

APPENDIX G

Biological Resources Information

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APPENDIX G-1
Previous Biological Studies

PREVIOUS BIOLOGICAL STUDIES

Several biological studies, including habitat evaluation technical memorandums and presence/absence survey reports, have been prepared in support of the proposed project and earlier versions of the proposed project. Previous biological studies for the proposed project were prepared between December 2003 and April 2008 by Vollmar Consulting, Wetlands and Water Resources (WWR), Inc., Wetland Wildlife Associates (WWA), and Condor Country Consulting under contract with the City. Previously prepared biological documents that were used in the development of this biological resources evaluation are listed below.

- Terrestrial Wildlife Habitat Evaluation Hercules Ferry/Intermodal Terminal Project (Vollmar 2006)
- Hercules Multimodal Transit Facility Project Eelgrass and Widgeongrass Presence/Absence Survey and Bathymetric Survey (WWR 2007b)
- Hercules Multimodal Transit Facility Fish and Fisheries Assessment (WWR 2007a)
- Hercules Ferry Intermodal Terminal Project, 90-Day Survey Report, 2007 Wet Season Large Branchiopod Surveys (Vollmar 2007)
- Bird Surveys for the Hercules Ferry Terminal Project (WWA 2007)
- Hercules Intermodal Transit Facility Delineation of Potential Jurisdictional Waters of the U.S. (Vollmar 2008; included as part of wetland delineation report in **Appendix G-2**)
- Biological Evaluation Report – Chelsea Wetland Restoration Project (WWR 2009)

Focused biological surveys were conducted to determine presence/absence of the following species on the project site:

- Eelgrass (*Zostera marina*) and widgeongrass (*Ruppia maritima*) beds;
- Federally-listed vernal pool branchiopods;
- California clapper rail (*Rallus longirostris* spp. *obsoletus*);
- California black rail (*Laterallus jamaicensis coturniculus*);
- San Pablo song sparrow (*Melospiza melodia samuelis*); and
- Burrowing owl (*Athene cunicularia*).

These surveys are summarized below.

Eelgrass, Widgeongrass, and Bathymetric Survey

WWR conducted field surveys for sensitive aquatic habitats, particularly eelgrass and widgeongrass beds, for the Hercules ITC project (WWR 2007b) prior to the project being

redefined to not include construction of the ferry terminal and dredging operations to provide a channel for ferry access from San Pablo Bay. The survey also included a Class 1 hydrographic survey of the San Pablo Bay seafloor to provide current bathymetric data in the area near the project site. The survey footprint covered all areas within the current project boundary and included approximately 650 acres between the shoreline and -6.6 ft (-2 m) Mean Lower Low Water (MLLW) in the area where the proposed navigation channels were planned to be dredged and where ferry wake wash could be a factor. No eelgrass or widgeongrass beds or individual shoots were detected within the survey footprint. This document is included as **Appendix G-3**.

HDR conducted a visual survey for eelgrass beds in the spring of 2010 (HDR 2010). HDR biologists walked the intertidal mudflat habitat within the project boundaries during low tide and visually scanned the area for eelgrass or any other type of seagrass. No eelgrass or any other type of seagrass was observed.

Surveys for Federally-listed Vernal Pool Branchiopods

Wet season surveys for federally-listed vernal pool branchiopods were conducted on the western portion of the project site during the 2003-2004 rainy season by Condor Country Consulting (Vollmar 2007); and on the eastern portion of the project site during the 2007-2008 rainy season by Vollmar Consulting (Vollmar 2007). For both surveys, the project site was monitored to determine when the puddles within the railroad ROW had filled. Surveys were conducted every two weeks, beginning when the puddles filled and ending when all pools were dry. All surveys were conducted according to the Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods (USFWS 1996a). One common species of fairy shrimp, the versatile fairy shrimp (*Branchinecta lindahli*), was observed in several of the pools in the project site. No federally-listed vernal pool branchiopods were observed. Wet season surveys for federally-listed vernal pool branchiopods were also conducted during the 2009/2010 rainy season by HDR. No federally-listed vernal pool branchiopods were observed by HDR in 2009/2010. Fairy shrimp survey are included as **Appendix G-4**.

Bird Surveys

Focused surveys for California clapper rail (*Rallus longirostris* spp. *obsoletus*), California black rail (*Laterallus jamaicensis coturniculus*), and San Pablo song sparrow (*Melospiza melodia samuelis*), as well as a general bird census, were conducted during the spring and early summer of 2007 by WWA, with the assistance of rail expert Jules Evens (WWA 2007). The surveys focused on the marsh habitats bordering Hercules Point because of their proximity to the project site and potential to support special-status bird species. The clapper rail and black rail surveys were conducted according to the accepted scientific protocol. For

clapper rail, surveys used the standard “walking transect” protocol written by USFWS biologists and used by researchers throughout the San Francisco Estuary. For black rail, surveys used the widely accepted protocol for California black rail surveys developed and used by regional researchers. Additionally, standardized point count surveys were conducted simultaneously with the rail surveys during most visits. No clapper rails or black rails were observed during the surveys. Several San Pablo song sparrows were observed and their locations mapped on aerial photos. One pair of white-tailed kites was also observed during surveys. This document is included as **Appendix G-5**.

Burrowing Owl Nesting Survey

An individual burrowing owl was incidentally observed on Hercules Point by Vollmar Consulting on January 2, 2007. To determine if the owl was a winter migrant or remained on site to nest or as a resident, focused surveys were conducted according to the requirements of the Burrowing Owl Survey Protocol and Mitigation Guidelines (dated April 1993) prepared by the California Burrowing Owl Consortium and endorsed by the CDFG. Consistent with the survey requirements, four surveys were conducted during the nesting season. No burrowing owls were observed in the project site.

REFERENCES

- HDR Engineering, Inc (HDR). 2010. City of Hercules Intermodal Transit Center Project – Spring 2010 Eelgrass Survey. In prep.
- U.S. Fish and Wildlife Service (USFWS). 1996. Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods.
- Vollmar Consulting. 2006. Memo from Memo from Josh Phillips of Vollmar Consulting to Elizabeth Purl of Impact Sciences, Inc., regarding Terrestrial Wildlife Habitat Evaluation, Hercules Ferry/Intermodal Terminal Project. September 12, 2006.
- . 2008. Delineation of Potential Jurisdictional Waters of the United States, June 2008. Hercules Intermodal Transit Facility.
- . 2007. 90 Day Survey Report, 2007 Wet Season Large Branchiopod Surveys. Hercules Ferry Intermodal Terminal Project.
- Wetland Wildlife Associates (WWA). 2007. Bird Surveys for the Hercules Ferry Terminal Project.
- Wetlands Water Resources, Inc (WWR). 2009. Biological Evaluation Report – Chelsea Wetland Restoration Project. May 11, 2009. Project No. 1136. Prepared for the City of Hercules.

- . 2007a. Hercules Multimodal Transit Facility. Fish and Fisheries Assessment.
- . 2007b. Hercules Multimodal Transit Facility Project. Eelgrass and Widgeongrass Presence/Absence Survey and Bathymetric Survey. Data Collection Report.

APPENDIX G-2
Special-Status Species Life History Descriptions

SPECIAL-STATUS SPECIES POTENTIALLY IN THE PROJECT AREA

Special-status species and sensitive natural communities analyzed in **Appendix G-6** that were determined to have potential habitat in the project area are listed in **Appendix G-7**, the Project Study Area Sensitive Species/Natural Communities Table. This section contains an in-depth evaluation of the plant and animal species and natural communities of concern (listed in Appendix G-7) that are known to occur or have the potential to occur in the project site and vicinity.

Federally-Listed Threatened or Endangered Wildlife Species

California Red-legged Frog (CRLF; *Rana aurora draytonii*)

LISTING STATUS: Federally-listed as Threatened; California Species of Special Concern.

The CRLF was listed as a threatened species under the Federal Endangered Species Act by the USFWS on May 23, 1996 (Federal Register 61:25813).

HABITAT AND BIOLOGY: The CRLF occurs from Baja California, Mexico, north to the vicinity of Redding inland, and at least to Point Reyes, California coastally (Jennings and Hayes, 1994). Northern red-legged frog (*Rana aurora aurora*), which is a California Species of Special Concern, occurs north of the CRLF range in northern California and the species are largely geographically isolated. Traditionally a wide intergrade zone, which is an area of interbreeding between the two subspecies of red-legged frog (California red-legged frog and northern red-legged frog), was thought to exist spanning most of Sonoma, Mendocino and Humboldt counties. However, studies have shown that the intergrade zone is narrower than previously thought. The study proposed that the intergrade zone is located near Point Arena in Mendocino County. Red-legged frogs north of the intergrade zone are the northern subspecies and red-legged frogs south of the intergrade zone are the CRLF. Frogs found in the intergrade zone require genetic analysis to determine the subspecies.

The CRLF occurs from sea level to elevations of 1,500 meters (5,200 feet), occupying a fairly distinct habitat, combining both specific aquatic and riparian components. Aquatic habitat consists of low-gradient freshwater bodies, including ponds, marshes, sag ponds, dune ponds, stock ponds, lagoons, seeps, springs, and backwaters within streams and creeks. While CRLF can occur in either ephemeral or perennial streams or ponds, populations generally cannot be maintained in ephemeral streams in which surface water disappears before metamorphosis (July to September) during most years. Studies have indicated that this species can not inhabit water bodies that exceed 70° F, especially if there are no cool, deep portions (USFWS 2002). The adults require dense, shrubby or emergent riparian vegetation closely associated with deep (greater than 2 1/3-foot deep) still or slow moving water, but frogs have been observed in shallow sections of streams and ponds that are devoid of vegetative cover. The largest

densities of CRLF are associated with deep-water pools with dense stands of overhanging willows (*Salix sp.*) and an intermixed fringe of cattails (*Typha latifolia*). Well-vegetated terrestrial areas within the riparian corridor may provide important sheltering habitat during winter. Also, the species is known to utilize well-vegetated riparian zones for foraging habitat and facilitating dispersal. During summer, CRLF often disperse from their breeding habitat to forage and seek summer habitat if water is not available (USFWS, 2002). This habitat may include shelter under boulders, rocks, logs, industrial debris, agricultural drains, water troughs, small mammal burrows, incised stream channels, or areas with moist leaf litter (Jennings and Hayes 1994, USFWS 1996b, 2002). CRLF may use these upland habitats up to approximately 200 feet from suitable aquatic habitat (USFWS 2002, USFWS 2008a). CRLF have also been found up to 100 feet from water in adjacent dense riparian vegetation.

Critical habitat for the CRLF must include: (a) essential aquatic habitat; (b) associated uplands; and (c) dispersal habitat connecting essential aquatic habitat (66 FR 14626-14758). Aquatic components consist of all still or slow-flowing freshwater aquatic features possessing minimum water depths of 20 cm (8 in.), with the exception of deep lacustrine water habitat inhabited by nonnative predators, that are essential for providing space, food, and cover needed to sustain eggs, tadpoles, metamorphosing juveniles, non-breeding sub-adults, and breeding and non-breeding adult frogs, and are found in areas with two or more suitable breeding locations and a permanent water source with no more than 2 km (1.25 mi) separating these locations. Dispersal habitat consists of upland and aquatic areas, free of barriers, essential for providing connectivity between aquatic areas identified above. Upland habitat components are areas within 150 m (500 ft) from the edge of the aquatic primary constituent element.

