3.5 Hydrology and Flooding

This section analyzes the surface water and groundwater resources of the Planning Area in relation to the location of projects comprising the buildout of the proposed General Plan. Stormwater runoff, flooding, sea level rise and inundation hazards are also addressed in this chapter.

Environmental Setting

SURFACE WATER

The City of Pacifica is located within all or part of nine watersheds, shown on **Figure 3.5-1**. 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 covers various land types, including an undeveloped portion of the Golden Gate National Recreation Area (GGNRA) in the southern portion of the watershed. Much of the remaining area is 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 water quality assessment in the GGNRA that consisted of three water and sediment samples within Milagra Creek in February, April, and July of 2006.[1] This study aimed to determine baseline levels of pesticides in the water and sediment of urban creeks within the GGNRA and the Presidio. The findings suggested that excess pes-

[1] Hladik, M.L., and Orlando, J.L., *Level 1 Water-Quality Inventory of Baseline Levels of Pesticides in Urban Creeks – Golden Gate National Recreation Area and the Presidio of San Francisco, California:* U.S. Geological Survey Data Series 338, 2008.

ticides were being washed into the creek during the early wet season. By the later wet season, most pesticides had been already been flushed through the creek.

Sanchez Creek

Sanchez Creek watershed drains approximately 1,071 acres west to the Pacific Ocean.[2] This watershed is almost entirely within the City of Pacifica. Much of the contributing area to Sanchez Creek is within the GGNRA. Portions of the valley bottoms and flatter portions of the hillsides within the watershed have residential development, a segment of Highway 1, and a golf course. Sanchez Creek has intermittent flow in most years, and frequently runs dry in the summertime in its upper reaches.

At its mouth, Sanchez Creek flows through Horse Stable Pond and exchanges water with Laguna Salada in the Sharp Park Golf Course. Creek flow is then conveyed through a levee to the ocean through a system of pipes. The discharge point of the pipes 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 creek. 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 described above collected data on Sanchez Creek.[3] Water samples showed limited concentrations of three pesticides and no concentrations measurable in the sediment samples.

Calera Creek

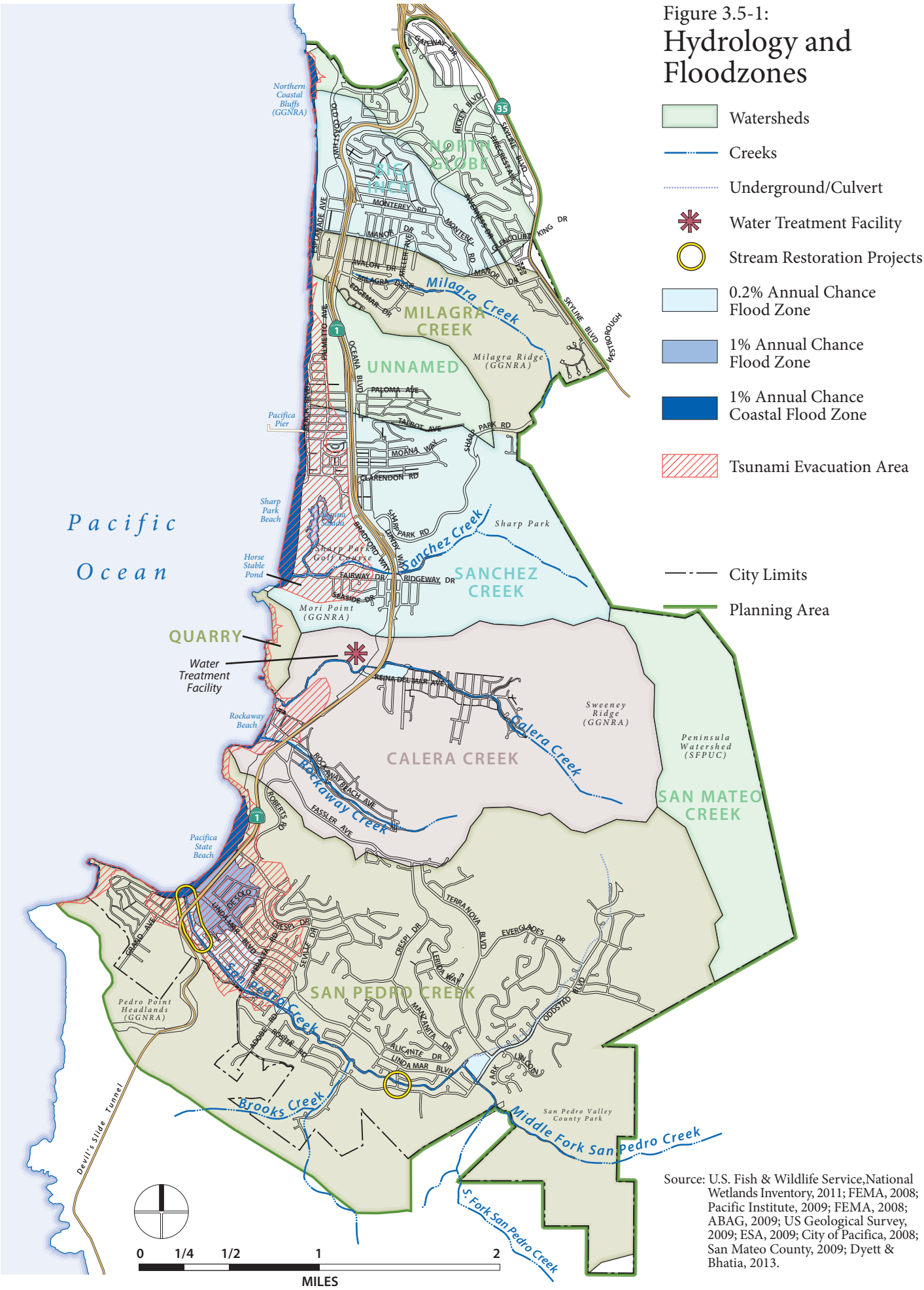
Calera Creek drains the central portion of the City of Pacifica west to the ocean, flowing onto the north end of Rockaway Beach. Calera Creek drains approximately 1,600 acres via two forks: a main channel to the north and a smaller southern fork (sometimes referred to as Rockaway Creek).

