponds E13 and E14 would be subject to closure during the western snowy plover nesting season, impacts of recreational access on this species would be minimal.

Increased recreational access has the potential to impact sensitive species and their habitats in the manner described in SBSP Impact 3.6-18. Because these areas are not currently open to public access, human activity along these trails could adversely affect wildlife such as nesting, roosting, and foraging birds that currently use Ponds E10, E11, E12, E13, and E14, as well as some of the Eden Landing ponds and marshes outside of the SBSP Restoration Project Area. What limited human access (*e.g.,* for monitoring) currently occurs in these areas affects relatively small areas of each of these ponds, and it is likely that

disturbance from recreational access would be limited to relatively small areas along the public trails. However, these effects would be monitored and managed, and implementation of the Adaptive Management Plan (Appendix D) would ensure that impacts to sensitive species and their habitats do not reach significant levels.

Alviso. Phase 1 actions in Alviso would involve the installation of an interpretive station on the east side of Pond A16, a viewing platform on the south side of Pond A16, and the completion of the Bay Trail spine from Stevens Creek to Sunnyvale, north of Moffett Federal Airfield. Trails around Pond A16 are already open to the public. Because A16 would be managed for shallow-water habitat conditions, and would have numerous islands, under Phase 1, recreational access has the potential to result in disturbance of roosting, nesting, and foraging birds. However, such disturbance would likely be limited to relatively narrow corridors along the edges of the pond, and nesting islands would be located at least 300 ft from the edges of the pond, and 600 ft from wildlife observation platforms, to minimize human disturbance of birds nesting on islands within A16. The ponds adjacent to the Stevens Creek-Sunnyvale trail do not support substantial numbers of birds that are sensitive to human disturbance. Although increased recreational access has the potential to impact sensitive species and their habitats in the manner described in SBSP Impact 3.6-18, these effects would be monitored and managed. Also, as described in SBSP Impact 3.6-18, the Project includes measures to minimize impacts to western pond turtles near Moffett Federal Airfield. Implementation of the Adaptive Management Plan (Appendix D) would further ensure that impacts to sensitive species and their habitats do not reach significant levels.

Ravenswood. Phase 1 actions at Ravenswood involve the creation of an interpretive station at Bayfront Park (with the City of Menlo Park) and two viewing platforms on the eastern side of Pond SF2, and trail rehabilitation along the existing levee along the east and south edges of Pond SF2. Because SF2 would be managed for shallow-water habitat conditions, and would have numerous islands, under Phase 1, recreational access has the potential to result in disturbance of roosting, nesting, and foraging birds. However, such disturbance would likely be limited to relatively narrow corridors along the edges of the pond; nesting islands would be located at least 300 ft from the edges of the pond, and 600 ft from wildlife observation platforms, to minimize human disturbance of birds nesting on islands within Pond SF2. Although increased recreational access has the potential to adversely affect sensitive species and their habitats in the manner described in SBSP Impact 3.6-18, these effects would be monitored and managed. Implementation of the Adaptive Management Plan (Appendix D) would ensure that impacts to sensitive species and their habitats do not reach significant levels.

Net Phase 1 Effects. Increased recreational access resulting from Phase 1 activities may impact sensitive species and their habitats. However, these effects would be monitored and managed, and implementation of the Adaptive Management Plan (Appendix D) would ensure that impacts to sensitive species and their habitats do not reach significant levels. Public access has considerable potential to result in long-term benefits to sensitive species in the South Bay by improving public education concerning the importance of the SBSP Restoration Project, and habitat restoration and South Bay conservation in general. Such education and public enjoyment of the South Bay's biological resources may be important in maintaining public support for adequate funding for future phases of restoration and long-term monitoring and management of SBSP Restoration Project-area habitats. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-19: **Potential impacts to special-status plants.**

Potential impacts to special-status plants are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-19 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Eden Landing. There are no known populations of special-status plants at Eden Landing likely to be affected by the No Action Alternative. Under this alternative, potential habitat for special-status plants could be enhanced through the uncontrolled breaching of existing salt pond levees and subsequent restoration of tidal marsh in Ponds E8A, E8X, E9, E12, and E13. However, because such restoration is uncontrolled, the high marsh/upland transition habitat and beach habitat used by special-status plants in the Bay Area are not expected to develop, at least not to the level of quality that would be achieved through directed restoration under the Phase 1 actions. Therefore, there is a low probability that special-status plants would be affected, either adversely or beneficially, due to the Phase 1 No Action Alternative at Eden Landing.