Adult CRLF breeding typically starts in November and continues into April (USFWS, 2002). CRLF typically lay eggs between December and early April. Eggs are attached to vegetation in shallow water. Larvae metamorphose in 3.5 to 7 months, typically between July and September. Breeding ponds must retain water until this time. CRLF may remain active throughout the year along the coast. In drier inland areas they aestivate in upland habitat from late summer to early winter (USFWS, 2002; USFWS, 2008a).

Salinity of the water is also a determinant whether CRLF have the potential to occur. Like most amphibians, the maximum salinity tolerated by ranid frogs is near 9 parts per thousand (o/oo) (Ruibal 1959 in Jennings and Hayes 1990), although notable exceptions exist (Gordan et al. 1961, Gordon and Tucker 1965 in Jennings and Hayes 1990). Embryonic stages of the CRLF have a relatively low salinity tolerance (<5 o/oo) (Jennings and Hayes 1990 and references therein). Jennings and Hayes (1990) observed embryos dying relatively quickly in salinities ≥ 6 o/oo, and significant abnormalities occurring in embryos at salinities between 5.0 and 6.5 o/oo. Ultimately, embryos exposed to the latter salinity levels were uniformly

characterized by morphological abnormalities (Jennings and Hayes 1990). In their research, Jennings and Hayes (1990) noted adult CRLF's in salinities from 0.5 o/oo to 10.8 o/oo, with most adults occurring at salinities ≤ 6.5 o/oo. Furthermore, adult CRLF vacated areas where salinities increased above 6.5 o/oo.

The decline of the red-legged frog is attributable to a variety of factors. Largescale commercial harvesting of red-legged frogs led to severe depletions of populations at the turn of the century (Jennings and Hayes 1985 as cited in Jennings and Hayes 1994). Subsequently, exotic aquatic predators such as bullfrogs (*Rana catesbeiana*), crayfish (*Procambarus clarki*), and various species of fish became established and contributed to the continued decline of the species (Hayes and Jennings 1986 as cited in Jennings and Hayes 1994). Habitat alterations such as conversion of land to agricultural and commercial uses, reservoir construction, off-road vehicle use, and abusive land-use practices (i.e., livestock grazing) threaten the remaining populations (Kauffman et al. 1983, Kauffman and Krueger 1984, Bohn and Buckhouse 1986 as cited in Jennings and Hayes 1994).

RECOVERY PLAN/CRITICAL HABITAT DESIGNATION: According to the California Red-Legged Frog Recovery Plan (USFWS 2002), factors associated with declining populations of the frog include degradation and loss of its habitat through: (1) agriculture, (2) urbanization, (3) mining, (4) overgrazing, (5) recreation, (6) timber harvesting, (7) non-native plants, (8) impoundments, (9) water diversions, (10) degraded water quality, (11) use of pesticides, and (12) introduced predators (e.g., bullfrogs, crayfish, and a variety of non-native predatory fish). Furthermore, the California Red-Legged Frog Recovery Plan reports that Contra Costa is one of two counties that contains the majority of known CRLF localities within the San Francisco Bay area, although they seem to have been nearly eliminated from the western lowland portions of these counties (west of highways 80 and 580), particularly near urbanization. The project site is not within a core recovery area for CRLF. Core recovery areas in Contra Costa County are in the eastern portion of the County, east of Interstate 680.

Critical Habitat, which is defined as “a specific area needed by an endangered or threatened animal or plant in order for it to survive, not go extinct, and recover to a healthy population” was designated for CRLF on April 13, 2006 (Federal Register 71:19243). An increase in critical habitat for the CRLF was proposed by the USFWS in a news release on September 16, 2008. The project site is not located within USFWS-designated critical habitat for the CRLF. The closest critical habitat for CRLF is located approximately 8 miles southeast of the project area (Contra Costa County) and approximately 8 miles northeast of the project area (Solano County). Given that this habitat is located well outside the project area (including across the Carquinez Strait, a natural barrier), impacts on CRLF critical habitat is not discussed further in this document.

CNDDDB RECORDS: Observations of CRLF have not been reported within the project site limits; however, there is a reported occurrence of CRLF in CNDDDB within one mile of the project site. CRLF (2 adults and 9 juveniles) have been recorded approximately 0.8 miles southeast of the project area footprint; in a tributary to Refugio Creek, just southeast of the intersection of I-80 and highway 4, between the cities of Pinole and Rodeo (CDFG 2009).

POTENTIAL TO OCCUR ON THE PROJECT SITE: Based on a protocol-level habitat assessment conducted by HDR and review of previous habitat assessments and focused surveys, the project site and areas within one-mile do not contain suitable breeding habitat for the CRLF. While CRLF was observed within one mile of the project site (in 2000); approximately 0.8 miles southeast of the project boundary, the occurrence was not believed to be a breeding population. Several factors contribute to make aquatic features near the project site unsuitable for breeding: (1) brackish conditions; (2) extreme dense growth of cattails and other in-channel vegetation (making movement by CRLF along the channel very difficult); (3) lack of permanent deep water; (4) lack of open water in identified pond features; (5) variability in creek depth due to tidal influence and urban runoff; (6) presence of predators (e.g., mosquito fish); (7) degraded water quality; (8) lack of connection to large pristine habitat areas; as well as the (9) long history of human disturbance. Additionally, all potential dispersal corridors identified within one mile of the project site contain dispersal barriers. Barriers included heavy traffic areas (e.g., I-80, SR-4, city streets) with more than 30 cars per hour, moderate to high-density urban, commercial, and industrial developments, and numerous culverts stretching for long distances.

Because habitats on the project site are not suitable for breeding, and potential corridors for dispersal to the site have barriers, CRLF is not expected to occur in the project site.

Vernal Pool Fairy Shrimp (VPFS; *Branchinecta lynchi*)

LISTING STATUS: Federally-listed as Threatened.

The VPFS was listed as a threatened species under the Federal Endangered Species Act by the USFWS on September 13, 1994 (Federal Register 59-48136).

HABITAT AND BIOLOGY: VPFS has only been a recognized species since 1990 and there is little information on the historical range of the species. However, this species is currently known to occur in a wide range of vernal pool habitats in the southern and Central Valley areas of California, and in two vernal pool habitats within the "Agate Desert" area of Jackson County, Oregon (USFWS 2009). VPFS is found from the vicinity of Red Bluff in Shasta County southward through much of the Central Valley. The southernmost known populations of VPFS occur in the Santa Rosa Plateau in Riverside County (Eriksen and Belk 1999). The VPFS occupies a variety of different vernal pool habitats, from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools. Although the species has been

collected from large vernal pools, including one exceeding 25 acres, it tends to occur in smaller pools. It is most frequently found in pools measuring less than 0.05 acre. These are most commonly in grass or mud bottomed swales, or basalt flow depression pools in unplowed grasslands (USFWS 2009b).

VPFS eggs either are dropped to the pool bottom or remain with the mother until the mother dies and sinks. When the pool dries out, so do the eggs. They remain in the dry pool bed until rains and other environmental stimuli hatch them (USFWS 2009). Resting fairy shrimp eggs are commonly referred to as cysts. They are capable of withstanding heat, cold and prolonged desiccation. When the pools refill, some, but not all, of the cysts may hatch. The cyst bank in the soil may contain cysts from several years of breeding.

RECOVERY PLAN/CRITICAL HABITAT DESIGNATION: Critical habitat for VPFS was originally designated by USFWS on August 6, 2003 (Federal Register 68:46683) and revised on August 11, 2005 (Federal Register 70:46923). Species by unit designations for all federally-listed vernal pool branchiopods were published on February 10, 2006 (Federal Register 71:7117). The project is not located within designated critical habitat for VPFS and there are no elements of VPFS critical habitat present in the project site. VPFS critical habitat within Contra Costa County is in the eastern and northern part of the county.

The following information on VPFS critical habitat is from the Federal Register (Federal Register 71:7117). The primary constituent elements of critical habitat for VPFS are the habitat components that provide: (i) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described below in paragraph (2)(ii), providing for dispersal and promoting hydroperiods of adequate length in the pools; (ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water for a minimum of 18 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands; (iii) Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and (iv) Structure within the pools described above in paragraph (3)(ii), consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter. Existing manmade features and structures, such as buildings, roads, railroads, airports, runways, other paved areas, lawns, and other urban landscaped areas do not contain one or more of the primary constituent elements.

Federal actions limited to those areas, therefore, would not trigger a consultation under section 7 of the Act unless they may affect the species and/or primary constituent elements in adjacent critical habitat.

CNDDDB RECORDS: No occurrences of this species are recorded in CNDDDB within ten miles of the project site. The only record within the nine quad regional radius of the project site was from 2003, along the south end of the Napa airport, approximately 1.5 miles west of Highway 29.

POTENTIAL TO OCCUR ON THE PROJECT SITE: While some of the freshwater seasonal wetlands and unvegetated ponded depressions on the project site provide marginal habitat for VPFS, the project site is outside of the known range of this species. It is unlikely that VPFS occur on the project site. During biological reconnaissance surveys conducted by Vollmar in 2006, an unidentified species of fairy shrimp was observed in several of the seasonally ponded habitats in the project site. In order to identify the fairy shrimp, USFWS was contacted and protocol presence/absence surveys were initiated (pers. comm., Josh Phillips).

Presence/absence surveys were conducted by Vollmar in winter/spring of 2006/2007 in the eastern portion of the project site according to USFWS protocols outlined in the Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods (Guidelines; USFWS 1996a). USFWS protocol wet season surveys were also conducted in winter/spring of 2003/2004 in the western portion of the project site. The results of those surveys have been submitted to USFWS and are included as **Appendix G-4**. No federally-listed vernal pool branchiopods were found in the project site during the surveys. One non special-status fairy shrimp, the versatile fairy shrimp (*Branchinecta lindahli*), was found in seasonally ponded areas throughout the project site. In order to complete the USFWS protocol, which requires two wet season surveys to be conducted within a five year period, wet season surveys are being conducted during winter/spring 2009/2010 by HDR over the entire project site. To date, no federally-listed vernal pool branchiopods have been observed within the project site.

Because the project site is outside of the known range of VPFS, the habitat on-site is marginal, and no VPFS have been found during one full wet season of protocol surveys, VPFS are not expected to occur in the project site. No impacts to VPFS are anticipated. If VPFS are found during wet season surveys in 2009/2010, the sighting will be reported to USFWS and consultation will be initiated.

California Clapper Rail (*Rallus longirostris obsoletus*)

LISTING STATUS: Federally-listed as Endangered; State Listed as Endangered and Fully Protected.

The California clapper rail was listed as an endangered species under the Federal Endangered Species Act by the USFWS on October 13, 1970 (Federal Register 35:16047) and as endangered under the California Endangered Species Act by the CDFG on June 27, 1971.

HABITAT AND BIOLOGY: Throughout their distribution, California clapper rails occur within a range of salt and brackish marshes. In south and central San Francisco Bay and along the perimeter of San Pablo Bay, rails typically inhabit salt marshes dominated by pickleweed (*Sarcocornia pacifica*) and Pacific cordgrass (*Spartina foliosa*). Pacific cordgrass dominates the middle marsh zone throughout the south and central Bay (Federal Register 35:16047).

In the north Bay (Petaluma Marsh, Napa-Sonoma marshes, Suisun Marsh), clapper rails also live in tidal brackish marshes which vary significantly in vegetation structure and composition. Use of brackish marshes by clapper rails is largely restricted to major sloughs and rivers of San Pablo Bay and Suisun Marsh, and along Coyote Creek in south San Francisco Bay. Clapper rails have rarely been recorded in nontidal marsh areas (Federal Register 35:16047).