---

[2] Philip Williams & Associates, Ltd. (PWA), *Laguna Salada Resource Enhancement Plan,* Prepared for the City of San Francisco and the State of California Coastal Conservancy, June, 1992.

[3] Hladik, M.L., and Orlando, J.L., 2008.

Figure 3.5-1:
Hydrology and Floodzones



Source: U.S. Fish & Wildlife Service,National Wetlands Inventory, 2011; FEMA, 2008; Pacific Institute, 2009; FEMA, 2008; ABAG, 2009; US Geological Survey, 2009; ESA, 2009; City of Pacifica, 2008; San Mateo County, 2009; Dyett & Bhatia, 2013.

This page intentionally left blank.

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 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 substantial restoration project implemented in 1997 and 1998. This project excavated a new stream channel, restored 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 perennial in the lower reach due to the input from the WWTP. The creek was likely intermittent in at least some years prior to operation of the WWTP, 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 in the area to the north of Devil's 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 four main tributaries extending well past the City's eastern and southern boundaries. The tributaries are: South Fork, Middle Fork, North Fork, and Brooks Creek.

San Pedro Creek is a key watershed along this portion of the coast because it has perennial flow that supports 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, which is beyond the Planning Area, extends into the GGNRA and is largely undeveloped. The lower portion within the City is highly developed with residential uses and 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 with residential housing.[4]

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

[4] Collins, L., P. Amato, and D. Morton.2001. *San Pedro Creek Geomorphic Analysis.*

erosion throughout the reach has threatened roads and residential lots and structures adjacent to the creek. Various types of formal and informal bank stabilization techniques have been installed over the years to protect banks.[5]

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 its historic form as a tidally-influenced estuary. The restoration project acquired creekside property and removed fill 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 connectivity 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 restoration 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 in 2005. This project installed of rock weirs to stabilize the degrading channel bed, smoothed the longitudinal profile, and improved fish passage through the site.[6]

From 2002 to 2004, San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP) conduced bioassessment and collected water quality grab samples throughout the San Pedro Creek watershed.[7] The results of the bioassessment generally confirmed that the portions of the creek that are higher in the watershed and do not receive as much runoff from developed lands support greater species richness and diversity. The elevation and substrate quality did not appear to influence species richness and diversity, indicating that poor water quality was the main driver that reduced the health of the benthic macroinvertebrate community in San Pedro Creek.[8]

Water quality samples were taken for the STOPPP assessment from three locations on three different days. The levels of organo-phosphorous pesticides, pH, temperature, conductivity, and dissolved oxygen were measured in the samples. The results of the testing were all within general water quality standards, with the exception of relatively high temperature readings during one sampling event. Organo-phosphorous pesticides were not detected in these tests.