Alviso. There are no known populations of special-status plants at Alviso likely to be affected by the No Action Alternative. While Pond A6 would continue to be operated as a seasonal pond in the short term, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6. Such habitats are not expected to support special-status plants. Therefore, there is a low probability that special-status plants would be affected, either adversely or beneficially, due to the Phase 1 No Action Alternative at Alviso.

Ravenswood. Under the No Action Alternative, SF2 would continue to be managed much as it is currently. Because there are no known populations of special-status plants at Pond SF2 likely to be affected by the No Action Alternative, there is a low probability that special-status plants would be affected at all, either adversely or beneficially, due to the Phase 1 No Action Alternative at Pond SF2. Therefore, impacts under the No Action Alternative would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

No threatened or endangered plants are known or are expected to occur in the Phase 1 Project Area. Similarly, there are no known populations of other special status plants that are likely to be affected by the restoration actions. Pre-construction surveys at all of the proposed Phase 1 restoration action locations would be performed to ensure that no special-status plants are adversely affected. No revegetation or upland transition habitat creation is being proposed to specifically benefit special-status plants as a part of Phase 1, and there is a low probability that special-status plants would be affected, either adversely or beneficially, due to the Phase 1 actions. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-20: **Colonization of mudflats and marshplain by non-native *Spartina* and its hybrids.**

Potential impacts from smooth cordgrass and its hybrids are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-20 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Eden Landing. Under the No Action Alternative, some existing levees and water-control structures would no longer be maintained and would fail, and eventually Ponds E8A, E8X, E9, E12, and E13 are likely to breach and eventually become vegetated tidal marsh. The potential uncontrolled nature of levee breaching under the No Action Alternative could lead to locations and timing of tidal restoration that are counterproductive to the efforts of the Invasive *Spartina* Project. Additionally, the lack of monitoring under the No Action Alternative would increase the burden on existing eradication efforts in identifying potential areas of concern. Therefore, if invasive *Spartina* is not controlled by the Invasive *Spartina* Project, impacts resulting from the No Action Alternative could be significant. However, if invasive *Spartina* is controlled by the Invasive *Spartina* Project as the Project has assumed, this impact should not be substantial. Therefore, impacts would be less than significant.

Eden Landing Phase 1 No Action Level of Significance: Less than Significant

Alviso. Under the No Action Alternative, Pond A6 would continue to be operated as a seasonal pond in the short term. However, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6. Although these habitats are unlikely to be colonized by *Spartina* due to erosive wave action, the lack of monitoring under the No Action Alternative would increase the burden on existing eradication efforts in identifying potential areas of concern. If invasive *Spartina* is controlled by the Invasive *Spartina* Project as the Project has assumed, this impact should not be substantial. Therefore, impacts would be less than significant.

Alviso Phase 1 No Action Level of Significance: Less than Significant

Ravenswood. Under the No Action Alternative, SF2 would continue to be maintained as a managed pond; such management is not expected to affect colonization by invasive *Spartina*.

Ravenswood Phase 1 No Action Level of Significance: No Impact

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. The Eden Landing Pond complex presents a greater challenge than the other pond complexes for controlling smooth cordgrass and its hybrids by 2008. Eden Landing is densely infested with smooth cordgrass and its hybrids. The densest infestation of smooth cordgrass and its hybrids in San Francisco Bay occurs in ponds adjacent to the Project site near the Alameda Flood Control Channel, and in OAC, adjacent to the site where smooth cordgrass was initially introduced. These dense stands provide a nearby source of seed dispersal to the Eden Landing restoration area that may compromise (via competition) the establishment of native vegetation in the Eden Landing restoration area. It is unlikely that smooth cordgrass and its hybrids would be completely controlled in the Eden Landing area prior to 2008 (E. Grijalva, pers. comm.).

