5 ENVIRONMENT

5.1 HYDROLOGY AND FLOODING

Surface Water

The City of Pacifica is located within all or part of nine watersheds, shown on Figure 5-1, Hydrology and Flooding. The majority of the City drains west towards the Pacific Ocean. From north to south, the major watersheds that drain to the ocean are Milagra Creek, Sanchez Creek (also known as Sharp Park Creek), Calera Creek, and San Pedro Creek. A small portion of the Planning Area drains to the east, contributing to the upper basin of San Mateo Creek watershed, which flows east toward San Francisco Bay.

Milagra Creek

Milagra Creek watershed drains approximately 460 acres including the northern portion of Pacifica west to the ocean. The drainage area for Milagra Creek has varied land cover types, with the southern portion of the drainage including an undeveloped portion of the Golden Gate National Recreation Area (GGNRA). Much of the remaining contributing area includes relatively dense residential and commercial development and Highway 1. Milagra Creek has intermittent flow in most years. The lower reaches of Milagra Creek have been altered and the channel hardened in the reach below Highway 1 to the ocean.

Limited information regarding water quality of Milagra Creek is available. The United States Geological Survey (USGS) performed a limited water quality assessment in the GGNRA that included three water and sediment samples within Milagra Creek in February, April, and July of 2006 (Hladik and Orlando, 2008). This study attempted to develop baseline levels of pesticides in the water and sediment of urban creeks within the GGNRA and the Presidio. The findings suggested that excess pesticides were being washed into the creek during the early wet season, but not later in the wet season.

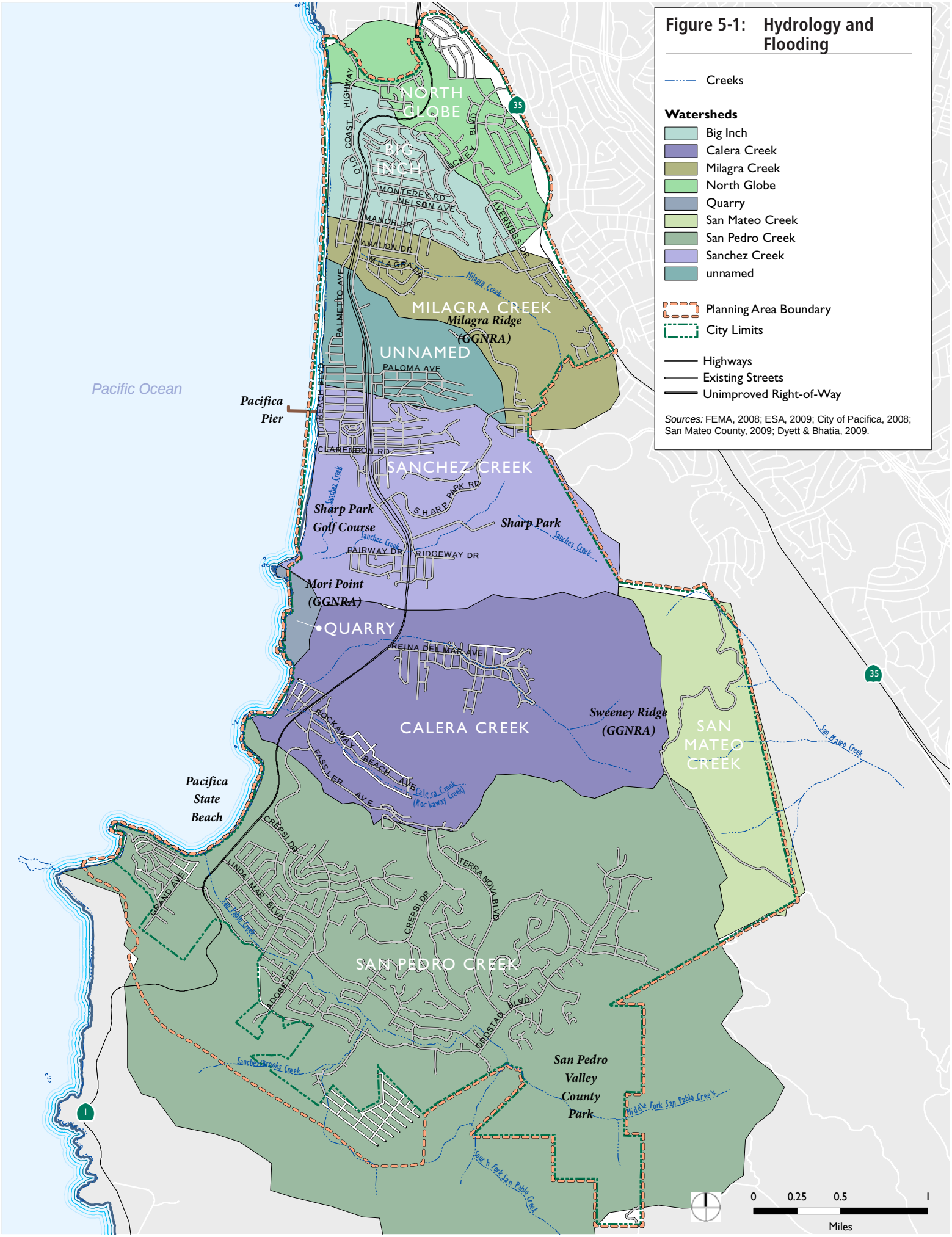
Figure 5-1: Hydrology and Flooding
Creeks
Watersheds
Big Inch
Calera Creek
Milagra Creek
North Globe
Quarry
San Mateo Creek
San Pedro Creek
Sanchez Creek
unnamed
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: FEMA, 2008; ESA, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
NORTH GLOBE
BIG INCH
MILAGRA CREEK
Milagra Ridge (GGNRA)
UNNAMED
SANCHEZ CREEK
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
QUARRY
CALERA CREEK
Sweeney Ridge (GGNRA)
SAN MATEO CREEK
Pacifica Pier
Pacifica State Beach
SAN PEDRO CREEK
San Pedro Valley County Park
OLD COAST HIGHWAY
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
MILAGRA DR
PALMETTO AVE
PALOMA AVE
BEACH BLVD
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
LINDA MAR BLVD
GRAND AVE
TERRA NOVA BLVD
ADOBE DR
ODDSTAD BLVD
Milagra Creek
Sanchez Creek
Calera Creek (Rockaway Creek)
San Mateo Creek
San Pedro Creek
Sanchez Brooks Creek
Middle Fork San Pablo Creek
South Fork San Pablo Creek
0 0.25 0.5 1
Miles

Sanchez Creek

Sanchez Creek watershed drains approximately 1,071 acres west to the Pacific Ocean (Philip Williams and Associates, Ltd. [PWA], 1992). This watershed is almost entirely within the City of Pacifica. Much of the contributing area to Sanchez Creek is within Sharp Park and GGNRA lands. Portions of the valley bottoms and flatter portions of the hillsides include residential development, Highway 1, and a golf course. Sanchez Creek likely has intermittent flow in most years.

At its mouth, Sanchez Creek flows through Horse Stable Pond and exchanges water with Laguna Salada within the Sharp Park Golf Course. Creek flow is then conveyed through a levee to the ocean via a system of pipes. The discharge point of the pipe(s) is often buried in beach sands and is occasionally excavated to allow for free drainage. During high flows, water from the golf course is pumped over the levee into the ocean.

There are several riverine wetlands associated with Sanchez Creek throughout the watershed. Notable wetlands include a headwater wetland on the north fork of the creek, and an old irrigation pond along the main stem of the river. The irrigation pond has been used to provide water for the Sharp Park Golf Course. There are also several depressional and formerly estuarine wetlands near the mouth of Sanchez Creek at Horseshoe Pond and Laguna Salada.

The USGS pesticide baseline study mentioned above included Sanchez Creek (Hladik and Orlando, 2008). Water samples showed limited concentrations of three pesticides and no concentrations measurable in the sediment samples.

Calera Creek

Calera Creek drains the central portion of the City of Pacifica west to the ocean, flowing onto the north end of Rockaway Beach. Calera Creek drains approximately 1,600 acres via two forks, a main channel to the north, and a smaller southern fork (sometimes referred to as Rockaway Creek).

Land use throughout the Calera Creek basin is dominated by residential neighborhoods with some commercial businesses along main roads. The contributing area of Calera Creek is generally

The lower reach of Calera Creek was part of a significant restoration project involving the excavation of a new stream channel and habitat restoration. The site receives tertiary-treated wastewater from the City's new Water Recycling Plant.

Need new photo: too low res

more altered along the valley bottom and near the mouth. The City of Pacifica's wastewater treatment plant (WWTP) is located near the mouth of Calera Creek, west of Highway 1.

The lower reach of Calera Creek was part of a significant restoration project implemented in 1997 and 1998. This project included the excavation of a new stream channel, restoration of approximately 16 acres of wetlands, and 12 acres of surrounding uplands. The restoration site receives additional tertiary-treated wastewater from the City's WWTP, which adds approximately 3.6 million gallons per day (mgd) to the lower reach. The amount of flow generated by the WWTP varies with rainfall events and usage.

Calera Creek is now perennial in the lower reach due to the input from the WWTP. The creek was likely intermittent in at least some years, and is still intermittent with residual pools above the WWTP discharge point.

San Pedro Creek

San Pedro Creek watershed is the largest of the surface water channels within the City of Pacifica, draining approximately 5,300 acres west to the Pacific Ocean north of San Pedro Point. The watershed extends north to Sweeney Ridge, east to Spring Valley Ridge, and south into the slopes of Montara Mountain. San Pedro Creek has five main tributaries extending well past the City's eastern and southern boundaries. These tributaries include: South Fork, Middle Fork, North Fork, and Brooks/Sanchez Creek.

San Pedro Creek is a key watershed along this portion of the coast in that it has perennial flow that continues to support anadromous steelhead trout, which are listed under the federal Endangered Species Act. This creek also has one of the only functioning estuaries between the Devil's Slide area and the Golden Gate Bridge. Riverine wetlands along San Pedro Creek also provide habitat for the threatened California red-legged frog.

The upper watershed, beyond the City's Planning Area, extends into the GGNRA and is largely undeveloped. The lower portion within the City is highly developed as residential with commercial shopping centers near Highway 1.

Portions of San Pedro Creek have been significantly altered during past agricultural and urban land cover conversions. The North Fork of San Pedro Creek has been ditched and realigned to support farming in the valley bottom. The North Fork is currently contained within a pipe that was installed as the area developed as residential housing (Collins et al., 2001).

Direct alterations and changing hydrology from urban development have resulted in a deeply incised channel with steep banks in much of the main channel. Channel downcutting and erosion throughout the reach has threatened roads and structures, as many residential lots back up against the creek. Various types of formal and informal bank stabilization techniques have been installed over the years to protect banks (Collins et al., 2001).

STREAM RESTORATION

The City of Pacifica and its partners have implemented several restoration projects along San Pedro Creek since the mid-1990s. The mouth of San Pedro Creek has been restored to a tidally-influenced estuary. This project included the acquisition of a property and significant fill removal west of Highway 1.

In 2000, earthwork and planting was completed on a combination stream restoration and flood protection project on former California Department of Transportation (Caltrans) property east of Highway 1. This project established more natural channel geometry and increased channel-floodplain connections to provide additional flood storage. This project was implemented with federal assistance from the U.S. Army Corps of Engineers. This project is one part of a multi-phase project intended to reduce flood risks, improve channel stability, and restore ecosystem functioning along San Pedro Creek. This project provides multiple benefits, including the res-

toration of habitat for several listed species including steelhead trout and red-legged frogs.

Another phase of the San Pedro Creek restoration work occurred further upstream at the Capistrano bridge crossing. This project included the installation of rock weirs to stabilize the degrading channel bed, smooth the longitudinal profile, and improve fish passage through the site. This project was implemented in 2005 (San Pedro Watershed Coalition).

WATER QUALITY

From 2002 to 2004, San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP) collected bioassessment and limited water quality grab samples throughout the San Pedro Creek watershed (STOPPP, 2005). The results of the bioassessment generally confirm that the portions of the creek that are higher in the watershed, and that do not receive as much runoff from developed lands, support greater species richness and diversity. Habitat scores were similar throughout the watershed, however, suggesting that water quality may be the main driver of benthic macroinvertebrates in San Pedro Creek (STOPPP, 2005).

The limited water quality testing consisted of water samples from three locations on three different days. Tested parameters included screening for organophosphorous pesticides, pH, temperature, conductivity, dissolved oxygen, and velocity. The results of the testing were all within general water quality standards though some temperature readings were relatively high during one sampling event. Organo-phosphorous pesticides were not identified in these tests.

San Pedro Creek is listed on the San Francisco Bay Regional Water Quality Control Board's (RWQCB) 2006 303(d) list of impaired waters for high coliform bacteria. Impaired water bodies refer to those that do not meet one or more of the water quality standards established by the state (SWRCB, 2007). A Total Maximum Daily Load (TMDL) for coliform bacteria in San Pedro Creek is proposed to be established by 2019 (SWRCB, 2007). TMDL refers to the maximum amount of a pollutant that a water body can receive and still meet water quality standards (see Applicable Regulations section for more details).

SAN MATEO CREEK

A small portion of the City's Planning Area drains east into the upper San Mateo Creek watershed. This area covers approximately 600 acres, approximately seven percent of the Planning Area, located along the eastern slopes of Sweeney Ridge. This area is within National Park Service lands, and is currently undeveloped with the exception of a ridge-top fire access road. San Mateo Creek is listed on the RWQCB's 2006 303(d) list of impaired waters for diazinon (insecticide). A TMDL for diazinon in San Mateo Creek was established in 2007 (SWRCB, 2007).

Groundwater

The San Pedro Valley Groundwater Basin lies within the City of Pacifica and includes a surface area of approximately 700 acres. Alluvial deposits are found throughout the majority of the basin and are the primary water-bearing formation in the City of Pacifica. These deposits consist primarily of clays, sands, and silts, with some gravels (Department of Water Resources [DWR], 2004). Existing data indicates that the alluvial deposits in San Pedro Valley are approximately 150 feet thick or more (City of Pacifica, 1992).

The alluvium probably contains semi-confined and unconfined groundwater which is transmitted and stored through intergranular porosity. Previous studies indicate that the aquifer is recharged by local precipitation and runoff (City of Pacifica, 1992). The outflow of water from the aquifer occurs by evapotranspiration and seepage to streams, springs, and the ocean. The water table fluctuates seasonally in response to outflow and recharge volumes. The fluctuations vary based on characteristics such as soil permeability, rainfall, and slopes. Water quality, groundwater level, and groundwater storage data for the San Pedro Valley Groundwater Basin is minimal.

Groundwater wells in the City of Pacifica were monitored to determine the location of seasonally shallow groundwater, as part of a Sewer System Evalua-

tion Survey. The groundwater was mapped for three depths below the ground surface: less than 1.5 feet; less than 3.0 feet; and less than 6.0 feet (City of Pacifica, 1992). Communities with seasonally shallow groundwater include Pedro Point, Park Pacifica, Vallemar, Fairway Park, Linda Mar, and Sharp Park.

Riverine Flood Zones

Flood hazards exist along most of the significant surface channels in Pacifica. Broad flood inundation is relatively common in several low-lying areas, including the Sharp Park area along Sanchez Creek, and in the Linda Mar neighborhood along San Pedro Creek. In much of the City, however, the creeks are confined within deeply incised channels, limiting potential flooding in these areas.

Some flood hazards have been mapped by the Federal Emergency Management Agency (FEMA) to support the development of Flood Insurance Rate Maps (FIRMs). These maps generally identify areas of greater flood risk (e.g., 1 and 0.2 percent annual chance flood areas, also referred to as 100 and 500 year events) in the lower reaches of the main stream channels, and the risk of coastal flooding along the shoreline. The FIRMs have been recently updated, and are expected to be finalized in October 2010. The new maps are refelcted in Figure 5-2, Flood Zones.

Along Milagra Creek, mapped flood hazards are typically within the active channel.

Along Sanchez Creek, mapped flood hazard zones include portions of the channel extending from Highway 1 west to the seawall within the Sharp Park Golf Course. These areas include the 1 percent annual chance area typically within or near the main channel, and a broad area within the 0.2 percent chance area over much of the golf course.

Both 1 and 0.2 percent annual chance flood areas are mapped along Calera Creek extending from the coast upstream past the Highway 1 crossing. A broad area within the 0.2 percent chance area is mapped in the former lower quarry area extending upstream along the south fork of Calera Creek. A broad area within the 1 percent chance area is shown in the lower quarry area.

The 1 percent annual chance flood area along San Pedro Creek is primarily confined to the creek channel and the wetland area west of Highway 1. A broad 0.2 percent annual chance flood area is mapped at the confluence of the main stem with the North Fork of the San Pedro Creek. With the new flood insurance maps, a significant area of West Linda Mar has been removed from high flood risk classification due to the completion of the San Pedro Creek flood protection project.

Recent Floods

San Pedro Creek has a history of significant flooding in the Linda Mar area. The low area of Linda Mar has pump systems to provide drainage to the ocean, but these systems can be overwhelmed during high flow/tide events. Significant flooding in this area occurred in 1955, 1962, 1972, 1982, 1997, and 1998 (McDonald, 2004).

Coastal Flooding

Pacifica can also experience flooding from coastal sources. Coastal flooding in Pacifica typically occurs as some combination of high tides, large wind-driven waves, storm surge, and/or tsunami wave. Areas with the potential for coastal flooding have been mapped and shown on the FEMA FIRMs (Figure 5-2) based on a coastal flooding analysis performed in 1984 (FEMA, 2008). Areas mapped as prone to coastal flooding are focused on the low lying areas along the coast including:

- The Sharp Park Golf Course/Laguna Salada area;
- Lower Calera Creek;
- Portions of Rockaway Beach;
- Residential and commercial area at Linda Mar near the mouth of San Pedro Creek.

Most of these areas lie to the west of Highway 1, with the notable exception of the San Pedro Creek Valley. This area extends well past Highway 1 into the residential and commercial area of Linda Mar.

The coastal flooding analysis determined the extent of the 1 percent annual chance flood event as a two-step process. First, stillwater elevations were defined using historical data for astronomical tide, storm surge, and wave setup. Second, wave runup on the beach was calculated using a wave tracking model (FEMA, 2008). The wave runup calculations were performed on offshore bathymetry maps and beach transects collected by the USACOE in 1978 (FEMA, 2008).

The only section of coastline that is protected by levees is the Sharp Park Golf Course area. Waves overtopping the levee along the golf course resulted in significant flooding in 1983 and 1986 (PWA, 1992). Since that time, the levee has been reinforced, reducing overtopping risk in the area. However, drainage from Sanchez Creek and Laguna Salada to the ocean can be insufficient to prevent lowland flooding during high tide/high flow events.

A seawall/revetment structure protects the area north of the Sharp Park Golf Course, generally along Beach Boulevard, including the Pacifica Pier. The structure has required maintenance on several occasions to repair areas where beach erosion has undermined the structure. The City of Pacifica is in the process of designing and permitting additional structural protections for portions of the revetment.

Potential Sea Level Rise

Sea level rise resulting from global climate change, discussed in more detail in Section 5.7, has the potential to alter the frequency and magnitude of coastal flood events in Pacifica. Current estimates of sea level rise are based on Global Climate Models (GCMs), based on work performed by the Intergovernmental Panel on Climate Change (IPCC), which released a summary report in 2007 (IPCC, 2007).

The IPCC results have been used by researchers in California to investigate possible ramifications along the California coast, often looking over the next 100 years. Estimates of sea level rise vary between model runs, so trends and potential increases are typically reported in ranges. Cayan et al. (2008) presents

Laguna Salada, in Sharp Park Golf Course, is among the low-lying areas in Pacifica prone to coastal flooding. It is also the only section of the City's coastline protected by levees.

ranges of sea level rise of between 40.2 inches and 57.5 inches (Pacific Institute, 2009).

In general, these estimates are shown as smooth or accelerating trends meaning that these changes will be relatively constant with time. However the climate model runs intended to capture more severe carbon dioxide loadings to the atmosphere typically show acceleration in rising levels in the decades ahead.

INCREASED COASTAL FLOODING

A recent report funded by a consortium of California state agencies has developed approximate mapping to indicate potential increases in the 1 percent annual chance of coastal inundation, assuming a 55.1 inch rise in sea level (Pacific Institute, 2009). This model, as it applies to Pacifica, is shown in Figure 5-2, Flood Zones. This flood mapping is approximate, and should not be used in place of FEMA FIRMs or FIS, or for land use planning. The model does not factor in changes to the frequency of flooding events, variation in wave patterns, or intervening topography or structures (Pacific Institute, 2009). It does suggest that areas of West Linda Mar, lower Pedro Point, Rockaway Beach, and West Sharp Park neighborhoods, as well as the Sharp Park Golf Course, could be vulnerable to increased coastal flooding.

Tsunami

Coastal flooding, potentially severe damage, and threats to human health and safety can occur as a result of a tsunami. A tsunami is a wave generated by abrupt movement of the seabed, which can occur as an earthquake or after a significant landslide. Tsunami hazards occur for the low-lying portions of Pacifica, generally coincident with the coastal flooding zones discussed above (Association of Bay Area Governments [ABAG], 2009). While these areas are at risk, the occurrence of tsunamis is less frequent than riverine or coastal flooding.

Tsunamis can reach Pacifica from several sources, including: (1) 'far-field' sources throughout the Pacific Ocean, (2) a substantial earthquake along the Cascadia Subduction Zone in northern California north to Vancouver Island, (3) movement along local fault lines, and (4) local coastal landslides. Travel times, the degree of warning, and the magnitude of the wave will vary depending on the source and initial strength of the tsunami-generating event.

Earthquakes along the Cascadia Subduction Zone are likely the most hazardous to Pacifica because of the potential for very large wave generation, and a relatively short travel time (on the order of 1-3 hours) (San Mateo County, 2006). However, smaller events along local faults could result in a wave that reaches Pacifica with essentially no warning time.

A recent study investigated the probability of tsunami occurrence and the potential severity of tsunamis reaching the City of Pacifica to support the City's planning process for a new City Hall building (Coastal Environments, 2007). Historical tsunami run-up (wave height) values from San Francisco to Monterey from 1854 to 2007 from the National Geophysical Data Center (NGDC) were used to investigate recorded patterns at Pacifica. These records indicated that two tsunamis have reached Pacifica during the 153 year record (Coastal Environments, 2007).

The most significant recorded tsunami wave that has reached Pacifica was related to the 1964 earthquake in Prince William Sound, Alaska. This event was a 9.2 magnitude earthquake that resulted in a 4.5 foot (1.37 m) runup at Pacifica. The study resulted in an estimate of tsunami runup heights and frequencies ranging from 0.16 feet (0.05 m) for the 5-year (20 percent annual chance) event to 4.2 feet (1.27 m) for the 500-year (0.2 percent annual chance) event (Coastal Environments, 2007).

Overall, the report rates tsunami risks in Pacifica as lower than other areas in northern California. Recorded tsunami runup magnitude is generally lower at Pacifica than other locations from San Francisco to Monterey, likely due to offshore bathymetry and shoreline alterations along the City (Coastal Environments, 2007).

San Mateo County has an established emergency plan for tsunamis (San Mateo County, 2009). The

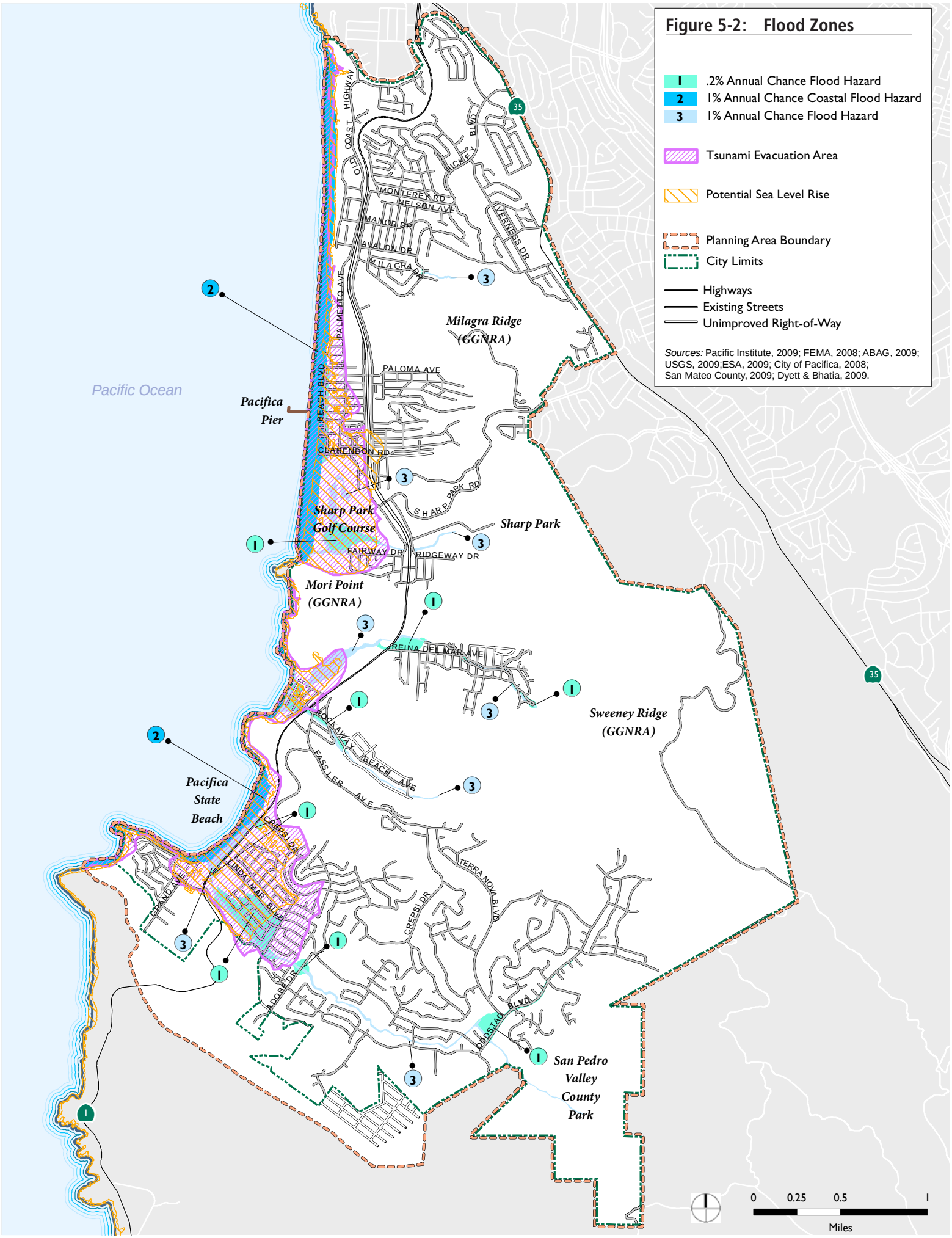
Figure 5-2: Flood Zones
1 .2% Annual Chance Flood Hazard
2 1% Annual Chance Coastal Flood Hazard
3 1% Annual Chance Flood Hazard
Tsunami Evacuation Area
Potential Sea Level Rise
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: Pacific Institute, 2009; FEMA, 2008; ABAG, 2009; USGS, 2009;ESA, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
OLD COAST HIGHWAY
MICHELLE BLVD
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
VILLAGRA DR
VERNESS DR
PALMETTO AVE
BEACH BLVD
PALOMA AVE
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
LINDA MAR BLVD
GRAND AVE
TERRA NOVA BLVD
ADOBE DR
DODSTAD BLVD
35
0 0.25 0.5 1
Miles

City of Pacifica has identified tsunami hazards in their local annex to the Association of Bay Area Government's Multi-Jurisdictional Local Hazard Mitigation Plan for the Bay Area (City of Pacifica, 2005). As part of this program, the City of Pacifica has recently installed a tsunami warning system, consisting of three solar powered alarm towers. One is located in the Sharp Park neighborhood, the second is located in the Rockaway Beach neighborhood, and the third tower stands at Pacifica State Beach. This system links into a San Mateo County alert system that can reach email and cell phones.

Regulatory Framework

Federal Regulations

CLEAN WATER ACT (CWA)

The Clean Water Act (CWA) provides jurisdiction over waters of the United States and authorizes the Environmental Protection Agency (EPA) to implement water quality regulations. The intent of the CWA is to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. The CWA includes regulatory and nonregulatory guidance to reduce direct and indirect pollution discharges into waterways.

National Pollutant Discharge Elimination System (NPDES)

Section 402(p) of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES permit program regulates stormwater discharges into the waters of the United States. The NPDES program includes a permit that regulates discharges from municipal wastewater treatment plants, and a permit regulating municipal drainage systems that may carry stormwater, surface water and groundwater. The NPDES program also includes a construction general permit which applies to both municipal and private development projects which disturb an acre or more of soils, as well as smaller projects which have been determined to need coverage by the Regional Water Quality Control Board. This permit is discussed in more detail later in this section. The EPA has given authority for NPDES permitting to the California State Water Resources Control Board (SWRCB) and the nine regional water quality boards. The San Francisco Bay Regional Water Quality Control Board (RWQCB) regulates water quality for the City of Pacifica.

Total Maximum Daily Load (TMDL)

Section 303(d) of the CWA requires that each state identify segments of water bodies or entire water bodies that are impaired. After a segment of water body or an entire water body is listed for a specified pollutant, the state is required to establish a TMDL for the pollutant identified as causing the impairment. Generally, the TMDL is the sum of the loads of a single specified pollutant from both "point" and "nonpoint" sources. In Pacifica, San Pedro Creek is listed as impaired by coliform bacteria and San Mateo Creek is listed as impaired by diazinon (Table 5-1). The RWQCB is currently preparing a report on San Pedro Creek, which will provide recommendations for addressing microbial water quality issues.

State Regulations

PORTER-COLOGNE WATER QUALITY CONTROL ACT

Porter-Cologne Water Quality Control Act provides the basis for water quality regulation within Cali-

TABLE 5-1: SECTION 303(D) LIST OF IMPAIRED WATER BODIES

Water Body	Pollutant	Potential Source	Status of TMDL Preparation and Approval[1]
San Pedro Creek	Coliform bacteria	Urban runoff/storm sewers	Planned (2019)
San Mateo Creek	Diazinon	Urban runoff/storm sewers	Approved (2007)

Source: SWRCB, 2007.

Note:

1 The date of planned TMDL completion is provided in the 303(d) lists from the SWRCB.

fornia and defines water quality objectives as the limits or levels of water constituents that are established for protection of beneficial uses. The SWRCB administers water rights, water pollution control, and water quality functions throughout California. The RWQCB conducts planning, permitting, and enforcement activities. To facilitate these activities the San Francisco Bay RWQCB has prepared the San Francisco Bay Basin Plan (Basin Plan), which describes established water quality objectives and details implementation programs that shall be used to meet these objectives (see Regional section below). Additionally, the act authorizes the NPDES program and various permit requirements for the City of Pacifica.

Regional Regulations

SAN FRANCISCO BAY WATER QUALITY CONTROL PLAN (BASIN PLAN)

The Basin Plan contains descriptions of the technical, legal, and programmatic bases of water quality regulations in the San Francisco Bay Region, which includes the City of Pacifica. The Basin Plan defines beneficial uses for water bodies in the region. The "Beneficial Uses" listed for water bodies located in the City of Pacifica and deemed "Beneficial" as well as the names of the water bodies are identified in Table 5-2.

Currently, San Mateo Creek and San Pedro Creek are regulated under the Basin Plan. An amendment to the Basin Plan under development as of May 2010 would add Milagra and Calera creeks to the Plan, and would add Beneficial Use designations for both San Mateo and San Pedro creeks, as shown in Table 5-2.

MUNICIPAL REGIONAL PERMIT (MRP): R2-2009-0074 NPDES PERMIT NO. CAS612008 OCTOBER 14, 2009 AND SAN MATEO COUNTY STORMWATER POLLUTION PREVENTION PROGRAM

In October 2009, The San Francisco Bay RWQCB adopted a new five-year MS4 (Municipal Separate Stormwater System) NPDES Permit that covers 76 cities within the region. This permit regulates discharges into the stormdrain system and is separate from the Sanitary Sewer System NPDES Permit. The Cities are within the following counties: San Mateo, Contra Costa, Fairfield-Suisun, Vallejo (City of) and Sanitary District, Alameda, and Santa Clara. The goal of adopting a permit that covers a wider region is to set equal yet measurable goals

TABLE 5-2: DESIGNATED BENEFICIAL USES

	Water Bodies in Adopted Basin Plan		Water Bodies in Basin Plan with Proposed Amendment			
Designated Beneficial Uses	**San Pedro Creek**	**San Mateo Creek**	**San Pedro Creek**	**San Mateo Creek**	**Milagra Creek**	**Calera Creek**
Municipal and Domestic Supply (MUN)	Yes	No	Yes	No	No	No
Body Contact Recreation (REC-1)	No	Potential	No	**Yes**	**Yes**	**Yes**
Noncontact Recreation (REC-2)	Yes	Potential	Yes	**Yes**	**Yes**	**Yes**
Warm Freshwater Habitat (WARM)	Yes	No	Yes	**Yes**	**Yes**	**Yes**
Cold Freshwater Habitat (COLD)	Yes	Potential	Yes	**Yes**	No	No
Fish Migration (MIGR)	Yes	No	Yes	**Yes**	**Yes**	No
Fish Spawning (SPWN)	Yes	Yes	Yes	Yes	No	No
Wildlife Habitat (WILD)	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Freshwater Replenishment (FRSH)	No	Yes	No	Yes	No	No
Preservation of Rare and Endangered Species (RARE)	No	Yes	**Yes**	Yes	No	**Yes**

Sources: RWQCB, 2007, 2010.

Note: Bold text indicates proposed addition of Water Body or change to Designated Beneficial Use.

regionwide that are therefore theoretically easier to implement, monitor, and meet for permittees as well as regulate and enforce for the Regional Board Staff. The challenges that existed when the Regional Board had numerous individualized permits were many but namely were associated with interpreting and enforcing the laws when areas within the RWQCB's jurisdiction crossed borders and therefore resulted in varying regulations and potential non-compliance with multiple permits.