---

[5] *Ibid.*

[6] San Pedro Watershed Coalition, Capistrano Fish Passage Restoration Project Description and Design, http://pedrocreek.org/cap_fish_passage.html, accessed January, 2009.

[7] San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP), *Bioassessment and Water Quality Monitoring in the San Pedro Creek Watershed, San Mateo County, California,* March 2005.

[8] *Ibid.*

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.[9] A Total Maximum Daily Load (TMDL) for coliform bacteria in San Pedro Creek will be established by 2019.[10] 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 7 percent of the Planning Area, 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.[11]

GROUNDWATER

The San Pedro Valley Groundwater Basin lies within the City of Pacifica and has a surface area of approximately 700 acres. Alluvial deposits, or clays, sands, and silts with interspersed gravel deposited by rivers, are found throughout the majority of the basin and are the primary water-bearing formation in the City of Pacifica.[12] Existing data indicates that the alluvial deposits in San Pedro Valley are approximately 150 feet thick or more.[13]

The alluvium contains semi-confined and unconfined groundwater that is transmitted and stored through intergranular porosity. Previous studies indicate that the aquifer is recharged by local precipitation and runoff.[14] 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.

---

[9] State Water Resources Control Board (SWRCB). 2006 CWA Section 303(d) List of Water Quality Limited Segment, Region 2, approved by U.S. EPA June 2007.

[10] *Ibid.*

[11] *Ibid.*

[12] Department of Water Resources (DWR), "San Pedro Valley Groundwater Basin," *California's Groundwater,* Bulletin 118, 2004.

[13] City of Pacifica, *Draft Wastewater Facilities Plan*, Revision 2, 1992.

[14] *Ibid.*

As part of a Sewer System Evaluation Survey, groundwater wells in the City of Pacifica were monitored to determine the location of seasonally shallow groundwater 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.[15] 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 creeks 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.

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, as well as the risk of coastal flooding along the shoreline. See **Figure 3.5-1**.

FEMA FIRM maps show riverine flood hazards on Milagra Creek, Sanchez Creek, Calera Creek, Rockaway Creek and, San Pedro Creek. The mapped flood hazards are generally within the active channels of these creeks in the lower elevation areas.

A portion of Milagra Creek above Miller Avenue is mapped within the 1 and 0.2 percent annual flood area. 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 a 1 percent annual chance area 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 portion of the former lower quarry area is within the 0.2 percent chance 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, but does not appear to reflect the new channel alignment that exists resulting from the Calera Creek restoration project.

The broadest mapped flood hazard areas are located along San Pedro Creek, covering much of the Linda Mar area north of the creek extending down to the coast. 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.

According to the local hazard mitigation plan for the City of Pacifica, the City contains:

---

[15] *Ibid.*

- 119 acres in the 500 year floodplain and 159 acres in the 100-year flood plain.
- 3 miles of roadway in the 500-year flood plain and 6 miles of roadway in the 100-year flood plain.
- No critical facilities located in the 500-year floodplain.
- One critical facility, the wastewater treatment plant, is located in the 100-year flood plain.

Recent Floods

San Pedro Creek has a history of substantial flooding in the Linda Mar area. The low area of Linda Mar has pump systems providing drainage to the ocean, but these systems can be overwhelmed during high flow/tide events. Substantial flooding in this area occurred in 1955, 1962, 1972, 1982, 1997, and 1998.[16] The 1982 flood damaged more than 300 homes. One home was eventually lost, and two homes and a restaurant remained threatened by storm surges and erosion. Following the 1982 flood, the U.S. Army Corps of Engineers and the City's Flood Control Committee supported proposals to further harden and channelize the creek to reduce the risk of flooding.