California clapper rail is almost entirely restricted to the marshes of the San Francisco estuary, where the only known breeding populations occur. In south San Francisco Bay, populations occur in all of the larger tidal marshes (USFWS 2010). In San Pablo Bay and Suisun Bay, its distribution is patchy and discontinuous, occurring along major sloughs and rivers of San Pablo Bay and along major tidal sloughs of Suisun Marsh (USFWS 1984, USFWS 2010).

Breeding California clapper rails require tidal marshes with the following elements: a well-developed tidal channel system with full tidal influence, cordgrass, and a vegetated upper marsh/upland ecotone. The minimum marsh size likely to be used by clapper rails is estimated at approximately 2.5 acres. The maximum dispersal distance recorded in radio telemetry studies is approximately 1.9 miles (USFWS 2010).

RECOVERY PLAN/CRITICAL HABITAT DESIGNATION: A recovery plan for salt marsh harvest mouse and California clapper rail was completed in 1984, but is considered outdated. A new recovery plan that will cover both species, called the Tidal Marsh Ecosystem Recovery Plan, is being prepared but has not been finalized.

Critical habitat has not been designated for California clapper rail.

CNDDDB RECORDS: Observations of California clapper rail have not been reported within the project site limits. Many occurrences of California clapper rail are reported in CNDDDB within ten miles of the project site and three occurrences are reported within five miles of the project site. The closest record to the project site is from 2000 and is near Point Pinole, approximately 0.5 miles west of San Pablo Ave. and Garrity Creek, and approximately 2.5 miles west of the project site. This site was resurveyed in 2006 and no rails were present.

Another occurrence in CNDDDB is from 1996 where this species was reported on the southwest tip of Mare Island Naval Shipyard, approximately 2.5 miles north of the site. A third record was reported in 1979 and is approximately 0.5 miles south of Giant Salt Marsh, approximately 4.5 miles southwest of the project site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Tidal marsh habitat at or adjacent to the project site contains cord grass and vegetated upper marsh/upland, but lacks a tidal channel system. The habitat in or adjacent to the project site is large enough to support only one pair of California clapper rails at the most. Because the project site is so isolated from other marshes with established populations, it is not likely to be colonized except after years of exceptionally high recruitment when other higher quality marshes are at carrying capacity. A bird survey was conducted in 2007 for nesting California clapper rail and other nesting marsh birds. The survey did not detect any California clapper rail in or adjacent to the project site (**Appendix G-5**). The California clapper rail is not likely to occur in or adjacent to the project site. However, there is a low potential that California clapper rail could begin nesting in or adjacent to the project site prior to construction and be impacted by construction activities.

Salt Marsh Harvest Mouse (*Reithrodontomys raviventris*)

LISTING STATUS: Federally-listed as Endangered; State Listed as Endangered and Fully Protected.

The salt marsh harvest mouse was listed as an endangered species under the Federal Endangered Species Act by the USFWS on October 13, 1970 (Federal Register 35:16047) and as endangered under the California Endangered Species Act by the CDFG on June 27, 1971.

HABITAT AND BIOLOGY: The species is endemic to tidal and brackish marsh habitats of the San Francisco Bay region. Salt marsh harvest mice are primarily found in the salt marshes along the northern San Pablo Bay, surrounding the Suisun Bay, and along the southern San Francisco Bay (USFWS 1984, Goals Project 2000). The salt marsh harvest mouse is critically dependent on dense cover and its preferred habitat is pickleweed. In marshes with an upper zone of halophytes, it uses this vegetation to escape high tides, and may also move into adjoining grasslands during the highest winter tides. The best type of pickleweed association for the species has: 100 percent cover, cover depth of 30 to 50 centimeters at summer maximum, high percentage cover of pickleweed (at least 60 percent), and additional halophytes, such as fat hen (*Atriplex patula*) and alkali heath (*Frankenia salina*). The amount of salt grass, brass buttons (*Cotula coronopifolia*), alkali bulrush (*Bolboschoenus maritimus*), or other *Scirpus* or *Typha* species should be low (USFWS 1984).

The Salt Marsh Harvest Mouse and California Clapper Rail Recovery Plan (USFWS 1984) lists five principal reasons for the decline of the salt marsh harvest mouse: habitat loss, fragmentation of the remaining marshes, widespread loss of the high marsh zone as a result of

backfilling, land subsidence, and vegetational change. It furthermore points out that small marshes separated by open land or dikes have very low immigration, and that very few areas are likely to be recolonized.

RECOVERY PLAN/CRITICAL HABITAT DESIGNATION: A recovery plan for salt marsh harvest mouse and California clapper rail was completed in 1984, but is considered outdated. A new recovery plan that will cover both species, called the Tidal Marsh Ecosystem Recovery Plan, is being prepared but has not been finalized.

Critical habitat has not been designated for salt marsh harvest mouse.

CNDDDB RECORDS: Observations of salt marsh harvest mouse have not been reported within the project site limits. The closest reported populations of salt marsh harvest mouse in the CNDDDB are 2.6 miles northeast of the site (across the Carquinez Strait, which is a dispersal barrier) and 4.0 miles southwest of the site (Point Pinole Regional Park).

POTENTIAL TO OCCUR ON THE PROJECT SITE: Three small patches of pickleweed tidal marsh are located at Hercules Point, on or adjacent to the project site. The patches add up to a total of less than four acres. Compared to habitats that have known populations, the project site's habitat patches are small. The closest habitat of any kind (Bayfront Park) is approximately 300 meters southwest of the site and does not support a known population. Most of the 300 meters separating the project site from Bayfront Park appears to be beach and riprap, which is unsuitable for salt marsh harvest mouse dispersal. Bayfront Park is approximately 2.5 kilometers (1.5 miles) from Point Pinole Regional Park. Nearly the entire 2.5 kilometers separating these two habitat patches is riprap adjacent to railroad, and residential development inland of the railroad, which is also unsuitable dispersal habitat for this species. For these reasons, the project site is effectively isolated from known populations and is expected to be unsuitable to support a viable salt marsh harvest mouse population. However, there is a low potential that salt marsh harvest mouse could occur in tidal marsh habitats on Hercules Point in and adjacent to the project site and be impacted by construction activities.

State Listed Threatened or Endangered Species

*California Black Rail (*Laterallus jamaicensis coturniculus*)*

LISTING STATUS: State Listed as Threatened.

The California black rail was listed as threatened under the California Endangered Species Act by the CDFG on June 27, 1971.

HABITAT AND BIOLOGY: In coastal California during the breeding season, the California black rail is presently found at Bodega Bay, Tomales Bay, Bolinas Lagoon, San Francisco Estuary, and Morro Bay. The bulk of the population is restricted to the tidal marshlands of the northern reaches of the San Francisco Estuary (San Pablo Bay) (Goals Project 2000). The California black rail is associated with high overall vegetation cover, high cover of small tidal channels, and low cover of saltgrass, tule (*Schoenoplectus acutus*), and California bulrush (*Schoenoplectus californicus*). The bird is more likely to be present in larger marshes with higher proportions of adjacent natural upland or agriculture, and is less likely in more isolated marshes. Particularly where the marsh vegetation is low, California black rails require access to vegetated upper marsh as refuge from predation during high tides. The black rail commonly nests in pickleweed and alkali bulrush (**Appendix G-5**).

CNDDDB RECORDS: Many occurrences of California black rail are reported in CNDDDB within ten miles of the project site and four occurrences are reported within five miles of the project site. The closest record to the site is on the western portion of the site and to the southwest. This record is from 1977 and was only recorded as Pinole, so the record was mapped by CNDDDB as the salt marshes at the mouth of Pinole Creek. Another record from 1988 is reported at the mouth of Garrity Creek, approximately two miles west, southwest of the site. A third occurrence from 1991 is recorded east, southeast of Pinole Point, between the Southern Pacific Railroad and San Pablo Bay, approximately 3 miles west of the project site. A fourth record from 2008 is reported in Giant Marsh and Breuner Marsh, approximately four miles southwest of the site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: The marsh within and adjacent to the project site is of a relatively small acreage and isolated; however, other habitat elements are present. A bird survey was conducted in 2007 for nesting California black rail and other nesting marsh birds. The survey followed the widely accepted protocol for California black rail surveys developed and used by regional researchers (Albertson and Downart 2004). The survey did not detect any California black rails; however, there is some chance that pickleweed marsh in or adjacent to the project site may be occupied in some years (**Appendix G-5**). Within the Chelsea Mitigation area, this species was documented in the nearby tidal marsh in 2001 (WWR 2009). If California black rail occupied the pickleweed marsh prior to construction, it could be impacted by construction of the proposed project.

Other Sensitive Wildlife Species

*Cooper's Hawk (*Accipiter cooperi*)*

LISTING STATUS: The Cooper's hawk is protected during the nesting season by Fish and Game code.

HABITAT AND BIOLOGY: Cooper's hawk is a breeding resident within California. Breeding habitat occurs in the southern Sierra Nevada foothills, New York Mountains, Owens Valley, and other areas in southern California. They range from sea level to above 2700 m (0-9000 ft). Habitats used most frequently include dense stands of live oak, riparian deciduous or other forest habitats near water. They are seldom found in areas without dense stands of trees. Nesting and foraging usually occur near open water or riparian vegetation. Nests are built in crotches of deciduous trees approximately 20-50 feet above ground. Coniferous trees are also used for nesting though the locations of nests are usually located in the main branch intersections. Nests can be recognized as a stick platform lined with bark.

CNDDDB RECORDS: There is one reported occurrence of nesting Cooper's hawk in CNDDDB within 10 miles of the project site. Nesting Cooper's hawk were reported approximately 3.5 miles east of the project site in 1999 alongside a public golf course.

POTENTIAL TO OCCUR ON THE PROJECT SITE:

Suitable nesting and foraging habitat for Cooper's hawk occurs in and adjacent to the project site. No Cooper's hawk were observed in the project area

Tricolored Blackbird (*Agelaius tricolor*)

LISTING STATUS: The tricolored blackbird is a CDFG species of special concern.

HABITAT AND BIOLOGY: Tricolored blackbird is common locally throughout central California. It nests and seeks cover in emergent wetland vegetation, specifically cattails and tules. Nesting areas must be large enough to support a minimum colony of 50 pairs as they are a highly colonial species. The bird forages on ground in croplands, grassy fields, flooded land, and edges of ponds.

CNDDDB RECORDS: No occurrences of tricolored blackbird are recorded in CNDDDB within five miles of the project site; however three records are reported within ten miles. The closest occurrence is from 1988 and is just east of Admiral Callaghan Lane in Vallejo, approximately 7.5 miles north of the site. Another occurrence is from 1987 and is near the Lake Herman Parking Lot, approximately eight miles northeast of the site. A third occurrence is reported in CNDDDB approximately nine miles east of the site, however no data accompanies this record.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Although records of this species have not recently been reported within the vicinity of the project site, suitable nesting habitat for the tricolored blackbird occurs within the cattail/tule habitat within Refugio Creek, adjacent to the project site and suitable foraging habitat is also present.

Burrowing Owl (*Athene cunicularia*)

LISTING STATUS: The burrowing owl is a CDFG species of special concern.

HABITAT AND BIOLOGY: Burrowing owls are often found in open, dry grasslands, agricultural and range lands, and desert habitats. They can also inhabit grass, forb, and shrub stages of pinyon and ponderosa pine habitats. Burrowing owls occur at elevations ranging from 200 feet below sea level to over 9,000 feet. In California, the highest elevation where burrowing owls are known to occur is 5,300 feet above sea level in Lassen County. In addition to natural habitats, burrowing owls can be found in urban habitats such as at the margins of airports and golf courses and in vacant urban lots.