The MRP has 18 provisions and covers municipal operations, code enforcement, new and redevelopment, integrated pest management, public information and participation, conditionally and non-conditionally exempted discharges, municipal maintenance, commercial and industrial discharges, business inspections for stormwater compliance, construction site inspection, legacy pesticides and PCBs, and monitoring and reporting.

Permit Compliance and Collaboration via SMCWPPP
The San Mateo County Water Pollution Prevention Program, formerly known as the San Mateo County Stormwater Pollution Prevention Program, was established in 1990 with the assistance of C/CAG. This program is managed and maintained by way of all 21 San Mateo County cities participating in the Technical Advisory Committee and all associated subcommittees that are managed by the TAC. The subcommittees each are assigned a section of the Permit, and are attended by staff who implement permit compliance for that section while completing regular work activities.

The City has requirements for City-owned and -operated facilities and complies while implementing regular operations that are carried out through the Public Works Department. Public Education and Outreach requirements are coordinated through the Planning Department and are often met in conjunction with collaboration with the Parks, Beaches and Recreation Department.

The Permit requires community compliance and holds the City responsible for community members' actions. This compliance is achieved through our code enforcement department when violations occur, and for new and redevelopment projects, is regulated by the planning department during discretionary plan review, the engineering department during both discretionary and building plan review, the Building Department, and the Waste Water Department. These departments review projects for compliance with the Provision C.3 New and Redevelopment requirements, C.5 Illicit Discharge Detection and Illumination, and C.6 Construction Site Controls and staff works with the applicant to see that all requirements as defined by the C.3 regulated projects provision are met, designed, implemented and maintained in accordance with Permit requirements.

With the new MRP, new regulated projects thresholds have been established which call for stormwater controls and additional erosion control measures to be implemented for projects of a smaller size threshold. Beginning in 2011, thresholds for certain types of regulated projects, mainly those of a commercial nature and that deal in chemicals and "pollutants of concern" such as vehicle service centers, gas stations and restaurants, will be lowered from 10,000 to 5,000 square feet of disturbed soils. This will result in more projects in the commercial and industrial zoned areas of the City implementing more stringent water quality control engineered treatment measures in compliance with both numeric sizing criteria defined in the permit and hydromodification requirements also as defined in the Permit. Low Impact Development as it relates to stormwater specifically is also required to be met and the permit identifies specific types of water treatments consistent with LID and therefore required to be used on site and incorporated into the site design such as infiltration, evapotransportation, and rainwater harvesting and use. These controls are to be designed to comply with numeric sizing criteria and hydromodification requirements as per the permit. The City is required to confirm compliance and report compliance and non compliance annually to the regional board.

CONSTRUCTION GENERAL PERMIT

Construction Activities that disturb one acre or more of soils are required to be permitted under the NPDES Construction General Permit." This requirement includes both municipal and private new and re-development. The Regional Water Quality Control Board can determine that some projects that disturb less than 1 acre of soils require coverage under the State's NPDES Construction General Permit, and use several measurable indicators including the scope, complexity, location in proximity to receiving water bodies, pollutant exposure, soils and proximity to sensitive habitat to determine necessity for permit coverage. Coverage under this permit adds requirements to the project that must be met during certain phases of the project and include the development and approval by the RWQCB of a SWPPP: Stormwater Pollution Prevention Plan. This plan is required to be updated as conditions and seasons change and is to be on site at all times throughout construction. The SWPPP identifies Best Management Practices (BMP's) that are to be implemented during site preparation, construction and post construction. These BMP's are required to control stormwater run on and run off from the site, control erosion and sheet flows, protect water bodies close to the site and contain and control construction debris. BMP's are to regulate the stormwater and construction debris and potential pollution and maintain flows at or under thresholds identified within the Construction General Permit Provisions. These thresholds may be incorporated into the permit via reference and are described in the CASQA Handbooks; a series of guidance manuals created by the California Stormwater Quality Association and that cover all methods of pollution prevention.

CONSTRUCTION DEWATERING PERMIT

The RWQCB construction dewatering permit is required for construction activities such as excavating and trenching in areas with shallow groundwater. Dewatering is regulated under state requirements for stormwater pollution prevention and control. Discharge of non-stormwater from an excavation or trench that contains sediments or other pollutants to water bodies is prohibited. Discharge of uncontaminated groundwater from an excavation or trench is a conditionally exempted discharge by the RWQCB. Since the removed water could be contaminated by chemical released from construction equipment, disposal of this water would require permits either from the RWQCB for discharge to surface creeks or local agencies for discharge to sewers. Dewatering operations would require a NPDES permit, or an exemption, from the RWQCB, which would establish discharge limitations for specific chemicals, as applicable.

LOCAL HAZARD MITIGATION PLAN

In 2005, a task force representing the City of Pacifica studied the City's exposure to natural hazards and identified mitigation strategies. Their work is incorporated into the regional Local Hazard Mitigation Plan directed by the ABAG.

The task force examined Pacifica's vulnerability to flooding during and after intense storms. It notes that approximately 990 dwelling units and ten acres of commercial areas are located within flood zones and subject to special regulation for flood insurance purposes.

The task force concluded that earthquakes, with the potential to cause ground shaking, liquefaction, and landslides; and winter storms, which may cause landslides, coastal erosion, and flooding, are Pacifica's two highest priorities for mitigation.

Three of the four mitigation strategies identified in the Plan that concern flooding are already existing programs in Pacifica. These include having requirements for new development to manage peak stormwater runoff flows through design; and regulations for new development in flood zones that are in compliance with federal requirements. One strategy was not embedded in existing policy as of 2005, and was determined to be "moderate" priority: incorporate FEMA guidelines and suggested activities into local government plans and procedures for managing flood hazards (Association of Bay Area Governments, 2005).

CITY OF PACIFICA GENERAL PLAN

Conservation Element

The Conservation Element, part of the 1980 General Plan, considers the conservation and use of natural resources in Pacifica. The Element identifies significant probems with sewage overflows into ocean waters during prolonged periods of wet weather. It calls attention to the need to protect the San Pedro Creek watershed, in order to protect steelhead habitat, and to protect Laguna Salada wetland area for the San Francisco garter snake.

Policies

5. Local year-round creeks and their riparian habitats shall be protected.
7. Promote the conservation of all water, soil, wildlife, vegetation, energy, minerals and other natural resources.

SEISMIC SAFETY AND SAFETY ELEMENT

Pacifica updated the Seismic Safety and Safety Element of its General Plan in 1983, following serious storms resulting in property damage and loss of life during the previous two winters. The Element details the known and potential hazards from flooding, as well as other issues dealt with elsewhere in this document.

Policies

1. Prohibit development in hazardous areas, including flood zones, unless detailed site investigations ensure that risks can be reduced to acceptable levels and the structure will be protected for its design life. Development shall be designed to withstand a minimum of a 100-year hazard event, regardless of the specific nature of the hazard. This concept applies to both on-site and off-site hazards.
5. Do not locate structures which are necessary for protection of the public's health and safety, provide for public assembly, or emergency services in hazardous areas unless no reasonable alternative exists.

CITY OF PACIFICA MUNICIPAL CODE

The City of Pacifica's municipal code includes the following applicable codes related to hydrology and flooding (City of Pacifica, 2008):

Title 7 Public Works, Chapter 5 Flood Damage Prevention, Article 5 Provisions for Flood Hazard Reduction

- Sec. 7-5.501. Standards of construction.
- Sec. 7-5.502. Standards for utilities.
- Sec. 7-5.503. Standards for subdivisions.
- Sec. 7-5.504. Standards for manufactured homes.
- Sec. 7-5.505. Coastal high hazard areas.

5.2 GEOLOGY AND SEISMIC RISK

Regional Geology

The Planning Area lies within the geologically complex region of California referred to as the Coast Ranges geomorphic province.[1] The Coast Ranges province lies between the Pacific Ocean and the Great Valley (Sacramento and San Joaquin valleys) provinces and stretches from the Oregon border to the Santa Ynez Mountains near Santa Barbara. Much of the Coast Range province is composed of marine sedimentary deposits and volcanic rocks that form northwest trending mountain ridges and valleys, running subparallel to the San Andreas Fault Zone. The Coast Ranges can be further divided into the northern and southern ranges which are separated by the San Francisco Bay. West of the San Andreas Fault lies the Salinian Block, a granitic core that extends from the southern end of the province to north of the Farallon Islands.

1 A geomorphic province is an area that possesses similar bedrock, structure, history, and age. California has 11 geomorphic provinces (CGS, 2002).

Modern seismic activity within the Coast Range continues to be associated with movement along the San Andreas system of faults. Regionally, this fault system is the boundary between large sections, or plates, of the earth's crust known as the North American Plate and Pacific Plate. This boundary is a complex system of generally parallel, northwest trending faults that extend across the greater San Francisco Bay Area. The San Andreas is also the closest active fault to the Planning Area as it transects across the northeastern tip of the Planning Area.[2] Other nearby active faults include the San Gregorio and Hayward faults.

Local Geology

The Planning Area includes coastal areas as well as part of the Santa Cruz Mountains, one of the north-

2 An "active" fault is defined by the State of California as a fault that has had surface displacement within Holocene time (approximately the last 11,000 years). A "potentially active" fault is defined as a fault that has shown evidence of surface displacement during the Quaternary (last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not, of course, mean that faults lacking evidence of surface displacement are necessarily inactive. "Sufficiently active" is also used to describe a fault if there is some evidence that Holocene displacement occurred on one or more of its segments or branches (Hart, 1997).

The Planning Area includes six miles of coastline, as well as the northern end of the Santa Cruz Mountains, a series of northwest-trending ridges along the spine of the San Francisco peninsula.

west trending ridges typical of the Coast Ranges. The Santa Cruz Mountains form the mountainous spine of the San Francisco Peninsula. Much of the upland areas are underlain by granitic bedrock associated with the Salinian Block creating rugged steep terrain in areas. The Salinian Block consists of highly fractured and weathered granite, granodiorite and quartz diorite much of which has been subject to a lot of tectonic forces. More competent granitic rocks can be found in areas such as Montara and San Pedro Mountains located to the south. Other geologic units in the area include sandstones associated with the Franciscan Formation, greenstones, and alluvial materials associated with the drainages that head towards the Pacific Ocean.

Seismicity

Regional Faults

The San Andreas, Hayward and Calaveras Faults pose the greatest threat of significant damage in the San Francisco Bay Area according to the USGS Working Group (USGS, 2003). These three faults exhibit strike-slip orientation and have experienced movement within the last 150 years.[3] Other principal faults capable of producing significant ground shaking in the San Francisco Bay Area include the Concord–Green Valley, Marsh Creek–Greenville, San Gregorio and Rodgers Creek Faults.

An "active" fault is defined by the State of California as a fault that has had surface displacement within approximately the last 11,000 years. A "potentially active" fault is defined as a fault that has shown evidence of surface displacement during the last 1.6 million years, unless direct geologic evidence demonstrates inactivity for the last 11,000 years or longer. This definition does not, of course, mean that faults lacking evidence of surface displacement are necessarily inactive. "Sufficiently active" is also used to describe a fault if there is some evidence that displacement occurred in the last 11,000 years on one or more of its segments or branches. These faults are considered either active or potentially active. Inactive faults are located throughout the San Francisco Bay Area. Inactive faults with a long period of inactivity do not provide any guarantee that a considerable seismic event could occur. Occasionally, faults classified as inactive can exhibit secondary movement during a major event on another active fault.

SAN ANDREAS FAULT

The San Andreas Fault Zone is a major structural feature that forms at the boundary between the North American and Pacific tectonic plates, extending from the Salton Sea in Southern California near the border with Mexico to north of Point Arena, where the fault trace extends out into the Pacific Ocean. The main trace of the San Andreas Fault through the San Francisco Bay Area trends northwest through the Santa Cruz Mountains and the eastern side of the San Francisco Peninsula. As the principal strike-slip boundary between the Pacific plate to the west and the North American plate to the east, the San Andreas is often a highly visible topographic feature, such as between Pacifica and San Mateo, where Crystal Springs Reservoir and San Andreas Lake clearly mark the rupture zone. Near San Francisco, the San Andreas Fault trace is located immediately off-shore near Daly City and continues northwest through the Pacific Ocean approximately 6 miles due west of the Golden Gate Bridge.

In the San Francisco Bay Area, the San Andreas Fault Zone was the source of the two major seismic events in recent history that affected the San Francisco Bay region. The 1906 San Francisco earthquake was estimated at magnitude (M) 7.9 and resulted in approximately 290 miles of surface fault rupture, the longest of any known continental strike slip fault. Horizontal displacement along the fault approached 17 feet near the epicenter. The more recent 1989 Loma Prieta earthquake, with a moment magnitude (Mw) of 6.9, resulted in widespread damage throughout the Bay Area.

3 *A strike-slip fault is a fault on which movement is parallel to the fault's strike or lateral expression at the surface (Bates and Jackson, 1984).*

HAYWARD FAULT

The Hayward Fault Zone is the southern extension of a fracture zone that includes the Rodgers Creek Fault (north of San Pablo Bay), the Healdsburg fault (Sonoma County), and the Maacama fault (Mendocino County). The Hayward fault trends to the northwest within the East Bay, extending from San Pablo Bay in Richmond, 60 miles south to San Jose. The Hayward fault in San Jose converges with the Calaveras fault, a similar type fault that extends north to Suisun Bay. The Hayward fault is designated by the Alquist-Priolo Earthquake Fault Zoning Act as an active fault.

Historically, the Hayward fault generated one sizable earthquake in the 1800s.[4] In 1868, a M 7 earthquake on the southern segment of the Hayward Fault ruptured the ground for a distance of about 30 miles. Recent analysis of geodetic data indicates surface deformation may have extended as far north as Berkeley. Lateral ground surface displacement during these events was at least 3 feet.

A characteristic feature of the Hayward fault is its well-expressed and relatively consistent fault creep. Although large earthquakes on the Hayward fault have been rare since 1868, slow fault creep has continued to occur and has caused measurable offset. Fault creep on the East Bay segment of the Hayward fault is estimated at 9 millimeters per year (mm/yr) (Peterson, et al., 1996). However, a large earthquake could occur on the Hayward fault with an estimated Mw of about 7.1 (Table IV.F-2). The USGS Working Group on California Earthquake Probabilities includes the Hayward–Rodgers Creek Fault Systems in the list of those faults that have the highest probability of generating earthquakes of M 6.7 or greater in the Bay Area (USGS, 2003).

4 *Prior to the early 1990s, it was thought that an M 7 earthquake occurred on the northern section of the Hayward Fault in 1836. However, a study of historical documents by the California Geological Survey concluded that the 1836 earthquake was not on the Hayward Fault (Bryant, 2000).*

CALAVERAS FAULT

The Calaveras fault is a major right-lateral strike-slip fault that has been active during the last 11,000 years. The Calaveras Fault is located in the eastern San Francisco Bay region and generally trends along the eastern side of the East Bay Hills, west of San Ramon Valley, and extends into the western Diablo Range, and eventually joins the San Andreas Fault Zone south of Hollister. The northern extent of the fault zone is somewhat conjectural and could be linked with the Concord Fault.

The fault separates rocks of different ages, with older rocks west of the fault and younger sedimentary rocks to the east. The location of the main, active fault trace is defined by youthful geomorphic features (linear scarps and troughs, right-laterally deflected drainage, sag ponds) and local groundwater barriers. The Calaveras fault is designated as an Alquist-Priolo Earthquake Hazard Zone (see discussion on this zone designation below). There is a distinct change in slip rate and fault behavior north and south of the vicinity of Calaveras Reservoir. North of Calaveras Reservoir, the fault is characterized by a relatively low slip rate of 5–6 mm/yr and sparse seismicity. South of Calaveras Reservoir, the fault zone is characterized by a higher rate of surface fault creep that has been evidenced in historic times. The Calaveras Fault has been the source of numerous moderate magnitude earthquakes and the probability of a large earthquake (greater than M 6.7) is much lower than on the San Andreas or Hayward Faults (USGS, 2003). However, this fault is considered capable of generating earthquakes with upper bound magnitudes ranging from Mw 6.6 to M 6.8.

SAN GREGORIO FAULT

The San Gregorio Fault Zone is a complex of faults that skirt the coastline North of Big Sur, run northwestward across Monterey Bay, briefly touching the shoreline of the San Mateo County coastline at Point Ano Nuevo and at Seal Cove, just North of Half Moon Bay. This fault is an active fault that has been recently recognized as capable of producing large earthquakes. Recent studies have shown

Holocene displacement on the San Gregorio Fault, as recently as 1270 AD to 1400 AD (USGS and CGS, 2006). Additionally, a 1929 earthquake with magnitude above 6.0, thought to have occurred on the Monterey Fault, may have actually ruptured an offshore segment of the San Gregorio Fault Zone. According to the working group on earthquake probabilities, the San Gregorio Fault has a 10 percent chance of producing one or more M 6.7 earthquakes in the next 30 years (USGS, 2008).

Groundshaking

The Planning Area is located within a region of California that is considered an area of high seismic activity. The U.S. Geological Survey (USGS) along with the California Geological Survey and the Southern California Earthquake Center formed the 2007 Working Group on California Earthquake Probabilities which has evaluated the probability of one or more earthquakes of M 6.7 or higher occurring in the state of California over the next 30 years. The result of the evaluation indicated a 63 percent likelihood that such an earthquake event will occur in the Bay Area (USGS, 2008). As mentioned above, the San Andreas Fault transects the northeastern tip of the Planning Area. According to mapping compiled by the Association of Bay Area Governments, a characteristic magnitude 7.2 earthquake on the San Andreas Fault (Peninsula segment) could cause strong to very violent groundshaking in the Planning Area.

Fault Rupture

Fault rupture is the surface displacement of the earth's surface due to the movement along a fault associated with an earthquake. Ground displacement is generally experienced on or within the immediate vicinity of the mapped fault trace. The Alquist-Priolo Earthquake Fault Zoning Act of 1972 established the requirement to regulate development within established Earthquake Fault zones associated with active faults. Development is feasible but requires detailed geologic and seismic evaluations by certified professionals prior to approval of a building permit. An Alquist-Priolo fault hazard zone associated with the San Andreas Fault is located within the Planning Area, and is shown in Figure 5-3, Liquefaction and Fault Lines.

Liquefaction

Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits. Four kinds of ground failure commonly result from liquefaction: lateral spread, flow failure, ground oscillation, and loss of bearing strength. Liquefaction and associated failures could damage foundations, roads, underground cables and pipelines, and disrupt utility service. The depth to groundwater influences the potential for liquefaction, in that sediments need to be saturated to have a potential for liquefaction.

Hazard maps produced by the Association of Bay Area Governments (ABAG) depict liquefaction for the greater Bay Area in the event of a significant seismic event. According to these maps, the majority of the Planning Area is in an area expected to have a very low potential to experience liquefaction although areas surrounding some of the alluvial drainages (i.e., San Pedro Creek Valley and Calera Creek Valley) contain some areas of high potential (ABAG, 2003). See Figure 5-3.

Soils

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (formerly known as the Soil Conservation Service) has mapped soils in the Planning Area in a soil survey for San Mateo County. Soils are characterized according to various properties and grouped into soil associations. The majority of soils within the Planning Area include the Barnabe-Candlestick complex, the Candlestick-Kron-Buriburi complex, Orthents Cut

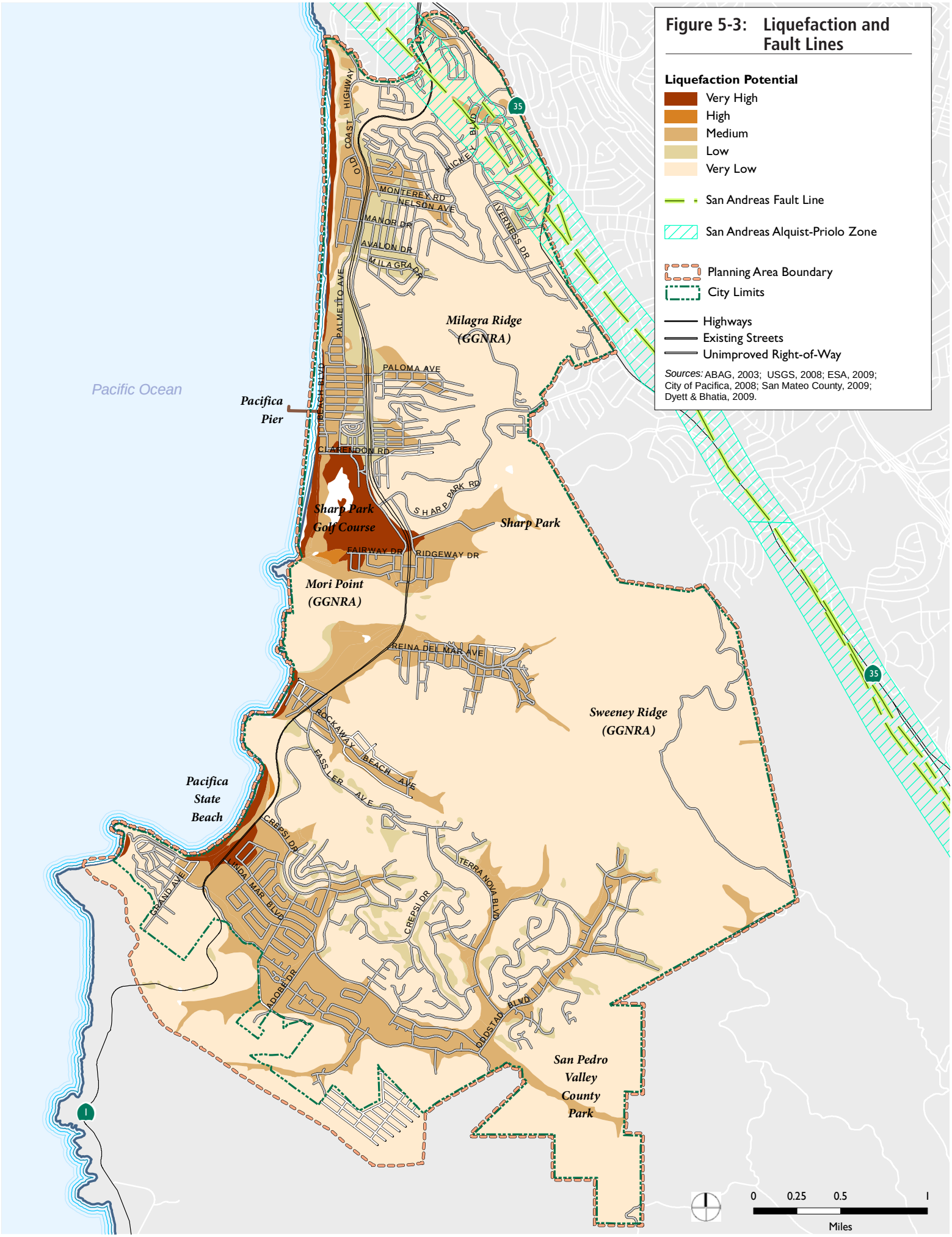
Figure 5-3: Liquefaction and Fault Lines
Liquefaction Potential
Very High
High
Medium
Low
Very Low
San Andreas Fault Line
San Andreas Alquist-Priolo Zone
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: ABAG, 2003; USGS, 2008; ESA, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
OLD COAST HIGHWAY
HICKEY BLVD
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
MILAGRA DR
VERNESS DR
PALMETTO AVE
BEACH BLVD
PALOMA AVE
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
TERRA NOVA BLVD
LINDA MAR BLVD
GRAND AVE
ADOBE DR
ODDSTAD BLVD
35
1
0
0.25
0.5
1
Miles

and Fill – Urban Land complex, and Candlestick-Barnabe Complex. The soils of these complexes typically include sand loams, clay loams, and sandy clay loams. In the upland regions these soils are generally shallow and found on slopes ranging from 30 to 75 percent. The Orthents and Urban Land complex soils are often located in the more gentle slopes of 0 to 30 percent. Soils found in developed areas have generally been reworked to the point that most of the native soils are only found at depth if at all. Figure 5-4 shows the distribution of soils in the Planning Area.

Subsidence

Subsidence or settlement can occur from immediate settlement, consolidation, shrinkage of expansive soil, and liquefaction. Immediate settlement occurs when a load from a structure or placement of new fill material is applied, causing distortion in the underlying materials. This settlement occurs quickly and is typically complete after placement of the final load. Consolidation settlement occurs in saturated clay from the volume change caused by squeezing out water from the pore spaces. Consolidation occurs over a period of time and is followed by secondary compression, which is a continued change in void ratio under the continued application of the load.

Soils tend to settle at different rates and by varying amounts depending on the load weight or changes in properties over an area, which is referred to as differential settlement. Areas underlain by soft sediments or undocumented fills are most prone to settlement.

Soil Erosion

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind and underground water. Excessive soil erosion can eventually lead to damage of building foundations and roadways. At the project site, areas that are susceptible to erosion are those that would be exposed during the construction phase and along the shoreline where soil is subjected to wave action. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or slope protection.

Figure 5-4 shows parts of the Planning Area where soils are most susceptible to erosion caused by wind or rainfall. These areas include the northern slope of Mori Point; upper Sharp Park; Shamrock Ranch; and along San Pedro Creek in San Pedro Valley County Park. Erosion caused by coastal processes is covered in a following section.

Landslides and Slope Failure

Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. A slope failure is a mass of rock, soil, and debris displaced downslope by sliding, flowing, or falling. Exposed rock slopes undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience shallow soil slides, rapid debris flows, and deep-seated rotational slides. Landslides may occur on slopes of 15 percent or less; however, the probability is greater on steeper slopes that exhibit old landslide features such as scarps, slanted vegetation, and transverse ridges. Landslide-susceptible areas are characterized by steep slopes and downslope creep of surface materials. Debris flows consist of a loose mass of rocks and other granular material that, if saturated and present on a steep slope, can move downslope. The rate of rock and soil movement can vary from a slow creep over many years to a sudden mass movement. Landslides occur throughout the state of California, but the density of incidents increases in zones of active faulting.

Slope stability can depend on a number of complex variables. The geology, structure, and amount of groundwater in the slope affect slope failure potential, as do external processes (i.e., climate, topography, slope geometry, and human activity). The factors that contribute to slope movements include those that decrease the resistance in the slope materials and those that increase the stresses on the slope.

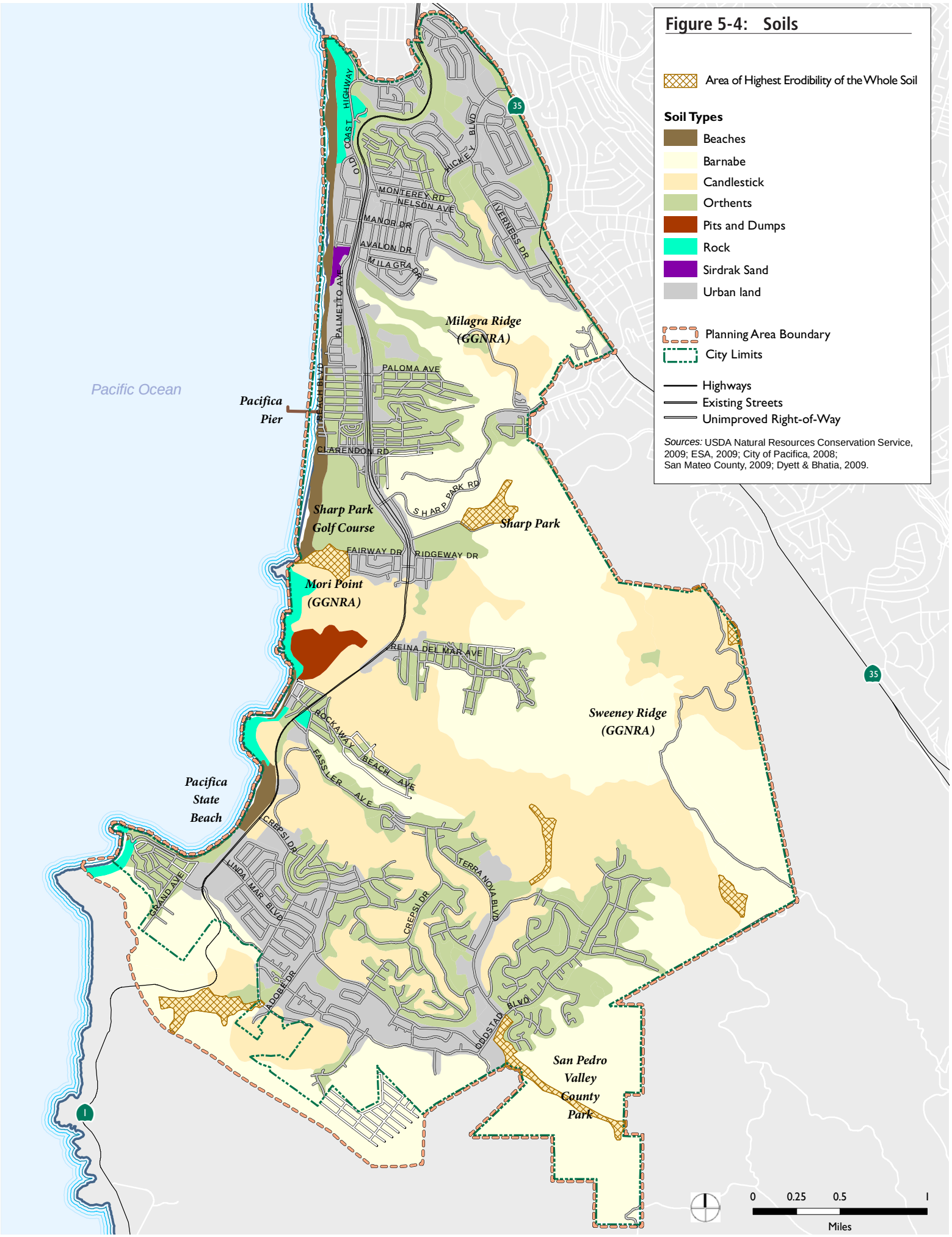
Figure 5-4: Soils
Area of Highest Erodibility of the Whole Soil
Soil Types
Beaches
Barnabe
Candlestick
Orthents
Pits and Dumps
Rock
Sirdrak Sand
Urban land
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: USDA Natural Resources Conservation Service, 2009; ESA, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
OLD COAST HIGHWAY
HICKEY BLVD
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
WILAGRA DR
VERNISS DR
PALMETTO AVE
PALOMA AVE
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
TERRA NOVA BLVD
LINDA MAR BLVD
GRAND AVE
ADOBE DR
ODDSTAD BLVD
35
1
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0.25
0.5
1
Miles

Figure 5-5: Topography
100ft Contours
500ft Contours
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: USGS, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
OLD COAST HIGHWAY
HICKEY BLVD
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
MILAGRA DR
VERNESS DR
PALMETTO AVE
BEACH BLVD
PALOMA AVE
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
LINDA MAR BLVD
GRAND AVE
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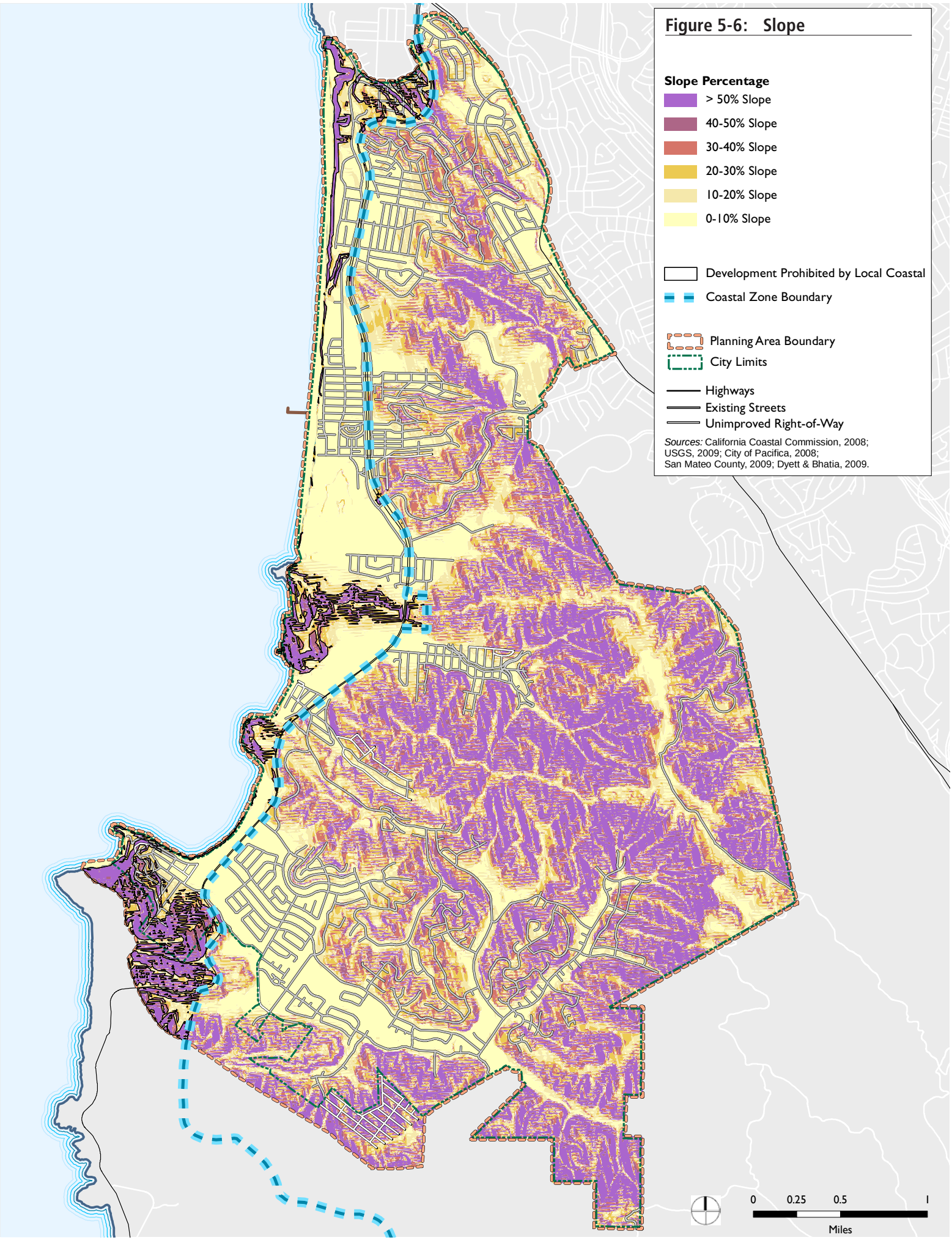
Figure 5-6: Slope
Slope Percentage
> 50% Slope
40-50% Slope
30-40% Slope
20-30% Slope
10-20% Slope
0-10% Slope
Development Prohibited by Local Coastal
Coastal Zone Boundary
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: California Coastal Commission, 2008; USGS, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
0
0.25
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1
Miles