COASTAL FLOODING

Pacifica can experience flooding from coastal sources. Coastal flooding in Pacifica typically occurs as some combination of high tides, large wind-driven waves, storm surge, or tsunami waves. Areas with the potential for coastal flooding have been mapped and shown on the FEMA FIRMs (**Figure 3.5-1**) based on a coastal flooding analysis performed in 1984.[17] 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 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

---

[16] McDonald, K.N., *San Pedro Creek Flood Control Project: Integrative Analysis of Natural Hazard Response*. MA Thesis, San Francisco State University, July 2004.

[17] FEMA, Draft Flood Insurance Study: San Mateo County and Incorporated Areas. Flood Insurance Study Number 06081CV001A, 2008.

astronomical tide, storm surge, and wave setup. Second, wave runup on the beach was calculated using a wave tracking model.[18] The wave runup calculations were performed on offshore bathymetry maps and beach transects collected by the USACOE in 1978.[19]

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.[20] 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 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 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.[21]

The Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT) and other scientists have used IPCC results to investigate the implications of sea level rise along the California coast.[22] 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 of between 40.2 inches and 57.5 inches (Pacific Institute, 2009). CO-CAT estimates for coastal regions south of Cape Mendocino range from approximately 16 inches to over 65 inches (or 1.38 to 5.48 feet).[23]

There is strong agreement among the various climate models that sea levels will continue to rise steadily through 2050 for the amount of sea level rise that is likely to occur.[24] After midcentury, projections of sea level rise become less certain, primarily due to uncertainties

---

[18] *Ibid.*

[19] *Ibid.*

[20] PWA, 1992.

[21] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007, Synthesis Report,* 2008.

[22] Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT). 2013. *State of California Sea Level Rise Guidance Document*. Available: http://www.opc.ca.gov/webmaster/ftp/pdf/docs/2013_SLR_Guidance_Update_FINAL1.pdf.

[23] *Ibid.*

[24] *Ibid.*

about future global greenhouse gas emissions and uncertainties associated with the modeling of land ice melting rates. Climate model runs intended to capture more severe carbon dioxide loadings to the atmosphere typically show acceleration in rising sea levels in the decades ahead.

Increased Coastal Flooding

A 2009 report the California Climate Change Center 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.[25] This flood mapping is approximate, and should not be used in place of FEMA FIRMs or FIS, or for land use planning. The mapping does not factor in changes to the frequency of flooding events, variation in wave patterns, or intervening topography or structures.[26] 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.[27] 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).[28] However, smaller events along local faults could result in a wave that reaches Pacifica with essentially no warning time.

---

[25] ,California Climate Change Center. 2009. *The Impacts of Sea-Level Rise on the California Coast.* Prepared by: the Pacific Institute. Available: http://www.pacinst.org/wp-content/uploads/2013/02/report16.pdf

[26] *Ibid.*

[27] Association of Bay Area Governments (ABAG), Tsunami Evacuation Planning MAP, http://www.abag.ca.gov/bayarea/eqmaps/tsunami/tsunami.html, May 15, 2009.

[28] San Mateo County, *Summary of Tsunami Alert and Evacuation on the San Mateo County Coast*, http://www.sanmateocourt.org/grandjury/2006/reports/TsunamiReportFinal.pdf, 2006.

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 constructing a new City Hall. [29] 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.[30] The most significant recorded tsunami wave that reached Pacifica was caused by 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) run-up at Pacifica. The study resulted in an estimate of tsunami run-up 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.[31]

Overall, the report rates tsunami risks in Pacifica as lower than other areas in northern California. Recorded tsunami run-up magnitude is generally lower for Pacifica than other locations from San Francisco to Monterey, likely due to offshore bathymetry and shoreline alterations along the City[32]. The City of Pacifica reported no damage or injuries following the tsunami from the March 2011 Japan earthquake, which damaged other areas of California including Santa Cruz and Crescent City.

San Mateo County has an established emergency plan for tsunamis.[33] The 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.[34] As part of this program, the City of Pacifica has recently installed a tsunami warning system, consisting of three solar powered alarm towers. Two are located in the Sharp Park neighborhood and one is located at Rockaway Beach. This system links into a San Mateo County alert system that can reach email and cell phones.