Burrowing owls nest in burrows in the ground, often in old ground squirrel burrows or badger dens. They are also known to use artificial burrows such as abandoned pipes or culverts. The nesting season for burrowing owls can begin as early as February 1 and continues through August 31. The owl commonly perches on fence posts or on top of mounds outside its burrow. Burrowing owls forage in adjacent grasslands and other suitable habitats primarily for insects and small mammals, and less often for reptiles, amphibians, and other small birds.

CNDDDB RECORDS: No occurrences of burrowing owl are reported by CNDDDB within five miles of the project site; however three occurrences are recorded within ten miles. The closest occurrence is from 2004 and is just southwest of the Junction of Montgomery Ave. and 48th Street in Richmond, approximately 7.5 miles southwest of the project site. Another occurrence is reported in 1983 on the lower slopes of Sulfur Springs Mountain, approximately 8.5 miles northeast of the project site. A third occurrence is reported just off of Suisun Road on the northeast edge of Vallejo, approximately 8.5 miles north of the site. However this record has been extirpated.

POTENTIAL TO OCCUR ON THE PROJECT SITE: The project site's ruderal habitat lacks ground squirrel holes typically used by burrowing owls as dens. Upland vegetation covering most of Hercules Point is taller than in areas that burrowing owls typically inhabit. One burrowing owl was sighted incidentally in January 2007. Follow-up surveys conducted during the breeding season of 2007 did not locate any burrowing owls or burrowing owl dens. Suitable nesting habitat does not occur within the project site, however the site provides marginal wintering habitat.

Northern Harrier (*Circus cyaneus*)

LISTING STATUS: The northern harrier is a CDFG species of special concern.

HABITAT AND BIOLOGY: The northern harrier is a permanent resident of the northeastern plateau and coastal areas and a less common resident of the Central Valley. Habitat consists of coastal scrub, Great Basin grassland, marsh and swamp (coastal and fresh water), riparian scrubs, valley and foothill grassland, and wetlands. Northern harriers nest on the ground,

usually in tall, dense clumps of vegetation, either alone or in loose colonies. The species occurs from annual grassland up to lodgepole pine and alpine meadow habitats, as high as 3000 meters.

CNDDDB RECORDS: No occurrences of northern harrier are reported by CNDDDB within five miles of the project site; however three occurrences are recorded within ten miles. The closest occurrence is from 2004 and is at the upper end of Southampton Bay, approximately 5.5 miles northeast of the project site. Another occurrence is from 1986 and is at Wildcat Creek Marsh, approximately six miles southwest of the site. A third occurrence is from 2004 and is on an island between China Slough and South Slough, approximately nine miles north – northwest of the site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Foraging habitat occurs in the project site along Refugio Creek, on Hercules Point, adjacent to the project site, and within the Chelsea Mitigation area. Marginal nesting habitat occurs in the upper margins of marshes on Hercules Point, adjacent to the project site, and within the Chelsea Mitigation area.

White-tailed Kite (*Elanus leucurus*)

LISTING STATUS: The white-tailed kite is a CDFG fully protected species.

HABITAT AND BIOLOGY: White-tailed kite is a common to uncommon, yearlong resident in coastal and valley lowlands and is rarely found away from agricultural areas. However, it does inhabit herbaceous and open stages of most habitats, mostly in cismontane California. The main prey of white-tailed kite is voles and other small, diurnal mammals, but it occasionally preys on birds, insects, reptiles, and amphibians. White-tailed kite forages in undisturbed, open grasslands, meadows, farmlands and emergent wetlands. Nests are made of loosely piled sticks and twigs and lined with grass, straw, or rootlets and placed near the top of a dense oak, willow, or other tree stand; usually 6-20 m (20-100 ft) above ground. Nests are located near open foraging areas in lowland grasslands, agricultural areas, wetlands, oak-woodland and savannah habitats, and riparian areas associated with open areas.

CNDDDB RECORDS: No occurrences of white-tailed kite have been recorded in CNDDDB within five miles of the project site; however two occurrences have been recorded within CNDDDB within ten miles. One is from 1995 and is of a mating pair approximately 0.2 miles south of Dutchman Slough, approximately 6.5 miles north of the project site. A second record is from 1986 and is of a courting pair at Wildcat Creek Marsh in Richmond, approximately 6.5 miles southwest of the project site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Marginal foraging habitat occurs adjacent to the project site, in the ruderal habitat on the Point of Hercules. Marginal nesting habitat also occurs within the willow riparian forest habitat within the project site. A pair of white-tailed

kites was observed in 2007 (**Appendix G-5**) and again during HDR surveys in December 2009, although no nests were observed. WWR (2009) reports that this species is frequently observed foraging in Chelea Mitigation area. White-tailed kite uses the site for foraging and has a low potential to nest in or adjacent to the project site prior to construction.

Saltmarsh Common Yellowthroat (*Geothlypis trichas sinuosa*)

LISTING STATUS: The saltmarsh common yellowthroat is a CDFG species of special concern.

HABITAT AND BIOLOGY: Its breeding range bounded by Tomales Bay on the north, Carquinez Strait on the east, and Santa Cruz county to south, with occurrences in the Bay Area during migration and winter. The species occurs in salt marshes. It builds its nests just above ground or over water, in thick herbaceous vegetation, often at base of shrub or sapling, sometimes higher in weeds or shrubs up to about 1 meter.

CNDDDB RECORDS: Several records of this species are reported within ten miles, north and east of the project site, in CNDDDB. Only one occurrence is reported within five miles of the site. This record is from 2004 and consists of ten adults and one nest occurring in Southampton Bay, between Vallejo and Benicia, approximately five miles northeast of the project site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Suitable habitat for this species occurs within the marsh habitat within and adjacent to the project site. Suitable habitat is present in the Chelsea Mitigation area, as well as nearby marsh habitats along Pinole Creek.

San Pablo Song Sparrow (*Melospiza melodia samuelis*)

LISTING STATUS: The San Pablo song sparrow is a CDFG species of special concern.

HABITAT AND BIOLOGY: The San Pablo song sparrow is distributed in marshes around San Pablo Bay continuously from Gallinas Creek in the west, along the northern San Pablo bayshore, and throughout the extensive marshes along the Petaluma, Sonoma, and Napa rivers. It is commonly found in saltmarsh, brackish marsh, and fringe areas where marsh vegetation is limited to edges of dikes, land fills, or other margins of high ground bordering salt or brackish water areas.

CNDDDB RECORDS: Several records of this species are reported in CNDDDB within ten miles, north and southwest of the project site. Five occurrences are reported within five miles of the site. The closest occurrence is from 1947 and is recorded only as Pinole in CNDDDB. This occurrence is less than 0.5 miles west of the project site. Another record from 1901 is reported in Selby, approximately 1.5 miles northeast of the site. A third record is from 2004 is reported on the southwest tip of Mare Island, approximately 2.5 miles north of the project

site. A fourth record is from 1941 in Sobrante, approximately 2.5 miles south of the site. Another record is from 1947 in San Pablo, approximately three miles southwest of the site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Suitable habitat for this species occurs within and adjacent to the project site on Hercules Point and potentially along the banks of Refugio Creek. Bird surveys recorded between seven and nine pairs of San Pablo song sparrows on Hercules Point during the 2007 breeding season (**Appendix G-5**).

Alameda Song Sparrow (*Melospiza melodia pusillula*)

LISTING STATUS: The Alameda song sparrow is a CDFG species of special concern.

HABITAT AND BIOLOGY: The Alameda song sparrow is restricted to tidal salt marshes on the fringes of south San Francisco Bay. It nests low in grinnelia bushes and in salicornia. Although confined to tidal salt marsh habitat located on the fringes of the south arm of San Francisco Bay east to El Cerrito, south to Alviso, and west to San Francisco, they are found in most remnant patches of marsh vegetation along sloughs, dikes, and levees, including some highly disturbed and urbanized sites. The Alameda song sparrow inhabits tidal salt marshes that have an appropriate configuration of vegetation, water, and exposed ground. Vegetation is required for nesting sites, song perches, and concealment from predators. The dominant plants of tidal salt marshes in San Francisco Bay are cord grass (*Spartina* spp.) in low elevations of the marsh, pickleweed (*Salicornia* spp.) on slightly higher ground, and gumplant (*Grindelia* spp.) even higher along slough edges.

CNDDDB RECORDS: Several records (between 1940 and 1942) of this species are reported in CNDDDB within ten miles of the project site, including the Berkley shoreline in West Berkley, shoreline west of Albany Hill in North Albany, marsh located between Stege and Point Isabel, west of El Cerrito, and in the vicinity of Point Richard.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Suitable habitat for this species occurs in the Chelsea Mitigation area (WWR 2009), and the species is reported to nest in this area as well.

Osprey (*Pandion haliaetus*)

LISTING STATUS: The osprey is a CDFG species of special concern.

HABITAT AND BIOLOGY: Breeding occur along ocean shores, bays, freshwater lakes, and larger streams. This species feeds primarily on fish, but will also feed on invertebrates and other small vertebrates. The osprey utilizes large trees and snags in forest and riparian habitats for nesting and cover. This species breeds from March to September and nests on platforms of sticks up to 250 feet above ground. Nests are built at the top of snags, human-made structures, dead-topped trees, or similar structures within 15 miles of foraging grounds.

CNDDDB RECORDS: One record (1990) for this species is reported in CNDDDB within 10 miles of the project site, in an area adjacent to the Napa River in the City of Vallejo.

POTENTIAL TO OCCUR ON THE PROJECT SITE: This species is regularly observed foraging in the Chelsea Mitigation area and could nest in this area (WWR 2009).

Pallid Bat (*Antrozus pallidus*)

LISTING STATUS: The pallid bat is a CDFG species of special concern.

HABITAT AND BIOLOGY: Pallid bat occurs from British Columbia to Texas south to Baja California and central Mexico. In California, pallid bat occurs throughout the state except in the high Sierra Nevada Range from Shasta County to Kern County. It is found in deserts, grasslands, shrublands, woodlands, and forests. It is most common in open dry habitats with rocky areas for roosting. It feeds mainly in open areas on beetles and other large insects, often landing on ground to catch prey. The bat roosts in buildings, large trees with cavities, bridges, rocky outcrops, rock crevices, and caves. Roosts must be sufficient to protect this species from high temperatures. The pallid bat is extremely sensitive to disturbance of roosting.

CNDDDB RECORDS: Five occurrences of this species are recorded in CNDDDB within ten miles of the project site. The closest occurrence is less than 0.5 miles west of the site and is from 1937. This record is from the Martinez Ranch, Pinole and consists of one male specimen collected. Another occurrence is from 1943, is from El Cerrito, approximately 6.5 miles south of the site, and also consists of one male specimen collected. Two more occurrences are recorded in Berkeley and are from 1942 and 1945. Another record is from 1965, is from Russell Tree Farm, approximately 1.5 miles north of Lafayette, and consists of five collected specimens.

POTENTIAL TO OCCUR ON THE PROJECT SITE: While no occurrences of pallid bat have been recorded recently in the vicinity of the project site and habitat on site is marginal due to disturbance, the pallid bat may forage within the project site or use the large culverts that pass under the railroad or large trees in the willow riparian habitat for night roosting. Due to disturbance and lack of suitable habitat, no maternal colonies are expected to occur within the project site.