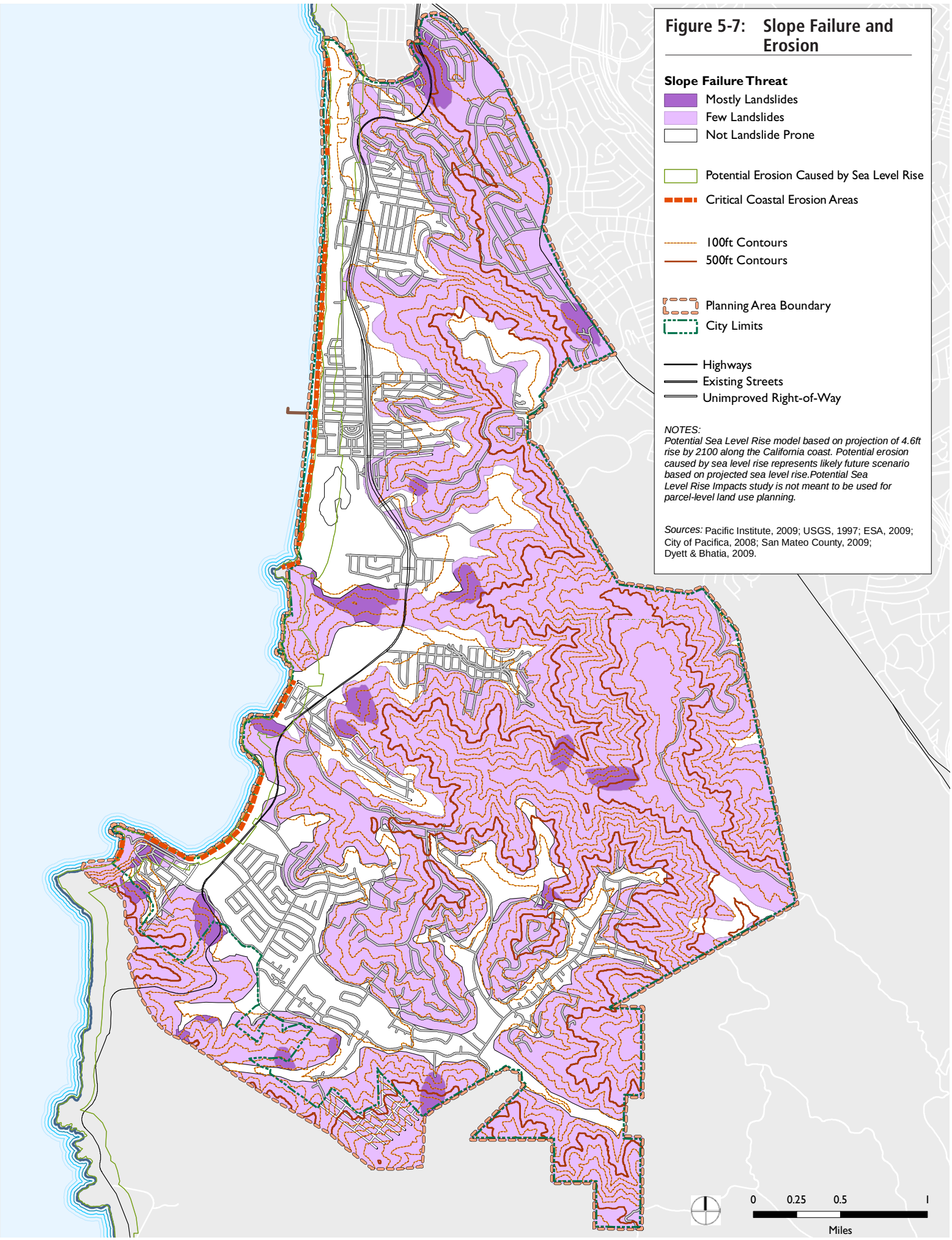


Figure 5-7: Slope Failure and Erosion
Slope Failure Threat
Mostly Landslides
Few Landslides
Not Landslide Prone
Potential Erosion Caused by Sea Level Rise
Critical Coastal Erosion Areas
100ft Contours
500ft Contours
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
NOTES:
Potential Sea Level Rise model based on projection of 4.6ft rise by 2100 along the California coast. Potential erosion caused by sea level rise represents likely future scenario based on projected sea level rise.Potential Sea Level Rise Impacts study is not meant to be used for parcel-level land use planning.
Sources: Pacific Institute, 2009; USGS, 1997; ESA, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
0
0.25
0.5
1
Miles

Slope failure under static forces occurs when those forces initiating failure overcome the forces resisting slope movement. For example, a soil slope may be considered stable until it becomes saturated with water (e.g., during heavy rains or due to a broken pipe or sewer line). Under saturated conditions, the water pressure in the individual pores within the soil increases, reducing the strength of the soil. Cutting into the slope and removing the lower portion, or slope toe, can reduce or eliminate the slope support, thereby increasing stress on the slope.

The coastline of San Mateo County includes steep upland areas that are susceptible to slope failures. Most notably, the large coastal slide known as Devil's Slide, is located at the southern end of the Planning Area. Devil's Slide has a long history of slope failures rock slides that have caused closures of Highway 1. A tunnel (the Devil's Slide Tunnels Project) is currently being constructed to avoid this area. Within the planning boundary, steep slopes on Mori Point, Sweeney Ridge, Cattle Hill, Gypsy Hill, and Montara Mountain are identified as likely sites of slope failures, as are small portions of areas in or near development in the Pedro Point and Fairmont neighborhoods and along the west side of Skyline Boulevard.

Figure 5-5, Topography, and Figure 5-6, Slope, show the Planning Area's terrain. Figure 5-7, Slope Failure and Erosion, identifies the relative likelihood of landslides in the Planning Area. The map shows three slope failure threat categories: Mostly Landslides, Few Landslides, and Not Landslide prone (USGS, 1997). Mostly Landslide areas consist of mapped landslides, intervening areas typically narrower than 1,500 feet, and narrow borders around landslides; defined by how groups of mapped landslides are clustered. Areas mapped as Few Landslides contain few, if any, large mapped landslides, but locally contain scattered small landslides and questionably identified larger landslides; defined in most of the region by excluding groups of mapped landslides. Not Landslide Prone refers to areas of gentle slope at low elevation that have little or no potential for the formation of slumps, translational slides, or earth flow except along stream banks and terrace margins; defined by the distribution of surficial deposits.

Devil's Slide, located at the southern edge of the Planning Area, has a long history of slope failures and rock slides that have caused closures of Highway 1. A tunnel is currently being built to allow the highway to avoid this area.

Beaches and Coastal Erosion

Northern California is characterized by rugged coastline areas where mountain ranges extend to the shoreline with narrow slivers of sand at their base. Rocky bluffs interspersed with small sandy coves are common. Under natural conditions the sand is provided by sediment transport along the coast through wave action as well as from deposition through rivers and streams that empty into the ocean. Winter storms tend to cause heavy wave action which reduces sand content at beaches that will typically recover during milder summer conditions. Whereas 30 to 50 years ago engineering methods of introducing hard barriers to protect shoreline improvements were common, soft stabilization methods have proven more effective in maintaining natural systems of sand transport. Soft stabilization methods include sand and cobble beach fills which can more closely mimic natural conditions and respond to changes in wave action.

According to a study done by the U.S. Geological Survey following the heavy winter storms of 1982–1983, the entire coastline of San Mateo County contains areas susceptible to severe erosion and slope failure (USGS, 2009). Coastal areas within the Planning Area include locations that the USGS have determined to have critical erosion hazards and unstable segments where the sedimentary rocks are susceptible to failure from heavy wave action. A similar study of the winter storms of 1997–1998 showed that sea cliffs in the Planning Area were particularly impacted and a number of homes were impacted as a result. The long term average erosion rate for cliffs in this general area is roughly 0.2 m/year and the winter storms of 1997–1998 caused approximately 50 years worth of erosion at the location where 12 homes were condemned (USGS, 2005). Coastline segments that have experienced significant coastal erosion are shown in Figure 5-7.

Impacts of Sea Level Rise

Sea level rise resulting from global climate change is projected to cause more extensive erosion of beaches, dunes, bluffs and cliffs. A 2009 study of the impacts of sea level rise on the California Coast developed erosion models for dune and cliff/bluff backshore environments. For both types of shoreline, erosion is

Parts of the San Mateo County coastline are susceptible to severe erosion and slope failure. The long-term average erosion rate for cliffs in the area is roughly 0.2 meters per year, but the winter storms of 1997-1998 caused approximately fifty years worth of erosion.

projected based on Total Water Level (TWL), calculated as the sum of high tide line, wave run-up, and sea-level rise.

According to the study, a majority of the dune shoreline along the northern California coast is currently accreting, but this is projected to reverse between 2050 and 2100. Mean lateral erosion of dunes is estimated at 115 to 116 meters by 2025, 119m to 128m by 2050, and 132m to 175m by 2100. Bluffs, meanwhile, are projected to have eroded by 8m to 9m by 2025, 23m to 24m by 2050, and 58m to 64m by 2100, with geology, wave exposure, and bluff toe elevation all playing important roles in producing variation (Pacific Institute, 2009).

It is important to reiterate that these models are approximate, and not meant to be used for parcel-specific land use planning. They do indicate that there could be new risks of erosion along the length of Pacifica's coastline in areas that are not currently exposed to wave action erosion, which could impact all of the coastal neighborhoods and coastal habitats.

Shoreline Protection Programs

In the early 1990s, the City of Pacifica, the California Coastal Conservancy, and the Pacifica Land Trust collaborated to improve steelhead trout habitat and preserve the sandy beach at Pacifica/Linda Mar State Beach, with the removal of vulnerable structures along the shore. The stabilization methods were used to expand and enhance the tidally influenced wetlands at the mouth of San Pedro Creek and restore more than 1,900 feet of eroding creek banks. This restoration both enhanced steelhead trout habitat and achieved 100-year flood protection for the nearby community.

To address the remaining flood threat to homes and businesses, the City also removed the most vulnerable structures. In 2002, the City partnered with the Pacifica Land Trust and the California Coastal Conservancy to purchase two homes and their surrounding acreage and delivered 4,000 cubic yards of sand to rebuild dunes and restore four acres of beach and the nearby estuary.

Placement of rip-rap and other types of armoring has been a typical response to shoreline erosion.

In addition, the City is continuing to maintain and improve the existing seawall and revetment originally constructed in 1962 at Rockaway Beach. Repairs in the past have consisted of retrieval of displaced rip-rap, importation of additional rip-rap and repair of the revetment. Other revetments are placed along the beaches of the Planning Area and a seawall has been constructed along Beach Boulevard between Paloma Avenue and Clarendon Road.

Regulatory Framework

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act), signed into law December 1972, requires the delineation of zones along active faults in California. The Alquist-Priolo Act regulates development on or near active fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for human occupancy across these traces.[5] Cities and counties must regulate certain development projects within the delineated zones, and regulations include withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement (Hart, 1997). Surface fault rupture, however, is not necessarily restricted to the area within an Alquist-Priolo Zone.

California Building Code

The California Building Code (CBC) has been codified in the California Code of Regulations (CCR) as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. The CBC is based on the International Building Code. The 2007 CBC is based on the 2006 International Building Code (IBC) published by the International Code Conference. In addition, the CBC contains necessary California amendments which are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

Local Hazard Mitigation Plan

In 2005, a task force representing the City of Pacifica studied the City's exposure to natural hazards and identified mitigation strategies. Their work is incorporated into the regional Local Hazard Mitigation Plan directed by the Association of Bay Area Governments (ABAG).

The task force noted Pacifica's vulnerability to groundshaking, liquefaction, and subsidence caused by potential seismic activity along the San Andreas fault. It also described Pacifica's susceptibility to landslides and slope failures, which can be caused by earthquakes, hillside erosion, or coastal erosion.

5 *A "structure for human occupancy" is defined by the Alquist-Priolo Act as any structure used or intended for supporting or sheltering any use or occupancy that has an occupancy rate of more than 2,000 person-hours per year.*

Major landslides in Pacifica have been triggered by heavy rainfall. Coastal erosion was identified as another serious hazard, as bluffs are progressively undercut by wave action and eroded from above by rainfall, with severe effects during winter storms.

The task force concluded that earthquakes, with the potential to cause ground shaking, liquefaction, and landslides; and winter storms, which may cause landslides, coastal erosion, and flooding, are Pacifica's two highest priorities for mitigation.

All mitigation strategies identified in the Plan that concern geologic hazards are already existing programs in Pacifica (Association of Bay Area Governments, 2005.)

City of Pacifica General Plan

SEISMIC SAFETY AND SAFETY ELEMENT

Pacifica updated the Seismic Safety and Safety Element of its General Plan in 1983, following serious storms resulting in property damage and loss of life during the previous two winters. The Element details known and potential hazards from hillside erosion and landslides; coastal erosion; seismic events; and other issues dealt with elsewhere in this document.

Seismic Events

The San Andreas fault and its associated Alquist-Priolo Fault Zone pass through Pacifica. Regardless, the Element notes that all of Pacifica could be affected by ground shaking, and liquefaction and landslide hazards are best identified by site-specific geotechnical study.

Hillside Erosion and Landslides

The Element describes the major slope failures that occurred in Pacifica during the winters of 1982 and 1983, triggered by an overall wet season followed by exceptionally heavy rainfall events. The General Plan emphasizes the need for site-specific geotechnical studies for all proposed development.

Coastal Erosion

Coastal erosion is an ongoing process affecting Pacifica's shoreline, operating through a combination of undercutting of bluffs by wave action and sloughing off of rain-saturated bluff tops, exacerbated by winter storms. The General Plan determines that site-specific geotechnical studies are the best mitigation to address the hazard of coastal erosion, and density, setback, and other requirements can be determined on a case-by-case basis. Required setbacks should accommodate any 100-year hazard event, and be adequate to protect structures for their design life.

Policies

1. Prohibit development in hazardous areas unless detailed site investigations ensure that risks can be reduced to acceptable levels and the structure will be protected for its design life. Development shall be designed to withstand a minimum of a 100-year hazard event, regardless of the specific nature of the hazard. This concept applies to both on-site and off-site hazards.

3. Prohibit mitigation measures for potential geotechnical hazards if the mitigation measures could adversely affect surrounding public or private property. For example, use of the public right-of-way as a landslide repository could adversely affect public health, safety, and welfare.

4. Prohibit seawalls which are necessary as a mitigation measure for new development. Projects should not be approved which eventually will need seawalls for the safety of the structures and residents.

7. Maintain an emergency plan which provides adequate response to disasters, including emergency ingress and egress communitywide and for individual neighborhoods.

City of Pacifica Municipal Code

The City of Pacifica's Municipal Code includes Title 8 Building Regulations, Chapter 1 Building Code which establishes the local building code for the City. The building code adopts the 2007 California Building Code and includes amendments contained in Chapter 1 that are specific to the City of Pacifica.

5.3 BIOLOGICAL RESOURCES

Pacifica's varied topography has created a range of habitats including intertidal areas, beaches, ridges, coastal headlands, woodlands, grasslands, scrub, creeks, and wetlands. Most of the natural vegetation in the valley and canyon bottoms has been converted to development. However, intact native habitats persist along riparian corridors (San Pedro, Calera, Rockaway, and Milagra Creeks) and on steep slopes.

Plant Communities and Wildlife Habitats

Plant communities are assemblages of plant species that occur together in the same area, and are defined by species composition and relative abundance. The vegetation/habitat classification system used here is based on the California Department of Fish and Game's (CDFG) List of California Terrestrial Natural Communities Recognized by the CNDDB (CDFG, 2003) and field observations. A Manual of California Vegetation (Sawyer and Keeler-Wolf, 1995), which maintains a more detailed inventory of terrestrial natural communities based on the dominant plant species present, is also referenced. Plant communities generally correlate with wildlife habitat types, and these typically are classified and evaluated using CDFG's A Guide to Wildlife Habitats of California (Mayer and Laudenslayer, 1988). These communities and habitats are described below and depicted in Figure 5-8, Vegetation.

Annual Grasslands

Annual grasslands in Pacifica occur most often in a mosaic with coastal scrub and are dominated by non-native annual grass species and a variety of other non-native weeds. The grasslands in Pacifica are of limited and highly disturbed nature. Grasslands have been damaged through unauthorized vehicle activity, which have created off-road trails on hillsides. Common dominants of grasslands include ripgut brome (*Bromus diandrus*), annual fescue (*Vulpia myuros ssp. myuros*), and wild oat (*Avena fatua*). Associated forbs include filaree (*Erodium botrys*), sweet clover (*Melilotus indicus*), plantain (*Plantago lanceolata*), and wild radish (*Raphanus sativus*). Weedy species include foxtail (*Hordeum leporinum*), Italian ryegrass (*Lolium multiflorum*), French broom (*Genista monspessulanus*), pampas grass (*Cortaderia selloana*), cape ivy (*Delairea odorata*), Bermuda buttercup (*Oxalis pescaprae*), black mustard (*Brassica nigra*), and sweet alyssum (*Lobularia maritima*). Native species that may be found are wild iris (*Iris missouriensis*), blue-eyed grass (*Sisyrinchium montanum*), and California poppy (*Escholzia californica*) (John Northmore Roberts & Associates et al., 1992; State of California Department of Parks and Recreation, 1990).

Grasslands attract reptiles and amphibians such as western fence lizard (*Sceloporus occidentalis*), common garter snake (*Thamnophis sirtalis*), northern alligator lizard (*Elgaria coerulea*), gopher snake (*Pituophis catenifer*), and western rattlesnake (*Crotalis viridis*). Bird species commonly found in this community include California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), Brewer's blackbird (*Euphagus cyanocephalus*), robin (*Turdus migratorius*), American goldfinch (*Carduelis tristis*), western meadowlark (*Sturnella neglecta*), song sparrow (*Melospiza melodia*), and red-winged blackbird (*Agelaius phoeniceus*) (John Northmore Roberts & Associates et al., 1992; State of California Department of Parks and Recreation, 1990). Annual grasslands are important foraging grounds for aerial and ground-foraging insect eaters such as Myotis bat species and pallid bats (*Antrozous pallidus*). Mammals such as coyote (*Canis latrans*), black-tailed deer (*Odocoileus hemionus columbianus*), California ground squirrel (*Spermophilus beecheyi*), black-tailed jackrabbit (*Lepus californicus*), deer mouse (*Peromyscus maniculatus*), California meadow vole (*Microtus californicus*), and Botta's pocket gopher (*Thomomys bottae*) may browse and forage on project-area grasslands. Small rodents attract raptors (birds of prey) including red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*B. lineatus*), American kestrel (*Falco sparverius*), great horned owl (*Bubo virginianus*), turkey vulture (*Cathartes aura*), and white-

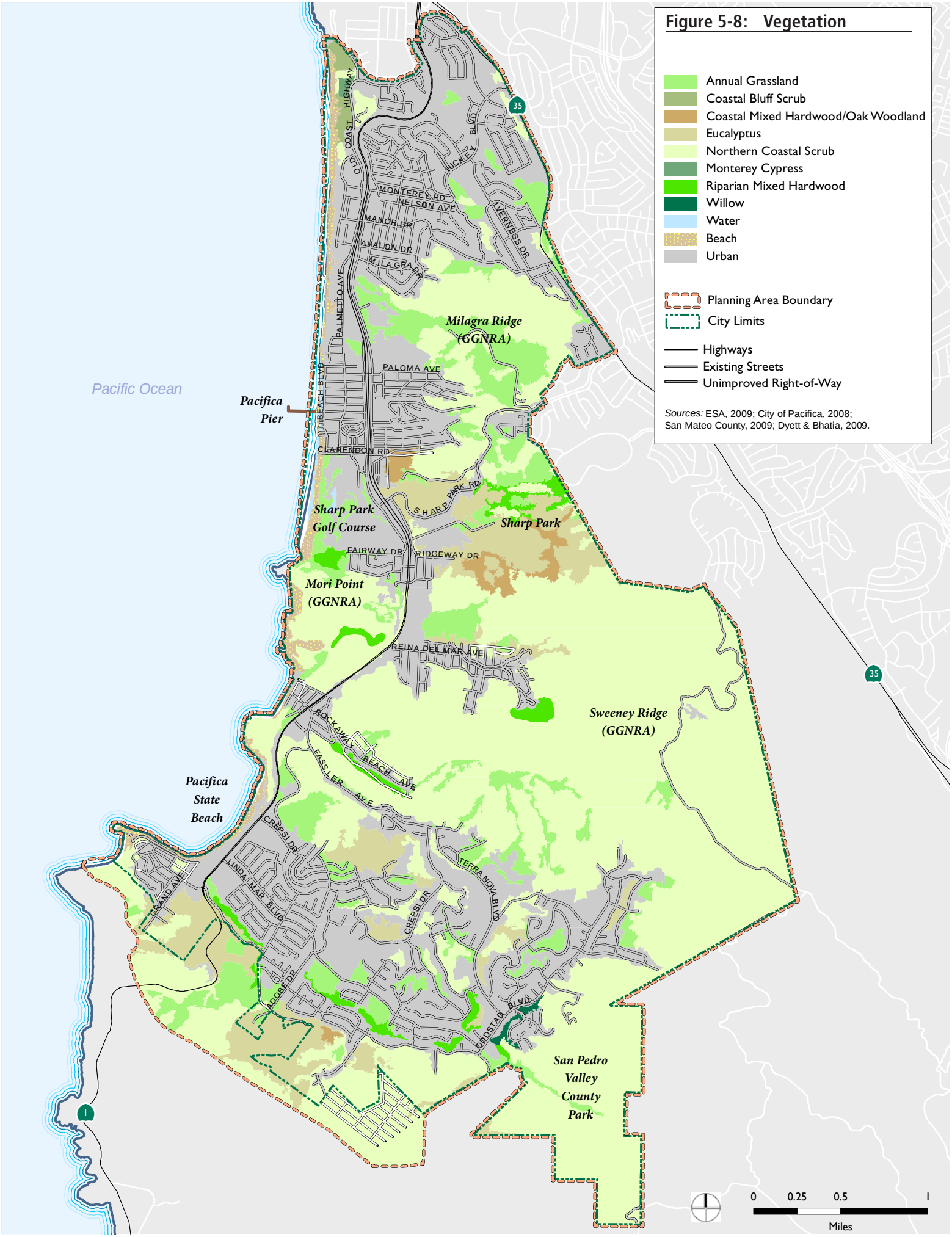


Figure 5-8: Vegetation
Annual Grassland
Coastal Bluff Scrub
Coastal Mixed Hardwood/Oak Woodland
Eucalyptus
Northern Coastal Scrub
Monterey Cypress
Riparian Mixed Hardwood
Willow
Water
Beach
Urban
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: ESA, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
OLD COAST HIGHWAY
HICKEY BLVD
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
MILAGRA DR
IVERNESS DR
PALMETTO AVE
BEACH BLVD
PALOMA AVE
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
LINDA MAR BLVD
GRAND AVE
TERRA NOVA BLVD
ADOBE DR
ODDSTAD BLVD
35
1
0
0.25
0.5
1
Miles

tailed kite (*Elanus leucurus*). In urban situations, grassland patches tend to support more disturbance tolerant animals adapted to impacted environments. These include eastern fox squirrels (*Sciurus niger*), skunks (*Mephitis mephitis*), raccoon (*Procyon lotor*), feral and domestic dogs (*Canis lupus familiaris*), feral and domestic cats (*Felis catus*), rats, and mice.

Special-status species[6] that have the potential to occur in grassland habitats around Pacifica include the Mission blue butterfly (*Plebejus icarioides missionensis*), San Bruno elfin butterfly (*Callophrys mossii bayensis*), Crystal Springs fountain thistle (*Cirsium fontinale var. fontinale*), Marin western flax (*Hesperolinon congestum*), San Mateo thorn-mint (*Acanthomintha duttonii*), white-rayed pentachaeta (*Pentachaeta bellidiflora*), Crystal Springs lessingia (*Lessingia arachnoidea*), pappose tarplant (*Centromadia parryi ssp. parryi*), and San Francisco owl's clover (*Triphysaria floribunda*). See Special-Status Species below for detailed species descriptions.

Coastal Bluff Scrub

Coastal bluff scrub is found along the immediate coastline to the west of Highway 1. It consists of a mosaic of open sand, native low growing shrubs and herbaceous perennials. Much of this community has been disturbed through recreation and replaced by development. They are also subject to successional changes in vegetation as well as erosion. Planted, non-native iceplant (*Carpobrotus edulis*) has also replaced much of the historical distribution of this vegetation type along the Pacifica coastline. New Zealand spinach (*Tetragonia tetragonioides*) and sea rocket (*Cakile maritima*) are also dominant, non-native species. Native species present include dwarf coyote brush (*Baccharis pilularis var. consanguinea*), silver bush lupine (*Lupinus albifrons*), yellow bush lupine (*Lupinus arboreus*), seaside woolly sunflower (*Eriophyllum staechadifolium*), bunchgrass, buckhorn plantain (*Plantago coronopus*), Chenopodium sp., beach evening primrose (*Camissonia cheiranthifolia ssp. suffruticosa*), beach bur (*Franseria chamissonis*), yellow sand verbena (*Abronia latifolia*), beach saltbush (*Atriplex leucophylla*), and beach morning glory (*Calystegia soldanella*). Other exotic species are Italian ryegrass, bull thistle (*Cirsium vulgare*), and fennel (*Foeniculum vulgare*) (State of California Department of Parks and Recreation, 1990; ESA surveys, 2008).

Special-status species that may be found in this habitat around Pacifica are bumblebee scarab beetle (*Lichnanthe ursina*), sandy beach tiger beetle (*Cicindela hirticollis gravida*), Hickman's cinquefoil (*Potentilla hickmanii*), blue coast gilia (*Gilia capitata ssp. chamissonis*), coast yellow leptosiphon (*Leptosiphon croceus*), coastal marsh milk-vetch (*Astragalus pycnostachyus var. pycnostachyus*), coastal triquetrella (*Triquetrella californica*), compact cobwebby thistle (*Cirsium occidentale var. compactum*), Franciscan thistle (*Cirsium andrewsii*), Point Reyes horkelia (*Horkelia marinensis*), rose leptosiphon (*Leptosiphon rosaceus*), San Francisco Bay spineflower (*Chorizanthe cuspidata var. cuspidata*), and short-leaved evax (*Hesperevax sparsiflora var. brevifolia*). Bank swallows (*Riparia riparia*), double-crested cormorants (*Phalacrocorax auritus*), and big free-tailed bats (*Nyctinomops macrotis*) may use cliff sides for nesting. See Special-Status Species below for detailed species descriptions.

Northern Coastal Scrub

Northern coastal scrub habitat is found on undeveloped slopes throughout the Planning Area, often in a mosaic with annual grasslands. Northern maritime chaparral, a special-status community, is included in this category (see Sensitive, Critical, and Special-Status Habitat below). Northern coastal scrub is dominated by either coyote brush (*Baccharis pilu-*

6 *"Special-status" plant and animal species are defined in more detail in the Special-status Species section of this chapter. Briefly, they are:*

Species listed under the Federal Endangered Species Act, Marine Mammal Protection Act, California Endangered Species Act, California Fish and Game Code, and the Native Plant Protection Act as endangered, threatened, or depleted; species that are candidates or proposed for listing; or species that are designated as rare or fully protected

Locally rare species defined by CEQA Guidelines Sections, which may include species that are designated as sensitive, declining, rare, locally endemic, or as having limited or restricted distribution by various federal, state, and local agencies, organizations, and watch lists.

laris) or California sagebrush (*Artemesia californica*), depending on slope aspect. North facing slopes support a greater diversity of shrub species and canopy cover than south facing slopes. Other species present include seaside woolly sunflower (*Eriophyllum stoechadifolium*), arroyo willow (*Salix lasiolepis*), California blackberry (*Rubus ursinus*), California bee plant (*Scrophularia california*), yarrow (*Achillea millefolium*), cudweed (*Gnaphalium sp.*), and Carmel creeper (*Ceanothus griseus var. horizontalis*).

Coastal scrub habitat, often interspersed with other habitats, provides foraging and nesting habitat for species that are attracted to edges of plant communities. Bird species that use the scrub habitat include bushtits (*Psaltriparus minimus*), wrentits (*Chamaea fasciata*), California quail (*Callipepla californica*), California towhee (*Pipilo crissalis*), white-crowned sparrow (*Zonotrichia leucophrys*), and California thrasher (*Toxostoma redivivum*) (John Northmore Roberts & Associates et al., 1992). Flowering scrub vegetation (e.g., *Ceanothus sp.*) attracts nectar drinkers such as Anna's hummingbird (*Calypte anna*). Mammals, including striped skunk, may use this habitat for protection and foraging grounds. Reptiles and small mammals that are expected to occur within scrub habitats include western fence lizard, brush rabbit (*Sylvilagus bachmani*), Botta's pocket gopher (*Thomomys bottae*), and deer mouse. Small mammals attract predators such as coyote (*Canis latrans*), bobcat (*Lynx rufus*), and gray fox (*Urocyon cinereoargenteus*).

Special-status animals that may use northern coastal scrub around Pacifica include merlins (*Falco columbarius*), dusky-footed woodrat (*Neotoma fuscipes*), Mission blue butterfly, and San Bruno elfin butterflies (John Northmore Roberts & Associates et al., 1992). Special-status plants with the potential to occur include: Pacific manzanita (*Arctostaphylos pacifica*), Presidio manzanita (*A. hookeri ssp. ravenii*), San Bruno manzanita (*A.imbricata*), San Francisco lessingia (*Lessingia germanorum*), Choris' popcorn-flower (*Plagiobothrys chorsianus var. chorisianus*), Davidson's bush-mallow (*Malacothamnus davidsonii*), fragrant fritillary (*Fritillaria liliacea*), Kellogg's horkelia (*Horkelia cuneata ssp. sericea*), Montara manzanita (*Acrtostaphylos montarensis*), Oregon polemonium (*Polemonium carneum*), pale yellow hayfield tarplant (*Hemizonia congesta ssp. congesta*), San Francisco campion (*Silene verecunda ssp. verecunda*), San Francisco collinsia (*Collinsia multicolor*), and San Francisco gumplant (*Grindelia hirsutula var. maritima*). See Special-Status Species below for detailed species descriptions.

Coastal mixed hardwood/oak woodland

This habitat type includes woodlands dominated by coast live oak (*Quercus agrifolia*), black oak (*Q. kelloggii*), blue oak (*Q. douglassi*), as well as other hardwood species. Wildlife commonly associated with woodlands in general are western flycatcher (*Empidonax difficilis*), chestnut-backed chickadee (*Poecile rufescens*), oak titmouse (*Baelophus inomatus*), ruby-crowned kinglet (*Regulus calendula*), bushtit (*Psaltripus minimus*), ringneck snake (*Diadophis punctatus*), California newt (*Taricha torosa*), and California slender salamander (*Batrachoseps attenuatus*). Seeds and fruit provide food for black-tailed deer (*Odocoileus hemionus*), scrub and Stellar's jays (*Cyanocitta aphelocoma and C. stelleri*), and woodpeckers, while tree branches and cavities can provide areas for nesting.

Special-status species that are likely to use coastal mixed hardwood/oak woodland habitat in Pacifica are the hoary bat (*Lasiurus cinereus*), San Mateo woolly sunflower (*Eriophyllum latiolobum*), bent-flowered fiddleneck (*Amsinckia lunaris*), Diablo helianthella (*Helianthella castanea*), Franciscan onion (*Allium peninsulare var.franciscanum*), Hillsborough chocolate lily (*Fritillaria biflora var. ineziana*), and Indian Valley bush-mallow (*Malacothamnus aboriginum*). See Special-Status Species below for detailed species descriptions.

Eucalyptus

This habitat type dominated by planted Eucalyptus species, primarily blue-gum eucalyptus (*E. globulus*). Stands of eucalyptus are dense and form a closed canopy, restricting other native overstory trees to clearings. Eucalyptus trees have allelopathic prop-

erties, releasing chemicals into the soil to reduce or inhibit growth of other plants. In addition, they produce extensive leaf and bark litter which further inhibits the growth of understory plants. However, this can also provide habitat for small vertebrates, mammals, and reptiles. Also, eucalyptus trees provide perching, roosting, and nesting sites for larger birds such as crows (*Corvus brachyrynchos*), ravens (*Corvus corax*), red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawks (*B. lineatus*), and barn owls (*Tyto alba*). The migratory monarch butterfly (*Danaus plexippus*) frequently roosts in eucalyptus trees in the winter.

Monterey cypress

Small patches of Monterey cypress (*Cupressus macrocarpa*) occur throughout the Planning Area in planted stands surrounded by a mosaic of scrub and grasslands. The largest stand occurs at the north end of the Planning Area. Although the small patches of Monterey cypress found in Pacifica are unlikely to support significant wildlife populations, they provide additional habitat complexity and complement surrounding habitats by providing nesting and roosting substrates for birds as well as shelter for other animals.