REGULATORY SETTING

Federal Regulations

Clean Water Act (CWA)

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

---

[29] Coastal Environments, Tsunami risks in the City of Pacifica, California: A probabilistic approach, final Report by Hany Elwany June 2007.

[30] *Ibid.*

[31] *Ibid.*

[32] Coastal Environments. 2007.

[33] San Mateo County, Tsunami, http://www.smcready.org/BeInformed/Tsunami.html, accessed May 19, 2009.

[34] City of Pacifica, *Local Hazard Mitigation Plan Annex: City of Pacifica, Association of Bay Area Governments Local Hazard Mitigation Plan*, 2005.

biological integrity of the waters of the 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 permit program regulates stormwater discharges into the waters of the United States. 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 the segment of water bodies or the entire water body is listed, the state is required to establish a TMDL for the pollutant identified as causing the impairment. Generally, TMDL is the sum of the loads of a single pollutant from 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 3.5-1**).

Table 3.5-1: 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)

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

Source: SWRCB, 2007.

National Flood Insurance Act

The U.S. Congress passed the National Flood Insurance Act (NFIA) in 1968 and the Flood Disaster Protection Act in 1973 to restrict certain types of development on floodplains and to create a National Flood Insurance Program (NFIP). The purpose of these acts is to reduce the need for large, publicly funded flood control structures and disaster relief. The NFIP is a federal program administered by the Flood Insurance Administration of FEMA. It enables individuals who have property within the 100-year floodplain to purchase insurance against flood losses. Community participation and eligibility, flood hazard identification, mapping, and floodplain management aspects are administered by state and local programs and support directorate within FEMA. FEMA works with the states and local communities to identify flood hazard areas and publishes a flood hazard boundary map of those areas. Floodplain mapping is an ongoing process in the Bay Area and flood maps must be regularly updated for both major rivers and tributaries as land uses and development patterns change.

Many local jurisdictions regulate development within floodplains. Construction standards are established within local ordinances and planning elements to reduce flood impedance, safety risks and property damage. Historic flooding in the San Francisco Bay region has also led local flood control agencies and the U. S. Army Corps of Engineers to establish extensive flood control projects including dams and improved channels.

State Regulations

Porter-Cologne Water Quality Control Act

Porter-Cologne Water Quality Control Act provides the basis for water quality regulation within California. It 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. The act requires the RWQCB to establish water quality objectives for specific water bodies. The RWQCB has prepared the San Francisco Bay Basin Plan (Basin Plan), which establishes water quality objectives and implementation programs to meet these objectives (see Regional section below). Additionally, the act authorizes the NPDES program and permit requirements for the City of Pacifica.

Regional Regulations

San Francisco Bay Water Quality Control Plan (Basin Plan)

The 2007 Basin Plan contains descriptions of the technical, legal, and programmatic bases of water quality regulations for 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 in the City of Pacifica are shown in **Table 3.5-2**.

Table 3.5-2: Designated Beneficial Uses

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

Source: RWQCB, 2007

General Construction Permit

The California Construction Stormwater Permit (Construction General Permit)[35], adopted by the State Water Resources Control Board (SWRCB), regulates construction activities that include clearing, grading, and excavation resulting in soil disturbance of at least one acre of total land area. The Construction General Permit authorizes the discharge of storm water to surface waters from construction activities. It prohibits the discharge of materials other than storm water and authorized non-storm water discharges and all discharges that contain a hazardous substance in excess of reportable quantities established at 40 Code of Federal Regulations 117.3 or 40 Code of Federal Regulations 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

The Construction General Permit requires that all developers of land where construction activities will occur over more than one acre do the following:

- Complete a Risk Assessment to determine pollution prevention requirements pursuant to the three Risk Levels established in the General Permit;
- Eliminate or reduce non-storm water discharges to storm sewer systems and other waters of the Nation;
- Develop and implement a Stormwater Pollution Prevention Plan (SWPPP), which specifies Best Management Practices (BMPs) that will reduce pollution in storm water discharges to the Best Available Technology Economically Achievable/Best Conventional Pollutant Control Technology standards; and
- Perform inspections and maintenance of all BMPs.