Prior to 2005, treatment of invasive *Spartina* in the Eden Landing pond complex has had only limited efficacy (E. Grijalva, pers. comm.). Initial research trials in 2004 using the herbicide imazapyr along OAC produced mixed results. In 2005, the areas surrounding and including the Eden Landing pond complex were extensively treated with imazapyr. In 2006, the Invasive Spartina Project treated 94 percent of the Bay Area occurrences of non-native cordgrass (approximately 1,450 acres), with 60-90 percent of occurrences killed (Olofson 2007), indicating substantial improvements in the effectiveness of cordgrass control.

If opened to tidal action, the large acreage of the Eden Landing pond complex may present problems for detecting patches of smooth cordgrass and its hybrids both prior to treatment, and during post-treatment monitoring due to the difficulty of accessing interior areas. If breached prior to eradication of smooth cordgrass and its hybrids from the surrounding marshes, it is possible that these hybrids would rapidly colonize the restored ponds. Eradication of an invasion of smooth cordgrass and its hybrids into the Eden

Landing pond complex may require long-term planning, as well as staff and financial resources dedicated to control of smooth cordgrass and its hybrids. The biologically preferable approach is to prevent invasion of smooth cordgrass and its hybrids into the Eden Landing pond complex. This would greatly reduce the need for future monitoring and control efforts. The Adaptive Management Plan is designed to prevent smooth cordgrass and its hybrids from having a significant impact on the larger baywide eradication effort or on the habitat quality of the restored tidal marshes. Therefore, impacts would be less than significant.

Eden Landing Phase 1 Actions Level of Significance: Less than Significant

Alviso. Overall, the Invasive Spartina Project predicts that by 2008 the Alviso pond complex vicinity would be reasonably free from smooth cordgrass (E. Grijalva, pers. comm.). These areas currently do not contain dense stands of smooth cordgrass and its hybrids. However, there are some dense stands of non-native cordgrass in the vicinity of Pond A6, and it is possible that breaching of Pond A6 will be delayed until these stands are eradicated. Local managers, including SCVWD, the Refuge, Cooley Landing managers, and the City of Palo Alto are coordinating with the ISP and actively controlling smooth cordgrass and its hybrids in this vicinity. Therefore, impacts would be less than significant.

Alviso Phase 1 Actions Level of Significance: Less than Significant

Ravenswood. Likewise, the Invasive Spartina Project predicts that smooth cordgrass and its hybrids would be reasonably under control in the area surrounding the Ravenswood pond complex by 2008 (E. Grijalva, pers. comm.). The San Mateo County Mosquito Abatement District is treating the limited number of patches around the Ravenswood pond complex, and throughout San Mateo County, beginning in 2004. The City of Palo Alto is also controlling smooth cordgrass and its hybrids in this area. In addition, no tidal restoration is being proposed in Phase 1 for the Ravenswood pond complex, and management of Pond SF2 is not expected to affect colonization by invasive *Spartina*.

Ravenswood Phase 1 Actions Level of Significance: No Impact

Net Phase 1 Effects. The net effect of Phase 1 activities on the further establishment and spread of smooth cordgrass and its hybrids depends primarily on the degree to which control efforts currently being undertaken by the Invasive *Spartina* Project and South Bay localities are effective in controlling this species' populations. If these control efforts can reduce the extent of potential sources of smooth cordgrass and its hybrids, Phase 1 restoration activities have a higher probability of resulting in the establishment of tidal marshes dominated by the native Pacific cordgrass. If invasive *Spartina* is not controlled by the Invasive *Spartina* Project, and no adaptive management measures were implemented, effects of Phase 1 activities on the spread of smooth cordgrass and its hybrids could be significant. The Adaptive Management Plan (Appendix D) would be implemented to prevent smooth cordgrass and its hybrids from having a significant impact on the larger baywide eradication effort or on the habitat quality of the restored tidal habitats. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-21: **Colonization by non-native *Lepidium*.**