Riparian mixed hardwood

Riparian areas in Pacifica may have a variety of vegetative cover from dense thickets to open channels with sparse cover (John Northmore Roberts & Associates et al., 1992). Areas with riparian mixed hardwood habitat occur along San Pedro Creek, Rockaway Creek, Calera Creek, and Laguna Salada. Alder and willow dominate the overstory. Native trees that are found include red alder (*Alnus rubra*), shining willow (*Salix lucida*), Arroyo willow (*S. lasiolepis*), Sitka willow (*S. sitchensis*), and creek dogwood (*Cornus sericea*). Native herbs include yarrow (*Achillea millefolium*), coast iris (*Iris longipetala*), twinberry (*Lonicera involucrate*), red elderberry (*Sambucus racemosa*), bee plant (*Scrophularia californica*), thimbleberry (*Rubus parviflora*), giant horsetail (*Equisetum telmateia*), cow parsnip (*Heracleum lanatum*), Pacific oenanthe (*Oenanthe sarmentosa*), valley manroot (*Marah fabaceous*), and California blackberry (*Rubus ursinus*). Emergent vegetation includes panicled bulrush (*Scirpus microcarpus*), Pacific bog rush (*Juncus effuses*), salt rush (*J. leseurii*), spreading rush (*J. patens*), and narrow-leaved cattail (*Typha angustifolia*). Non-native species include cape ivy, English ivy (*Hedera helix*), pampas grass, giant reed (*Arundo donax*), poison hemlock (*Conium maculatum*), wild radish (*Raphanus sativa*), French broom, bristly oxtongue (*Picris echioides*), Himalayan blackberry (*Rubus discolor*), black mustard, fennel, mallow (*Malva parviflora*), bull thistle, watercress (*Nasturtium aquaticum*), spurge (*Euphorbia peplus*), cutleaf geranium (*Geranium dissectum*), small flowered fumitory (*Fumaria parviflora*), and harding grass (*Phalaris aquatica*) (San Pedro Creek Watershed Coalition, 2005).

Birds that forage for insects in riparian areas include Bewick's wren (*Thryomanes bewickii*), black phoebe (*Sayornis nigricans*), black-headed grosbeak (*Pheuticus melanocephalus*), dark-eyed juncos (*Junco hyemalis*), bushtits (*Psaltriparus minimus*), oak titmouse (*Baeolophus inornatus*), chestnut-backed chickadees, and brown creepers (*Certhia americana*), and piscivorous birds such as the belted kingfisher (*Ceryle alcyon*). Bark-insect foraging birds such as the acorn woodpecker (*Melanerpes formicivorus*), Nuttall's woodpecker (*Picoides nuttalli*), and white-breasted nuthatch (*Sitta canadensis*) can be found in this habitat. Riparian woodlands also provide habitat for reptiles and amphibians including the western toad (*Bufo boreas*), California newt (*Taricha torosa*), Pacific tree frog (*Hyla regilla*), and Pacific slender salamander (*Batrachoseps pacificus*). Mammals such as the western harvest mouse (*Reithrodontomys megalotis*), deer mouse, western gray squirrel (*Sciurus griseus*), Virginia opossum (*Didelphis marsupialis*), and raccoon (*Procyon lotor*), utilize these habits for nesting and foraging.

Special-status wildlife that could be present in the riparian corridor includes tricolored blackbirds (*Agelaius tricolor*), raptors such as Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*), great

blue heron (*Ardea herodias*). See Special-Status Species below for detailed species descriptions.

Willow riparian scrub

Willow riparian scrub in Pacifica is dominated by arroyo willow (*Salix lasiolepis*), with red willow (*S. laevigata*), and dogwood (*Cornus spp.*). This habitat occurs in the upper reaches of San Pedro Creek, in San Pedro Valley County Park. Where an overstory is present it is dominated by non-native trees. Species found in upper reaches of San Pedro Creek are bluegum eucalyptus, Monterey pine, coast redwood (*Sequoia sempervirens*), French broom, cape ivy, common periwinkle (*Vinca major*), Algerian ivy (*Hedera helix ssp. canariensis*), and wax myrtle (*Myrica californica*). In San Pedro Valley County Park the species include arroyo and red willow, alder (*Alnus sp.*), coastal wood fern (*Dryopteris arguta*), lady fern (*Athyrium felix-femina*), western sword fern (*Polystichum munitum*), and alumroot (*Heuchera micrantha*).

Riparian areas are under CDFG jurisdiction under Sections 1600–1616 of the California Fish and Game Code.

Urban/Developed

Residential developments and other areas with ornamental landscaping can provide habitat for wildlife species adapted to human habitation, such as striped skunk, Virginia opossum (*Didelphis virginiana*), raccoon, European starling (*Sturnus vulgaris*), American robin, and mourning dove. Bat species including Myotis species, pallid bats, and Townsend's big-eared bats (*Corynorhinus townsendii*) may roost in larger trees or buildings within the City. In addition, larger trees may provide roosting and nesting habitat for raptors and other birds. Areas classified as Urban/Developed are those where most human impacts have already occurred, and thus are *not* considered sensitive. Most of the species utilizing this habitat are relatively tolerant to at least certain types of human disturbances.

Seasonal Wetlands and Ponds

Seasonal wetlands occur in smaller drainages and localized depressions, forming ponds or flowing water, and are underlain by saturated soils during the winter and spring. Seasonal wetlands also occur along the banks and sediments that accumulate in creeks. Wetlands in Pacifica are found along riparian areas, drainages, along the coast, and as fresh and brackish water marshes (such as on the Sharp Park Golf Course). The National Wetlands Inventory (USFWS, 2005) has identified different types of wetlands within the Planning Area (Cowardin et al., 1979). These are intertidal marine wetlands and emergent, forested, scrub-shrub, and unconsolidated palustrine wetlands. The brackish water marsh at the north end of Pacifica State Beach is known to contain gumplant (Grindelia stricta), sneezeweed (*Gnaphilium microphalum*), coyote brush, salt grass (*Distichilis spicata*), arroyo willow, common tule (*Scirpus acutus*), and cattails (*Typha latifolia*) (State of California Department of Parks and Recreation, 1990). Wildlife found there includes black phoebe, red-winged blackbird, white-crowned sparrows, and snowy egret (State of California Department of Parks and Recreation, 1990). Vegetation and wildlife found in other wetlands around Pacifica varies with water characteristics, inundation patterns, surrounding habitat, and level of disturbance.

California red-legged frog (*Rana draytonii*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), Leech's skyline diving beetle (*Hydroporus leechi*), San Francisco forktail damselfly (*Ischnura gemina*), Tomales isopod (*Caecidotea tomalensis*), western pond turtle (*Actinemys marmorata*), and bristly sedge (*Carex comosa*) are special-status species that may be found in wetlands around Pacifica. The wetlands in Sharp Park are also known to support saltmarsh common yellowthroat as well. See Special-Status Species below for detailed species descriptions.

For a detailed description of the regulatory protections given to wetlands, see Regulatory Framework on page 5-56.

Streams

Streams are important habitat features in Pacifica as they can function as movement corridors as well as providing protective cover. There are several creeks in Pacifica, which all flow west into the Pacific Ocean. The only perennial creek is San Pedro Creek, located in the southern part of the City. San Pedro Creek and its five main tributaries drain a basin of 5,114 acres (San Pedro Creek Watershed Coalition, 2005). The watershed comprises approximately 13 percent impervious cover and one-third of the watershed is developed (EOA, 1998). The stream suffers from water quality issues, most notably coliform bacteria (*Escherichia coli* and *Streptococcus spp.*). The North Fork and the mouth of the creek are the most polluted. Overall, San Pedro Creek is well-oxygenated, somewhat alkaline, moderately conductive, relatively hard, and maintains a relatively stable temperature (Matuk, 2001). These all have effects on the aquatic biota. There has been a long history of human alterations (direct and indirect) to the creek and watershed, including substantial channelization.

Wildlife species that are associated with stream habitat include the river otters (*Lontra canadensis*), great blue heron (*Ardea herodias*), snowy egret, belted kingfisher (*Ceryle alcyon*), dark-eyed junco, and black phoebe. Black-tailed deer, raccoon, opossum, and grey fox may use the creeks as movement corridors. Fish species present include the prickly sculpin (*Cottus asper*), the Pacific lamprey (*Lampetra tridentate*), and the threespine stickleback (*Gasterosteus aculeatus*). The federally threatened steelhead trout (*Oncorhynchus mykiss* – Central California Coast Evolutionarily Significant Unit [ESU]) use parts of the stream for spawning, including the main portion parallel to Linda Mar Boulevard, as well as the middle and south forks in San Pedro County Park (San Pedro Creek Watershed Coalition, 2005). This is the only stream with a steelhead population between the Golden Gate Bridge and Half Moon Bay.

Streams within the Planning Area are subject to the U.S. Army Corps of Engineers (Corps) and Regional Water Quality Control Board (RWQCB) jurisdictions under Sections 404 and 401 of the Clean Water Act, respectively, and CDFG jurisdiction under Sections 1600–1616 of the California Fish and Game Code.

San Pedro Creek is the only perennial stream in the Planning Area and provides important habitat for steelhead trout, a federally listed species. The stream also suffers from water quality issues.

Beach/intertidal

Significant expanses of continuous sandy shoreline occur along the San Mateo coasts. Beaches are dynamic systems that change with wind and waves; generally, sand is eroded from beaches in the winter and redeposited in the summer, resulting in annual changes in beach slope and width. Fine to medium-grained sand beaches are the most common type in the north central coast of California (BLM, 1981).

Beach habitats can be divided into upper tidal, intertidal, and subtidal. The upper tidal beach fauna consists of sand crabs (such as the sand-burrowing Pacific mole crab [Emerita spp.]), California beach flea (*Megalorchestia californiana*), amphipods, polychaete worms, flies, and isopods which feed on detritus (BLM, 1981; State of California Department of Parks and Recreation, 1990). These are fed on by birds such as sanderlings (*Calidris alba*), marbled godwits (*Limosa fedoa*), Brewer's blackbird, killdeer, mourning doves, song sparrows, and willets (*Catoptrophorus semipalmatu*) (State of California Department of Parks and Recreation, 1990). The by-the-wind sailor (*Velella velella*), a jellyfish-like colony of organisms, frequently washes up on the upper beach areas. Exposed rocks or cobble, especially at the lower intertidal areas, can have attached algae, mussels, and barnacles. Intertidal areas are home to the Pacific egg cockle (*Laevicardium substriatum*),and spiny mole crab (*Blepharipoda occidentalis*). Subtidal zone is primarily inhabited by fish such as surf perch, striped bass, salmon, anchovies, sanddabs (*Citharichthys spp.*), California halibut, and the starry flounder (BLM, 1981).

Some special-status species may be found in the shallow waters off of Pacifica. Pinnipeds such as harbor seals (*Phoca vitulina*) and sea lions (*Zalophus californianus*) haul out on isolated beaches and sands spits (BLM, 1981). The endangered black abalone (*Haliotes cracherodii*) may be present in intertidal areas attached to rocks. The threatened green sturgeon (*Acipenser medirostris*) may also forage in the shallow waters off of Pacifica. Both the gray whale (*Eshrichtius robustus*) and southern sea otter (*Enhydra lutris nereis*) use the nearshore waters. The California brown pelican (*Pelecanus occidentalis californicus*) is also frequently observed. See Special-Status Species below for detailed species descriptions.

Sensitive, Critical, and Special-Status[7] Habitats and Natural Communities

These areas are those with unique, rare, or sensitive biological characteristics and/or possess special legal status.

Critical Habitat

Critical habitat areas are designated by the USFWS for species listed under the Federal Endangered Species Act (FESA). These areas contain features that are essential for the conservation of the species and may require special management and protection outside that which is already provided by FESA.

Critical habitat for California red-legged frogs (CRLF) has been designated in the southeast portion of the Planning Area (see Figure 5-9, Sensitive and Critical Habitat). This area contains both aquatic and upland areas with suitable breeding and non-breeding habitat. Unit SNM-1 was designated by the USFWS on April 13, 2006 (Federal Register 71:19243). However, a proposal was issued on September 16, 2008 (Federal Register 73:53491) to expand the current critical habitat from 450,288 acres to 1,804,865 acres. This proposal would result in an expansion of critical habitat in Pacifica. There is currently no critical habitat designated for the San Francisco garter snake (SFGS).

San Pedro Creek is known to support steelhead trout, which is a federally listed threatened species. In 2005, the National Marine Fisheries Service (NMFS) designated it as critical habitat for Central California Coast steelhead under Section 3(5)(A) of federal ESA (16 U.S.C. 1532 (5)). They spawn in the

7 *A "special-status natural community" is a natural habitat community that is unique in its constituent components, restricted in distribution, supported by distinctive soil conditions, considered locally rare, potentially supporting special-status plant or wildlife species, and/or that receives regulatory recognition from municipal, county, state, and/or federal entities such as the California Natural Diversity Database (CNDDB).*

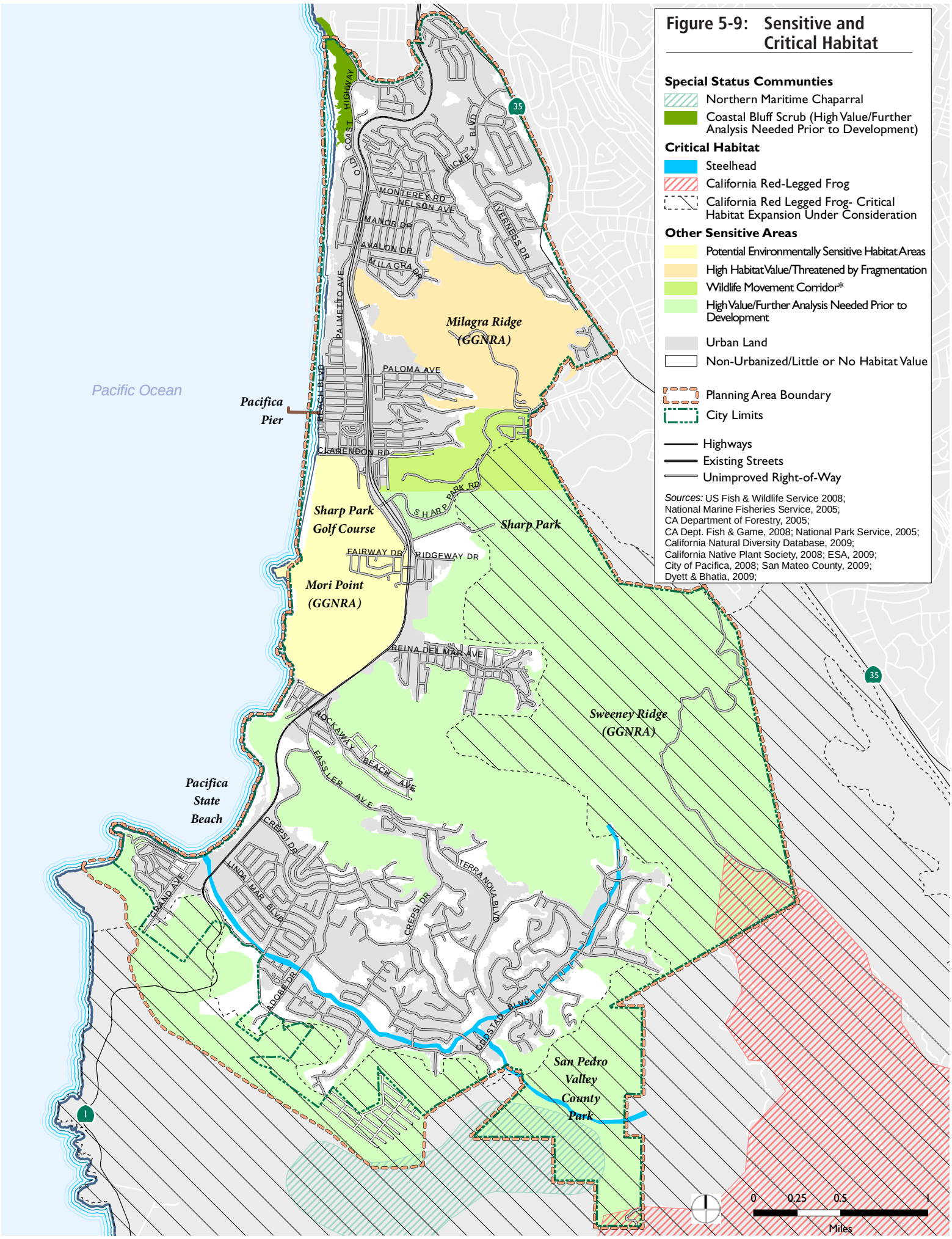


Figure 5-9: Sensitive and Critical Habitat
Special Status Communties
Northern Maritime Chaparral
Coastal Bluff Scrub (High Value/Further Analysis Needed Prior to Development)
Critical Habitat
Steelhead
California Red-Legged Frog
California Red Legged Frog- Critical Habitat Expansion Under Consideration
Other Sensitive Areas
Potential Environmentally Sensitive Habitat Areas
High Habitat Value/Threatened by Fragmentation
Wildlife Movement Corridor*
High Value/Further Analysis Needed Prior to Development
Urban Land
Non-Urbanized/Little or No Habitat Value
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: US Fish & Wildlife Service 2008; National Marine Fisheries Service, 2005; CA Department of Forestry, 2005; CA Dept. Fish & Game, 2008; National Park Service, 2005; California Natural Diversity Database, 2009; California Native Plant Society, 2008; ESA, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009;
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
OLD COAST HIGHWAY
HICKEY BLVD
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
MILAGRA DR
VERNESS DR
PALMETTO AVE
PALOMA AVE
BEACH BLVD
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
LINDA MAR BLVD
TERRA NOVA BLVD
GRAND AVE
ADOBE DR
ODDSTAD BLVD
35
1
0
0.25
0.5
1
Miles

main portion of the creek that runs parallel to Linda Mar Boulevard, as well as the middle and south forks in San Pedro County Park (San Pedro Creek Watershed Coalition, 2002). However, conditions in parts of the creek limit its suitability for steelhead habitat. Hagar Environmental Science (2002) identified the major limiting factors to steelhead are fish passage at main stem road crossings, low base flows, mobilization and accumulation of fine sediments in the main stem, deterioration of water quality, disturbance, and exploitation.

The nearshore marine areas off of Pacifica are part of the Green Sturgeon Critical Habitat, designated by NOAA in November 2009. This includes offshore areas up to 110 m in depth.

Special-Status Communities

The CNDDB (CDFG, 2009) indicates that there is an area of northern maritime chaparral at the south end of the Planning Area, at the edge of San Pedro Valley County Park and on Whiting Ridge and Montara Mountain (in the Lake Pilarcitos drainage). This community is fairly open chaparral, with about 50–80 percent cover. It is dominated by Manzanita or Ceanothus species (Holland, 1986). It occurs on sandy soil, usually on rolling or hilly terrain. It requires fire for continued reproduction and is also subject to coastal fog. This has not been verified or delineated in the field, but it is presumed extant.

Based on information from the California Department of Forestry (2005) as well as on the ground verification by ESA, an area of coastal bluff scrub was identified at the north end of Pacifica, west of Old Coast Highway (Palmetto Avenue), as shown on Figure 5-9. Coastal bluff scrub communities are found on steep, exposed bluffs along the ocean and are dominated by low shrubs and ground-hugging herbaceous species. It may be found on either sandy or serpentine soil. Species overlap with coastal scrub, however, coastal bluff species are necessarily more tolerant of wind, salt spray, and steep slopes. It is particularly important for stabilizing sand dunes. In addition to the area indicated on the map (Figure 5-9), smaller patches may be present in the northern parts of Pacifica State, Rockaway, and Sharp Park beaches. Both bluff and northern coastal scrub habitat has been damaged by unauthorized vehicle activity and pedestrian use.

In the Pacifica Boundary Study for the Golden Gate National Recreation Area, the National Parks Service (1997) describes San Pedro Point as containing northern coastal prairie habitat. It is unknown if this habitat type is still found there. Northern coastal prairie is the most diverse type of grassland found in North America, however less than 1 percent of it is still intact. Coastal prairies are dominated by perennial bunchgrasses such as purple needlegrass (*Nasella pulchra*), California fescue (*Festuca californica*), and California oatgrass (*Danthonia californica*) (NPS, 2007).

Environmentally Sensitive Habitat Areas (ESHA)

Environmentally Sensitive Habitat Areas are defined by the California Coastal Act as "any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments" (California Public Resources Code Section 30107.5). Article 5 Section 30240 of the California Coastal Act states that:

(a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.

(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

An area around Mori Point and Sharp Park Golf Course supports both CRLF and SFGS. Portions or all of this area likely qualify as an Environmentally Sensitive Habitat Area (ESHA), under Section 30240. ESHAs are not defined separately in the Coastal Act,

Coastal bluff scrub, found at the north end of Pacifica, is important for stabilizing sand dunes, and is sensitive to being damaged by vehicle and pedestrian use.

The area around Mori Point and Sharp Park Golf Course supports the California red-legged frog and the San Francisco garter snake, and is likely to qualify as an Environmentally Sensitive Habitat Area under the California Coastal Act.

but development within or adjacent to an ESHA is expressly and severely limited. ESHAs are formally delineated in Local Coastal Plans, and this area is not designated as an ESHA in Pacifica's current LCP.

Wildlife Movement Corridors

Wildlife movement corridors link together areas of suitable habitat that are otherwise separated by rugged terrain, changes in vegetation, or by areas of human disturbance or urban development. They allow wildlife to access additional areas with food, water, and other resources such as shelter that would otherwise be blocked by impenetrable barriers such as highways. Topography and other natural factors in combination with urbanization can fragment or separate large open-space areas. The fragmentation of natural habitat creates isolated "islands" of vegetation that may not provide sufficient area to accommodate sustainable populations of animals or plants, and can adversely impact genetic and species diversity as well as population survival. Movement corridors mitigate the effects of fragmentation by allowing animals to move between remaining habitats. This allows depleted populations to be replenished and promotes genetic exchange with separate populations, thereby increasing genetic resources within the population.

Natural wildlife corridors in Pacifica include riparian corridors and drainages such as San Pedro Creek, canyons, ridgelines, and corridors across valley floors where impermeable barriers (such as dense urban development, exclusionary fencing, and heavily traveled roadways) have not yet eliminated options for wildlife movement and plant dispersal. An area on the south side of Sharp Park Road may function as a corridor (depicted as "Wildlife Corridor") between Milagra and Sweeney Ridges. It is sensitive because of the link it provides between populations of California red-legged frog, San Francisco Garter Snake, and other plants and animals. This area has also been identified as part of the Mission Blue butterfly migration corridor (NPS, 2005).

It should be noted that while a wildlife movement corridor is needed somewhere within the area designated on the map; the entire area would not be designated as a wildlife movement corridor. Corridors typically range from 100 to 400 feet in width, within which habitat is continuous and suitable for wildlife movement.

High Habitat Value Areas Threatened by Fragmentation or Requiring Further Analysis

Two other sensitive habitat categories are used here. SFGS and CRLF are known to occur on Milagra Ridge, depicted as "High Habitat Value/Threatened by Fragmentation" on Figure 5-9. This area is also threatened by fragmentation into smaller areas. This means that the ridge could become a biological island, isolating its inhabitants from other populations of the same species, as well as preventing access to suitable habitat. Isolated populations are at greater risk of population losses due to a lack of genetic diversity or catastrophic events (including environmental, human-induced, and genetic).

High Value/Further Analysis areas are those occupied by special-status species or containing sensitive natural communities, but sufficiently dispersed to accommodate some degree of impact if, in project specific environmental documents, sufficient mitigation measures are applied.

Special-Status Species

Several species known to occur in the project vicinity are accorded "special-status" because of their recognized rarity or vulnerability to various causes of habitat loss or population decline. Some of these receive specific protections defined in federal or state endangered species legislation (see Regulatory Framework below). Others have been designated as "sensitive" based on adopted policies and expertise of state resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies to meet local conservation objectives. The latter category is recognized by Section 15380(b) of the California Environmental Quality Act (CEQA) Guidelines. This CEQA Guidelines section provides a definition of rare, endangered or threatened species that is broader than that included in federal and state endangered species regulations. These species are referred to collectively as "special-

Milagra Ridge provides high habitat value for endangered or threatened species, including the Mission blue butterfly and the California red-legged frog. It is also at risk of becoming fragmented by development, which would isolate its inhabitants from other populations of the same species and preventing access to suitable habitat.

status species" in this document, following a convention that has developed in practice but has no official sanction. The various categories encompassed by the term, and the legal status of each, are discussed in the Regulatory Framework component of this section below. For purposes of this report, special-status species include:

- Plant and animal species designated as rare, threatened or endangered under the federal or state endangered species acts (ESA);
- Species that are candidates for listing under either federal or state law;
- Species designated by the USFWS as species of concern or species of local concern, or by CDFG as species of special concern;
- Species protected by the federal Migratory Bird Treaty Act (16 U.S.C. 703-711);
- Bald and golden eagles protected by the federal Bald Eagle Protection Act (16 U.S.C. 668); and
- Species such as candidate species and CNPS List 1 and 2 species that may be considered rare or endangered pursuant to Section 15380(b) of the CEQA Guidelines.

Figure 5-10 displays known records of the occurrence of special-status species in the project area.

A more comprehensive list of species which are either known or presumed to be in the area based on suitable habitat is provided in Appendix A. The list comprises 51 special-status plant species and 45 special-status animal species reported to occur in the vicinity of the project site based on data in the CNDDB (2009), CNPS Electronic Inventory (2009), special-status species information from the USFWS (2009), and biological literature of the region. Due to Pacifica's location on USGS quad maps, only 3 quads (Montara Mountain, San Mateo, and San Francisco South) were determined to be appropriate for database searches. Species with a high potential are known to occur in Pacifica. A moderate potential indicates that there is suitable habitat for the species, though presence has not been confirmed. A low potential indicates that there is insufficient suitable habitat present in Pacifica to support the species.

The following species were determined to have a medium to high potential-to-occur in Pacifica:

Animals

- Bank swallows
- Big free-tailed bat
- Black abalone
- Bumblebee scarab beetle
- California red-legged-frog
- Double-crested cormorant
- Fringed myotis
- Green sturgeon
- Hoary bat
- Leech's skyline diving beetle
- Merlin
- Mission blue butterfly
- Monarch butterflies
- Pallid bat.
- Saltmarsh common yellowthroat
- San Bruno elfin butterfly
- San Francisco forktail damselfly
- San Francisco garter snake
- Sandy beach tiger beetle
- Steelhead - Central California Coast ESU
- Tomales isopod
- Western pond turtle
- Western snowy plover

Plants

- Arcuate bush mallow
- Bent-flowered fiddleneck
- Blue coast gilia
- Bristly sedge
- Choris' popcorn-flower

- Coast yellow leptosiphon
- Coastal marsh milk-vetch
- Coastal triquetrella
- Compact cobwebby thistle
- Crystal Springs fountain thistle
- Crystal Springs lessingia
- Davidson's bush-mallow
- Diablo helianthella
- Fragrant fritillary
- Franciscan onion
- Franciscan thistle
- Hickman's cinquefoil
- Hillsborough chocolate lily
- Indian Valley bush-mallow
- Kellogg's horkelia
- Marin western flax
- Montara manzanita
- Oregon polemonium
- Pacific manzanita
- Pale yellow hayfield tarplant
- Pappose tarplant
- Point Reyes horkelia
- Presidio manzanita
- Robust spineflower
- Rose leptosiphon
- San Bruno Mountain manzanita
- San Francisco Bay spineflower
- San Francisco campion
- San Francisco collinsia
- San Francisco gumplant
- San Francisco lessingia
- San Francisco owl's clover
- San Mateo thorn-mint
- San Mateo woolly sunflower
- Short-leaved evax
- White-rayed pentachaeta.

SPECIAL-STATUS WILDLIFE SPECIES

In addition to these 21 species, migratory birds, raptors, and common bat species, are subject to general protections provided by state and federal regulations. For a discussion of these general protections, please see the Regulatory Setting below.

Bank swallows (Riparia riparia) are listed as threatened under the state ESA. They nest in colonies along rivers, lakes, and major streams, typically adjacent to open grasslands. This species requires vertical cliffs and banks with fine-textured or sandy soils for construction of nesting holes. Nest holes are lined with plant material and measure one to two inches in width and up to 54 inches in depth. Bank swallows arrive in California in April and May, breeding from May through July (peak in mid-May to mid-June), and departing by mid-September. This species is known to desert its colony if there is too much human disturbance in the area. They are threatened by habitat loss from erosion and flood control projects (Garrison 1999).

Big free-tailed bat (Nyctinomops macrotis) is a Species of Special Concern in California. They are generally found in rugged, rocky habitats and arid landscapes, in desert shrub, woodlands, and evergreen forests. They roost in crevices of rocks in cliffs and occasionally in buildings, caves, and tree cavities. They primarily consume moths, but may also eat grasshoppers, beetles, crickets, leafhoppers, and flying ants. The only documented predator of big free-tailed bats is owls. Populations may be suffering from the same general threats as other bats such as grazing, riparian management, pesticides, and roost disturbance (WBWG 2005a).

Black abalone (Haliotis cracherodii) is a large marine mollusk that is federally endangered. They have a smooth black or slate blue shell with a pearly

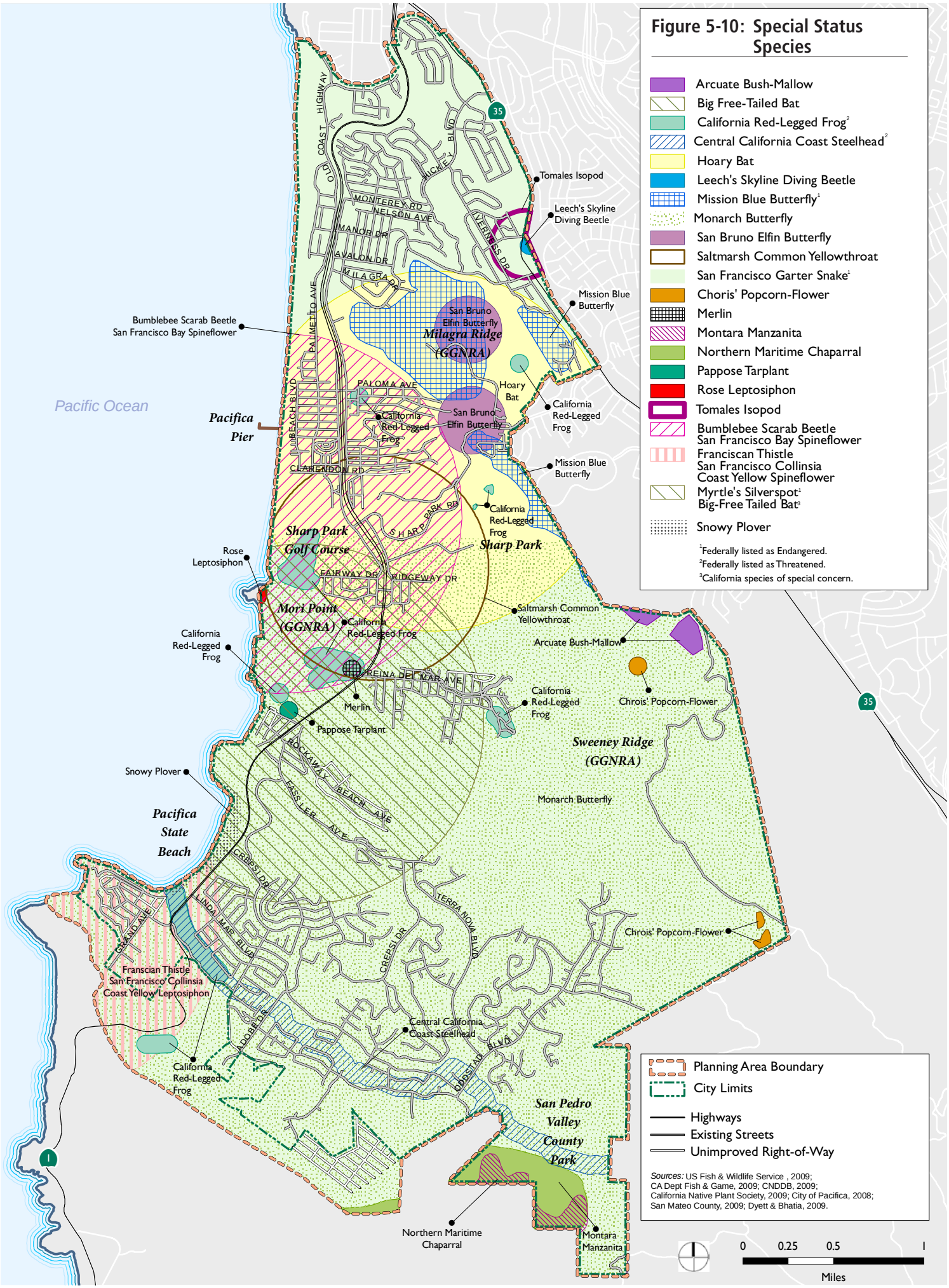


Figure 5-10: Special Status Species
Arcuate Bush-Mallow
Big Free-Tailed Bat
California Red-Legged Frog[2]
Central California Coast Steelhead[2]
Hoary Bat
Leech's Skyline Diving Beetle
Mission Blue Butterfly[1]
Monarch Butterfly
San Bruno Elfin Butterfly
Saltmarsh Common Yellowthroat
San Francisco Garter Snake[1]
Choris' Popcorn-Flower
Merlin
Montara Manzanita
Northern Maritime Chaparral
Pappose Tarplant
Rose Leptosiphon
Tomales Isopod
Bumblebee Scarab Beetle
San Francisco Bay Spineflower
Franciscan Thistle
San Francisco Collinsia
Coast Yellow Spineflower
Myrtle's Silverspot[1]
Big-Free Tailed Bat[3]
Snowy Plover
[1]Federally listed as Endangered.
[2]Federally listed as Threatened.
[3]California species of special concern.
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: US Fish & Wildlife Service , 2009; CA Dept Fish & Game, 2009; CNDDB, 2009; California Native Plant Society, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
0 0.25 0.5 1
Miles
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
OLD COAST HIGHWAY
HICKEY BLVD
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
MILAGRA DR
VERNESS DR
PALMETTO AVE
BEACH BLVD
PALOMA AVE
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
TERRA NOVA BLVD
LINDA MAR BLVD
GRAND AVE
ADOBE DR
ODDSTAD BLVD
Tomales Isopod
Leech's Skyline Diving Beetle
Mission Blue Butterfly
Bumblebee Scarab Beetle
San Francisco Bay Spineflower
San Bruno Elfin Butterfly
Hoary Bat
California Red-Legged Frog
Mission Blue Butterfly
California Red-Legged Frog
Rose Leptosiphon
California Red-Legged Frog
Saltmarsh Common Yellowthroat
Arcuate Bush-Mallow
California Red-Legged Frog
Chrois' Popcorn-Flower
Merlin
Pappose Tarplant
Snowy Plover
Monarch Butterfly
Chrois' Popcorn-Flower
Franscian Thistle
San Francisco Collinsia
Coast Yellow Leptosiphon
Central California Coast Steelhead
California Red-Legged Frog
Northern Maritime Chaparral
Montara Manzanita

white interior. It is found in rocky intertidal and subtidal habitats from Point Arena in northern California to Mexico. At low tides they can be found wedged in cracks, crevices, and holes in rocks. When they are submerged, they are able to move over rock surfaces. They are able to withstand large fluctuations in temperature, salinity, moisture, and wave action but are threatened by overfishing and disease (NMFS, 2009).