In order to obtain coverage under the NPDES Construction General Permit, the Legally Responsible Person must electronically file all Permit Registration Documents with the SWRCB prior to the start of construction. Permit Registration Documents must include:

- Notice of Intent;
- Risk Assessment;
- Site Map;
- SWPPP;
- Annual Fee; and
- Signed Certification Statement.

Typical BMPs contained in Stormwater Pollution Prevention Plans are designed to minimize erosion during construction, stabilize construction areas, control sediment, control pollutants from construction materials, and address post construction runoff quantity (volume) and

[35] *General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities,* Order No. 2009-0009-DWQ, as amended by Order No. 2010-0014-DWQ, National Pollutant Discharge Elimination System No. CAS000002.

quality (treatment). The Stormwater Pollution Prevention Plan must also include a discussion of the program to inspect and maintain all BMPs.

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 Regulations

San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP)

STOPPP was established in 1990 and includes San Mateo County and 20 cities and towns in the county, including City of Pacifica. The primary goal of STOPPP is to reduce pollution carried by stormwater throughout San Mateo County into local creeks, San Francisco Bay, and the Pacific Ocean. STOPPP maintains compliance with the NPDES Stormwater Discharge Permit and promotes stormwater pollution prevention.

Participating agencies, including the City of Pacifica, must comply with the NPDES Storm water Discharge Permit by ensuring that development and redevelopment mitigate water quality impacts to stormwater runoff during construction and operation phases of projects. These projects are subject to NPDES Provision C.3 and are grouped into categories based on project size. Group 1 includes new development and redevelopment projects that would replace or create more than one acre of impervious surface and Group 2 includes new development and redevelopment that would replace or create more than 10,000 square feet of impervious surfaces.

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 noted 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 Pacifica's two highest priorities for mitigation are earthquakes, which may cause ground shaking, liquefaction, and landslides, and winter storms, which may cause landslides, coastal erosion, and flooding.

Three of the four mitigation strategies identified in the proposed General Plan that concern flooding are already implemented as existing programs in Pacifica. These include having requirements for new development to manage peak stormwater runoff flows through design, as well as 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

Seismic Safety and Safety Element

The City of Pacifica updated the Seismic Safety and Safety Element of its General Plan in 1983, following serious storms that resulted 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.

General Plan 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.

Short-Term Action Programs

3. Develop regulations which consider location in a flood zone and tsunami run-up areas as major factors in determining future land uses.

4. Geotechnical studies should include at least a preliminary study of expansive and creeping soils, as well as appropriate analysis of erosion, seismic, tsunami, and other geotechnical hazards.

5. Development in areas subject to flooding should be carefully reviewed for public safety and property loss prior to permitting new development or redevelopment.

17. Zoning and other City ordinances should be revised to restrict development in hazardous areas where access is impractical, or areas particularly prone to hillside and coastal erosion, landslides, seismic shaking, tsunami inundation, or flooding.

20. Regularly maintain flood control structures, including, but not to drainage channels, pipes, culverts, and streambeds.

Long-Term Action Programs

1. Periodically provide public education on disaster preparedness. Work through the schools, voluntary organizations and City staff to ensure dissemination of information.

2. Develop a more widespread public education program on personal and public emergency procedures, particularly for the disasters with the highest probability of occurring.

3. The national disaster emphasis of the City's Emergency Plan and its annexes should be supplemented by a plan for local disasters.

4. Review codes and ordinances dealing with public safety and reaffirm those most important. Develop adequate code enforcement procedures and staffing to ensure that these codes and ordinances accomplish their public safety purposes.

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.

Impact Analysis

SIGNIFICANCE CRITERIA

Implementation of the proposed General Plan could have a significant impact if it would:

Criterion 1: Violate any water quality standards or waste discharge requirements or degrade water quality;

Criterion 2: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;

Criterion 3: Substantially alter the existing drainage pattern of a site or area through the alteration of the course of a stream or river, or by other means, in a manner that would result in substantial erosion or siltation on- or off-site;

Criterion 4: Substantially alter the existing drainage pattern of a site or area through the alteration of the course of a stream or river or, by other means, substantially

increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site;

Criterion 5: Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

Criterion 6: Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map;

Criterion 7: Place within a 100-year flood hazard area structures that would impede or redirect flood flows;

Criterion 8: Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or

Criterion 9: Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow.