Potential impacts from *Lepidium* are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-21 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood. The adaptive management triggers in place for non-native vegetation would prevent *Lepidium* from exceeding 10 percent of any particular habitat zone before eradication efforts are initiated.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Eden Landing. Under the No Action Alternative, some existing levees and water-control structures would no longer be maintained and would fail, and eventually Ponds E8A, E8X, E9, E12, and E13 are likely to breach and eventually become vegetated tidal marsh. The potential uncontrolled nature of levee breaching under the No Action Alternative could lead to locations and timing of tidal restoration that may provide new areas for potential *Lepidium* colonization. Additionally, no monitoring for potential *Lepidium* colonization would take place under the No Action Alternative. However, it is anticipated that the increased salinity and tidal scour associated with additional tidal prism resulting from levee breaching would offset any potential new brackish marsh areas that would be susceptible to *Lepidium* colonization. Therefore, impacts would be less than significant.

Eden Landing Phase 1 No Action Level of Significance: Less than Significant

Alviso. Under the No Action Alternative, Pond A6 would continue to be operated as a seasonal pond in the short term. However, the bayfront levee around Pond A6 is actively eroding and would likely not be maintained, eventually resulting in the unplanned breaching of levees and development of open bay and intertidal mudflat habitat in A6. These habitats are unlikely to be colonized by *Lepidium* due to erosive wave action, although small amounts of *Lepidium* could establish on remnant levees. Therefore, impacts would be less than significant.

Alviso Phase 1 No Action Level of Significance: Less than Significant

Ravenswood. Under the No Action Alternative, SF2 would continue to be maintained as a managed pond; such management is not expected to affect colonization by non-native *Lepidium*.

Ravenswood Phase 1 No Action Level of Significance: No Impact

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. The tidal restoration of Ponds E8, E8X and E9 would increase the tidal prism in OAC. This is expected to have a small impact on the brackish marsh habitat upstream of the breach locations, potentially increasing the extent of salt marsh that is not optimal for *Lepidium* colonization and moving the zone of *Lepidium* infestation farther upstream.

Island and berm creation in Ponds E12 and E13 would create potential new substrate for *Lepidium* colonization. However, vegetation maintenance is a key component of the Adaptive Management Plan for nesting birds.

Alviso. The tidal restoration of Pond A6 and the increase in tidal circulation in Pond A8 would increase the tidal prism in Alviso Slough. This is expected to reduce the amount of brackish marsh habitat available for colonization by *Lepidium*.

Island and berm creation in Pond A16 would create potential new substrate for *Lepidium* colonization. However, vegetation maintenance is a key component of the Adaptive Management Plan for nesting birds.

Ravenswood. Island and berm creation in Pond SF2 would create potential new substrate for *Lepidium* colonization. However, vegetation maintenance is a key component of the Adaptive Management Plan for nesting birds.

Net Phase 1 Effects. Phase 1 activities would likely reduce the area that is suitable for *Lepidium* colonization by increasing the tidal prism along OAC and Alviso Slough. However, some portions of the tidal marsh that develops within Ponds A6, E8A, E8X, and E9 may support this species, and vegetation management would be necessary to prevent *Lepidium* from infesting the islands created in each of the three pond complexes as part of Phase 1 activities. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-22: **Potential increase in exposure of wildlife to avian botulism and other diseases.**