Bumblebee scarab beetle (Lichnanthe ursina) These scarab beetle's are patchily distributed along the coast and are restricted to dunes. L. ursina is 12.9-17.22mm long and is most active between May and June. Males fly close to the surface of the sand in search of mates. They are hairy and brightly colored as well as fast fliers, and may be mistaken for a bumble bee (Evans and Hogue, 2006). This beetle was previously a Federal Species of Concern, but is now included on the CDFG's Special Animals List (2009). It has been collected on the dunes at Salada Beach (John Northmore Roberts & Associates et al. 1992).

California red-legged frog. The California red-legged frog (CRLF) is a federally Threatened species and a California Species of Special Concern. CRLF typically occur in perennial streams with deep pools and stands of overhanging willows and an intermixed fringe of cattails (Jennings, 1988). However, CRLF also have been found in ephemeral creeks and drainages and in ponds that may or may not have riparian vegetation. During winter rain events, juvenile and adult CRLF are known to disperse up to 1 to 2 kilometers (0.6 to 1.2 miles) (Rathburn et al., 1993). There is suitable breeding and dispersal habitat for this species in Pacifica, and known populations in the Planning Area (CDFG, 2009) and the Sharp Park Golf Course, particularly around Horse Stable Pond, and the connecting canal (Philip Williams & Associates, 1992). The USFWS designated critical habitat for this species in 2006, some of which is in Pacifica. However, there is a pending proposal to expand critical habitat by four times, with a significant increase in Pacifica.

The California red-legged frog (CRLF) is a federally Threatened species and a California Species of Special Concern. There is suitable breeding and dispersal habitat for this species in Pacifica, and known populations in the Planning Area. A pending proposal would expand designated critical habitat significantly in Pacifica.

Double-crested cormorant(Phalacrocorax auritus) Rookery sites for double-crested cormorants are protected under section 3503 of CDFG Code. Double-crested cormorants are colonial breeders. They are year-long residents of California and rest and roost on offshore rocks, islands, steep cliffs, dead branches of trees, wharfs, jetties, transmission lines, bridges, and marine terminals (CWHR, 2008).

Fringed myotis(Myotis thysanodes) is a California Species of Special Concern. The fringed myotis is most common in drier woodlands, but they may roost in crevices in buildings, mines, rocks, cliff faces, bridges, trees, and snags. They feed on a variety of invertebrates but most frequently beetles and moths. They are threatened by loss or modifications of roosting habitat, such as: closure or renewed activity at abandoned mines, spelunking, loss of large trees, and replacement of buildings and structures with non- bat friendly structures. Other general threats are loss of clean, open water, habitat modification, disturbance of hibernacula, and environmental chemicals (WBWG 2005b).

Green sturgeon (Acipenser medirostris) This anadromous fish is the most widely distributed member of the sturgeon family and the most marine-oriented. It is a Federal endangered species, a National Marine Fisheries Service Species of Concern, and a California Species of Special Concern. Green sturgeons are found in nearshore waters, ranging from Mexico to the Bering Sea and are common occupants of bays and estuaries along the western coast of the United States (Moyle et al. 1995). Adult green sturgeons migrate into freshwater beginning in late February with spawning occurring in March through July, with peak activity in April and June. After spawning, juveniles remain in fresh and estuarine waters for 1 to 4 years and then begin to migrate out to sea (Moyle et al. 1995). Critical habitat has been proposed and includes water up to 110 m in depth of the coast of Pacifica.

Hoary bat (Lasiurus cinereus) is the most widespread of all North American bats, but has been identified by the Western Bat Working Group as Medium Priority. This species ranges from Canada to South America and is primarily associated with forested habitats. Hoary bats are solitary and roost primarily in foliage of both coniferous and deciduous trees, often at the edge of a clearing. The species is highly migratory, but neither wintering sites nor migratory routes are well documented. Hoary bats reportedly have a strong preference for moths, but are also known to eat beetles, flies, grasshoppers, termites, dragonflies, and wasps (WBWG, 2005c).

Leech's skyline diving beetle (Hydroporus leechi) This former Federal Species of Concern has been found in freshwater ponds, shallow waters of streams, marshes, and lakes (ESA 2001). It was originally collected in a pond in Pacifica, but no other information about it is known other than its use of aquatic habitats (Gordon 1981). Other EIRs report that *H. leechi* may be widely distributed, but the original source of this has not been verified (National Parks Service, 2004).

Merlin (Falco columbarius) This bird of prey is found most commonly on coastlines, open grasslands, savannahs, woodlands, lakes, wetlands, edges, and early successional stages. They feed primarily on small birds, but also on small mammals and insects. They do not breed in California, but winter here between September and May. They are threatened by habitat loss and the use of organochlorine pesticides (NatureServe 2009, CWHR 2008). Their wintering grounds are protected under section 3503 of CDFG Code, and as raptors, they are also protected under section 3503.5.

Mission blue butterfly. The Mission blue butterfly is listed as endangered by the federal Endangered Species Act. Male adults are light blue and females are brown with some blue. Adults are about the size of a quarter. This species is largely restricted to grasslands where its host plants (*Lupinus albifrons*, *L. variicolor*, and *L. formosus*) are found. Adults feed on the nectar of composite flowers (from the sunflower or Asteraceae family). They are threatened by habitat loss due to urban and agricultural expansion, exotic plant species (such as ice plant, pampas

grass, French broom, gorse, and eucalyptus), and trampling (GGNRA, 2009). It has been found on Milagra and Sweeney Ridges (May and Associates, 2005).

Monarch butterflies (Danaus plexippus) Monarchs west of the continental divide migrate to the west coast to overwinter in about 200 sites between north of San Francisco south to Mexico. Although this is much smaller than the eastern migration to Mexico, it is still an important life history component for 1-2 million monarchs. Monarch larvae feed on milkweed plants (genus Asclepius), ingesting toxic compounds which make them unpalatable to predators. As adults they migrate north and east, eventually turning around to travel back to the overwintering grounds. In California, the overwintering grounds are threatened by coastal development as well as removal of nonnative eucalyptus trees for restoration of native habitat. In addition, milkweeds are often removed as weeds (Xerces, 2009).

Pallid bat (Antrozous pallidus) The pallid bat is a California Species of Special Concern and is identified by the Western Bat Working Group as High Priority. Pallid bats range throughout western North America, from British Columbia to Mexico and east to Texas. This species is most abundant in arid lands, including deserts and canyonlands, shrub-steppe grasslands, and higher elevation coniferous forests and is therefore only likely to occur within the Project Site on a transient basis during spring and summer migrations. Pallid bats may roost alone or in groups in trees in cavities or under bark and structures such as bridges and buildings. Pallid bats forage over open areas and are opportunistic feeders on a wide variety of insects, foraging both on surfaces and in the air. Prey includes beetles, centipedes, crickets, moths, and rarely, lizards, and small rodents (WBWG, 2005a).

Saltmarsh common yellowthroat (Geothlypis trichas sinuosa) is a subspecies of the common yellowthroat endemic to the San Francisco Bay Area. It is found year-round and breeds from mid March to late July. It is most common in brackish marshes, but can also be found in riparian woodlands/swamps, freshwater marshes, and salt marshes. It primarily consumes insects and spiders. Saltmarsh common yellowthroats are threatened by habitat loss (specifi-

The Mission blue butterfly is listed as endangered by the Endangered Species Act. The species, which requires grasslands where its host plants are found, has been found on Milagra and Sweeney ridges.

cally, wetland loss) (Shuford and Gardali, 2008). It has been reported in Sharp Park (John Northmore Roberts & Associates et al., 1992).

San Bruno elfin butterfly (Callophrys mossii bayensis) The San Bruno elfin butterfly is a small brownish butterfly in the gossamer wing family (*Lycaenidae*). Larvae require the broadleaf stonecrop (*Sedum spathulifolium*) for food. The butterflies also form a mutualistic relationship with ants, who feed on the "honeydew" produced by the larvae in exchange for defending them against predators and parasitoids. The San Bruno elfin butterfly inhabits rocky outcrops and cliffs in coastal scrub. They prefer steep north-facing slopes with little direct sunlight. They are limited to a few small populations and have lost much of their habitat to quarrying, introduced species, off-road recreation, and urban development (Black and Vaughan, 2005). The San Bruno elfin butterfly is known to occur on Milagra and Sweeney Ridges as well as on Montara Mountain and Whiting Ridge, just southeast of Pacifica (May and Associates, 2005; John Northmore Roberts & Associates et al. 1992).

San Francisco forktail damselfly (Ischnura gemina) This species is a former federal Species of Concern. These damselflies in the narrow winged damselfly family (*Coenagrionidae*) are known for their large compound eyes that are separated by a distance greater than its own body width. They have muscular mandibles, short legs, slender body about 7-8cm long, and an elongate ten-segmented abdomen. In contrast to dragonflies which are in the same order, damselfly forewings are the same shape as the hindwings and are held vertically instead of horizontally. They are resident in the San Francisco Bay area. They are active on sunny, warm days near clean bodies of water. They eat other arthropods such as mosquitoes, annelids, crustaceans, and mollusks. They are in turn consumed by birds, bats, spiders, and wasps (Marshall, 2001). They are found in wetlands with emergent vegetation in the San Francisco Bay Area. A population of this species was recently discovered in the wetlands at Sharp Park Golf Course and at Mori Point (Rademacher, 2009).

San Francisco garter snake (Thamnophis sitralis tetrataenia). The San Francisco garter snake (SFGS) is a federal and state endangered species and is found on the San Francisco peninsula in San Mateo and Santa Cruz counties. It lives in marshlands that border ponds and sloughs, riparian cover along streams, and bordering meadows with scattered brush, and also uses upland habitat for overwintering and feeding. Threats to this species include habitat loss, mowing operations, and mortality on roads. SFGS historically occurred and may still be present in the wetlands at Sharp Park Golf Course, and they are presently known to occur at the Horse Stable Pond, GGNRA wetlands, Mori Point, and in the Pacifica Quarry (Swaim, 2005). The USFWS SFGS Recovery Plan (1985) identifies Laguna Salada (Sharp Park) as one of six essential SFGS populations in need of a management plan to secure the future of the populations at this locale, and to provide for the recovery of the subspecies. Furthermore, Sharp Park is the northernmost extant known population of the SFGS. The Mori Point population is considered crucial for the survival of the species. This is the northernmost population of the subspecies and is most similar to the originally described specimens. Other populations have hybridized more with other garter snakes (Swaim in Rademacher, 2009).

Sandy beach tiger beetle (Cicindela hirticollis gravida) This species was historically widespread along the coast from north of San Francisco just south into Mexico. It is found in moist sand and dunes near the ocean, such as in swales behind dunes or upper beaches beyond normal high tide (Nature Serve, 2009).

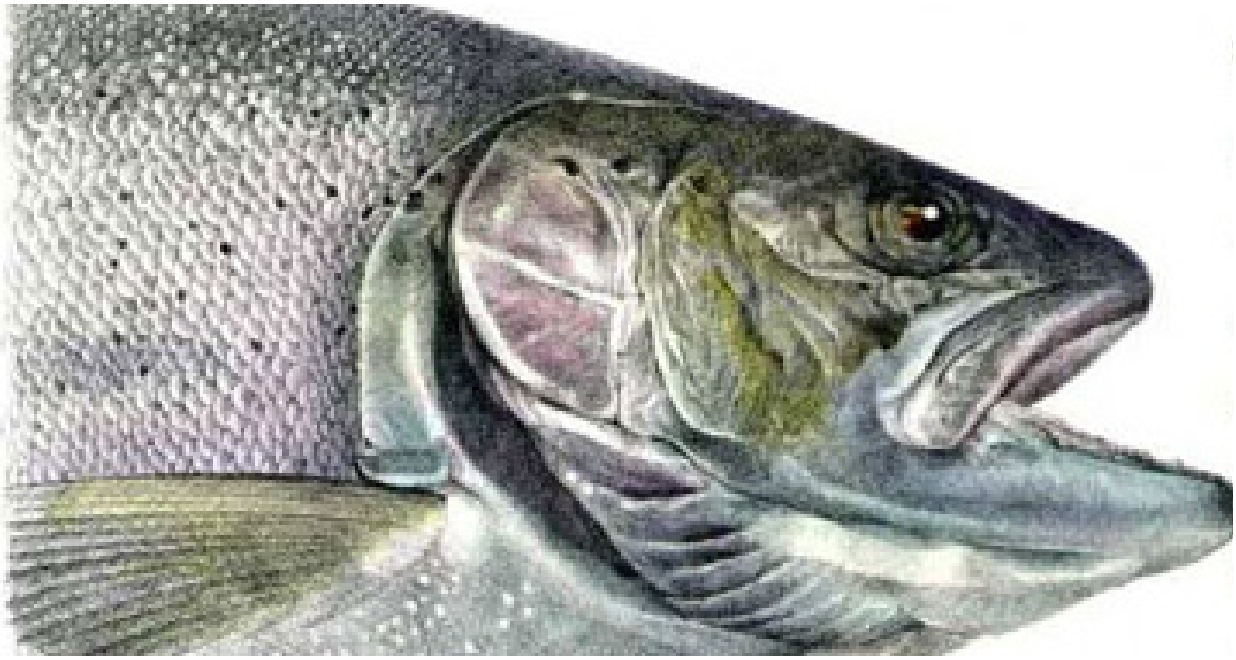
Steelhead (Oncorhynchus mykiss irideus) Steelhead from the Central California Coast ESU are listed as threatened under the Federal Endangered Species Act. Steelhead possesses the ability to spawn repeatedly, returning to the Pacific Ocean after spawning in freshwater. Juvenile steelhead may spend up to four years residing in freshwater prior to migrating to the ocean as smolts. Steelhead are known to spawn in several parts of San Pedro Creek at the south end of Pacifica. Known spawning areas are found in the

main stem of the stream that runs parallel to Linda Mar Boulevard, as well as the south and middle forks in San Pedro County Park. While the upper reaches of the Creek have healthy riparian areas and sufficient winter flows, the lower reaches have migration barriers which impede access to spawning habitat (SPCWC, 2005; Hagar Environmental Science 2002).

Tomales isopod (Caecidotea tomalensis) is a freshwater aquatic crustacean up to 10mm in length. It has been found in several locations from Sonoma to San Mateo. They prefer still to slow-moving, vegetated water such as spring-fed ponds. Little is known about their life history but they are detritivores like other members of the Asellid family of Crustaceans (CDFG 2006).

Western pond turtle (Actinemys marmorata) This California Species of Special Concern is found in a wide variety of permanent and nearly permanent aquatic habitats throughout California west of the Sierra Cascades. They require basking sites such as partially submerged logs, rocks, floating vegetation, or mud banks. They feed on both aquatic plant material and a variety of aquatic invertebrates, fish, frogs, and carrion. Western pond turtles are consumed by fish, bullfrogs, garter snakes, wading birds, and some mammals (Morey 2000). They are brown to blackish with cream to yellow coloring on legs and head (Stebbins 2003). Threats to the western pond turtle include habitat loss and fragmentation due to conversion to farmland, water diversion, and urbanization. They are also subject to overharvesting for food and pets, predation from introduced species (such as the bullfrog), and motor vehicle collisions (Ashton et al. 1997).

Western snowy plover *(Charadrius alexandrines nivosus)* The western snowy plover is a federally Threatened species and a California Species of Special Concern. The Pacific coast population of the western snowy plover breeds primarily above the high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries. In winter, western snowy plovers are found on many of the beaches used for nesting as well as on beaches where they do not nest, in man-made salt ponds, and on estuarine sand and mud flats. Pacifica State Beach (CA-48) is identified in the species' Recovery Plan as supporting primarily wintering and/or migrating snowy plovers (USFWS 2007).



Steelhead from the Central California Coast are listed as threatened under the Endangered Species Act. Steelhead are known to spawn in several parts of San Pedro Creek, though barriers prevent the fish from migrating into upper reaches.

SPECIAL-STATUS PLANT SPECIES

The large number of special-status plants and the severity of their population declines are reflective of the degree of habitat loss that has occurred throughout the San Francisco Peninsula. Outside of San Bruno Mountain, Pacifica encompasses the northernmost natural habitat on the peninsula. Due to extensive coastal development throughout neighboring counties, beach and bluff species have also become rare.

Of the special-status plant species listed in Appendix A, 38 special-status plants have the potential to occur within the Study Area. These species have been recorded in the vicinity of Pacifica and/or may be present in suitable habitat on site.

Certain trees within the City limits are also protected. The City of Pacifica supports numerous trees in the urbanized area, including heritage trees and street trees. Heritage trees are any trees in the City of Pacifica that have a trunk with a circumference of 50" or more, excluding eucalyptus. These trees are protected by the City and require special permits for alteration (See Regulatory Framework below).

Arcuate bush mallow (Malacothamnus arcuatus) this evergreen shrub in the mallow family is fairly endangered in California (CNPS List 1B.2). It blooms between April and September. It is found in chaparral and cismontane woodland habitats between 15 and 355 m in elevation. It is threatened by alteration of fire regimes. It was last observed on Sweeney Ridge over a decade ago (May and Associates, 2005).

Bent-flowered fiddleneck (Amsinckia lunaris) is on the CNPS list 1B.2 (a plant that is fairly endangered in California). This species is found in open grassland and woodland habitats of the Coast Ranges. This member of the borage family (Boraginaceae) produces asymmetric, bilaterally marked orange-yellow flowers with a bent corolla tube from March to June (CNPS, 2009). It is known to occur on San Bruno Mountain, near Pacifica.

Blue coast gilia (Gilia capitata ssp. chamissonis) is listed on the CNPS list 1B.1 (seriously endangered). It has bright blue-violet flowers with a skunk-like odor that bloom between April and July. A population is extant on the coastal sandhills just north of Pacifica. It is threatened by trampling, urbanization, recreational development, and nonnative plants (CNPS, 2009; Jepson).

Bristly sedge (Carex comosa) is considered by the CNPS to be seriously endangered in California, even though it is more common elsewhere (List 2.1). It is an herb in the sedge family (Cyperaceae) and can be found in marshes and swamps. It is threatened by marsh drainage and road maintenance (CNPS, 2009). There are historical records north in San Francisco, but these are possibly extirpated (CDFG, 2009). Potential habitat occurs in wetland and riparian areas throughout Pacifica.

Choris' popcorn-flower (Plagiobothrys chorisianus var. chorisianus) is an annual herb in the borage or forget-me-not family (Boraginaceae). It is considered to be fairly endangered in California (CNPS list 1B.2). It blooms white to yellow flowers between March and June (CNPS, 2009). It is known to occur in the eastern side of Pacifica in coastal scrub habitat on Sweeney Ridge (CDFG, 2009; May and Associates, 2005). It is threatened by development.

Coast yellow leptosiphon (Leptosiphon croceus) this annual in the phlox family (Polemoniaceae) is listed by the CNPS as seriously endangered (List 1B.1). It blooms yellow flowers between April and May. This species is threatened by development. There is an historical occurrence at south end of Pacifica but it may be extirpated.

Coastal marsh milk-vetch (Astragalus pycnostachyus var. pycnostachys) is a CNPS List 1B.2 species. This perennial herb in the legume family (Fabaceae) blooms greenish white or cream flowers between April and October. It is threatened by cattle trampling, erosion, and competition (CNPS, 2009).

Coastal triquetrella (Triquetrella californica) is a fairly endangered moss species (CNPS list 1B.2). It is grows in both coastal scrub and coastal bluff scrub, which are found in Pacifica. It is threatened by urbanization (CNPS, 2009).

Compact cobwebby thistle (Cirsium occidentale var. compactum) is a perennial herb, considered to be fairly endangered in California (CNPS list 1B.2). It is a member of the sunflower family (Asteraceae). It is found in chaparral, coastal dunes, coastal prairies, and coastal scrub. It blooms white, purple, or red flowers between April and June. It is threatened by grazing, insect predation, and possibly by road construction and development (CNPS, 2009).

Crystal Springs fountain thistle (Cirsium fontinale var. fontinale) is a federally and state endangered herbaceous perennial in the aster family (Asteraceae). It is also listed by the CNPS as seriously endangered (list 1B.1). It has several reddish stems about 1-2 feet high. The basal leaves are larger with spiny lobes; the leaves on stems are smaller. It blooms dull white to pinkish flowers from June to October. This fountain thistle is found in moist clay openings in riparian areas or serpentine chaparral (USFWS, 2009a). Although there are no known populations in Pacifica, due to its proximity to known populations and the potential for serpentine soils, there remains a possibility for the fountain thistle to be found within the Study Area. It is threatened by trail construction, modification of hydrological regimes, roadside maintenance, nonnative plants, and dumping (CNPS, 2009).

Crystal Springs lessingia (Lessingia arachnoidea) is an annual herb endemic to California. It is considered to be fairly endangered by the CNPS (list 1B.2). It is found in cismontane woodland, coastal scrub, and serpentinite valley and foothill grasslands. It blooms pale to deep lavender flowers from July to October. It is threatened by nonnative plants and pipeline maintenance (CNPS, 2009).

Davidson's bush-mallow (Malacothamnus davidsonii) is a deciduous shrub that is endemic to California. It is considered to be fairly endangered in California (CNPS list 1B.2). It is a member of the mallow family (Malvaceae). It is found in chaparral, cismontane woodland, coastal scrub, and riparian woodlands. It blooms pale pinkish purple or white from June to January and is threatened by urbanization and possibly by maintenance activities (CNPS, 2009).

Diablo helianthella (Helianthella castanea) is a federal Species of Concern and CNPS List1B.2 species. This perennial aster has yellow flowers and is found on open, grassy sites in broadleafed forests, chaparral, cismontane woodlands, coastal scrub, riparian woodlands, and grasslands between 600 and 1,300 ft. It blooms between March and June. It is threatened by urbanization, grazing, fire suppression and possibly by roadside maintenance (CNPS, 2009, Jepson).

Fragrant fritillary (Fritillaria lilacea) This fritillary is found on serpentine soils of the Coast Range in the vicinity of the San Francisco Bay. The species is a slender, herbaceous perennial lily developing from a bulb. The leaves are located opposite each other on the stems. The flowers, which appear from February to April are white, sometimes turning dull pink or red. This species is on CNPS List 1B.2 (CNPS, 2009; Jepson).

Franciscan onion (Allium peninsulare var. franciscanum) is a bulbiferous herb of the lily family (Liliaceae). It is fairly endangered in California (CNPS list 1B.2). It is found in cismontane woodlands and valley and foothill grasslands with clay, volcanic, or serpentinite soil. It blooms red-purple flowers between May and June. It is threatened by development, foot traffic, and nonnative plants (CNPS, 2009; Jepson).

Franciscan thistle (Cirsium andrewsii), also listed by the CNPS as a fairly endangered plant (list 1B.2), is member of the sunflower family (Asteraceae). This perennial produces solitary spiny flowers from June to July. It is found in moist places of northern coastal scrub, mixed evergreen forests, and bluffs and canyons near the coast from Sonoma County south to San Mateo. It is threatened by development and nonnative plants (CNPS, 2009).

Hickman's cinquefoil (Potentilla hickmanii) is a small perennial herb in the rose family (Rosaceae). It is both a federal and state endangered species and is also listed by the CNPS as seriously endangered (list 1B.1). It annually dies back to a woody taproot. The leaves are pinnately compound, with six pairs of small leaflets. Flowers generally have five yellow petals. It has the potential to be found in the coastal bluff scrub in Pacifica. It is threatened by urbanization, recreational activities, nonnative grasses, grazing, and the Devil's Slide Bypass highway project (CNPS, 2009).

Hillsborough chocolate lily (Fritillaria biflora var. ineziana) a bulbiferous herb from the lily family (Lilaceae), this flower is endemic to California where it is seriously endangered (CNPS list 1B.1). It is found in cismontane woodland and serpentinite valley and foothill grasslands. It blooms from March to April with foul smelling purplish to greenish flowers (CNPS, 2009; Jepson).

Indian Valley bush-mallow (Malacothamnus aboriginum), a deciduous shrub in the mallow family (Malvaceae), is endemic and fairly endangered in California (CNPS list 1B.2). It is found in chaparral and cismontane woodlands, often in burned areas. It blooms from April to October. It appears in abundance after fires. It is threatened by grazing, vehicles, and road maintenance (CNPS, 2009).

Kellogg's horkelia (Horkelia cuneata ssp. sericea) is a CNPS List 1B.1 species. This horkelia is a perennial herb in the rose family. Its habitat is described as old dunes, coastal sandhills, scrub, chaparral, and coniferous forests between 10 and 200 meters in elevation. It blooms white flowers from April to September. It is threatened by coastal development (CNPS, 2009).

Franciscan thistle is listed by the California Native Plant Society as a fairly endangered plant. It is found in moist places in northern coastal scrub, mixed evergreen forests, and bluffs and canyons near the central California coast, including Pedro Point.

Marin western flax (Hesperolinon congestum), also known as the Marin dwarf flax, is a federal and state threatened species and is considered by the CNPS to be seriously endangered (list 1B.1). It is an herbaceous annual in the flax family (Linaceae). It has slender, threadlike stems about 4-16 inches tall. It blooms from May to July with rose to whitish petals and deep pink to purple anthers. It is restricted to serpentine soils and is known from seven populations in San Mateo County. It is threatened by residential and recreational development, foot traffic, and competition from non-native species (CNPS, 2009; USFWS 2009b). It has the potential to be found in serpentine soils in Pacifica.

Montara manzanita (Arctostaphylos regismontana) is a tree-like scrub with distinct smooth blood-red bark growing to 15 or 20 feet with densely glandular twigs having both fine and bristly hairs. The leaves are strongly overlapping and light green with both sides the same. The stem produces no burl and therefore probably does not stump sprout after a fire but it may be dependent on fire for seed germination. It blooms white to pink flowers from January to March. The species occurs only on San Bruno Mountain and Montara Mountain, the latter of which is linked by contiguous natural habitat to the south end of Pacifica. It is known to occur just outside the Pacifica boundary (John Northmore Roberts & Associates et al. 1992). The species is on CNPS List 1B.2. It is threatened by development and vehicles (CNPS, 2009; Jepson).

Oregon polemonium (Polemonium carneum) is a perennial herb in the phlox family (Polemoniaceae). Although it is more common elsewhere, it is fairly endangered in California (CNPS List 2.2). It is found in coastal prairies, coastal scrub, and lower montane coniferous forest. It blooms pink to purple flowers between April and September. It is threatened by logging (CNPS, 2009, Jepson).

Pacific manzanita (Arctostaphylos pacifica) was formerly considered to be a hybrid between A. glandulosa and A. uva-ursi. This member of the heath family (Ericaceae) is listed in California as an endangered species and is also considered by the CNPS to be fairly endangered (list 1B.2). It is a mat-like shrub with shiny dark green leaves. Flowers have five white to pink petals and blooms from February to April. It is potentially threatened by alteration of fire regimes and recreational activities (CNPS, 2009). Although it has not been found in Pacifica, its close proximity to San Bruno Mountain and availability of coastal scrub habitat leaves the potential for it to occur.

Pale yellow hayfield tarplant (Hemizonia congesta ssp. congesta) this list 1B.2 plant is an annual herb in the sunflower family. It blooms yellow flowers between April and November. It is found in valley and foothill grasslands and sometimes on roadsides. It is threatened by agriculture, development, and possibly grazing (CNPS, 2009; Jepson).

Pappoose tarplant (Centromadia parryi ssp. parryi) an annual herb in the sunflower family, it is fairly endangered in California (CNPS list 1B.2). It is found in valley and foothill grasslands and sometimes on roadsides. It blooms yellow flowers from May to November. It is threatened by agriculture and development (CNPS, 2009; Jepson).

Point Reyes horkelia (Horkelia marinensis) a perennial herb in the rose family, is fairly endangered and endemic to California (list 1B.2). It is found in sandy areas in coastal dunes, coastal prairies, and coastal scrub. It blooms white flowers between May and September. It is threatened by nonnative plants and residential development (CNPS, 2009; Jepson).

Presidio manzanita (A. hookeri ssp. ravenii), also known as Raven's manzanita, is a federal and state endangered species and is also considered by the CNPS to be seriously endangered (list 1B.1). It is a low growing, wood shrub in the heath family (Ericaceae). The leaves are sharply pointed, slick, and glossy. It is found on serpentine and rocky soils in chaparral, coastal prairies, and coastal scrub. It is threatened by nonnative plants, encroachment of native shrubs, and fungal pathogens (CNPS, 2009; USFWS 2009c). Although it is not known to occur in Pacifica, suitable scrub habitat is found within the study area.

Robust spineflower (Chorizanthe robusta var. robusta) is a federally endangered and CNPS list 1B.1 species in the buckwheat or knotweed family (Polygonaceae). It is found in scrub areas, sandy terraces and bluffs, or in loose sand. It blooms white to rosy flowers from April to September. There are historical occurrences just outside the Study Area, although these are possibly extirpated. However the coastal scrub and sandy bluffs in Pacifica may provide suitable habitat. It is threatened by development, recreation, mining, and nonnative plants (CNPS, 2009).

Rose leptosiphon (Leptosiphon rosaceus) an annual herb in the phlox family, this flower is seriously endangered and endemic to California (CNPS list 1B.1). It blooms pink or white flowers between April and July. It is possibly threatened by competition with nonnative plants.

San Bruno Mountain manzanita (A. imbricata) is endangered in the state of California and is listed by the CNPS as seriously endangered (list 1B.1). This evergreen shrub in the heath family is mat or mound-like. It blooms white to pink flowers between February and May. Although it is only known from San Bruno Mountain, suitable coastal scrub is found within Pacifica. It can be found in chaparral or coastal scrub, often on sandstone outcrops. It is threatened by fungal infection and alterations in fire regimes (CNPS, 2009).

San Francisco Bay spineflower (Chorizanthe cuspidata var. cuspidata) is a CNPS List 1B.2 species. This tall spineflower is an annual herb in the buckwheat family. It is found in sandy places under 250 m elevation such as coastal bluff scrub, dunes, prairies, and scrub. It blooms between April and July (CNPS, 2009).

San Francisco campion (Silene verecunda ssp. verecunda) The species is a member of the pink family (Caryophyllaceae), grows as a multi-stemmed perennial with dense gland-tipped hairs. Plants of the species are perennial, from 4 to 20 inches in height and branched from the base of upright and hairy stems. The flowers have 5 petals that are fused into a tube and have 2 lobes on each petal blade and are white to rose in color. The San Francisco campion is native to sandy soils, coastal bluffs and in chaparral. It flowers from March to June. The species is a federal candidate (FC2) and is on List 1B.2 of the CNPS.

Pappoose tarplant, listed as fairly endangered, is found in valley and foothill grasslands and sometimes on roadsides. It is found at the southern end of the former Rockaway quarry.

San Francisco collinsia (Collinsia multicolor) is an annual herb in the figwort family (Scrophulariaceae). It is endemic to California and is fairly endangered (CNPS list 1B.2). It is found in closed-cone coniferous forests, coastal scrub, and sometimes on serpentinite soil. It is blooms between March and May with the upper lip white and the lower lip of the flower lavender to bluish purple. It is threatened by nonnative plants and urbanization (CNPS, 2009; Jepson).

San Francisco gumplant (Grindelia hirsutula var. maritima) is listed as 1B.2 by the CNPS. This perennial, glandular-aromatic species is endemic to San Francisco and southern portions of Marin County. Gumplants received this common name for the milky, resinous substance produced around the enclosed heads of immature blooms prior to flowering. This member of the sunflower family produces terminal, solitary, showy yellow flowers from May to September (but is identifiable year-round). San Francisco gumplant typically occurs in open places within either coastal scrub or grassland communities. It is threatened by coastal development and nonnative plants (CNPS, 2009; Jepson).

San Francisco lessingia (Lessingia germanorum) is a federal and state listed endangered species and is considered by the CNPS to be seriously endangered (list 1B.1). It is a low-growing, slender-stemmed annual herb in the sunflower family (Asteraceae). Leaves are narrow, lance-shaped, and less than an inch long. The leaves and stems are covered by grayish loosely interwoven hairs. Solitary flowers are yellow and bloom in late summer and fall. It is found historically in stabilized coastal sand dunes and sandy soils with open scrub and herbaceous vegetation. It is threatened by nonnative species, residential and commercial development, sand quarrying, trampling, recreational activities, inadequate regulatory mechanisms, bulldozing, use of fertilizers, and other urban land uses (CNPS, 2009; USFWS, 2009d).

San Francisco owl's clover (Triphysaria floribunda) This annual green root-parasite is found in coastal grasslands and on serpentine soils. The plant is up to 12 inches in height with creamy white, slender flowers and the leaves are often a yellowish-brown. The plant is on CNPS List 1B.2 (CNPS, 2009).

San Mateo thorn-mint (Acanthomintha duttonii) A annual native plant only found in San Mateo County's serpentine grasslands, this mint plant (in the Lamiaceae family) has stems less than 20 cm (10 inches) tall and white flowers tinged with lavender. The species flowers between April and June. It is named for the spines on the bracts that subtend the clusters of flowers surrounding the stem at the axils of the leaves. There are only two known areas where this species is found. The soils in which known populations occur are also found in Pacifica (USDA 2006). This species is listed by both the federal and state resource agencies as endangered and is on the CNPS List 1B.1 (CNPS, 2009).