METHODOLOGY AND ASSUMPTIONS

The impact analysis considered proposed General Plan policies and goals, hydrologic conditions within the City of Pacifica, and applicable regulations and guidelines. The proposed General Plan would facilitate development and growth in the City of Pacifica. Consideration is given to potential increases in new impervious surface area, erosion associated with future development-related construction activities, hazards associated with coastal erosion, sea level rise, and other results of growth, as well as proposed General Plan policies intended to minimize the impacts of growth on water resources.

SUMMARY OF IMPACTS

Potential impacts associated with implementation of the proposed General Plan include increased rates of storm water runoff and subsequent flooding hazards, erosion, increase in nonpoint source pollutants affecting receiving water quality, and coastal erosion and flooding that may be intensified by sea level rise. These impacts would be reduced to less-than-significant levels through regulatory compliance and with implementation of proposed policies and/or additional mitigation measures.

IMPACTS AND MITIGATION MEASURES

Impact

3.5-1 New development and other improvements under the proposed General Plan would not violate water quality standards or waste discharge requirements or degrade water quality. (*Less than Significant*)

The City of Pacifica has a mix of developed areas, with office, retail, and single-family and higher-density residential land uses, as well as extensive open space including parklands and

agricultural lands. The proposed General Plan would protect natural areas and resources. It would also allow for new construction, redevelopment, and infrastructure upgrades that would require earthwork. Earthwork activities such as excavation, soil stockpiling, boring, pile driving, and grading could generate loose, erodible soils that, if not properly managed, could be washed into surface water by rain or by water used during grading operations. Soil erosion could cause excess sediment loads in storm drains and affect the water quality of receiving waters. Construction could also involve use of fuel and other chemicals that, if not managed properly, could be washed off into the stormwater. Although construction of specific projects would be relatively short-term, the impact on water quality could be significant if not managed appropriately. Adherence to the Construction General Permit under the NPDES program would require that a SWPPP with best management practices (BMPs) be prepared for construction sites; it would include measures to protect water quality of stormwater that is discharged offsite and practices to limit erosion or unintentional releases of hazardous materials used during construction.

New development under the proposed General Plan could result in construction of structures with subsurface foundations or open trenches, such as building foundations or pipelines, which could intercept shallow groundwater. Common practices employed to facilitate construction include either dewatering the excavation site or shoring the sides of the excavation to reduce groundwater inflow. If dewatering methods are used, groundwater would be pumped out of the excavation to the surface and then discharged, typically to either a storm drain or sanitary sewer. Water extracted during dewatering could contain chemical contaminants (either from pre-existing sources or from equipment), or could become sediment-laden from construction activities. Depending on the construction site and the quality of the groundwater, the discharge could potentially contaminate the receiving waters and the Pacific Ocean.

Dewatering operations either on a short- or long-term basis will comply with certain provisions in the NPDES permit, such as the treatment of flows prior to discharge. Discharge of the groundwater from dewatering to the sanitary sewer or storm drain system shall occur pursuant to authorization and required permits from the Regional Water Quality Control Board or the City of Pacifica Public Works Agency and in compliance with applicable permit conditions associated with the treatment of groundwater prior to discharge. Adherence to established regulations will ensure that the potential impact is less than significant.

Development and redevelopment associated with the proposed Plan could result in incremental increases in the amount of impervious surfaces within the Planning Area. In turn, an increase in the amount of impervious surface has the potential to generate additional stormwater pollution in runoff during storm events. The introduction of new paved areas, building rooftops, parking lots etc., could therefore present the potential for accumulation and release of petroleum hydrocarbons, lubricants, sediments, and metals (generated by the wear of automobile parts), which, if not managed appropriately, could violate water quality standards.