Hoary Bat (*Lasiurus cinereus*)

LISTING STATUS: The hoary bat does not have a USFWS or CDFG listing status, but has a global rank of G5 and a state rank of S4. A global rank of G5 indicates that the population is secure within the world and a state rank of S4 indicates that while the species is apparently secure within California, factors exist to cause some concern.

HABITAT AND BIOLOGY: The hoary bat prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. It roosts in dense foliage of medium to large trees. Its preferred sites are hidden from above, with few branches below, and have ground cover of low reflectivity. Females and young tend to roost at higher sites in trees. The bat feeds primarily on moths and requires water.

CNDDDB RECORDS: No occurrences of this species are recorded in CNDDDB within five miles of the project site; however two occurrences are recorded within ten miles. The closest record is from 1972 and is from Berkley, approximately six miles from the site. The other record is from 1969 and is from El Cerrito, approximately nine miles from the site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: While no occurrences of hoary bat have been recorded recently in the vicinity of the project site and habitat on site is marginal, potential roosting habitat for this species may occur in exfoliating bark or tree crevices within the willow riparian habitat on site.

San Pablo Vole (*Microtus californicus sanpabloensis*)

LISTING STATUS: The San Pablo vole is a CDFG species of special concern.

HABITAT AND BIOLOGY: Habitat for this species consists of grassy habitats associated with salt marshes. This species differs from the California vole (*Microtus californicus*) in range and distinct physical characteristics. All known occurrences of San Pablo vole are in Contra Costa County, in the salt marshes of San Pablo creek, on the south shore of San Pablo Bay.

CNDDDB RECORDS: Several records of this species are reported in CNDDDB along the shoreline west of Point Pinole. Four occurrences are reported within five miles of the project site. The closest occurrence is from 1986 and is at Giant Salt March, east of the Southern Pacific Railroad, on the west side of Point Pinole, approximately three miles southwest of the project site. Another record is from 1998 and is in Point Pinole Regional Park, approximately four miles southwest of the project site. A third occurrence is from 1937 and is 0.5 miles south of Giant Salt Marsh, approximately 4.5 miles southwest of the project site. A fourth record is from 1986 and is adjacent to Freethy Lane, on the north end of San Pablo Creek Marsh, approximately five miles southwest of the site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: While no occurrences of this species have been recorded in the immediate vicinity of the project site, marginal habitat for this species occurs within the tidal marsh habitat within the project site.

Salt-marsh Wandering Shrew (*Sorex vagrans halicoetes*)

LISTING STATUS: The salt marsh wandering shrew is a CDFG species of special concern.

HABITAT AND BIOLOGY: The salt-marsh wandering shrew occurs in salt marshes of the south arm of San Francisco bay. It prefers a low, dense cover of pickleweed and scattered debris, such as driftwood, interspersed within its habitat.

CNDDDB RECORDS: Two occurrences are recorded by CNDDDB within ten miles of the project site. The closest occurrence is from 1950 and is within Giant Marsh, approximately four miles southwest of the project site. Surveys conducted at this site in 1986 did not detect any salt-marsh wandering shrews. Another occurrence is from 1959 and is within San Pablo Creek Salt Marsh, approximately five miles southwest of the project site. Surveys conducted at this site in 1985 did not detect any salt-marsh wandering shrews.

POTENTIAL TO OCCUR ON THE PROJECT SITE: While this species has not recently been detected in the vicinity of the project site, marginal habitat for this species occurs within the tidal marsh habitat within the project site.

Other Migratory Birds and Bats

Several migratory bird species and bat species have potential to utilize the culverts or willow riparian forest habitat for nesting or roosting. Three 72-inch culverts under the railroad ROW connect Refugio Creek to San Pablo Bay. A few species of migratory birds commonly nest in culverts or on bridges, including black phoebe (*Sayornis nigricans*) and cliff swallows (*Petrochelidon pyrrhonota*). Pallid bat and other non-special-status bats have potential to roost in the culverts. Three patches of willow riparian forest habitat occur on the project site: two on or adjacent to railroad ROW, and one along the northern channel of Refugio Creek. Several migratory bird species have potential to nest in the willow riparian forest habitat, including western kingbird (*Tyrannus verticalis*), house finch (*Carpodacus mexicanus*), mourning dove (*Zenaida macroura*), and western scrub jay (*Aphelocoma californica*). Pallid bat and other non-special-status bats also have potential to roost in the willow riparian forest habitat.

Sensitive Plant Species

Soft Bird's-beak (*Cordylanthus mollis* ssp. *mollis*)

LISTING STATUS: Federally-listed as Endangered; State listed as Rare, CNPS 1B.2.

The soft bird's beak was listed as an endangered species under the Federal Endangered Species Act by the USFWS on November 20, 1997 (Federal Register 62:61916) and by CDFG as rare in July 1979.

HABITAT AND BIOLOGY: Soft bird's beak is found predominantly in the high marsh (upper reaches) of salt grass-pickleweed marshes at or near the limits of tidal action. It is associated with pickleweed (*Salicornia virginica*), salt grass (*Distichlis spicata*), fleshy jaumea (*Jaumea*

carnea), alkali heath (*Frankenia salina*), and arrow-grass (*Troglochin maritima*). It is a hemiparasite whose typical host plants include salt grass and pickleweed. Historically, soft bird's beak ranged from the Petaluma River near the City of Novato in Marin County, in the west, to the mouth of the Sacramento River in Sacramento County, in the east. The species is currently restricted to widely scattered populations in Napa, Solano, and Contra Costa Counties, from Point Pinole and Fagan Slough marsh through the Carquinez Strait to Suisun Bay (USFWS 2009).

BLOOMING SEASON: This species blooms from July to November (CNPS 2010).

RECOVERY PLAN/CRITICAL HABITAT DESIGNATION: Critical habitat was designated by USFWS for soft bird's beak on April 12, 2007 (Federal Register 72:18517). There is no designated critical habitat for soft bird's beak in the project site. The closest critical habitat for this species occurs approximately three miles southwest of the project site on the Point Pinole shoreline.

CNDDDB RECORDS: Two occurrences of soft bird's beak are recorded in CNDDDB approximately three miles southwest of the project site on the Point Pinole shoreline. The closest record is from 1991, however only one plant was observed and surveys in 1993 failed to detect a population. Another record is from 2006, where approximately 400 plants were observed along the Point Pinole shoreline, approximately 3.5 miles west of the project site. An additional current occurrence was recorded in 2004 within Southampton Marsh, approximately five miles northeast of the project site. This record is of 99,005 plants. Three additional old occurrences are recorded within ten miles of the site, however surveys in 1993 (and other additional surveys) have failed to detect plants and these populations are considered possibly extirpated.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Soft bird's-beak was not observed during plant surveys that were conducted on the project site during the August 2006 focused plant surveys and there have not been any observations in the immediate vicinity of the site. While suitable habitat for this species occurs within the tidal marsh habitat within the project site, the species is not expected to occur in the project site.

Point Reyes Bird's-beak (*Cordylanthus maritimus* ssp. *palustris*)

LISTING STATUS: CNPS 1B.2

HABITAT AND BIOLOGY: Known populations of Point Reyes bird's-beak occur in Alameda, Humboldt, Marin, Santa Clara, San Mateo and Sonoma counties. Habitat consists of coastal salt marshes and swamps, at elevations ranging from 0 to 10 meters.

BLOOMING SEASON: Point Reyes bird's beak blooms from June to October (CNPS 2010).

RECOVERY PLAN/CRITICAL HABITAT DESIGNATION: No critical habitat has been designated for this species.

CNDDDB RECORDS: No occurrences of this species are recorded in CNDDDB within five miles of the project site; however one occurrence is recorded within ten miles. This record is from 1906 and is west of Berkley, along the Emeryville/Berkley shoreline, approximately 9.5 miles south of the project site. Records from 1990 indicate that this occurrence has been extirpated.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Point Reyes bird's-beak was not observed during plant surveys that were conducted on the project site during the August 2006 focused plant surveys and there have not been any recent observations in the vicinity of the site. While suitable habitat for this species occurs within the tidal marsh habitat within the project site, the species is not expected to occur in the project site.

Mason's Lillaeopsis (*Lillaeopsis masonii*)

LISTING STATUS: State listed as Rare, CNPS 1B.2

Mason's lillaeopsis was listed by CDFG as rare in November 1979.

HABITAT AND BIOLOGY: Mason's lillaeopsis is known to occur in Alameda, Contra Costa, Napa, Sacramento, San Joaquin, and Solano counties. Its habitat consists of marshes and swamps (brackish or freshwater) and riparian scrub, at elevations ranging from 0 to 10 meters.

BLOOMING SEASON: Mason's lillaeopsis blooms from April to November (CNPS 2010).

RECOVERY PLAN/CRITICAL HABITAT DESIGNATION: No critical habitat has been designated for this species.

CNDDDB RECORDS: Three occurrences of Mason's lillaeopsis are recorded in CNDDDB within ten miles of the project site. The closest record is from 1995 and is at the southeast tip of Mare Island Naval Reservation; approximately three miles north of the project site, where three clumps of plants were observed. Another record is from 1995 and is on the east side of Mare Island Naval Shipyard; approximately four miles north of the site, where another three clumps of plants were observed. A third record is from 2004 and is on the shoreline of Carquinez Straight, at the west end of E Street, Benicia, approximately 6.5 miles east of the site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Mason's lillaeopsis was not observed during plant surveys that were conducted on the project site during the August 2006 focused plant surveys and there have not been any recent observations in the vicinity of the site. While suitable habitat for this species occurs within the tidal marsh habitat within the project site, the species is not expected to occur in the project site.

Special-Status Fish Species

North American Green Sturgeon, Southern Distinct Population Segment

LISTING STATUS: The Southern DPS of North American green sturgeon was listed as threatened under the Federal Endangered Species Act on April 7, 2006 (Federal Register 71:17757), and is considered a State Species of Special Concern by CDFG (2009).

HABITAT AND BIOLOGY: The Southern DPS of green sturgeon includes all green sturgeon populations south of the Eel River, with the only known spawning population being in the Sacramento River (NMFS 2009a). Green sturgeon life history can be broken down into four main stages: eggs and larvae, juveniles, sub-adults, and sexually mature adults (NMFS 2009a).

San Pablo Bay serves as important rearing habitat for juvenile green sturgeon, as well as for overwintering subadults and adults (NMFS 2008). It also serves as a migration corridor for adults en route to, and from, spawning grounds in the upper Sacramento River (NMFS 2008). Primary constituent elements (PCEs) present include food resources (e.g., *Corophium* spp., *Crango franciscorum*, *Macoma* spp., *Photis californica*, *Synidotea laticauda*, unidentified crab, and fish (Ganssle, 1966)), depths, water quality, and migratory corridors to support juvenile rearing, feeding, and migration, and subadult and adult feeding and migration (NMFS 2008).

Kelly *et al.* (2007) indicated that green sturgeon enter the San Francisco Estuary during the spring and remain until autumn; Moyle *et al.* (1995) reported that adults may enter the estuary in late-February. Tagged subadults and adults in San Pablo Bay exhibited benthic foraging behavior as well as directional movements near the surface, and showed a high tolerance for the range of temperatures, salinities, and dissolved oxygen levels within the bay (Kelly *et al.*, 2007). Tagged adults and subadults also primarily occupied waters over shallow depths of less than 10 m, either swimming near the surface or foraging along the bottom (Kelly *et al.* 2007).

Prey species for juvenile, subadult, and adult green sturgeon within bays and estuaries primarily consist of benthic invertebrates and fish, including crangonid shrimp, callinassid shrimp, burrowing thalassinidean shrimp, amphipods, isopods, clams, annelid worms, crabs, sand lances, and anchovies (NMFS 2009a).