San Mateo woolly sunflower (Eriophyllum latilobum) This bushy, perennial in the sunflower family grows to 1 to 2 feet in height and has oval leaves, The golden flowers grow in loose, flat clusters from May to June. The plant occurs in sparsely wooded, rocky or grassy slopes in the mixed evergreen forest/coast live oak woodland and is commonly found growing under coast live oak. A species of limited distribution, the San Mateo woolly sunflower occurs only in the Crystal Springs region of San Mateo. Suitable woodland habitat may be found within the Study Area. The species is listed as endangered by both the USFWS and CDFG, and is on the CNPS List 1B.1 (CNPS, 2009).

Short-leaved evax (Hesperevax sparsiflora var. breviflora). This annual herb in the sunflower family is endemic and fairly endangered to California (List 1B.2). It is found in coastal bluff scrub with sandy soil and coastal dunes. It blooms from March to June. It is threatened by development, competition with nonnative plants, foot traffic, recreational activities, and potentially by trail construction (CNPS, 2009).

White-rayed pentachaeta (Pentachaeta bellidiflora) This small annual of the sunflower family has 5 to 16 white or purple tinged ray flowers and hairy stems and leaves. The species flowers March to May. The plant was identified in serpentine grassland but it can also be found in northern coastal scrub and coastal prairie grassland (CNPS, 2009). The species is federally and state listed as endangered and is on the CNPS List 1B.1. It has the potential to occur in the grassland and coastal scrub areas in Pacifica. There is a historic occurrence documented in the east end of the Study Area, although this has been extirpated. Other populations may be present in suitable habitat in the vicinity.

Regulatory Framework

Regulation of Special-Status Species

FEDERAL ENDANGERED SPECIES ACT

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). Pursuant to the requirements of FESA, a federal agency reviewing a proposed project within its jurisdiction must determine whether any federally listed, threatened, or endangered species, or species proposed for federal listing may be present in the project area and determine whether the proposed project will have a potentially significant impact on such species. In addition, the federal agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under FESA or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536[3], [4]).

Procedures for addressing federally listed species (hereafter called "listed species") follow two principal pathways, both of which require consultation with the USFWS, which administers FESA for all terrestrial species, or the National Marine Fisheries Service (NMFS), which administers FESA for marine fish species, including anadromous salmonids. The first pathway (FESA, Section 10(a) Incidental Take Permit) is set up for situations where a non-federal government entity (or where no federal nexus exists) must resolve potential adverse impacts to species protected under FESA. The second pathway (FESA, Section 7 Consultation) involves projects with a federal connection or requirement; typically these are projects where a federal lead agency is sponsoring or permitting the proposed project. For example, a permit from the Corps may be required if a project will result in wetland impacts. In these instances, the federal lead agency (e.g., the Corps) initiates and coordinates the following steps: informal consultation with USFWS and/or NMFS to establish a list of target species; preparation of biological assessment assessing potential for the project to adversely affect listed species; coordination between state and federal biological resource agencies to assess impacts/proposed mitigation; and development of appropriate mitigation for all significant impacts on federally listed species.

The FESA administrating agency ultimately issues a final Biological Opinion on whether the project will affect a federally listed species. A Section 10(a) Endangered Species Incidental Take Permit would be necessary when the "taking" or harming of a species is incidental to the lawful operation of a project.

The USFWS also publishes a list of candidate species. Species on this list receive "special attention" from federal agencies during environmental review, although they are not otherwise protected under FESA. Candidate species are taxa for which the USFWS has sufficient biological information to support a proposal to list as endangered or threatened. In addition, the USFWS maintains a list of species of concern. Federal species of concern receive no legal protection under FESA but may meet CEQA criteria for being considered rare or endangered (see below).

CALIFORNIA ENDANGERED SPECIES ACT

Section 2080 of the California Fish and Game Code prohibits the taking of plants and animals listed under the authority of the California Endangered

Species Act of 1984 (CESA). Under CESA, CDFG maintains a list of threatened species and endangered species (California Fish and Game Code 2070). The CDFG also maintains a list of candidate species that are species CDFG has formally noticed as being under review for addition to either the list of endangered species or the list of threatened species, as well as a list of "species of special concern" which serve as "watch lists."

Pursuant to the requirements of CESA, an agency reviewing a project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project area and determine whether the proposed project will have a potentially significant impact on such species.

CEQA GUIDELINES SECTION 15380

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

CEQA also calls for the protection of other locally or regionally significant resources, including natural communities. Although natural communities do not at present have legal protection of any kind, CEQA calls for an assessment of whether any such resources would be affected, and requires a finding of significance if there will be substantial losses. Natural communities listed by CNDDB as sensitive are considered by CDFG to be significant resources and fall under the CEQA Guidelines for addressing impacts. Local planning documents such as general plans often identify these resources as well.

San Francisco garter snake is a federally- and state-listed endangered species found on the San Francisco peninsula. The species is known to occur at Horse Stable Pond, Mori Point, and the Rockaway Quarry site. Consultation with the US Fish & Wildlife Service would be a necessary part of environmental review for any proposal that may significantly impact the species.

OTHER STATUTES, CODES, AND POLICIES AFFORDING LIMITED SPECIES PROTECTION

Birds

The federal Migratory Bird Treaty Act (16 USC, Sec. 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs. Birds of prey are protected in California under the State Fish and Game Code, Section 3503.5 (1992). Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "taking" by the CDFG. Any loss of fertile eggs, nesting raptors, or any activities resulting in nest abandonment would constitute a significant impact. Project impacts to these species would not be considered significant unless they are known or have a high potential to nest in the project area or to rely on it for primary foraging.

Plants

The legal framework and authority for the state's program to conserve plants are woven from various legislative sources, including CESA and CEQA Guidelines. In addition, the California Native Plant Protection Act of 1977 (Fish and Game Code Section 1900 – 1913) gives the CDFG authority to designate state endangered, threatened, and rare plants and provides specific protection measures for identified populations.

The California Native Plant Society (CNPS) maintains a list of special status plant species based on collected scientific information. Designation of these species by CNPS has no legal status or protection under federal or state endangered species legislation. CNPS designations are defined as List 1A (plants presumed extinct); List 1B (plants rare, threatened, or endangered in California and elsewhere); List 2 (plants rare, threatened, or endangered in California, but more numerous elsewhere); List 3 (plants about which more information is needed – a review list); and List 4 (plants of limited distribution - a watch list). There is a general agreement among biologists, ecologists and other resource specialists, that vascular plants listed as rare or endangered or as List 1 or 2 by the CNPS meet the broader definition in CEQA Guidelines Section 15380(b). Thus, substantial adverse effects to these species would be considered significant. Additionally, plants constituting CNPS List 1A, 1B or 2 meet the definitions of CDFG Code Section 1901 (Native Plant Protection Act) or Sections 2062 and 2067 (CESA).

Regulation of Wetlands

U.S. ARMY CORPS OF ENGINEERS

Wetlands and other waters, e.g., rivers, streams and natural ponds, are a subset of "waters of the U.S." and receive protection under Section 404 of the Clean Water Act. The Corps has primary federal responsibility for administering regulations that concern waters and wetlands on the project site under statutory authority of the Clean Water Act (Section 404). In addition, the regulations and policies of various federal agencies (e.g., U.S. Department of Agriculture, and Natural Resource Conservation Service [NRCS], U.S. EPA) mandate that the filling of wetlands be avoided to the extent possible.

The term "waters of the U.S. " as defined in Code of Federal Regulations (33 CFR 328.3[a]; 40 CFR 230.3[s]) includes: (1) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (2) All interstate waters including interstate wetlands; (3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of

which could affect interstate or foreign commerce including any such waters which are or could be used by interstate or foreign travelers for recreational or other purposes; or from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or which are used or could be used for industrial purposes by industries in interstate commerce; (4) All impoundments of waters otherwise defined as waters of the United States under the definition; (5) Tributaries of waters identified in paragraphs (1) through (4); (6) Territorial seas; and (7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6). The Corps requires obtaining a permit if a project proposes placing structures within navigable waters and/or alteration of waters of the United States.

SAN FRANCISCO REGIONAL WATER QUALITY CONTROL BOARD

Under Section 401 of the federal Clean Water Act (CWA), the San Francisco Regional Water Quality Control Board (RWQCB) must certify that actions receiving authorization under Section 404 of the CWA also meet state water quality standards. The RWQCB also regulates waters of the state under the Porter-Cologne Act Water Quality Control Act (Porter Cologne Act). The RWQCB requires projects to avoid impacts to wetlands if possible and requires that projects do not result in a net loss of wetland acreage or a net loss of wetland function and values. The RWQCB typically requires compensatory mitigation for impacts to wetlands and/or waters of the state. The RWQCB also has jurisdiction over waters deemed "isolated" or not subject to Section 404 jurisdiction under Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers (SWANCC). Dredging, filling, or excavation of isolated waters constitutes a discharge of waste to waters of the state and prospective dischargers are required obtain authorization through an Order of Waste Discharge or waiver thereof from the RWQCB and comply with other requirements of the Porter-Cologne Water Quality Control Act.

CALIFORNIA DEPARTMENT OF FISH AND GAME

Under Sections 1600 - 1616 of the California Fish and Game Code, the CDFG regulates activities that would substantially divert, obstruct the natural flow, or substantially change of rivers, streams and lakes. The jurisdictional limits of CDFG are defined in Section 1602 of the California Fish and Game Code as, "bed, channel, or bank of any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake…." The CDFG requires a Streambed Alteration Agreement for activities within its jurisdictional area.

Local Ordinances, Plans, and Policies

PACIFICA GENERAL PLAN 1980

The current Pacifica General Plan outlines a number of policies regarding biological resources. These are outlined below:

Conservation Element Policies

1. Conserve trees and encourage native forestation.
2. Require the protection and conservation of indigenous rare and endangered species.
3. Protect significant trees of neighborhood or area importance and encourage planting of appropriate trees and vegetation.
4. Protect and conserve the coastal environment, sand dunes, habitats, unique and endangered species and other natural resources and features which contribute to the coastal character.
5. Local year-round creeks and their riparian habitats shall be protected.
6. Develop policies and ordinances directed to energy conservation.
7. Promote the conservation of all water, soil, wildlife, vegetation, energy, minerals and other natural resources.

Open Space Element Policies

1. Retain open space which preserves natural resources, protects visual amenities, prevents inappropriate development, provides for the managed use of resources, and protects the public health and safety.

Land Use Element Policies

7. Development shall maximize beach and open space access and be oriented as much as possible to the carrying capacity of each particular coastal environment in use, design, and intensity.

LOCAL COASTAL PROGRAM, CALIFORNIA COASTAL ACT

The California Coastal Act (1976) gives local government the duty to prepare and implement Local Coastal Programs (LCPs). An LCP is a local government's land use plans, zoning ordinances, zoning district maps, and other implementing actions within sensitive coastal resource areas. Together, these tools must adhere to and implement the California Coastal Act. LCPs carry out the mandate of the Coastal Act: to protect coastal resources and maximize public access to the shoreline. LCPs that are certified by the Coastal Commission issue permits for new development subject to standards outlined in the LCP. LCPs can address public access, recreation and visitor facilities, water quality, natural resources, agricultural resources, new development, scenic resources, coastal hazards, shoreline erosion, and other coastal development.

The California Coastal Act included 35 coastal policies which were intended to form the parameters for planning the State's Coastal Zone. Unlike the General Plan where the policies evolved from the public input (primarily workshops) and then formed the basis for land use decisions, in coastal planning the policies are given. These policies are used to justify the various proposed land uses. Relevant coastal policies are included here. It is important to note that these policies are binding on the coastal portion of Pacifica's Plan; and can be amended only with the State Coastal Commission's approval. However, although they supplement the mandatory elements of the General Plan, the policies are not binding on the portion of the City outside the 1979 Coastal Zone (the area east of Highway 1).

Coastal Act Policies

- Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.
- The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other mean's, minimizing adverse effects of wastewater discharge and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface waterflow, encouraging wastewater reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.
- Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development of transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur.
- The diking, filling or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this policy, where there is no fea-

sible, less environmentally damaging, alternative and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:

1. New or expanded port, energy and coastal-dependent industrial facilities, including commercial fishing facilities.
2. Maintaining existing, or restoring previously dredged, depths in existing navigational channels, turning basins, vessel berthing and mooring areas, and boat launching ramps.
3. In open coastal waters, other than wetlands, including streams, estuaries and lakes, new or expanded boating facilities.
4. Incidental public services purposes, including, but not limited to, burying cables and pipes or inspection of piers and maintenance of existing intake and outfall lines.
5. Mineral extraction, including sand for restoring beaches, except in environmentally sensitive areas.
6. Restoration purposes.
7. Nature study, aquaculture, or similar resource-dependent activities.

Dredging and spoils disposal shall be planned and carried out to avoid significant disruption to marine and wildlife habitats and water circulation. Dredge spoils suitable for beach replenishment should be transported for such purposes to appropriate beaches, or into suitable longshore current systems.

In addition to the other provisions of this section, diking, filling, or dredging in existing estuaries and wetlands shall maintain or enhance the functional capacity of the wetland or estuary. Any alteration of coastal wetlands identified by the Department of Fish and Game shall be limited to…very minor incidental public facilities, restorative measures, nature study, commercial fishing facilities in Bodega Bay, and development in already developed parts of south San Diego Bay, if otherwise in accordance with this division.

Erosion control and flood control facilities constructed on watercourses can impede the movement of sediment and nutrients that would otherwise be carried by storm runoff into coastal waters. To facilitate the continued delivery of these sediments to the littoral zone, whenever feasible, the material removed from these facilities may be placed at appropriate points on the shoreline in accordance with other applicable provisions of this division, where feasible mitigation measures have been provided to minimize adverse environmental effects. Aspects that shall be considered before issuing a coastal development permit for these purposes are the method of placement, time of year of placement, and sensitivity of the placement area.

- Facilities serving the commercial fishing and recreational boating industries shall be protected and, where feasible, upgraded. Existing commercial fishing and recreational boating harbor space shall not be reduced unless the demand for those facilities no longer exists or adequate substitute space has been provided. Proposed recreational boating facilities shall, where feasible, be designed and located in such a fashion as not to interfere with the needs of the commercial fish industry.
- The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.
- Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.

- Channelizations, dams, or other substantial alterations of rivers and streams shall incorporate the best mitigation measures feasible, and be limited to: (1) necessary water supply projects; (2) flood control projects where no other method for protecting existing structures in the flood plain is feasible and where such protection is necessary for public safety or to protect existing development, or; (3) developments where the primary function is the improvement of fish and wildlife habitat.
- Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on such resources shall be allowed within such areas. Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade such areas and shall be compatible with the continuance of such habitat areas.
- The long-term productivity of soils and timberlands shall be protected, and conversions of coastal commercial timberlands in units of commercial size to other uses of their division into units of noncommercial size shall be limited to providing for necessary timber processing and related facilities.

PACIFICA STATE BEACH MASTER PLAN

The Master Plan covers public improvements and habitat enhancement features to Pacifica State Beach. Responsibility for improvement, management, and maintenance was transferred to the City of Pacifica in 1990. The City must submit any improvement plans to the State for approval prior to initiation. The Master Plan covers the following project areas: parking, access and circulation features; beach and dune restoration; restroom and pump house reconstruction; coastal trail extension; clean beaches initiative (constructed stormwater wetland); and the San Pedro Creek wetland ecosystem restoration and flood control project.

PACIFICA STATE BEACH GENERAL PLAN

The purpose of the Pacifica State Beach General Plan is to "protect, perpetuate, and make available to the public the natural, scenic and recreation resources of the ocean beach and wetlands." It includes long range planning proposals for resource, land use and facilities, and interpretive elements.

CITY OF PACIFICA STRATEGIC PLAN

The Pacifica Strategic Plan describes the vision, mission, goals, and objectives for the City. These guiding principles include specific directives pertaining to biological resources. The vision statement states that in five years, Pacifica will be "economically and ecologically vibrant." Pacifica is dedicated/committed to "the stewardship of its exceptional natural attributes." Goal 1 is to "preserve and enhance Pacifica's natural resources and open space to ensure an ecologically vibrant community."

HERITAGE TREE PROGRAM, CITY OF PACIFICA

Heritage trees are any trees in the City of Pacifica that have a trunk with a circumference of 50" or more, excluding eucalyptus. Any removal, substantial trimming or new construction within the dripline of a Heritage Tree requires approval by the City.

5.4 FIRE HAZARDS

This section discusses fire hazards in the Planning Area. Fire hazards include both urban and wildland fires. Urban fires involve the uncontrolled burning of built structures due to human-made causes; wildland fires affect grassland, forest, and brush (and the structures on them), and can result from either human or natural causes.

About two thirds of Pacifica is undeveloped, and nearly half is protected open space. This undeveloped land is mainly on the rugged ridges that form the City's western edge and descend down to the ocean between Pacifica's valley communities. Coastal scrub is the predominant vegetation type, interspersed with annual grassland. Significant areas of eucalyptus forest and mixed woodland are present in eastern Sharp Park and on Cattle Hill and Montara Mountain (see Figure 5-8, Vegetation, for review).

As Figure 5-11, Fire Hazards shows, the large areas of wild open space in Pacifica present a fire threat. According to the California Department of Forestry and Fire Protection, Milagra Ridge, Mori Ridge, Sweeney Ridge, Montara Mountain and Pedro Point all have large areas considered to have "high" or "very high" threat of fire, while Mori Ridge and Mori Point are classified by a mix of "high" and "moderate" risk areas. A Very High Fire Hazard Severity Zone designation is identified for very limited developed portions of the Pedro Point, Linda Mar, Park Pacifica, Vallemar, and East Sharp Park neighborhoods. Nearly all of the urbanized parts of the Planning Area are classified as having a "moderate threat" level for fire.

Regulatory Framework

The California Department of Forestry and Fire Protection (CDF) maps areas of significant fire hazards in the state. These areas are identified based on weather, terrain, fuels (e.g. type of ground vegetation), and other factors. The CDF designates land as State or Local Responsibility Areas (SRA and LRA), based on population density, land use, and land ownership. CDF is responsible for classifying fire hazards, and for designating Very High Fire Hazard Severity Zones (VHFHSZ) for SRA lands.

The interface between wild and urban land in Pacifica presents a fire threat. A Very High Fire Hazard Severity Zone has been designated on parts of Sweeney and Mori ridges, Pedro Point, and Montara Montain.

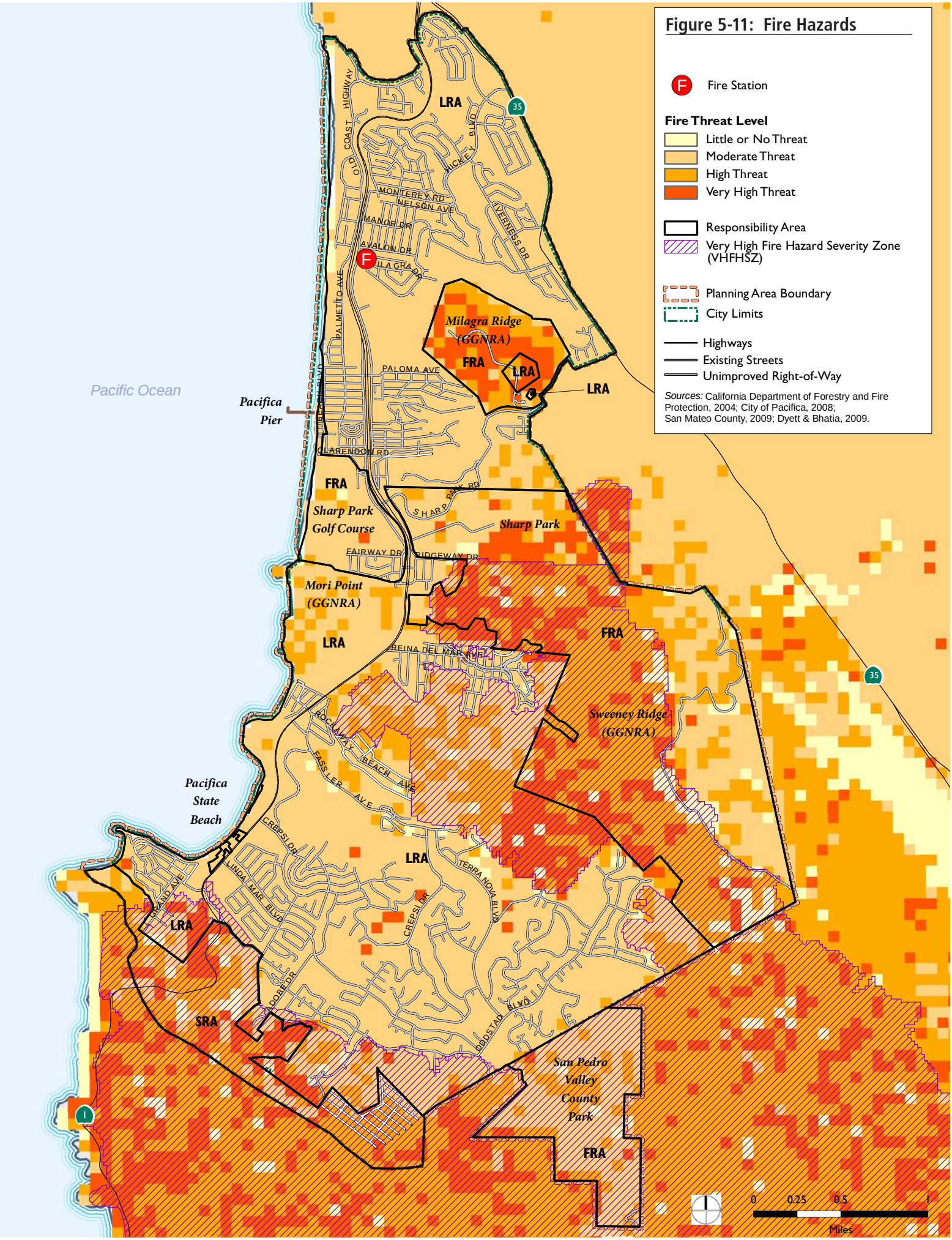


Figure 5-11: Fire Hazards
Fire Station
Fire Threat Level
Little or No Threat
Moderate Threat
High Threat
Very High Threat
Responsibility Area
Very High Fire Hazard Severity Zone (VHFHSZ)
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: California Department of Forestry and Fire Protection, 2004; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
Pacifica Pier
Pacifica State Beach
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
San Pedro Valley County Park
LRA
FRA
SRA
OLD COAST HIGHWAY
HICKEY BLVD
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
MILAGRA DR
VERNESS DR
PALMETTO AVE
PALOMA AVE
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
LINDA MAR BLVD
GRAND AVE
TERRA NOVA BLVD
ADOBE DR
ODDSTAD BLVD
0 0.25 0.5 1 Miles

CDF also identifies VHFHSZ for LRA lands, and periodically reviews local agency regulatory actions.

The City of Pacifica is a Local Responsibility Area (LRA), while the small areas of the Planning Area outside City limits are part of the SRA in San Mateo County. However, lands in Pacifica owned by the federal government and the County—GGNRA lands and San Pedro Valley County Park—are designated as a Federal Responsibility Area (FRA) within the Pacifica LRA. Within the Planning Area, VHFHSZ are designated on parts of Sweeney and Mori Ridges, within the FRA on GGNRA lands, and also to the land directly south of City limits on the slope of Montara Mountain.

California Building Code

In 2005, the California Building Code was amended to require that all new buildings located in any Fire Hazard Severity Zone in SRAs, or any Very High Fire Hazard Severity Zone in LRAs, must use building materials approved for use in wildland/urban interface areas. The code now specifies certain roof coverings, fire resistive wall and ceiling-floor assemblies, wall finish materials, hardware, insulation, and other building materials for use in high fire hazard areas.

Public Resources Code

Also in 2005, Public Resources Code (PRC) 4291 was amended to expand the defensible space clearance requirement around buildings from 30 feet to 100 feet, in any SRA. Building owners must minimize potential fuel around structures, to minimize the risk of loss, and to improve firefighter safety (California Department of Forestry and Fire Protection, 2009.)

Local Hazard Mitigation Plan

In 2005, a task force representing the City of Pacifica studied the City's exposure to natural hazards and identified mitigation strategies. Their work is incorportated into the regional Local Hazard Mitigation Plan directed by the Association of Bay Area Governments (ABAG).

The task force examined Pacifica's exposure to fire threats due to the interface between urbanized areas and wildland areas, and the steep terrain and occasionally narrow streets. The task force concluded in most cases, response time is within the acceptable range of six minutes, fifty-nine seconds, and that water supply and storage capacity are adequate for firefighting.

The Plan identifies two mitigation strategies concerning wildland fires. Of these, one is noted as an existing policy: to review development proposals to ensure that they incorporate appropriate fire-mitigation measures, including adequate provisions for evacuation and access by emergency responders. A second measure is identified as a moderate priority: to develop a clear legislative and regulatory framework at both the state and local levels to manage the wildland-urban interface consistent with best practices (Association of Bay Area Governments, 2005.)

City of Pacifica General Plan

SEISMIC SAFETY AND SAFETY ELEMENT

The Seismic Safety and Safety Element of the General Plan details the known and potential hazards from wildland fires, as well as other issues dealt with elsewhere in this document. The Element identifies the hazards of wildland fires combined with steep terrain, narrow streets, and inadequate water supply in some areas. The Element identifies fire prevention, including public education and code enforcement, as the most effective means of suppressing fire.

Policies

2. Support continuing public awareness of hazards by providing citizens with hazard information, results of studies, emergency procedures and alternatives. When appropriate, buyers shall be notified of geotechnical uncertainties or potential risks and costs.

7. Maintain an emergency plan which provides adequate response to disasters, including emergency ingress and egress communitywide and for individual neighborhoods.

8. Support the Water District in its efforts to provide adequate water service and emergency water storage
9. Provide and publicize a Citywide emergency communications system.
10. Emphasize fire prevention measures.

State and Local Programs

The North County Fire Authority (NCFA) is responsible for fire response and fire prevention in Pacifica, Daly City, and Brisbane. NCFA's primary fire prevention activity is the annual inspection of every business and multi-family property in its service area. The agency also conducts a Vegetation Management Program targeting urban/wildland interface fire hazards. Success of this program contributed to CDF's down-grading of Daly City's Southern Hills section from Very High Fire Hazard Severity Zone to a lower-hazard status, the first such down-grading in the state.

NCFA's Fire Prevention Bureau also participates in plan review, providing a fire prevention perspective during the design of new buildings in potentially fire-prone areas. Fire protection services are further discussed in Chapter 7.

5.5 HAZARDOUS MATERIALS

Releases, leaks, or disposal of chemical compounds, such as petroleum hydrocarbons, on or below the ground surface can lead to contamination of underlying soil and groundwater. Disturbance of a previously contaminated area through grading or excavation operations could expose the public to health hazards from physical contact with contaminated materials or hazardous vapors. Improper handling or storage of contaminated soil and groundwater can further expose the public to these hazards, or potentially spread contamination through surface water runoff or air-borne dust. In addition, contaminated groundwater can spread down gradient, potentially contaminating subsurface areas of surrounding properties.

Areas where historic or ongoing activities have resulted in the known or suspected release of hazardous materials to soil and groundwater, and where current clean-up activities monitored by the State Water Quality Control Board or the California Department of Toxic Substances are ongoing, are shown in Figure 5-12, and listed in Table 5-3. Eleven of the thirteen contaminated sites with current cleanup programs in Pacifica are classified as Leaking Underground Storage Tanks; most are associated with gasoline, while others have had leakage of oils, diesel, or mercury. Most of the identified sites are gas stations, former gas stations, auto body or repair shops. One former drycleaners is the site of a cleanup program targeting potential contamination with tetrachloroethylene (PCE). The former Sharp Park Rifle Range is the only site identified by both the California Department of Toxic Substances Control and the State Water Resources Board. A voluntary cleanup of residual lead from the former rifle range is currently underway.

Regulatory Framework

Federal Regulations

CLEAN WATER ACT (CWA)

The Clean Water Act (CWA) provides jurisdiction over waters of the United States and authorizes the Environmental Protection Agency (EPA) to implement water quality regulations. The intent of the CWA is to maintain and restore the chemical, physical, and biological integrity of the waters of the

Most of the contaminated sites identified in Pacifica are current or former gas stations, auto body or repair shops. Cleanup of leaking tanks typically involves soil and groundwater investigation and remediation under the direction of the local regulatory agency.

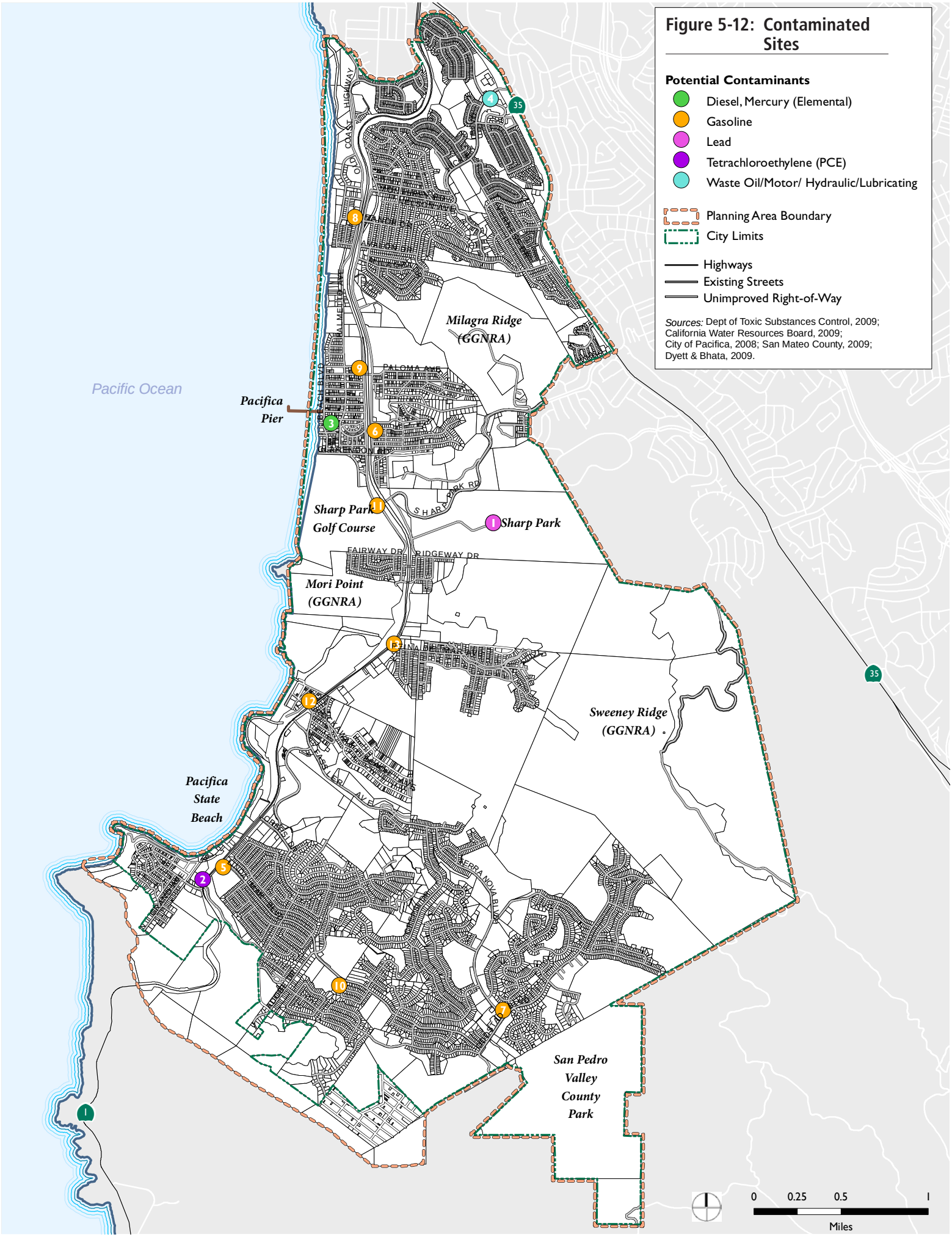


Figure 5-12: Contaminated Sites
Potential Contaminants
Diesel, Mercury (Elemental)
Gasoline
Lead
Tetrachloroethylene (PCE)
Waste Oil/Motor/ Hydraulic/Lubricating
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: Dept of Toxic Substances Control, 2009; California Water Resources Board, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhata, 2009.
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
0 0.25 0.5 1
Miles

TABLE 5-3: CONTAMINATED SITES IN PACIFICA

Map ID	Site Name	Address	Site Type	Potential Contaminants	Cleanup Status
Sites Identified by the California Department of Toxic Substances Control					
1	Sharp Park Rifle Range	Rifle Range Rd.	Voluntary Cleanup	Lead	Active
Sites Identified by the State Water Resources Board					
1	Sharp Park Rifle Range	Rifle Range Rd.	Cleanup Program Site	Lead	Open – Site Assessment
2	One Hour Martinizing, Former	5556 Cabrillo Hwy.	Cleanup Program Site	Tetrachloroethylene (PCE)	Open – Site Assessment
3	Sharp Park Wastewater Plant	2212 Beach Blvd.	LUST Cleanup Site	Diesel, Mercury (Elemental)	Open – Site Assessment
4	BP #11203	700 Hickey Blvd.	LUST Cleanup Site	Waste Oil/ Motor/ Hydraulic/ Lubricating	Open – Site Assessment
4	Shakoori Chevron	700 Hickey Blvd.	LUST Cleanup Site	Gasoline	Open – Site Assessment
5	Lion Oil Station (Former)	500 Linda Mar Blvd.	LUST Cleanup Site	Gasoline	Open – Site Assessment
6	Sunset Garage	2251 Oceana Blvd.	LUST Cleanup Site	Gasoline	Open – Site Assessment
7	Tosco #5898 (Former Unocal)	765 Oddstad Blvd.	LUST Cleanup Site	Gasoline	Open – Site Assessment
8	Arco #0433	498 Palmetto Ave.	LUST Cleanup Site	Gasoline	Open – Remediation
9	Olympic Sharp Park	1518 Francisco Blvd.	LUST Cleanup Site	Gasoline	Open – Remediation
10	Pacifica Fire Station #2	1100 Linda Mar Blvd.	LUST Cleanup Site	Gasoline	Open – Verification Monitoring
11	Sharp Park Golf Course	0 Francisco Blvd.	LUST Cleanup Site	Gasoline	Open – Verification Monitoring
12	Unocal #5529 (Former)	4460 Cabrillo Hwy.	LUST Cleanup Site	Gasoline	Open – Verification Monitoring
13	Vallemar Beacon	2095 Cabrillo Hwy.	LUST Cleanup Site	Gasoline	Open – Verification Monitoring

Sources: California Department of Toxic Substances Control; California Environmental Protection Agency; State Water Resources Control Board, 2009.