Potential impacts to South Bay wildlife, in particular waterbirds, due to diseases are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-22 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Under the No Action Alternative, the number and extent of managed ponds would be reduced as a result of unintentional breaching (*i.e.*, at Ponds E8A, E8X, E9, E12, E13, and A6), which would reduce the number of managed ponds over time. However, the number of ponds in which avian botulism might be cultivated may increase, at least in the short term, as these ponds may have poor water circulation during the period in which they are unmanaged, seasonal ponds, enhancing the conditions that could result in an avian botulism outbreak. Furthermore, poorly drained marshes that may develop as a result of unplanned levee breaches may also foster conditions conducive to an outbreak. With limited funding for monitoring and pond maintenance (*e.g.*, to maintain adequate water circulation), there is some potential for impacts of avian botulism on waterbirds in the South Bay to be substantial in the short term. However, the Phase 1 ponds that would be maintained as managed ponds in the long term under the No Action Alternative (*i.e.*, SF2, A8, and A16) would receive some maintenance and management attention from the landowners, and USFWS and CDFG staff would be expected to note any evidence of avian botulism (*i.e.*, afflicted birds) and respond to such outbreaks as necessary. As a result, it is unlikely that the No Action Alternative is expected to result in substantially increased exposure of wildlife to diseases in the long term. Therefore, impacts would be less than significant.

Phase 1 No Action Level of Significance: Less than Significant

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. The restored tidal habitats are not expected to foster wildlife diseases. Although the management of Ponds E12 and E13 as shallow ponds may improve conditions for avian botulism, these ponds (and the birds using them) would be managed and monitored closely as part of the Phase 1 experiment proposed here, and any evidence of avian botulism (*i.e.*, afflicted birds) would be quickly noted and addressed. As a result, outbreaks of avian botulism affecting large numbers of birds are not expected to occur in these ponds.

Alviso. Phase 1 actions at Alviso would include opening of Pond A6 to tidal action, muted tidal action in A8, and management of Pond A16 as a shallow pond, primarily for shorebirds. Tidal habitats at A6, and muted tidal habitats at A8 (when water-control structures are not close), are not expected to provide conditions conducive to an avian botulism outbreak. If the water-control structures in the Pond A5/A7/A8 system are closed for long periods, to provide flood storage capacity, they would be closed only during the wet season. High-temperature, low-oxygen conditions that favor avian botulism would not be present during this season, and it is therefore unlikely that the A5/A7/A8 system would provide conditions favorable for an outbreak. The management of Pond A16 as a shallow-water system has the potential to

improve conditions for avian botulism. However, this pond would be reconfigured to ensure adequate circulation of water to avoid low-oxygen conditions. In addition, implementation of other measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for such outbreaks. It is assumed that observers conducting regular bird monitoring surveys, as well as USFWS and CDFG staff, would note any evidence of avian botulism (*i.e.*, afflicted birds) and respond to such outbreaks as necessary.

Ravenswood. Phase 1 actions at Ravenswood involve the creation of two water-control structures along the eastern edge of Pond SF2, and the construction of internal berms and numerous islands within the pond. This pond would be managed for waterbirds, largely with shallow-water conditions. These conditions have the potential to foster avian botulism. However, this pond would be reconfigured to ensure adequate circulation of water to avoid low-oxygen conditions. In addition, implementation of other measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for such outbreaks. It is assumed that observers conducting regular bird monitoring surveys, as well as USFWS and CDFG staff, would note any evidence of avian botulism (*i.e.*, afflicted birds) and respond to such outbreaks as necessary.

Net Phase 1 Effects. Phase 1 activities include the management of Ponds E12, E13, A16, and SF2 as shallow-water ponds. Such ponds have the potential to support warm, low-oxygen water that favors avian botulism. However, adequate circulation within these ponds, monitoring of pond conditions, monitoring of birds for signs of avian botulism, and adaptive management as necessary to avoid conditions that favor this disease would avoid any adverse effects on waterbirds from reaching significant levels. Therefore, impacts would be less than significant.

Phase 1 Actions Level of Significance: Less than Significant

Phase 1 Impact 3.6-23: **Potential impacts to bay shrimp populations.**

Potential impacts to bay shrimp are addressed in detail above (see the program-level evaluation under SBSP Impact 3.6-23 above for a general discussion of this impact and the threshold of significance). Here, project-level impacts of the implementation of Phase 1 of the SBSP Restoration Project as well as the No Action are assessed. Phase 1 actions were described in Section 2.5. Project-level effects are addressed for each of the SBSP Restoration Project pond complexes: Eden Landing, Alviso, and Ravenswood.