CRITICAL HABITAT DESIGNATION: Critical habitat was designated for the Southern DPS of green sturgeon on October 9, 2009 and includes San Francisco and San Pablo bays (74 FR 52300, October 9, 2009).

POTENTIAL TO OCCUR ON THE PROJECT SITE: Juvenile green sturgeon are present in San Pablo Bay throughout the year and subadults and adults occur throughout most of the year

(from February to December) (NMFS 2008). In a study of juvenile green sturgeon in the Delta, relatively large numbers of juveniles were captured primarily in shallow waters (3-8 feet deep), indicating that juveniles may require shallower depths for rearing and foraging (Radtke 1966). Green sturgeon could be present in and adjacent to the intertidal mudflats in the project site.

Delta Smelt

LISTING STATUS: Delta smelt was listed as threatened under the Federal Endangered Species Act on March 5, 1993 (Federal Register 58:12854), and was listed as threatened under the California Endangered Species Act in 1993. In addition, delta smelt was proposed for listing as endangered under the California Endangered Species Act by CDFG on January 16, 2009.

HABITAT AND BIOLOGY: Delta smelt are a euryhaline species, native to the Sacramento-San Joaquin estuary. Delta smelt tolerate wide-ranging salinities, but rarely occur in waters with salinities greater than 10 ppt to 14 ppt (Baxter *et al.* 1999). Similarly, Delta smelt tolerate a wide-range of water temperatures (Moyle 2002). Delta smelt feed entirely on zooplankton.

During the late winter and spring, Delta smelt migrate upstream into freshwater areas to spawn. Spawning occurs primarily during April through mid-May (Moyle 2002) in sloughs and shallow edge areas in the Delta (Wang 1986; USFWS 2008b). Spawning also has been recorded in Suisun Marsh and the Napa River (Hobbs *et al.* 2007, as cited in USFWS 2008b). The center of distribution for delta smelt larvae < 20 mm is usually 5-20 km upstream of X2, but larvae move closer to X2 as the spring progresses into summer (Dege and Brown 2004, as cited in USFWS 2008b). Juvenile delta smelt are most abundant in the low salinity zone (LSZ), specifically at the upstream edge of the LSZ (USFWS 2008b). Currently, young delta smelt rear throughout the Delta into June or the first week of July, but thereafter, distribution shifts to the Sacramento-San Joaquin river confluence where water temperatures are cooler and water transparencies are lower (Feyrer *et al.* 2007; Nobriga *et al.* 2008).

CRITICAL HABITAT DESIGNATION: Critical habitat for Delta smelt was designated by USFWS in 1994 (Federal Register 59:65256). Designated critical habitat includes areas of all water bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun Cutoff, First Mallard (Spring Branch), and Montezuma Sloughs; and the existing contiguous waters contained within the Delta. The designation does not include San Pablo Bay or the project area.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Delta smelt generally occur in open surface waters and shoal areas (USFWS 1996c) and do not associate strongly with structure (USFWS 2008b). As discussed above, for the majority of their one-year life span, delta smelt inhabit areas within the western Delta and Suisun Bay characterized by salinities of approximately 2 ppt. During periods of high river flow into the estuary, delta smelt distribution can transiently

extend as far west as the Napa River and San Pablo Bay (USFWS 2008b). However, because free-swimming life stages of delta smelt mainly occupy offshore waters (USFWS 2008b), delta smelt are unlikely to occur in the project area.

River Lamprey

LISTING STATUS: River lamprey is a CDFG species of special concern

HABITAT AND BIOLOGY: The anadromous river lamprey is found in coastal streams from San Francisco Bay to Alaska (Moyle 2002). Adults immigrate into freshwater during fall and spawn from April to June in small tributary streams (Wang 1986). Adults migrate into freshwater through San Pablo Bay during the fall and spawn in small tributary streams from April to June (Wang 1986, CDM and the Bay Institute of San Francisco 2000). Adults likely need clean, gravelly riffles in permanent streams for spawning, while the ammocoetes require sandy backwaters or stream edges in which to bury themselves, where water quality is continuously high and water temperatures do not exceed 77°F. The length of the ammocoete life stage is not known, but is probably three to five years (Moyle 2002). Ammocoetes begin their transformation into adults when they are about 12 cm in total length (TL), during the summer. The process of metamorphosis may take nine to ten months, the longest known for any lamprey species. Lampreys in the final stages of metamorphosis congregate immediately upriver from saltwater and enter the ocean during late spring.

CRITICAL HABITAT DESIGNATION: No critical habitat has been designated for this species.

POTENTIAL TO OCCUR ON THE PROJECT SITE: River lamprey has the potential to occur in the intertidal mudflats in the project area.

Sacramento splittail

LISTING STATUS: Sacramento splittail was removed from the list of threatened species by the USFWS on September 22, 2003, and USFWS did not identify it as a candidate for listing. This species is considered by CDFG as a species of special concern and informally as a federal species of concern.

HABITAT AND BIOLOGY: Sacramento splittail is the only extant species in a unique genus of large, native minnows. It inhabits the Sacramento-San Joaquin river system and the Delta, including the brackish northern reaches of the San Francisco Estuary (California State Coastal Conservancy and USFWS 2003). The species has been collected in tidal waters as saline as 18 ppt, but splittail abundance is greatest in salinity lower than 10 ppt. Within the San Francisco Estuary, it occurs primarily in the Suisun Bay area, but reaches northern San Pablo Bay regularly in years of high river discharge (California State Coastal Conservancy and USFWS 2003). They spawn in fresh or nearly fresh, nonsaline shallow waters with submerged

vegetation. Within the San Francisco Estuary, they are reported to be most abundant in small tidal creeks, particularly those with freshwater discharges or partially submerged marsh vegetation (Sommer 2000 as cited in California State Coastal Conservancy and USFWS 2003).

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Typically, adults migrate upstream in January and February and spawn on seasonally inundated floodplains in March and April (Moyle et al. 2004). In May the juveniles migrate back downstream to shallow, brackish water rearing grounds, where they feed on detritus and invertebrates for 1-2 years before migrating back upstream to spawn (Moyle et al. 2004). Splittail spawn in fresh or nearly fresh, shallow waters with submerged vegetation. Within the San Francisco Estuary, they are reported to be most abundant in small tidal creeks, particularly those with freshwater discharges or partially submerged marsh vegetation (Sommer 2000 as cited in California State Coastal Conservancy and USFWS 2003). Non-reproductive splittail are most abundant in moderately shallow (<4 m), brackish tidal sloughs, such as those found in Suisun Marsh, but they also can occur in freshwater areas that have either tidal or riverine flow (Moyle et al. 2004). Juveniles (<2 yrs old and <170 mm SL) are most abundant in shallow (often <2 m deep), turbid water, with tidal currents, often in narrow sloughs lined with tules and other emergent plants (Moyle et al. 2004).

Splittail are primarily benthic daytime foragers (Caywood 1974). In Suisun Marsh in the early 1980s, splittail foraged on (in rough order of importance) opossum shrimp (*Neomysis mercedis*), amphipods (*Corophium* spp.), and harpacticoid copepods, though detritus accounted for more than half of the gut contents by volume (Daniels and Moyle 1983; Feyrer and others 2003).

CRITICAL HABITAT DESIGNATION: No critical habitat has been designated for this species.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Sacramento splittail have the potential to occur in the project area in San Pablo Bay, however, splittail are not known to occur or expected to occur in Refugio Creek.

Anadromous Salmonids (Chinook Salmon, Coho Salmon, and Steelhead)

San Pablo Bay is used primarily as a migration corridor for anadromous salmonids. Adult Chinook and Coho salmon and steelhead migrate through San Pablo Bay en route from the ocean to upstream spawning grounds and juvenile salmon and steelhead migrate back through San Pablo Bay on their way out to the ocean. Salmon and steelhead runs migrating through San Pablo Bay include the Sacramento River winter-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, Central Valley fall-/late fall-run Chinook salmon ESU, Central Valley steelhead DPS, Central California Coast steelhead DPS, and the Central California coast Coho salmon ESU.

All three salmonid species (Chinook salmon, Coho salmon, steelhead) spawn in various locations within the San Pablo Bay watershed, however, Coho have been nearly extirpated, and all species maintain significantly reduced populations (Leidy *et al.* 2005, Leidy 2007, and WWR 2007). The loss and degradation of upland stream spawning and rearing habitat appears to have had the greatest impact on anadromous salmonids in the San Pablo Bay watershed (Leidy 2000 *as cited in* California Coastal Conservancy and USFWS 2003). These impacts are due to dams or other barriers to migration, in-stream habitat conditions degraded by reduced stream flows, loss of riparian vegetation, siltation, and resultant elevated water temperatures and changes in habitat structure (e.g. loss of large woody debris) (Leidy 2000 *as cited in* California Coastal Conservancy and USFWS 2003). Historically, anadromous salmonids commonly spawned in the San Pablo Bay watershed, with some runs numbering in the tens of thousands of fish (Leidy 2000 *as cited in* California Coastal Conservancy and USFWS 2003). Refugio Creek does not support anadromous salmonids (Leidy *et al.* 2005 and Leidy 2007); however, because San Pablo Bay is used as a migration corridor for anadromous salmonids, anadromous salmonids may potentially occur in the project area.

Adult salmonids may potentially occur within the submerged habitats of San Pablo Bay adjacent to the project area, while juveniles may seek refuge in the tidal marshes and channels of the project area during high tides (WWR 2007). Juvenile Chinook salmon follow rising tides into shallow water habitats from the deeper main channels and return to the main channels when the tides recede (Healey 1991). Kjelson *et al.* (1981) reported that juvenile Chinook salmon demonstrated a diel migration pattern, orienting themselves to nearshore cover and structure during the day, but moving into more open, offshore waters at night. The fish also distributed themselves vertically in relation to ambient light. During the night, juveniles were distributed randomly in the water column, but would school up during the day into the upper three meters of the water column (NMFS 2009b).

Central California Coast Coho Salmon

LISTING STATUS: The Central California Coast Coho salmon ESU was listed by USFWS under the Federal Endangered Species Act as threatened on October 31, 1996 and later downgraded to endangered on June 28, 2005 (70 FR 37160). The ESU also is listed as endangered under CESA.

HABITAT AND BIOLOGY: Coho salmon juveniles may be present in the San Francisco Estuary from March through June, with a potential peak presence during May (NMFS 1997).

CRITICAL HABITAT DESIGNATION: Critical habitat for the Central California Coast ESU encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between Punta Gorda and the San Lorenzo River (inclusive) in California, including two streams entering San Francisco Bay: Arroyo Corte Madera Del Presidio and Corte Madera Creek (64 FR 24049, May 5, 1999). Critical habitat does not include San Pablo Bay, and therefore, does not include the project area.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Migrating adult and migrating and rearing juvenile coho salmon have the potential to occur in the project area in San Pablo Bay.

Central Valley Steelhead DPS

LISTING STATUS: On March 19, 1998, NMFS listed the Central Valley steelhead DPS as a threatened species (Federal Register 63:13347). Central Valley steelhead is not listed under the California Endangered Species Act.

HABITAT AND BIOLOGY: Central Valley steelhead adults generally leave the ocean from August through April (Busby *et al.* 1996), and spawn from December through April (Hallock *et al.* 1961, McEwan and Jackson 1996). Juvenile steelhead emigrate episodically from natal streams during fall, winter, and spring high flows (NMFS 2009a). Emigrating Central Valley steelhead use the lower reaches of the Sacramento River and the Delta for rearing and as a migration corridor to the ocean (NMFS 2009a).