United States. The CWA includes regulatory and non-regulatory guidance to reduce direct and indirect pollution discharges into waterways.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

Section 402(p) of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program includes a permit that regulates discharges from municipal wastewater treatment plants, and a permit regulating municipal drainage systems that may carry stormwater, surface water and groundwater. The NPDES program also includes a construction general permit which applies to both municipal and private development projects which disturb an acre or more of soils, as well as smaller projects which have been determined to need coverage by the Regional Water Quality Control Board. This permit is discussed in more detail elsewhere in this chapter. The EPA has given authority for NPDES permitting to the California State Water Resources Control Board (SWRCB) and the nine regional water quality boards. The San Francisco Bay Regional Water

Quality Control Board (RWQCB) regulates water quality for the City of Pacifica.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

The California Department of Toxic Substances Control (DTSC) is responsible for regulating the production and disposal of more than 800 hazardous substances. It enforces the federal Resource Conservation and Recovery Act in California, as well as provisions of the California Health and Safety Code that apply to toxic substances.

DTSC is also responsible for overseeing the clean-up of contaminated sites. As part of a nationwide policy to expedite site clean-ups, the agency created the Voluntary Cleanup Program and the Expedited Remedial Action Pilot Program, to encourage responsible parties to complete clean-ups, with incentives. The San Francisco Department of Recreation and Parks is currently undertaking a Voluntary Cleanup of the Rifle Range site in Sharp Park (California Department of Toxic Substances Control, 2009).

State Regulations

PORTER-COLOGNE WATER QUALITY CONTROL ACT

Porter-Cologne Water Quality Control Act provides the basis for water quality regulation within California and defines water quality objectives as the limits or levels of water constituents that are established for protection of beneficial uses. (See also Section 5-2– Hydrology and Flooding).

Underground storage tanks (USTs) used for hazardous materials—most often petroleum—are a widespread source of groundwater contamination. Assessment and cleanup of USTs is governed by the Porter Cologne Water Quality Control Act, and overseen by the Water Resources Control Board. Cleanup of leaking tanks typically involves soil and groundwater investigation and remediation under the direction of the local regulatory agency (State Water Resources Control Board, 2009).

5.6 AIR QUALITY

Climatic Conditions

Atmospheric conditions such as wind speed, wind direction, and air temperature interact with the physical features of the landscape to determine the movement and dispersal of air pollutants.

The Bay Area's climate is dominated by the strength and position of the semi-permanent high-pressure center over the Pacific Ocean. During the summer, dry and subsiding air associated with high pressure off the coast acts as a cap over the cooler marine air near the surface. During the winter, when the high pressure system has retreated southward, subsidence inversions are less common; however, radiant inversions caused by warmer air radiating back from the land trapped under colder air masses above are frequent. These inversions typically develop overnight and, while restricting vertical dispersion of pollutants emitted at ground level, generally dissipate by afternoon.

The Bay Area is also characterized by a complex terrain which distorts wind flow and significantly influences local atmospheric conditions and air quality. The Golden Gate and Carquinez Strait provide major gaps in the Coast Range, allowing air to pass between the Pacific Ocean and the Central Valley. Winds typically bring marine air from the northwest, and pick up speed where they are channeled through the gaps.

Pacifica lies in the northwestern portion of the Bay Area's peninsula climatological sub-region, on the coastal side of the Santa Cruz Mountains. The mountains generally rise to an elevation between 500 and 2,000 feet, with the exception of the San Bruno gap, extending from Fort Funston on the Pacific Ocean to SFO on the San Francisco Bay. Because it is oriented in the same northwest-to-southeast direction as the prevailing winds, and because elevations there are below 200 feet, marine air flows through the gap in the direction of the Bay.

Within the peninsula sub-region, air pollution potential is highest in the southeast (in the vicinity of Redwood City), the area most protected from high winds and most susceptible to pollution transported from upwind urban areas. As for Pacifica, winds bring air from the Ocean, and are generally strong enough to carry away local emissions.

In the Bay Area, winds typically carry marine air inland in a southeasterly direction, through the Golden Gate and across the San Bruno gap in the Santa Cruz mountains, east of Pacifica. The interaction of wind direction, air temperature, and landscape features tend to produce foggy conditions on the coast, but carry contaminated air eastward.

Regulatory Framework

Federal Regulations

The federal Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to establish national standards for "criteria air pollutants": ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter (PM-10 and PM-2.5), and lead. If an area does not meet the federal standard for a pollutant, the state is required to prepare and adopt State Implementation Plans (SIPs) to show how the standards will be attained.

Regulation of toxic air contaminants (TACs) is achieved through federal and State controls on individual sources. TACs are air pollutants with short-term (acute) and/or long-term (chronic or carcinogenic) adverse human health effects. The current list of toxic air contaminants includes approximately 200 compounds. TAC sources include industrial processes, commercial operations (e.g., gasoline stations and dry cleaners), and some agricultural activities.

The federal Clean Air Act also outlines requirements for ensuring that federal transportation plans, programs, and projects conform to the SIP's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards. As such, Regional Transportation Plans (RTPs) and Transportation Improvement Programs (TIPs) that require federal funding or approval must be included in the SIP emissions budget.

In April 2007, the U.S. Supreme Court found that the EPA has a statutory authority to formulate standards and regulations to address greenhouse gases, which it historically has not done. Greenhouse gas regulations are covered in Section 5.7, Climate Change.

State Regulations

The California Clean Air Act of 1988 focuses on attainment of the state ambient air quality standards, which, for certain pollutants and averaging periods, are more stringent than the comparable federal standards. In addition, California has established State ambient air quality standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles.

The State's regulatory efforts regarding the identification and control of toxic air contaminants (TACs) are embodied in Assembly Bill (AB) 1807, the Tanner Bill. The California Air Resources Board (CARB) identifies the most important toxic pollutants by considering risk of harm to public health, amount or potential amount of emissions, manner of usage of the substance, its persistence in the atmosphere, and its concentration in the outdoor air. CARB also regulates mobile emissions sources in California, such as construction equipment, trucks, and automobiles, and oversees the activities of air quality management districts, which are organized at the county or regional level. All new diesel-powered engines and vehicles sold in California are required to meet both federal and state emissions certification requirements. The Air Toxics 'Hot Spots" Act (AB 2588) was enacted in 1987 with the objective of collecting information concerning industrial emissions of toxic air contaminants and making the information available to the public.

Regional Governance

Local and regional air districts are required to prepare and adopt air quality attainment plans if the district violates state standards for criteria air pollutants. The Bay Area Air Quality Management District (BAAQMD) is the regional agency with regulatory authority over emission sources in the San Francisco Bay Area.

OZONE

The San Francisco Bay Area has made significant progress in reducing levels of ambient ozone, but remains in non-attainment for the one-hour ozone standard. BAAQMD, in collaboration with the Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG), prepared the Bay Area 2005 Ozone Strategy to bring the region into compliance with the State's one-hour standard, and to reduce the transport of ozone from

the Bay Area to other air basins. In March 2010, BAAQMD released the draft 2010 Bay Area Clean Air Plan, which updates the 2005 Ozone Strategy with new implementation control measures, and aims to provide a control strategy to reduce ozone, particulate matter, air toxics, and greenhouse gases in an integrated manner.

PARTICULATE MATTER

The Bay Area attains the national annual standards for coarse (PM 10) and fine (PM 2.5) particulate matter, and the 24-hour standard for PM 10. However, as of 2008 the District is not in attainment for the 24-hour standard for PM 2.5. BAAQMD must submit an attainment plan to EPA by April 2012 that shows how the District can meet standards by April 2014. The plan will make use of the Air Resources Board's list of 103 available and cost-effective control measures to reduce particulate matter, as mandated by 2003's Senate Bill 656.

TRANSPORTATION PLANNING

The transportation system has an important influence on air quality because it impacts the vehicle miles traveled, a major source of air pollutants. The Metropolitan Transportation Commission (MTC) is responsible for regional transportation planning for the nine-county San Francisco Bay Area. As the designated metropolitan planning organization for the Bay Area, MTC is responsible for developing and updating the Regional Transportation Plan (RTP), which establishes priorities and identifies projects. The MTC has significant authority over how both federal and state transportation funds are allocated in the region.

The current RTP, called the Transportation 2035 Plan, was adopted in April 2009. This plan and its implications for Pacifica are discussed in the Transportation chapter. The RTP is required to evaluate regional environmental effects of transportation investments, and to demonstrate conformity with the transportation emissions "budgets" in BAAQMD's air quality plans.

Existing Air Quality

The Bay Area air basin is considered in attainment for Federal and state carbon monoxide, nitrogen dioxide, and sulfur dioxide standards. The region is in nonattainment for state and Federal ozone standards and for California's standards for annual concentrations of coarse (PM 10) and fine (PM 2.5) particulate matter, as well as the federal 24-hour standard for PM 2.5.

The Bay Area Air Quality Management Division (BAAQMD) operates a regional monitoring network that measures the ambient concentrations of the six criteria pollutants. Since the closest monitoring station is approximately ten miles northeast of Pacifica on Arkansas Street in San Francisco, air quality in Pacifica can be inferred but not precisely gauged from BAAQMD's measurements. Table 5-4 shows measured pollutant concentrations for ozone, PM 10 and PM 2.5 from the Arkansas Street station over the last five years, and ambient air quality standards for these criteria pollutants.

Based on the data shown in Table 5-4, there have been no violations of the state or national ozone standard in the project vicinity over the past five years. However, because ozone is a regional pollutant and precursors can travel long distances before they react to form ozone, local emissions of reactive organic gases (ROG) and nitrogen oxides (NOx) may contribute to regional ozone levels as they are transported inland (wind generally blows from the coast toward inland valleys in summer). The regional monitoring network has recorded one-hour ozone levels exceeding the State standard on an average of approximately 10 days per year over the past five years, with 8-hour levels exceeding the state standard an average of about 15 days per year over the same period.

PM-10 and PM-2.5 are particulate matter that is 10 microns (a micron is one-millionth of a meter) or less in diameter and 2.5 microns or less in diameter, respectively. Particulate matter can cause adverse health effects when inhaled. PM-10 concentrations measured

TABLE 5-4: AIR QUALITY DATA SUMMARY, 2005-2009

			Monitoring Data by Year[a]				
Pollutant	**Standard**	**Level[b]**	**2005**	**2006**	**2007**	**2008**	**2009**
Ozone							
High 1 Hour Average (ppm)	0.09	State	0.058	0.053	0.06	0.082	0.072
Days over State Standard[c]			0	0	0	0	0
High 8 Hour Average (ppm)	0.07	State	0.054	0.046	0.053	0.066	0.056
Days over State Standard[c]			0	0	0	0	0
Particulate Matter (PM-10)							
High 24 Hour Average (mg/m3)	50	State	46.4	**61.4**	**69.8**	41.3	36
Days over State Standard c			0	**17.2**	**12**	0	0
Annual Average (mg/m3)	20	State	**20.1**	**22.9**	**21.8**	**21.9**	*
Particulate Matter (PM-2.5)							
High 24 Hour Average (mg/m3)	35d	National	43.6	54.3	**45.2**	29.4	35.5
Days over National '06 Standard[c]			6.4	3.1	5.1	*	*
Annual Average (mg/m3)	12	State	9.5	9.7	9.3	*	*

Sources: California Air Resources Board, Summaries of Air Quality Data, 2002, 2003, 2004, 2005, 2006, 2007; http://www.arb.ca.gov/adam.

Notes:

a Monitoring data are from the Arkansas Street station in San Francisco, the closest station to Pacifica.

b Where both state and federal standards apply, the more restrictive standard is reflected.

c Generally, state standards are not to be exceeded and national standards are not to be exceeded more than once per year.

d U.S. EPA lowered the 24-hour PM-2.5 standard from 65 mg/m3 to 35 mg/m3 in 2006; the averages from 2003-2005 did not exceed the standard that was in place at that time.

* Insufficient data

ppm = parts per million; mg/m3 = micrograms per cubic meter.

Values in bold are in excess of applicable standard.

in the project vicinity show that the state's 24-hour-average standard was violated during two of the last five years. For PM-2.5, the National standard was strengthened in 2006, from 65 to 35 micrograms per cubic meter, a level that has been exceeded in two of the three years it has been in effect. In general, particulate levels are relatively low near the coast, and peak in dry, sheltered valleys. PM-10 concentrations violated the State's 24-hour average standard at an average rate of about six days per year at the Arkansas Street station over the last five years, compared to 30 days for the San Francisco Bay Air Basin as a whole. For PM-2.5, the Air Basin exceeded the Federal standard an average of about ten days per year, compared to about five days per year for the last three years data is available for the Arkansas Street monitoring station (California Air Resources Board, 2010). Pacifica's air is generally less polluted than the region's, though local emissions play a role in the region's air quality issues.

The BAAQMD maintains an Emissions Inventory, which estimates the total volume of air pollutants generated each day by approximately 100 "areawide" sources, point sources such as factories, gas stations and power plants, and mobile sources (primarily vehicles). From estimates for San Mateo County for 2005, shown in Table 5-5, it is clear that the proportion of air pollution generated by different sources varies by pollutant. Cars, trucks, airplanes and boats are responsible for most of the smog-producing pollutants (nitrogen oxides and reactive organic gases) in the air and nearly all of the carbon monoxide. Area-wide sources, especially dust from roads, produce most of the particulate air pollutants. Ships account for virtually all of the sulfur dioxide emitted in San Mateo County. There are 11 "point sources" that emit more than 0.5 tons per day of any criteria pollutant in San Mateo County, but none are in Pacifica (Bay Area Air Quality Management District, 2009).

TABLE 5-5: 2005 SUMMARY OF EMISSIONS BY SOURCE CATEGORY IN SAN MATEO COUNTY

	Average Annual Emissions (tons/day)											
Category[1]	**PM 10**	**%**	**PM 2.5**	**%**	**ROG**	**%**	**NO_x**	**%**	**SO_2**	**%**	**CO**	**%**
Stationary Sources												
Fuel Combustion	1.4	7%	1.4	19%	0.8	2%	3.1	5%	0.0	0%	10.0	5%
Waste Management	0.2	1%	0.0	0%	0.5	1%	0.0	0%	0.0	0%	0.1	0%
Chemical Manufacturing	0.0	0%	0.0	0%	0.1	0%	0.0	0%	0.0	0%	0.0	0%
Food, Wine, and Agricultural	1.4	7%	1.3	17%	0.3	1%	0.0	0%	0.0	0%	0.0	0%
Metallurgical and Mineral	0.4	2%	0.3	4%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
SUBTOTAL	**3.4**	**17%**	**3.0**	**40%**	**1.7**	**4%**	**3.1**	**5%**	**0.0**	**0%**	**10.1**	**5%**
Areawide Sources												
Gas and Fueling Stations	0.0	0%	0.0	0%	2.0	5%	0.0	0%	0.0	0%	0.0	0%
Construction and Farming Operations	2.0	10%	0.2	3%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Road Dust	10.1	52%	1.4	19%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Consumer Products	0.0	0%	0.0	0%	4.8	12%	0.0	0%	0.0	0%	0.0	0%
Other Miscellaneous Sources	1.0	5%	0.3	4%	7.4	18%	0.0	0%	0.0	0%	0.0	0%
SUBTOTAL	**13.1**	**67%**	**1.9**	**25%**	**14.2**	**35%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**
Mobile Sources												
Passenger Vehicles	0.6	3%	0.4	5%	12.6	31%	11.8	18%	0.0	0%	124.8	60%
Trucks and Buses	0.2	1%	0.1	1%	2.0	5%	8.9	14%	0.0	0%	20.7	10%
Lawn, Garden and Utility Equipment	0.0	0%	0.0	0%	2.3	6%	0.7	1%	0.0	0%	13.0	6%
Industrial/ Commercial Equipment	0.0	0%	0.0	0%	1.1	3%	2.1	3%	0.0	0%	15.1	7%
Farm and Construction Equipment	0.5	3%	0.4	5%	1.3	3%	7.5	12%	0.0	0%	5.4	3%
Ships and Boats	1.7	9%	1.6	21%	1.9	5%	20.1	31%	11.5	99%	5.0	2%
Aircraft	0.1	1%	0.1	1%	1.9	5%	10.5	16%	0.1	1%	14.7	7%
Other Mobile Sources	0.0	0%	0.0	0%	1.2	3%	0.0	0%	0.0	0%	0.6	0%
SUBTOTAL	**3.1**	**16%**	**2.6**	**35%**	**24.3**	**60%**	**61.6**	**95%**	**11.6**	**100%**	**199.3**	**95%**
TOTAL	**19.6**	**100%**	**7.5**	**100%**	**40.2**	**100%**	**64.7**	**100%**	**11.6**	**100%**	**209.4**	**100%**

Source: Bay Area Air Pollution Control District, 2005.

Note:

1 PM 10: Coarse Particulate Matter; PM 2.5: Fine Particulate Matter; ROG: Reactive Organic Gases; NOx: Nitrogen Oxides; SO2: Sulfides; CO: Carbon Monoxide.

5.7 CLIMATE CHANGE

Global Climate Change

Global climate change (GCC) refers to a change in the average weather of the earth that may be measured by wind patterns, storms, precipitation, and temperature. Historically, the rate of temperature change has typically been incremental, with warming and cooling occurring over the course of thousands of years. In the past 10,000 years the earth has experienced incremental warming as glaciers retreated across the globe. However, scientists have observed an unprecedented increase in the rate of warming over the past 150 years, roughly coinciding with the global industrial revolution.

Although GCC is now widely accepted as a concept, the extent and speed of change to be expected, and the exact contribution from human sources, remains in debate. Nonetheless, the world's leading climate scientists, the Intergovernmental Panel on Climate Change (IPCC), have reached consensus that global climate change is "very likely" caused by humans, and that hotter temperatures and rising sea levels will continue for centuries no matter how much humans control their future emissions.

In its 2007 report, the IPCC predicted that global mean temperature increase from 1990-2100 could range from 2.0 to 11.5 degrees Fahrenheit, with the most likely scenario between 3.2 and 7.1 degrees. The same report projects a sea level rise of 7 to 23 inches by the end of the century, with a greater rise possible depending on the rate of polar ice sheet melting. Observations since then have led to projections for more significant change. A 2009 study done for a consortium of California state agencies has projected a sea level rise of 39 to 55 inches along the California coast by 2100. (California Climate Change Center, May 2009.)

According to the California Climate Action Team (CCAT), accelerating GCC has the potential to cause a number of adverse impacts in California, including but not limited to: a shrinking Sierra snowpack that would threaten the state's water supply; public health threats caused by higher temperatures and more smog; damage to agriculture and forests due to reduced water storage capacity, rising temperatures, increasing salt water intrusion, flooding, and pest infestations; critical habitat modification and destruction; eroding coastlines; increased wildfire risk; and increased electricity demand. (CCAT, April 2006) These impacts have and will continue to have considerable costs associated with them.

While all of these impacts may be felt to some extent in Pacifica, of particular concern are coastal erosion, flooding, and habitat modification, as well as water supply issues.

Greenhouse Gases

Gases that that trap heat in the Earth's atmosphere are called greenhouse gases (GHGs). These gases play a critical role in determining the Earth's surface temperature. Part of the solar radiation that enters Earth's atmosphere from space is absorbed by the Earth's surface. The Earth reflects this radiation back toward space, but GHGs absorb some of the radiation. As a result, radiation that otherwise would have escaped back into space is retained, resulting in a warming of the atmosphere. Without natural GHGs, the Earth's surface would be about 61°F cooler. (CCAT, April 2006) This phenomenon is known as the greenhouse effect. However, many scientists believe that emissions from human activities—such as electricity generation, vehicle emissions, and even farming and forestry practices—have elevated the concentration of GHGs in the atmosphere beyond naturally-occurring concentrations, contributing to the larger process of global climate change. The six primary GHGs are:

- **Carbon dioxide (CO_2),** emitted as a result of fossil fuel combustion, with contributions from cement manufacture;
- **Methane (CH_4),** produced through the anaerobic decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion;

- **Nitrous oxide (N_2O),** typically generated as a result of soil cultivation practices, particularly the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning;
- **Hydrofluorocarbons (HFCs),** primarily used as refrigerants;
- **Perfluorocarbons (PFCs),** originally introduced as alternatives to ozone depleting substances and typically emitted as by-products of industrial and manufacturing processes; and
- **Sulfur hexafluoride (SF_6),** primarily used in electrical transmission and distribution systems.

Though there are other emissions, these six are identified explicitly in California legislation as being of primary concern. GHGs have varying potentials to trap heat in the atmosphere, known as global warming potential (GWP), and atmospheric lifetimes. GWP ranges from 1 (carbon dioxide) to 23,900 (sulfur hexafluoride). GHG emissions with a higher GWP have a greater global warming effect on a molecule-by-molecule basis. For example, one ton of CH_4 has the same contribution to the greenhouse effect as approximately 21 tons of CO_2. (California Climate Action Registry, 2008)GWP is alternatively described as "carbon dioxide equivalents", or CO_2e. The parameter "atmospheric lifetime" describes how long it takes to restore the system to equilibrium following an increase in the concentration of a GHG in the atmosphere. Atmospheric lifetimes of GHGs range from tens to thousands of years.

Greenhouse Gas Emissions

According to the California Energy Commission's 2007 Integrated Energy Policy Report, California's emissions in 2004 were nearly 500 metric ton carbon dioxide equivalent (MMTCO2e), making it second only to Texas among American states. Per capita, however, California's emissions were the 4th lowest in the United States in 2001.[8] Per capita rates of emissions in the Bay Area and San Mateo County are slightly higher than the California average.

In 2008, the Bay Area Air Quality Management District (BAAQMD) completed a baseline inventory of GHG emissions for the year 2007. According to BAAQMD, carbon dioxide accounted for 91 percent of greenhouse gas emissions in the Bay Area in 2008, with methane, nitrous oxide, and other compounds making up the remainder.

The Bay Area's transportation sector was the primary source of Bay Area greenhouse gas emissions in 2007, contributing 40 percent of the region's CO_2e, followed by industrial and commercial sources (34 percent), electricity and co-generation (15 percent), residential fuel usage (7 percent), off-road equipment (3 percent), and agriculture and farming (1 percent). Bay Area emissions by sector are illustrated in Chart 5-1.

Absent any policy changes, the Bay Area's greenhouse gas emissions are expected to grow at a rate of approximately 1.4 percent a year in the future due to population growth and economic expan-

8 *California Energy Commission 2007, 18.*

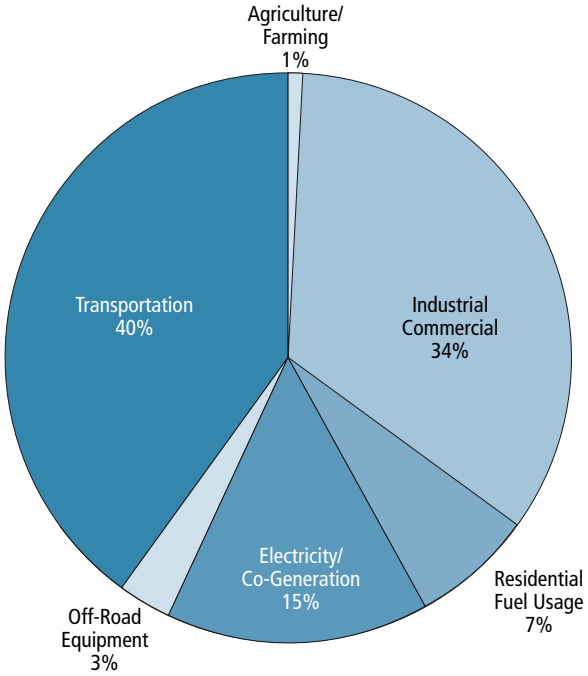
TABLE 5-6: COMPARATIVE GREENHOUSE GAS EMISSIONS

Area	Population	Emissions (CO2e)	Per Capita Rate (metric tons/ year/ person
San Mateo County (2007)	729,000	11 million	15.09
Bay Area (2007)	7,036,000	103 million	14.64
California (2004)	35,055,000	500 million	14.26
United States (2006)	299,398,000	7,054 million	23.56

Sources: Data for San Mateo County and the Bay Area are for 2007, BAAQMD, 2008. Emissions for California from California Energy Commission 2007 Integrated Energy Policy Report, population U.S. Census Bureau, 2004 American Community Survey. Emissions for the United States from EPA 2008. Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2006. U.S. Environmental Protection Agency, Washington, D.C. April 15, 2008, population U.S. Census Bureau, 2006 American Community Survey.

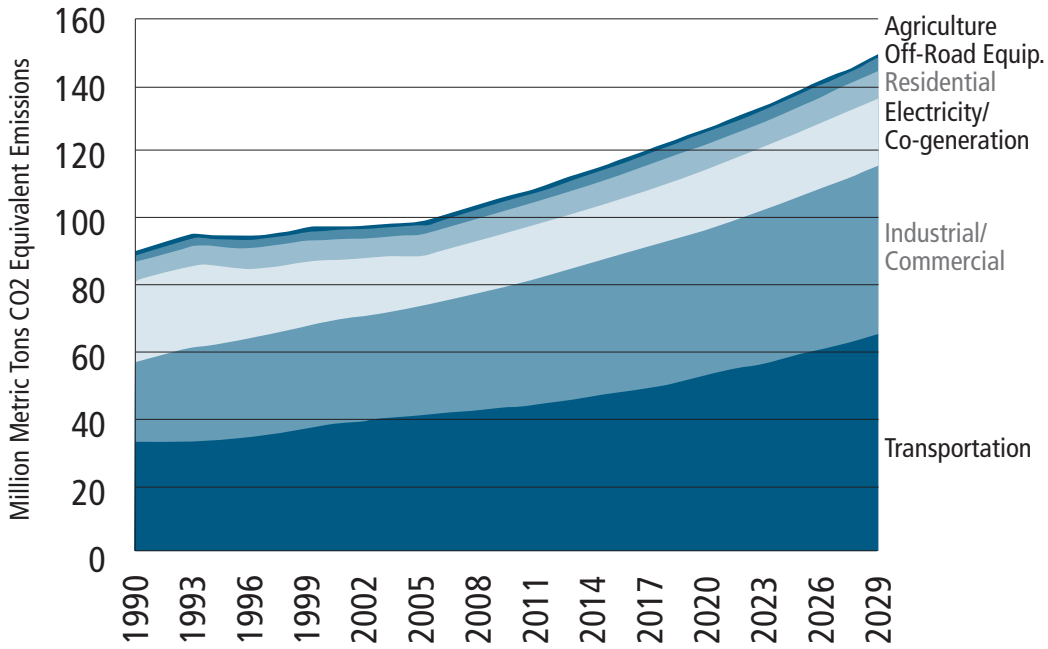
Note: Emissions are measured in metric tons of carbon dioxide equivalent.

CHART 5-1: 2007 Bay Area Greenhouse Gas Emissions by Sector



Sources: Bay Area Air Quality Management District, Source Inventory of Bay Area Greenhouse Gas Emissions, 2008

CHART 5-2: 2007 Bay Area Greenhouse Gas Emissions Trends by Sector



Source: Bay Area Air Quality Management District, Source Inventory of Bay Area Greenhouse Gas Emissions, 2008

sion (BAAQMD 2008). Economic activity variations and the fraction of electric power generation in the region will cause year-to-year fluctuations in the emissions trends. Chart 5-4 shows the emission trends in CO_2e by major sources for the period of 1990 to 2029 under "business as usual" conditions. According to the historical emissions data, total CO_2e emissions have increased by 14 percent (less than one percent annually) from 1990 to 2007.

Meanwhile, San Mateo County estimated that in 2006 countywide CO_2 emissions were 5.91 million metric tons, averaging 8.1 metric tons per capita. Emissions in Pacifica were estimated to be 169 thousand metric tons, and about 4.5 metric tons per capita. This reflects that Pacifica has relatively low carbon emissions compared to San Mateo County. These estimates do not include airplane travel, off-road vehicles, or boats.

Sea Level Rise

Sea level rise has the potential to alter the frequency and magnitude of coastal flood events in Pacifica. Current estimates of sea level rise are based on Global Climate Models (GCMs), based on work performed by the Intergovernmental Panel on Climate Change (IPCC), which released a summary report in 2007 (IPCC, 2007).

The IPCC results have been used by researchers in California to investigate possible ramifications along the coast, often looking over the next 100 years (see for example: Cayan et al. 2006; Pacific Institute, 2009). Estimates of sea level rise vary between model runs, so trends and potential increases are typically reported in ranges. Cayan et al. (2008) presents ranges of sea level rise increase of between 40.2 inches (1.02 m) to 57.5 inches (1.46 m) (Pacific Institute, 2009).

In general, these estimates are shown as smooth or accelerating trends meaning that these changes will be relatively constant with time. However the climate model runs intended to capture more severe carbon dioxide loadings to the atmosphere typically show acceleration in rising levels in the decades ahead.

Increased Coastal Flooding

A 2009 study of the potential impacts of sea level rise on the California Coast developed approximate mapping to indicate potential increases in the 1 percent annual chance of coastal inundation, assuming a 55.1 inch (1.4 m) rise in sea level (Pacific Institute, 2009). This model, as it applies to Pacifica, is illustrated in Figure 5-13, Potential Sea Level Rise. This flood mapping is approximate, and should not be used in place of FEMA FIRMs or FIS. The model does not factor in changes to the frequency of flooding events, variation in wave patterns, or intervening topography or structures (Pacific Institute, 2009). It does suggest that areas of West Linda Mar, lower Pedro Point, Rockaway Beach, and West Sharp Park neighborhoods, as well as the Sharp Park Golf Course, could be vulnerable to increased coastal flooding.

TABLE 5-7: 2006 CO_2 EMISSIONS IN SAN MATEO COUNTY AND PACIFICA

	San Mateo	% of Total	Pacifica	% of Total
Transportation	3,427,800	58%	98,000	58%
Electricity	1,182,000	20%	25,000	15%
Natural gas	1,182,000	20%	42,000	25%
Solid Waste	118,200	2%	4,000	2%
Total	5,910,000		169,000	
Per Capita CO_2 emissions	8.1		4.5	

Sources: Sustainable San Mateo, U.S. Census Bureau, 2005-2007 American Community Survey

Note: This inventory considers only CO_2, and not CO_2e emissions, as is reflected in the BAAQMD study.

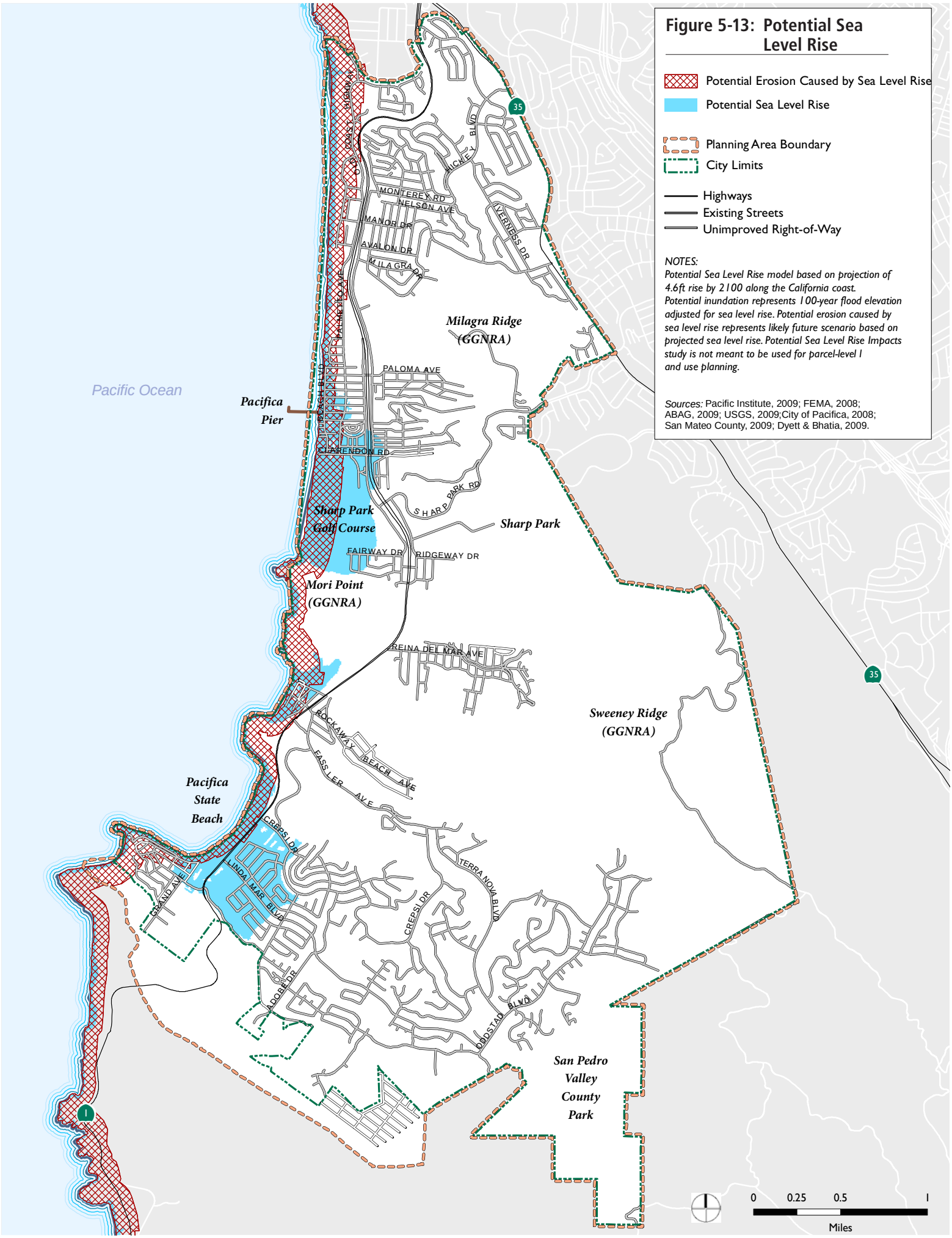


Figure 5-13: Potential Sea Level Rise
Potential Erosion Caused by Sea Level Rise
Potential Sea Level Rise
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
NOTES:
Potential Sea Level Rise model based on projection of 4.6ft rise by 2100 along the California coast. Potential inundation represents 100-year flood elevation adjusted for sea level rise. Potential erosion caused by sea level rise represents likely future scenario based on projected sea level rise. Potential Sea Level Rise Impacts study is not meant to be used for parcel-level l and use planning.
Sources: Pacific Institute, 2009; FEMA, 2008; ABAG, 2009; USGS, 2009;City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Pacifica State Beach
Sweeney Ridge (GGNRA)
San Pedro Valley County Park
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
VILLAGRA DR
PALOMA AVE
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CRESPI DR
TERRA NOVA BLVD
LINDA MAR BLVD
GRAND AVE
ADOBE DR
DODSTAD BLVD
VERNESS DR
MICHELLE BLVD
CABRILLO HWY
PACIFICA BLVD
PALMETTO AVE
0 0.25 0.5 1
Miles

Increased Coastal Erosion

A rising sea level also has the potential to accelerate coastal erosion processes, as discussed above in Section 5-2 Geology and Seismic Risk. The 2009 Pacific Institute study developed erosion models for dune and cliff/bluff backshore environments. For both types of shoreline, erosion is projected based on Total Water Level (TWL), calculated as the sum of high tide line, wave run-up, and sea-level rise.