Phase 1 No Action

The following discussion addresses the No Action Alternative (Alternative A) at the project level.

Eden Landing. Under the Phase 1 No Action Alternative, bay shrimp are expected to benefit considerably from the increase in tidal habitat that would occur due to unintentional breaching of Ponds E8A, E8X, E9, E12, and E13. Until these ponds breach, low water quality in discharges from these ponds

could potentially adversely affect bay shrimp, although such impacts are expected to be minor, as pond managers are becoming increasingly adept at avoiding problems of low water quality discharges from managed ponds. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Eden Landing Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Alviso. Under the Phase 1 No Action Alternative, bay shrimp are expected to benefit from the increase in tidal habitat that would occur due to unintentional breaching of Pond A6. Low water quality in discharges from Ponds A8 and A16 could potentially adversely affect bay shrimp, although such impacts are expected to be minor (and no different from current conditions), as pond managers are becoming increasingly adept at avoiding problems of low water quality discharges from managed ponds. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Alviso Phase 1 No Action Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)

Ravenswood. Management of Pond SF2 currently has little effect on bay shrimp. Under the No Action Alternative, there would be no change in the impacts of pond management at SF2 to bay shrimp.

Ravenswood Phase 1 No Action Level of Significance: No Impact

Phase 1 Actions

The following discussion addresses the Phase 1 actions (the first phase of Alternatives B and C) at the project level.

Eden Landing. Phase 1 actions at Eden Landing would include the conversion of Ponds E8A, E8X, and E9 to full tidal action, and conversion of Ponds E12 and E13 to a series of shallow ponds that have a range of salinities and are managed specifically as foraging habitat for small shorebirds. If bay shrimp occur in the vicinity of these ponds at all, they are more likely to benefit from the use of tidal marshes restored in Ponds E8A, E8X, and E9 than they are to be adversely affected by any discharges from Ponds E12 and E13. Overall, Phase 1 actions should have little to no effect, or possibly a beneficial effect, on bay shrimp at Eden Landing.

Alviso. Phase 1 actions at Alviso would include opening of Pond A6 to tidal action, muted tidal in A8, and management of Pond A16 as a shallow pond for shorebirds. Opening Pond A8 to tidal action would result in deeper water in this pond, as well as in Ponds A5 and A7, through which water would flow to reach Pond A8. Phase 1 actions would include the creation of one new water-control structure along Alviso Slough. These ponds would be managed to provide muted tidal flow in and out of Pond A8, and poor water quality is not expected to be an issue with these ponds. Therefore, any bay shrimp entering these ponds are not expected to incur elevated mortality rates, and discharge from these ponds is not expected to adversely affect any shrimp occurring in Alviso or Guadalupe Sloughs. The creation of tidal

salt marsh at Pond A6 is likely to benefit bay shrimp, which may utilize tidal sloughs within the restored marsh as nurseries.

The intake to Pond A16 would be located through Pond A17 at the existing structure along Coyote Slough. Pond A16 would be managed for shallow-water conditions, with the effluent entering Artesian Slough from the south end of A16. Pond A16 would be reconfigured to ensure adequate circulation of water to avoid low-oxygen conditions. In addition, implementation of other measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for water-quality problems associated with discharges from Pond A16. Management of Pond A16 is thus not expected to result in substantial effects on bay shrimp.

Ravenswood. Under Phase 1, Pond SF2 would be managed as shallow-water habitat primarily for foraging shorebirds. Implementation of measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for water-quality problems associated with discharges from Pond SF2. Management of this pond is not expected to result in substantial effects on bay shrimp.

Net Phase 1 Effects. Phase 1 activities are expected to have a net beneficial effect on bay shrimp due to tidal marsh restoration. Implementation of measures to avoid low DO conditions (see Section 3.4), including monitoring and adaptive management, is expected to minimize the potential for water-quality problems associated with discharges from managed ponds. Therefore, impacts would be less than significant under CEQA and beneficial under NEPA.

Phase 1 Actions Level of Significance: Less than Significant (CEQA); Beneficial (NEPA)