CRITICAL HABITAT DESIGNATION: Critical habitat was designated for Central Valley steelhead by NMFS on September 2, 2005 (Federal Register 70:52488), but it does not include San Pablo Bay, and therefore, does not include the project area.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Migrating adult and migrating and rearing juvenile steelhead have the potential to occur in the project area in San Pablo Bay.

Central California Coast steelhead

LISTING STATUS: The Central California Coast steelhead DPS was listed as threatened under the Federal Endangered Species Act on January 5, 2006 (Federal Register 71:834), and includes all naturally spawned steelhead populations below natural and manmade impassable barriers in California streams from the Russian River (inclusive) to Aptos Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. Tributary streams to Suisun Marsh include Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough, excluding the Sacramento-San Joaquin River Basin, as well as two artificial propagation programs (NMFS 2009a).

HABITAT AND BIOLOGY: Central California coast steelhead adults and smolts travel through the western portion of Suisun Marsh and Suisun Bay as they migrate between the ocean and their natal spawning streams. (NMFS 2009a). Adults reportedly migrate upstream through the Bays from December through May (San Francisco Bay Area Water Emergency Transportation Authority 2008).

CRITICAL HABITAT DESIGNATION: Critical habitat was designated for Central California Coast steelhead by NMFS on September 2, 2005 (Federal Register 70:52488), which includes San Francisco and San Pablo bays (NMFS 2009a).

POTENTIAL TO OCCUR ON THE PROJECT SITE: Migrating adult and migrating and rearing juvenile steelhead have the potential to occur in the project area in San Pablo Bay.

Central Valley fall-/late fall-run Chinook salmon

LISTING STATUS: The Central Valley Fall- and Late Fall-Run Chinook salmon ESU is classified as a Species of Concern under the Federal Endangered Species Act and is considered a California State Species of Special Concern (Federal Register 69:19975 (April 15, 2004)).

HABITAT AND BIOLOGY: Central Valley fall-run Chinook salmon fry begin entering the Delta during January, with peak abundance occurring during February and March. Fall-run Chinook salmon smolts generally emigrate through the Delta from April through June. Fall-run Chinook salmon smolts migrate quickly through the Delta and Suisun and San Pablo Bays. Central Valley fall-run Chinook salmon smolts show little estuarine dependence and may benefit from expedited ocean entry, although emigrating fry may rear for a longer period within the Delta and estuary prior to ocean emigration. Juvenile fall-run Chinook salmon may be present in the San Francisco Estuary from December through June (NMFS 1997).

CRITICAL HABITAT DESIGNATION: No critical habitat has been designated for this ESU. Pursuant to the Magnuson-Stevens Act, EFH is designated for Central Valley Chinook salmon and includes the portions of San Pablo bay in the project site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Migrating adult and migrating and rearing juvenile Chinook salmon have the potential to occur in the project area in San Pablo Bay.

Central Valley spring-run Chinook salmon

LISTING STATUS: The Central Valley spring-run Chinook salmon ESU is listed as threatened under the Federal Endangered Species Act (Federal Register 64:50394 (September 16, 1999)) and is also listed as threatened under CESA.

HABITAT AND BIOLOGY: Adult Central Valley spring-run Chinook salmon leave the ocean to begin their upstream migration in late January and early February (CDFG 1998, as cited in NMFS 2009a). The emigration period for Central Valley spring-run Chinook salmon extends from November to early May, with up to 69 percent of the YOY fish outmigrating through the lower Sacramento River and Delta during this period (CDFG 1998, as cited in NMFS 2009a). Juvenile spring-run Chinook salmon may be present in the San Francisco Estuary from November through May, with a peak during January and February (NMFS 1997).

CRITICAL HABITAT DESIGNATION: NMFS designated critical habitat for this ESU on September 2, 2005, but it does not include San Pablo Bay (Federal Register 70:52488 (Friday, September 2, 2005)). Pursuant to the Magnuson-Stevens Act, EFH is designated for Central Valley Chinook salmon and includes the portions of San Pablo bay in the project site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Migrating adult and migrating and rearing juvenile Chinook salmon have the potential to occur in the project area in San Pablo Bay.

Sacramento River winter-run Chinook salmon

LISTING STATUS: The Sacramento River winter-run Chinook salmon ESU is currently listed as endangered under the FESA (Federal Register 59:440 (January 4, 1994)), and also is listed as endangered under CESA.

HABITAT AND BIOLOGY: Adult winter-run Chinook salmon enter San Francisco Bay from November through June (Hallock and Fisher 1985, as cited in NMFS 2009a). Winter-run Chinook salmon juveniles remain in the Delta until they reach a fork length of approximately 118 millimeters (mm) and are from 5 to 10 months of age, and then begin emigrating to the ocean as early as November and continue through May (Fisher 1994; Myers *et al.* 1998), with peak emigration occurring during March and April (NMFS 2009a). Winter-run Chinook salmon juveniles may be present in the San Francisco Estuary from July through March, with a peak presence during September and October (NMFS 1997).

CRITICAL HABITAT DESIGNATION: Critical habitat was designated for winter-run Chinook salmon by NMFS on June 16, 1993 and includes all waters of San Pablo Bay westward of the Carquinez Bridge (Federal Register 58:33212), and therefore, includes the project area.

Pursuant to the Magnuson-Stevens Act, EFH is designated for Central Valley Chinook salmon and includes portions of San Pablo bay in the project site.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Migrating adult and migrating and rearing juvenile Chinook salmon have the potential to occur in the project area in San Pablo Bay.

Longfin smelt

LISTING STATUS: Longfin smelt was listed by CDFG as threatened under CESA on March 4, 2009, but is not listed under the FESA.

HABITAT AND BIOLOGY: Longfin smelt are euryhaline, occupying various areas of the San Francisco Estuary throughout their lifecycle. Their life cycle begins with spawning in Suisun Bay, the Delta and lower Sacramento and San Joaquin Rivers, followed by downstream transport of the larvae, juvenile dispersal and migration to marine waters, and an upstream spawning migration by yearlings during late fall and winter. The downstream extent of longfin spawning typically is upper Suisun Bay (Wang 1986, 1991, Moyle 2002), however, some spawning may also occur at the southern tip of South San Francisco Bay. Longfin smelt spawning may occur as early as November through as late as June, but primarily occurs from February through April.

The center of the longfin smelt population's distribution in the San Francisco Estuary gradually moves downstream during the summer. During most years adults concentrate in San Pablo Bay during April-June and become more dispersed during late summer (many moving into central San Francisco Bay) (Moyle 2002). During fall and winter the population gradually moves upstream to spawn. The exact distribution pattern of longfin smelt varies from year to year. During wet winters, high outflows may push yearlings back into San Francisco Bay, whereas during drought years they may concentrate in Suisun Bay (Armor and Herrgesell 1985, Moyle 2002). Except when spawning, longfin smelt are most abundant in Suisun and San Pablo bays (Moyle 2002).

Larvae are usually most abundant in the water column from January through April (CDFG unpublished, as cited in Reclamation 2008). The center of distribution of longfin smelt larvae varies with outflow conditions and is closely associated with the low-salinity zone (LSZ, which can be indexed as X2); the center of distribution is consistently seaward of X2 (Dege and Brown 2004, Reclamation 2008). Post-larval longfin smelt are reportedly associated with deep-water habitats (Rosenfield and Baxter 2007). During years when high outflows occur when larvae are being transported downstream, most larvae are transported to Suisun and San Pablo bays; during years with lower outflow, larvae are transported into the western Delta and Suisun Bay (Baxter 2000, Baxter et al. 1999, Moyle 2002). Strong freshwater outflow is thought to correspond with longfin smelt survival, as higher flows transport longfin smelt young to more suitable rearing habitat in Suisun and San Pablo bays (Moyle 2002).

The concentration of longfin smelt in deepwater habitats, combined with their migration into marine waters during the summer suggests that longfin smelt may be relatively intolerant of the warmer waters that occur in the estuary.

CRITICAL HABITAT DESIGNATION: No critical habitat has been designated for this species.

POTENTIAL TO OCCUR ON THE PROJECT SITE: Longfin smelt have the potential to occur in the portions of San Pablo Bay in the project area.

Essential Fish Habitat and Regionally Important Commercial and/or Recreational Fisheries

Several species of fish occur in San Pablo Bay that are managed under a federal Fishery Management Plan and have designated EFH because they provide regionally important commercial fisheries; however, they do not otherwise have a special-status designation. In addition, several species of fish and shellfish occurring in San Pablo Bay provide important commercial and/or recreational fisheries but do not have a special-status designation and are also not managed under a Fishery Management Plan and have no designated EFH. These regionally important commercial and/or recreational fisheries are listed in **Table 1** and discussed below.

Table 1. Regionally Important Commercial and/or Recreational Fisheries

Common Name	Scientific Name	Fishery Management Plan
Northern Anchovy	<i>Engraulis mordax</i>	Coastal Pelagic
Starry Flounder	<i>Platichthys stellatus</i>	Groundfish
Chinook/Coho salmon	<i>Oncorhynchus tshawytscha/O. kisutch</i>	Pacific Coast Salmon
English Sole	<i>Parophrys vetulus</i>	Groundfish
Big Skate	<i>Raja binoculatus</i>	Groundfish
Pacific Sardine	<i>Sardinops sagax</i>	Coastal Pelagic
Spiny Dogfish	<i>Squalus acanthias</i>	Groundfish
Leopard Shark	<i>Triakus semifasciatus</i>	Groundfish
Sand Sole	<i>Cynoglossus capensis</i>	Groundfish
California Halibut	<i>Paralichthys californicus</i>	--
Pacific Halibut	<i>Hippoglossus stenolepis</i>	--
Pacific herring	<i>Clupea pallasii</i>	--
Dungeness Crab	<i>Cancer magister</i>	--

Starry Flounder

Starry flounder spawn in shallow (less than 45 m deep) waters near the mouths of rivers and estuaries during the winter (Goals Project 2000 as cited in Reclamation 2008), from November to February, peaking in December and January (Orcutt 1950 as cited in Reclamation 2008). Eggs and larvae are pelagic and are carried inshore by currents settling to the bottom, which require low salinity water for rearing (Orcutt 1950, Wang 1986 as cited in Orsi 1999; Moyle 2002 and references therein). While some spawning may occur in the San

Francisco Estuary, most juveniles found in the Estuary are apparently carried in from nearshore ocean waters by strong tidal currents along the bottom (Moyle 2002). Eggs are found in polyhaline to euhaline waters. Juveniles are found in mesohaline to freshwater with a preference for sandy and muddy substrates (Reclamation 2008). Starry flounder tend to rear for up to two years in estuarine areas before moving to shallow coastal marine waters (Reclamation 2008) with higher salinities (Orsi 1999 and references within). Adults move inshore during winter or early spring to spawn and move offshore to deeper waters during the summer and fall (Reclamation 2008). Adults prefer sandy and coarse substrates.

Starry flounder distribution tends to shift with growth (Reclamation 2008). Young juveniles are commonly found in fresh or brackish water of Suisun Bay, Suisun Marsh, and the Delta, older juveniles range from brackish to marine water of Suisun and San Pablo Bays, and adults tend to live in shallow marine waters within and outside the San Francisco Bay before returning to estuaries to spawn (Goals Project 2000 as cited in Reclamation 2008). More specifically, composite habitats most important for the starry flounder are estuarine (for all life stages), non-rocky shelf (for juveniles and adults), and neritic habitats (for eggs and larvae), as defined by the FMP.