According to the study, a majority of the dune shoreline along the northern California coast is currently accreting, but this is projected to reverse between 2050 and 2100. Mean lateral erosion of dunes is estimated at 115 to 116 meters by 2025, 119m to 128m by 2050, and 132m to 175m by 2100. Bluffs, meanwhile, are projected to have eroded by 8m to 9m by 2025, 23m to 24m by 2050, and 58m to 64m by 2100, with geology, wave exposure, and bluff toe elevation all playing important roles in producing variation (Pacific Institute, 2009).

The potential erosion models, mapped and applied to the Planning Area, are shown in Figure 5-7. It is important to reiterate that these models are approximate, and not meant to be used for parcel-specific land use planning. They do indicate that there is considerable risk of erosion along the length of Pacifica's coastline, which could impact all of the coastal neighborhoods and coastal habitats.

Regulatory Context

Federal Regulations

In April 2007, the U.S. Supreme Court found that the EPA has a statutory authority to formulate standards and regulations to address greenhouse gases, which it historically has not done.

In December 2007, the Energy Independence and Security Act of 2007 was passed. The bill aims to increase the supply of alternative fuel sources by setting a mandatory Renewable Fuel Standard (RFS) requiring fuel producers to use at least 36 billion gallons of biofuel in 2022. It also tightens the Corporate Average Fuel Economy (CAFE) standards that regulate the average fuel economy in the vehicles produced by each major automaker.

Bluff erosion in Pacifica between January and March 1998 ultimately led to the demolition of ten homes. Sea level rise associated with climate change has the potential to accelerate coastal erosion processes. There is considerable risk of erosion along the length of Pacifica's coastline.

In May 2009, President Obama announced a plan to accelerate the rise in CAFÉ standards so that the American auto fleet averages 35.5 miles per gallon by 2016 rather than by 2020. This will put the national standards in line with California's heretofore more ambitious regulations.

State Regulations

AB 1493: VEHICLE EMISSIONS STANDARDS

In September 2004, pursuant to AB 1493 (Pavley), the California Air Resources Board (CARB) approved regulations to reduce greenhouse gas (GHG) emissions from new motor vehicles. The regulations set near-term emission standards, phased in from 2009 through 2012, and mid-term emission standards, phased in from 2013 through 2016. CARB calculates that the AB 1493 vehicle requirements will cumulatively produce 41 percent more GHG reductions by 2020 compared to the new federal CAFÉ standard in the Energy Independence and Security Act of 2007 (above).

EO S-20-04: COMMERCIAL BUILDING EFFICIENCY

Meanwhile, Governor Schwarzenegger's Executive Order S-20-04, signed in 2004, commits the State to aggressive action to increase building energy efficiency. In addition to requiring state-owned buildings to be retrofitted, this EO requires the California Energy Commission to undertake all actions within its authority to increase efficiency by 20 percent by 2015, compared to the non-residential building standards adopted in 2003.

EO S-3-05: GHG REDUCTION TARGETS

In June 2005, the Governor signed Executive Order S-3-05, which recognizes California's vulnerability to climate change, noting that increasing temperatures could potentially reduce snow pack in the Sierra Nevada, which is a primary source of the State's water supply. Additionally, according to this Order, climate change could influence human health, coastal habitats, microclimates, and agricultural yield. The Order set GHG reduction targets for California: emissions should be reduced to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.

AB 32: CALIFORNIA CLIMATE SOLUTIONS ACT

In September 2006, Governor Schwarzenegger signed Assembly Bill (AB) 32, the California Climate Solutions Act. The Act requires the reduction of statewide GHG emissions to 1990 levels by the year 2020. This change, which is equivalent to a 25 percent reduction from current emission levels, will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012.

AB 32 also directs CARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources and address GHG emissions from vehicles. CARB has stated that the regulatory requirements for stationary sources will be first applied to electricity power generation and utilities, petrochemical refining, cement manufacturing, and industrial/commercial combustion. The second group of target industries will include oil and gas production/distribution, transportation, landfills and other GHG-intensive industrial processes.

SB 1368: EMISSIONS FROM UTILITIES

Senate Bill (SB) 1368, also signed in September 2006, requires the California Public Utilities Commission (PUC) to establish a GHG emissions performance standard for "baseload" generation from investor-owned utilities by February 1, 2007. The California Energy Commission (CEC) was required to establish a similar standard for local publicly-owned utilities by June 30, 2007. The legislation further required that all electricity provided to California, including imported electricity, must be generated from plants that meet or exceed the standards set by the PUC and the CEC. In January 2007, the PUC adopted an interim performance standard for new long-term commitments (1,100 pounds of CO_2 per megawatt-hour), and in May 2007, the CEC approved regulations that match the PUC standard.

EO S-01-07: LOW-CARBON FUEL STANDARD

In January 2008, Governor Schwarzenegger established a Low-Carbon Fuel Standard by Executive Order. Executive Order S-01-07 calls for a statewide goal to be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020, and for a Low Carbon Fuel Standard ("LCFS") for transportation fuels be established for California. The LCFS applies to all refiners, blenders, producers or importers ("Providers") of transportation fuels in California, will be measured on a full fuels cycle basis, and may be met through market-based methods by which Providers exceeding the performance required by a LCFS shall receive credits that may be applied to future obligations or traded to Providers not meeting the LCFS. CARB has approved the LCFS as a Discrete Early Action item under AB 32.

SB 97: CEQA GUIDELINES

Senate Bill (SB) 97 directs the Office of Planning and Research (OPR) to prepare, develop, and transmit to the California Resources Agency guidelines for feasible mitigation of GHG emissions or the effects of GHG emissions, by July 1, 2009. The Resources Agency is required to certify and adopt amendments to the Guidelines implementing the California Environmental Quality Act ("CEQA Guidelines") on or before January 1, 2010. These new CEQA Guidelines will provide regulatory guidance on the analysis and mitigation of GHG emissions in CEQA documents. In the interim, the OPR offered informal guidance regarding steps lead agencies should take to address climate change in their CEQA documents. (Governor's Office of Planning and Research, 2008)

SB 375: SMART GROWTH

In September 2008, Governor Schwarzenegger signed Senate Bill (SB) 375 into law. This legislation links transportation and land use planning with the CEQA process to help achieve the GHG emission reduction targets set by AB 32. Regional transportation planning agencies are required to include a sustainable community strategy (SCS) in regional transportation plans. The SCS must contain a planned growth scenario that is integrated with the transportation network and policies in such a way that it is feasible to achieve AB 32 goals on a regional level. SB 375 also identifies new CEQA exemptions and streamlining for projects that are consistent with the SCS and qualify as Transportation Priority Projects (TPP). TPPs must meet three requirements: 1) contain at least 50 percent residential use; commercial use must have floor area ratio (FAR) of not less than 0.75; 2) have a minimum net density of 20 units per acre; and 3) be located within one-half mile of a major transit stop or high quality transit corridor included in the regional transportation plan.

EO S-13-08: ADAPTATION TO CLIMATE CHANGE

In November 2008, Governor Schwarzenegger issued Executive Order (EO) S-13-08 directing state agencies to plan for sea level rise and climate change impacts. There are four key actions in the EO including: (1) initiate California's first statewide climate change adaptation strategy that will assess the state's expected climate change impacts, identify where California is most vulnerable and recommend climate adaptation policies by early 2009; (2) request the National Academy of Science establish an expert panel to report on sea level rise impacts in California to inform state planning and development efforts; (3) issue interim guidance to state agencies for how to plan for sea level rise in designated coastal and floodplain areas for new projects; and (4) initiate a report on critical existing and planned infrastructure projects vulnerable to sea level rise.

Local Regulations

GENERAL PLAN CONSERVATION ELEMENT

The current General Plan features goals to move toward greater energy efficiency and conservation. While these statements were made prior to today's understanding of global climate change, they are relevant.

Policies

6. Develop policies and ordinances directed to energy conservation.

Short-Term Action Programs

6. Amend the Uniform Building Code to include appropriate energy-saving building requirements.

City, County, and State Response

The City of Pacifica has completed its greenhouse gas inventory for both municipal and community operations and has established a Climate Action Task Force to assist in preparation of the City's Climate Action Plan.

Meanwhile San Mateo County has responded to climate change concerns and AB 32 mandates with a San Mateo Energy Strategy, completed in 2008. With the Energy Strategy, the County aims to lead a collaborative, countywide effort to increase energy and water efficiency, and promote investment in clean energy technologies. Among other actions, the Energy Strategy recommends that cities develop climate action plans, Energy Elements, or updated General Plans to guide local energy and water efficiency actions.

The State continues to respond with annual reports, action plans, inventories, and guidance on how local jurisdictions can help to meet the AB 32 goal. Further, Senate Bill (SB) 375 establishes a program to help the California Air Resources Board (CARB) implement the State's global warming legislation, AB 32, for the transportation sector.

5.8 NOISE

Noise is commonly defined as undesirable or unwanted sound. Noises vary widely in their scope, source, and volume, ranging from individual occurrences such as leaf blowers, to the intermittent disturbances of overhead aircraft, to the fairly constant noise generated by traffic on freeways. Noise can have real effects on human health, including hearing loss and the psychological effects or irritability from lack of sleep.

Sound levels are measured and expressed in decibels (dB) with 0 dB roughly equal to the threshold of hearing and 100 dBA equal to the sound of an ambulance. Chart 5-3 shows the typical sound level from various sources at specified distances.

Sensitive Receptors

Some land uses are considered more sensitive to ambient noise levels than others. People in residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, natural areas, parks, and outdoor recreation areas are generally more sensitive to noise than are people at commercial and industrial establishments. Consequently, the noise standards for sensitive land uses are more stringent than for those at less sensitive uses. According to common practice, maximum noise levels of 60 dB are considered "normally acceptable" for unshielded residential development. Noise levels from 60 to 75 dB fall within the "conditionally unacceptable" range, and those in the 75 to 80 dB range are considered "normally unacceptable." Generally accepted land use compatibility for noise levels are shown in Chart 5-4.

CHART 5-3: Typical Sound Levels

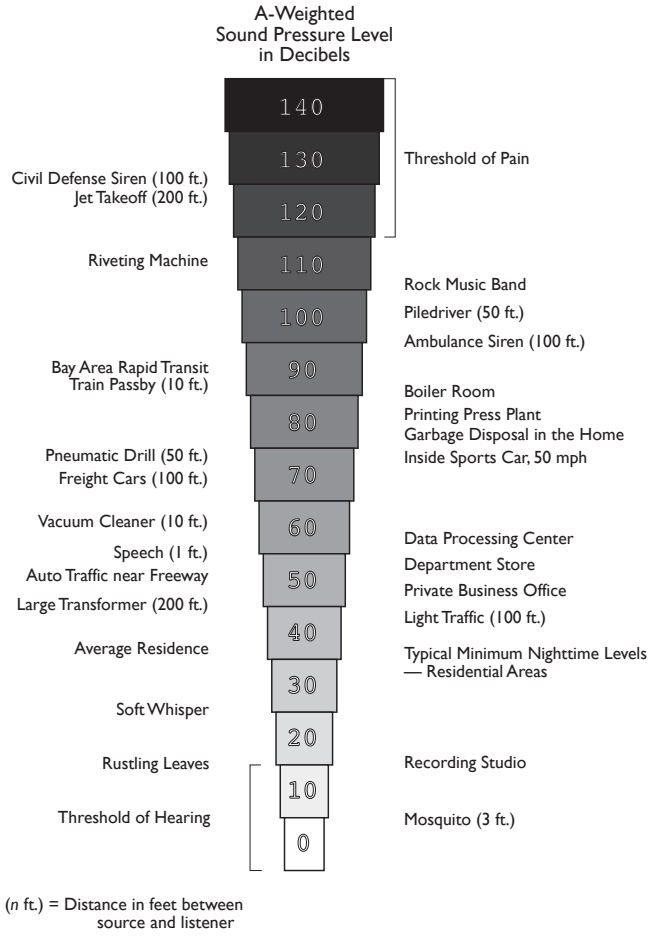
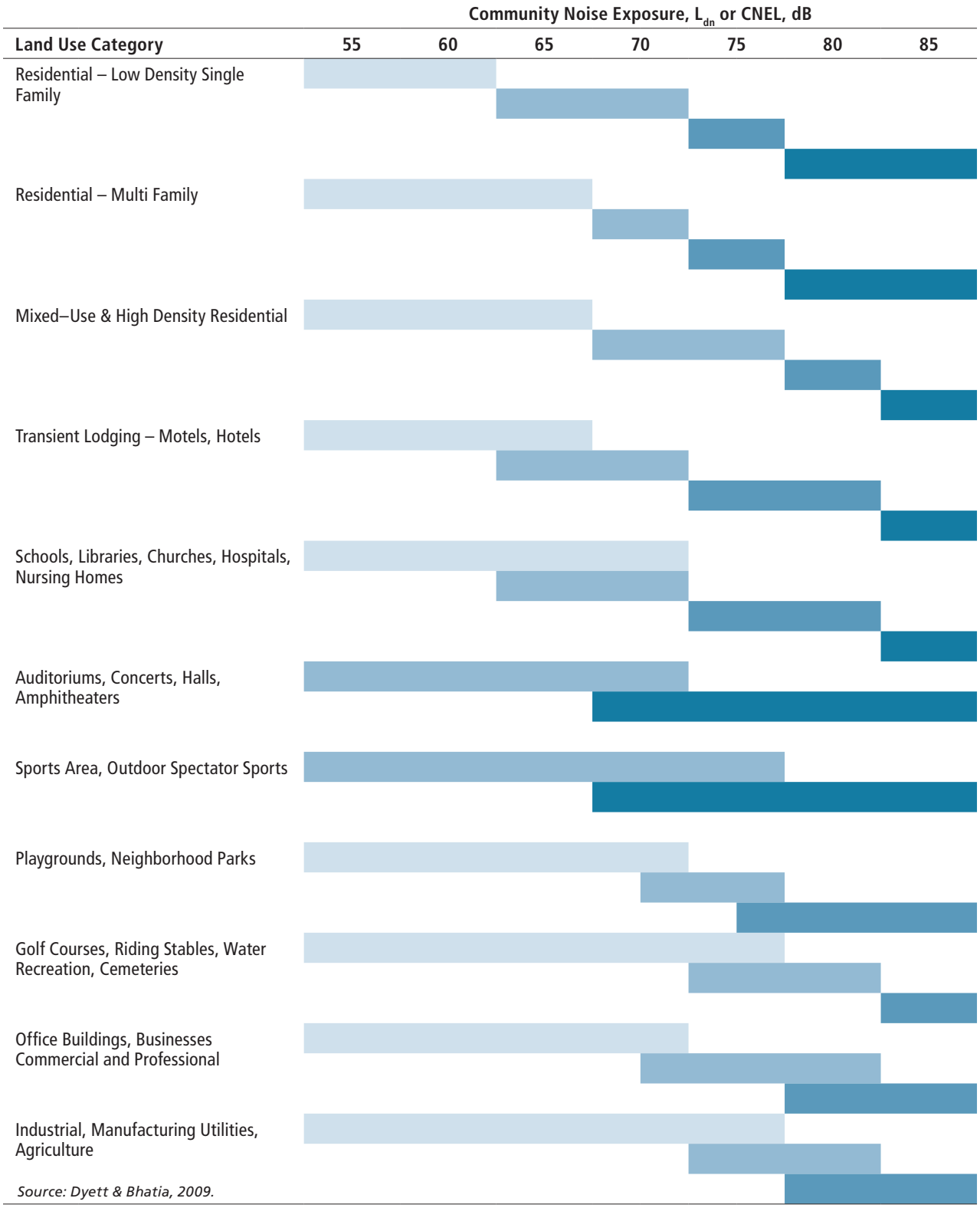


CHART 5-4: General Land Use Compatibility for Community Noise Environments



Source: Dyett & Bhatia, 2009.

Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements.
Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
Normally Unacceptable	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
Clearly Unacceptable	New construction or development should not be undertaken.

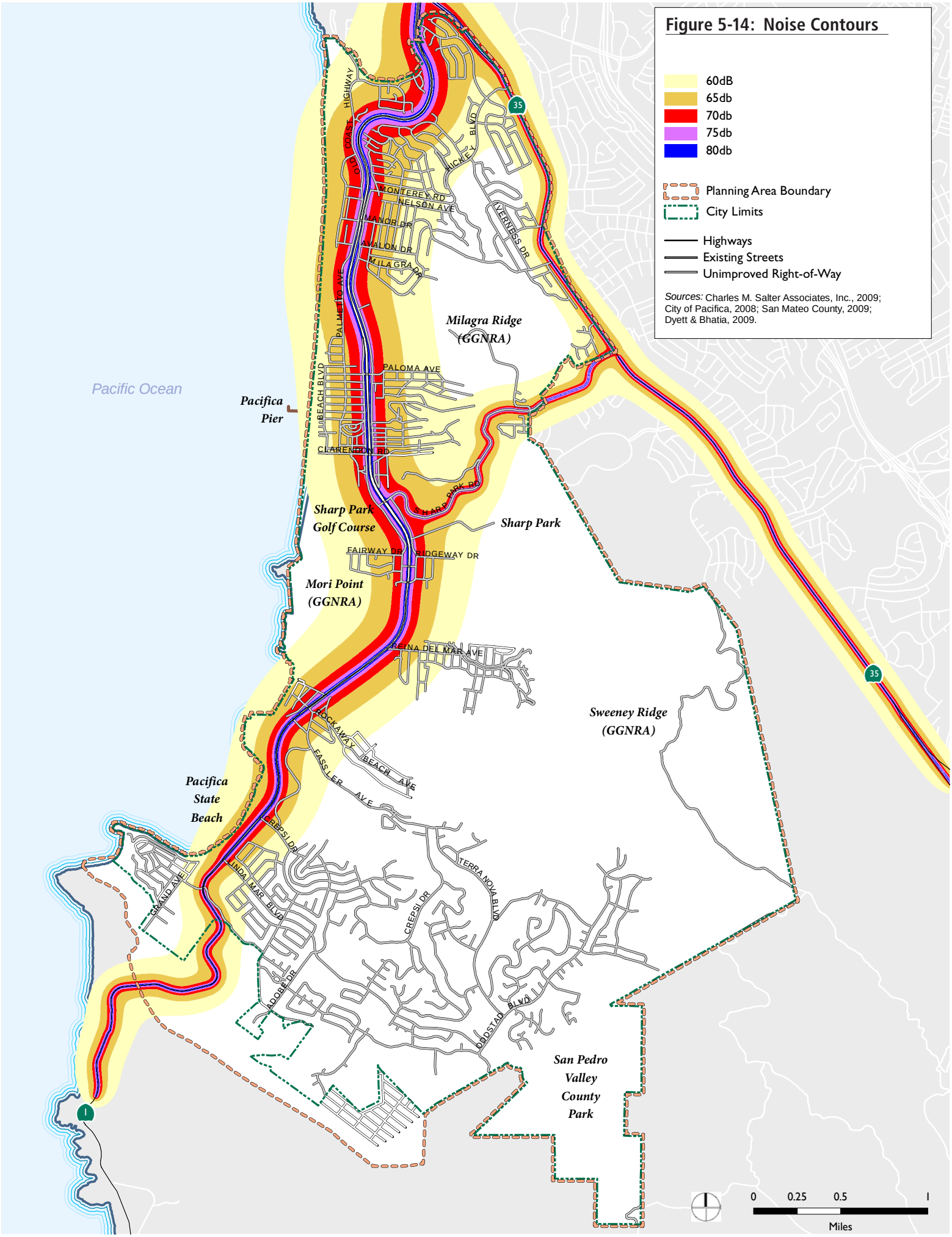


Figure 5-14: Noise Contours
60dB
65db
70db
75db
80db
Planning Area Boundary
City Limits
Highways
Existing Streets
Unimproved Right-of-Way
Sources: Charles M. Salter Associates, Inc., 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2009.
Pacific Ocean
Pacifica Pier
Milagra Ridge (GGNRA)
Sharp Park Golf Course
Sharp Park
Mori Point (GGNRA)
Sweeney Ridge (GGNRA)
Pacifica State Beach
San Pedro Valley County Park
OLD COAST HIGHWAY
MONTEREY RD
NELSON AVE
MANOR DR
AVALON DR
MILAGRA DR
PALMETTO AVE
PALOMA AVE
BEACH BLVD
CLARENDON RD
SHARP PARK RD
FAIRWAY DR
RIDGEWAY DR
REINA DEL MAR AVE
ROCKAWAY BEACH AVE
FASSLER AVE
CREPSI DR
LINDA MAR BLVD
GRAND AVE
ADOBE DR
TERRA NOVA BLVD
DODSTAD BLVD
NICKLE BLVD
INVERNESS DR
35
1
0
0.25
0.5
1
Miles

Noise in Pacifica

The major source of noise in Pacifica is traffic, including both automobiles and trucks, particularly on Highways 1 and 35. Noise levels are expected to be lower further away from the roadways. Figure 5-14, Noise Contours, is based on observed peak-period traffic counts along Pacifica's two highways and Sharp Park Road. A relatively small proportion of Pacifica residents live in areas where the ambient noise level is expected to be higher than 70dB. As modeled, this noise level applies about one block in from the Coast Highway in the East and West Sharp Park, Edgemar-Pacific Manor, and Fairmont neighborhoods. Most of the West Sharp Park, West Edgemar-Pacific Manor, and Fairmont West neighborhoods experience noise levels higher than 60 dB, as do significant parts of the neighborhoods east of Highway 1 in the northern part of the City. As traffic volumes decrease south of Sharp Park Road, neighborhood noise impacts become less significant.

Regulatory Framework

Federal, state, and local agencies regulate different aspects of environmental noise. Federal and state agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources associated with industrial, commercial and construction activities is left to local agencies. Local regulation of noise involves implementation of general plan policies and noise ordinance standards. Local general plans identify general principles intended to guide and influence development plans; local noise ordinances establish standards and procedures for addressing specific noise sources and activities.

Federal Regulations

Code of Federal Regulations. Federal regulations establish noise limits for medium and heavy trucks.. The federal truck passby noise standard is 80 dB at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers.

Federal Highway Administration. In addition to noise standards for individual vehicles, under regulations established by the U.S. Department of Transportation's Federal Highway Administration, noise abatement must be considered for certain federal or federally-funded projects. Abatement is an issue for new highways or significant modification of an existing freeway. The agency must determine if the project would create a substantial increase in noise or if the predicted noise levels approach or exceed the Noise Abatement Criteria. Under the regulations, a substantial increase is defined as an increase in L_{eq} 12 dB during the peak hour of traffic noise. The Noise Abatement Criteria differ among various activity categories. For sensitive uses, such as residences, schools, churches, parks, and playgrounds, the Noise Abatement Criteria is L_{eq} 57 (interior) and 67 dB (exterior) during the peak hour of traffic noise.

State Regulations

California Department of Transportation. The State establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the State passby standard is consistent with the federal limit of 80 dB. The State passby standard for light trucks and passenger cars (less than 4.5 tons, gross vehicle rating) is also 80 dB at 15 meters from the centerline. These standards are implemented through controls on vehicle manufacturers and by state and local laws enforced against vehicle operators.

California Code of Regulations, California Building Code. The State has established noise insulation standards for new multi-family residential units, hotels, and motels that would be subject to relatively high levels of transportation-related noise. These requirements are collectively known as the California Noise Insulation Standards. The noise insulation standards set forth an interior standard of DNL 45 dB for any habitable room. They also require an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard where such units are proposed in areas subject to noise levels greater than DNL 60 dB. If windows must be in the closed position to

meet the interior noise level standard, the project design must include a ventilation or air-conditioning system to provide fresh air to the habitable interior environment. Title 24 standards are typically enforced by local jurisdictions through the building permit application process.

Local Regulations

CURRENT GENERAL PLAN

The Noise Element of the existing General Plan observes that the highways are the primary source of noise, and that while the current noise level is significant, it is projected to decline over time as automobiles become quieter. The plan does propose mitigation measures, and directs residential growth to quieter parts of the City. It does not establish an exterior minimum sound level for residential uses (City of Pacifica, 1980).

Policies

1. Work with other agencies, airports and jurisdictions to reduce noise levels in Pacifica created by their operations.
2. Establish and enforce noise emission standards for Pacifica which are consistent with the residential character of the City and environmental, health and safety needs of the residents.

5.9 PLANNING ISSUES AND IMPLICATIONS

Pacifica's setting provides both a rich environmental context and considerable challenges. The City has made significant efforts to be a good steward of its land and water resources. These efforts include restoration of Pacifica State Beach and the San Pablo Creek estuary, and development of a state-of-the-art wastewater recycling facility and program. The City's residents participate actively in the conservation of local open space and habitat. The City has also sought to be prepared for natural hazards. In both resource conservation and hazard mitigation, the General Plan update will deal extensively with policies for both resource conservation and hazard mitigation. Some key issues follow.

Hydrology and Flooding

1. ***Improving Water Quality in San Pedro Creek.*** San Pedro Creek provides habitat for steelhead trout, a federally listed threatened species, and also has a level of coliform bacteria which makes it an "impaired waterway" by Regional Water Quality Control Board standards. Maintaining the quality of water in this creek will continue to be a high priority for Pacifica.

2. ***Establishing Regulations Responsive to Specific Flooding Hazard Areas.*** Flooding has been an ongoing issue for low-lying areas of the City, and likely will continue to be a challenge in the future. FEMA's flood insurance maps show a significant portion of the Rockaway Quarry site to be within the 100-year flood zone, but these maps do not reflect the restored stream channel, and so actual flood risk on the site is not known. Additionally, a recent report has shown that increased coastal flooding associated with sea level rise would occur in West Linda Mar, lower Pedro Point, Rockaway Beach, West Sharp neighborhoods, and the Sharp Park Golf Course.

3. Strategies will include limiting development in flood-prone areas, and managing the quantity and quality of runoff from existing and future impervious surfaces, to meet stringent requirements under the National Pollutant Discharge Elimination System (NPDES). An additional priority will be to incorporate FEMA guidelines and suggested mitigation activities into local government plans and procedures for managing flood hazards.

Geology and Seismic Risk

4. ***Minimizing Earthquake-Related Hazards, Liquefactions, and Landslides.*** The San Andreas fault, which traverses the northeast corner of the Planning Area, is active and capable of causing a large earthquake. Areas located on or immediately adjacent to the mapped fault traces require very thorough investigation in accordance with the Alquist-Priolo Act prior to any development to ensure that fault rupture hazards can be avoided or minimized.

   Areas located within the alluvial valleys could have a high potential for liquefaction. Site-specific geotechnical investigations can confirm the presence of liquefiable materials and can provide various foundation design criteria to mitigate the potentially damaging effects of liquefaction.

   The Planning Area also includes slopes that are susceptible to landslides, especially areas with greater than 50 percent inclines. Geotechnical engineering can typically overcome the challenges of development on steep terrain through drainage improvements, anchoring foundations in deeper materials, and regrading slopes, as well as other methods.

5. ***Minimizing Hazards Related to Winter Storms and Coastal Erosion.*** Much of Pacifica's coastline is subject to severe coastal erosion. Short term erosion hazards are generally mitigated through incorporation of best management practices and use of soft stabilization tech-

niques. In areas that are experiencing active coastal erosion, the most effective mitigation is to relocate development. If sea level rise proceeds as projected, there is potential for more serious long-term coastal erosion, which could be a critical challenge for the Planning Area.

Biological Resources

6. ***Protecting the Widespread-Critical Habitat in Public and Private Development.*** Pacifica contains some of the northernmost natural habitat on the San Francisco Peninsula. The Planning Area's location, richly varied topography, and its considerable undeveloped land provide habitat or potential habitat for a wide variety of species and natural communities. Some of these species and communities, both plant and animal, have special legal status, having been listed under the federal or state Endangered Species Acts or other statutes, or having been identified as sensitive in the California Natural Diversity Database.

   Currently, the California red-legged frog (CRLF) and steelhead trout have critical habitat within the Planning Area, on Sweeney Ridge and along San Pedro Creek, respectively. Additionally, the San Francisco garter snake (SFGS) is known to breed in open spaces in Pacifica, most notably Mori Point. The legal protections given to these species to ensure their survival will need to be taken into consideration when planning development in Pacifica.

7. ***Protecting Sensitive Natural Communities Identified.*** Coastal bluff scrub has been identified on Pacifica's northernmost shoreline, northern maritime chaparral has been identified in San Pedro Valley County Park, and northern coastal prairie is potentially present on San Pedro Point. These identifications as natural communities carry implications for preservation and management.

8. ***Protecting Other Environmentally Sensitive Areas Both Open Space Lands and New Private Development.*** In a third category, significant portions of the Planning Area have been noted for their high habitat values (providing important resources to plants and wildlife), use as a migration corridor, or their potential to be designated an Environmentally Sensitive Habitat Area (ESHA) under the provisions of the California Coastal Act. These areas include much of Sharp Park, Milagra Ridge, Sweeney Ridge, and Mori Point, which are already managed as protected open space. They also cover some of Pacifica's only privately-owned undeveloped land, on Gypsy Hill, the face of Cattle Hill, and the Rockaway Quarry site. A more complete evaluation of biological resources on these sites will be necessary to determine development potential and preservation requirements in these areas.

Fire Hazards

9. ***Actively Managing the Urban-Wildland Interface.*** Pacifica's 40,000 residents enjoy close contact with open ridges and woodlands. This brings with it the risk of proximity to wildland fires. Preparedness is essential, and the North County Fire Authority's fire prevention activities, especially its Vegetation Management Program, are important. Development in Very High Fire Hazard Severity Zone must be sensitively designed and meet strict building code requirements. The General Plan should provide a clear framework for managing the urban-wildland interface, at the local level.

10. ***Maintaining and Enhancing Evacuation Routes.*** It is critical that road capacity exists for Pacificans to evacuate in case of an environmental disaster, including fire.

Hazardous Materials

11. ***Facilitating Cleanup of Contaminated Properties.*** Pacifica is home to thirteen sites currently undergoing remediation for contamination with hazardous materials. Some contaminated sites are on vacant parcels or properties with the poten-

tial to redevelop, including the old Wastewater Treatment Plan in West Sharp Park. Contamination does not render these sites unusable, but may require time and funding for cleanup. The former Rifle Range in Sharp Park has potential to be reused for recreational purposes, an outcome the current clean-up effort will facilitate.

Air Quality

12. ***Contributing to Regional Air Quality Attainment.*** Levels of several criteria pollutants in the Bay Area meet air quality standards, but the region is in nonattainment for state and Federal ozone standards and for California's standards for annual concentrations of PM 10 and PM 2.5 particulate matter, as well as the federal 24-hour standard for PM 2.5. Due to its position relative to wind flow patterns and topography, air quality in Pacifica is better than it is in the Bay Area overall. Still, pollutants emitted locally have regional consequences.

    According to CEQA guidelines, local plans, such as Pacifica's General Plan, should be evaluated for their consistency with the most recent regional air quality plan, which will likely be the 2010 Bay Area Clean Air Plan, currently in draft form. The General Plan must be consistent with the population and vehicle use projections used in the Clean Air Plan, and must implement the Clean Air Plan's transportation control measures.

Climate Change

13. ***Reducing Greenhouse Gas Emissions.*** Reducing emissions of gases that contribute to climate change is increasingly important both globally and in order to meet state mandates. Pacifica will have to continue pursuing ways to reduce local emissions by setting goals, tracking emissions, and developing policies that reduce emissions. Policies that effectively address emissions reductions may require significant changes from the "business as usual" development pattern. Transit-oriented development, higher land use densities near employment and transit, and improved walkability are among strategies that reduce greenhouse gas emissions.

14. ***Preparing for Potential Sea Level Rise.*** The potential for sea level rise and increased coastal erosion has very serious implications for Pacifica. Areas of the Sharp Park Golf Course, the Rockaway Beach district, and the West Linda Mar and West Sharp Park neighborhoods could be inundated. Meanwhile, coastal erosion processes that have caused damage along the high bluffs of Pacifica's northern neighborhoods would very likely increase in magnitude. Pacifica should make it a priority to state a clear approach to the threat of coastal erosion and sea level rise in the General Plan.

Noise

15. ***Mitigating Noise Along State Route 1.*** Highway 1 is a significant source of noise for portions of Pacifica, and may dampen the residential development potential of some sites that could be could candidates for mixed-use development. Strategies for minimizing the negative effects of noise should be emphasized.

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