English Sole

English sole spawn over soft-bottom mud substrata at depths of 50 to 70 m (Ketchen 1956 *as cited in* PFMC 2005) from September through April (Orsi 1999 and references within), but primarily during January and February in California (Jow 1969 *as cited in* Orsi 1999). Specifically, the eggs and larvae are pelagic, while juveniles and adults are demersal (Garrison and Miller 1982 *as cited in* PFMC 2005). Larvae are found primarily in waters less than 200 m deep (Laroche and Richardson 1979 *as cited in* PFMC 2005). Juveniles reside primarily in shallow-water coastal, bay, and estuarine areas (Ketchen 1956, Krygier and Percy 1986, Laroche and Holton 1979, Olson and Pratt 1973, Percy and Myers 1974, Rogers *et al.* 1988, Toole 1980, Van Cleve and El-Sayed 1969, Westheim 1955 *as cited in* PFMC 2005). The PFMC (2005) reports juveniles often settling in estuarine and shallow near-shore areas. English sole appear to use the Bay as a nursery area, entering as transforming larvae or small juveniles during the winter-summer of their first year of life and emigrating sometime between the end of their first or second summer in the Bay. As they grow, they move to deeper waters and continue to do so after they emigrate to the open coast (PFMC 2005, Orsi 1999 and references within).

In the North Pacific, English sole is an inner-shelf mesohobenthal species (Allen and Smith 1988 *as cited in* PFMC 2005). English sole is an abundant species in San Pablo Bay (from San Rafael Bridge to Carquinez Bridge). The tidal currents of the Bay influence the distribution of this species (PFMC 2005).

Big Skate

The big skate is a demersal, marine species occurring at depths ranging from 3 to 800 m (PFMC 2005, FishBase 2009), however they primarily reside in depths from 3 to 110 m. Big skate produce large egg cases containing multiple embryos, typically utilizing spawning beds at depths of 60 – 65 m (DeLacy and Chapman 1935, Hitz 1964 *as cited in* PFMC 2005). Egg cases are laid year round, however some research indicates a possible seasonal egg laying (PFMC 2005 and references within).

Big skates are relatively abundant in northern and central California, occupying the inner and outer shelf areas (Allen and Smith 1988 *as cited in* PFMC 2005), particularly on soft bottom. Little is known about the movements of big skates (Martin and Zorzi 1993 *as cited in* PFMC 2005).

Spiny Dogfish

Spiny dogfish occur from the surface and intertidal areas to greater depths (Allen and Smith 1988, Bannister 1989, Castro 1983, Lineaweaver and Backus 1984, NOAA 1990 *as cited in* PFMC 2005). Spiny dogfish mate in the winter months on the ocean bottom between September and January (Jones and Geen 1977a, Ketchen 1972, NOAA 1990 *as cited in* PFMC 2005). After a gestation period ranging from 18 to 24 months, adult females occupy shallow waters during the spring to release their young in the mid-water zone (depths over 165 – 350 m) (Jones and Geen 1977a, NOAA 1990 *as cited in* PFMC 2005). Small juveniles are pelagic, while sub-adults and adults are mostly sublittoral-bathyal (NOAA 1990, Ebert 2003 *as cited in* PFMC 2005). Sub-adults are found on muddy bottoms when not found in the water column (NOAA 1990 *as cited in* PFMC 2005). Spiny dogfish are common in inland seas, such as San Francisco Bay (Ebert 1986 *in* PFMC 2005) and in shallow bays (Eschmeyer *et al.* 1983 *as cited in* PFMC 2005).

Leopard Shark

A coastal species, the leopard shark is abundant in northern California bays and estuaries (Ebert 2003 *as cited in* PFMC 2005), commonly occurring in littoral waters (on or near shore, especially the zone between the high and low tide marks) less than 20 m deep (PFMC 2005 and references within). In the San Francisco Estuary, most leopard sharks are resident but some emigrate from the estuary in the fall (Smith and Abramson 1990 *as cited in* Orsi 1999). They occupy various habitats including: (1) enclosed, muddy bays; (2) flat, sandy areas; (3) mudflats; (4) sandy and muddy bottoms strewn with rocks near rocky reefs; and (5) kelp beds (PFMC 2005 and references within). This species often enters shallow bays and intertidal flats during high tides and retreats on ebb tides. Although they are often found in the intertidal zone, they apparently spend little time feeding there (Russo 1975 *as cited in* Orsi 1999). Leopard sharks mate in April and May and release the pups from March to August (Compagno 1984, Emmett *et al.* 1991 *as cited in* PFMC 2005). Estuaries and shallow coastal waters (Emmett *et al.* 1991, Smith 2001 *as cited in* PFMC 2005) appear to be used as pupping

and feeding/rearing grounds. Neonate pups can be found near eel grass beds, such as those in San Francisco Bay (Ebert 2003 *as cited in* PFMC 2005).

Sand Sole

Sand sole are considered an inner shelf-outer shelf species. Spawning occurs in winter and spring, in shallow nearshore waters over sandy and muddy substrata (Garrison and Miller 1982 *as cited in* PFMC 2005). Once spawning is completed they move south and offshore in the summer to feed (Rogers and Millner 1996 *as cited in* PFMC 2005). Eggs, larvae, and small juveniles are pelagic, and are transported to estuaries and shallow nearshore bays by tidal currents (Haldorson *et al.* 1993 *as cited in* PFMC 2005). Older juveniles and adults are demersal (Haldorson *et al.* 1993 *as cited in* PFMC 2005). Adults and juveniles occupy depths between 1 and 325 m, but nearly all occur at depths shallower than 150 m (PFMC 2005 and references within).

Pacific Sardine

The Pacific sardine spawn throughout their range but most spawning takes place off southern California from January through September (Orsi 1999). Pacific sardine spawn in loosely aggregated schools in the upper 50 m of the water column, with eggs and larvae found near the water surface (PFMC 1998). The spatial and seasonal distribution of spawning is influenced by temperature (PFMC 1998). During periods of warm water, the center of sardine spawning shifts northward and spawning extends over a longer period of time (PFMC 1998 and references within). Eggs and larvae occur nearly everywhere adults are found (PFMC 1998). Pacific sardines are pelagic at all life history stages (PFMC 1998).

Pacific sardine are a seasonally migratory species that opportunistically occur in San Pablo Bay. During the Fall Midwater Trawl surveys between 1998 and 2003, CDFG collected only 13 Pacific sardine in San Pablo Bay between mid-October to early-December (BDAT 2009). The species has occasionally been found within Suisun Marsh during pronounced salinity intrusion events during droughts and low outflow periods (Reclamation 2008).

Northern Anchovy

A small short-lived fish typically found in schools near the water surface (PFMC 1998), northern anchovy spawn during every month of the year, increasing during late winter and early spring (PFMC 1998). It is reported that peak spawning occurs from January through April (Richardson 1981 *as cited in* Reclamation 2008). The northern anchovy is a broadcast spawner and spawns in batches each year. Most spawning takes place in channels or within 60 miles of the coast in the upper mixed layers at night (Reclamation 2008). Eggs and larvae are planktonic, generally at depths of less than 50 m and in the same areas as spawning adults (PFMC 1998). Juveniles and adults are pelagic, and are found ranging from the surface to 300 m deep (MacCrae 1994 *as cited in* Reclamation 2008). The San Francisco Bay is thought to provide favorable reproductive habitat for the anchovy because of abundant food exists for

both adults and larvae and coastal upwelling keeps eggs and larvae in productive areas (Reclamation 2008).

Northern anchovy are found year-round in the San Francisco Bay area (from Suisun Bay to South Francisco Bay and occasionally in the lower Delta) (Herbold *et al.* 1992, Goals Project 2000 *as cited in* Reclamation 2008). This species is most abundant downstream of the Carquinez Strait and outside the Bay in the California Current (Herbold *et al.* 1992, Goals Project 2000 *as cited in* Reclamation 2008). Between 1970 and 2004, approximately 49,000 northern anchovy have been collected by CDFG during fall midwater trawl surveys in the project vicinity (BDAT 2009). Based on their abundance, northern anchovy are likely an important forage fish.

California Halibut

California halibut spawn in coastal waters year-round, but in the San Francisco Bay larvae are generally most numerous in the fall (CDFG Website 2009b). Both eggs and larvae are pelagic. Larvae settle to the bottom at about 10 mm TL and the juvenile halibut seek out shallow protected water for their first few years of life, moving to deeper water with growth (CDFG Website 2009b). Juvenile halibut were not common in San Francisco Bay prior to the El Nino currents of 1982-1984. Halibut numbers have increased substantially in San Francisco Bay through the late 1980s and early 1990s due to local recruitment during the numerous warm water years (CDFG Website 2009b). Halibut are now an important component of the in-Bay and nearshore recreational fishery. Increased effort has been directed at halibut due to declining striped bass and salmon populations (CDFG Website 2009b).

Pacific Halibut

Pacific halibut occur at depths from 20 to 3,600 feet and prefer deep sandy environments. Spawning takes place from November to January (CDFG Website 2009c). The eggs and young drift casually with the currents, gradually rising toward the surface as development proceeds. By early spring, the transformation is complete and the young settle to the bottom in shallow waters. The diet of the Pacific halibut includes fishes, crabs, clams, squid and other invertebrates (CDFG Website 2009c).

Pacific herring

In California, herring are found offshore during the spring and summer months foraging in the open ocean. Beginning as early as October and continuing as late as April, schools of adult herring migrate inshore into the San Francisco Estuary spawn (CDFG Website 2009a). Schools first appear in the deep water channels of bays, where they can stay for up to two weeks as their gonads mature, prior to moving into shallow areas to spawn. Most spawning areas are characterized as having reduced salinity with calm and protected waters (CDFG Website 2009a). Spawning-substrate such as marine vegetation or rocky intertidal areas are

preferred but man-made structures such as pier pilings and riprap are also frequently used spawning substrates in San Francisco Bay (CDFG Website 2009a).

The state-managed commercial herring fishery is one of the few fisheries in California that undergo annual population assessments and subsequent regulatory change. Like other short-lived coastal pelagic species, Pacific herring abundance fluctuates widely due to variable recruitment (the success of each year-class of new fish), making annual population assessments necessary for effective management (CDFG Website 2009a). Due to an historic low 2008-2009 season spawning biomass estimate and concerns over the health of the Pacific herring population, the California Fish and Game Commission adopted a zero quota for San Francisco Bay for the 2009-2010 season, resulting in a zero quota for the herring roe, fresh fish market, and herring-eggs-on-kelp fisheries in San Francisco Bay for the 2009-2010 season (CDFG Website 2009a).

Dungeness crab

Dungeness crab is a valuable sport and commercial species that reproduces in the ocean in winter and rears in nearshore coastal areas and estuaries (CDFG 2004). Small juvenile *C. magister*, 5-10 mm carapace width (CW), immigrate to San Francisco Estuary during the spring, rear for 8-10 months, and emigrate to the ocean in fall and winter at a size of approximately 100 mm CW (CDFG 2004). Clams, fish, isopods and amphipods are preferred prey items of Dungeness crab, and cannibalism is prevalent among all age groups (Hankin and Warner 2001). Predators on the various life stages of Dungeness crabs, especially pelagic larvae and small juveniles, include octopuses, larger crabs and as many as 28 species of fish, including Coho and Chinook salmon, flatfishes, lingcod, cabezon and various rockfishes (Hankin and Warner 2001).

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Personal Communication

Phillips, Josh. Phone call with Serge Stanich. November 2009.