The management of landscaped areas would also present the potential for runoff and/or infiltration of herbicides and pesticides. These types of common urban pollutants could be transported in runoff, potentially adversely affecting the quality of receiving surface waters or groundwater. Nonpoint source pollutants would be washed by rainwater from rooftops and

landscaped areas into onsite and local drainage networks. Potential nonpoint source pollutants include products used in landscaping (e.g., pesticides, herbicides and fertilizers); oil, grease, and heavy metals from automobiles; and petroleum hydrocarbons from fuels.

Pollutant concentrations in stormwater runoff from a particular site would depend on numerous factors, including: land use conditions, implementation of best management practices (BMPs), site drainage conditions, intensity and duration of rainfall, and climatic conditions preceding a rainfall event.

However, in general, existing local stormwater management plans and policies, and State Water Board regulations, which implement federal Clean Water Act requirements, would prevent these potential impacts from rising to a level of significance under CEQA through requirements that minimize the creation of pollution generating surfaces. Clean Water Act Section 402 NPDES MS4 Permit, which covers many Bay Area jurisdictions including the City of Pacifica, requires stormwater management plans, which in turn require source and treatment control measures. In many cases, as part of the NPDES program to reduce the severity of impacts, stormwater drainage control/Low Impact Design (LID) measures may be required as standard conditions of approval and building permit application submittals, along with compliance with RWQCB Municipal Regional Stormwater Permit Order No. 2011-0083 Provision C.3 (Provision C.3).

As required by Provision C.3, for new development that would introduce 10,000 square feet of new impervious surfaces, a project applicant would incorporate LID strategies, such as stormwater reuse, onsite infiltration, and evapotranspiration as initial stormwater management strategies. Secondary methods that could be incorporated include the use of natural, landscape-based stormwater treatment measures, as identified by Provision C.3. Stormwater treatment measures may also be required in the final design plans in accordance with local stormwater management plans. The treatment measures may vary from "local" improvements at individual building sites to "area wide" concepts, such as stormwater treatment wetlands with large open space areas. Treatment control measures may include use of vegetated swales and buffers, grass median strips, detention basins, wet ponds, or constructed wetlands, infiltration basins, and other measures. Filtration systems may be either mechanical (e.g., oil/water separators) or natural (e.g., bioswales and settlement ponds).

Projects that redevelop existing sites may even result in improved water quality compared to existing conditions, particularly in cases where existing development was constructed under older, less stringent stormwater requirements. Selection and implementation of such LID measures would occur on a project-by-project basis, depending on project size and stormwater treatment needs as required to meet NPDES or any other local permitting requirements.

Ultimately, adherence to stormwater control measures as part of the Municipal Regional NPDES stormwater permit, a SWPPP prepared as part of the General Construction Permit, and improvements under the proposed Plan would minimize the water quality impact to a less-than-significant level. For commercial development, the City also requires preparation and submission of a landscaping plan that includes provisions for erosion control in graded areas that would remain vacant during construction. In addition, compliance with the follow-

ing proposed General Plan policies would ensure the impact to water quality is less than significant.

Proposed General Plan Policies that Reduce the Impact

Conservation Element

CO-G-1 **Water Quality.** Support the improvement of Pacifica's water quality, including both surface water and groundwater, through Best Management Practices (BMPs) for stormwater management, stream restoration, and riparian habitat restoration.

CO-G-2 **Watershed Management.** Recognize the interrelated nature of Pacifica's hydrology system, its watersheds, and development in the Planning Area, and protect water resources through comprehensive management of entire watersheds.

CO-G-3 **Maintain Creeks as a Resource.** Ensure both access to and ecological functionality of the creek system in Pacifica.

CO-I-12 **Protect Water Quality through Best Management Practices.** Continue to require the use of best management practices to reduce water quality impacts from construction and development. Measures include:

- ***Site Design and Source Control***. Ensure that all new development incorporates site design and source control BMPs into the project design in order to preserve the infiltration, purification, and retention functions of each site's natural drainage systems, and to prevent or minimize the runoff of pollutants, sediments, waste, and pathogens from the site.
- ***Construction Pollution Control.*** Require all construction projects to adopt measures to minimize erosion and runoff of pollutants and sediments from construction-related activities, and to limit activities that result in the disturbance of land or natural vegetation.

  Construction projects will be required to use appropriate erosion prevention techniques, sediment control measures, and best management practices in accordance with City specifications and the San Mateo Countywide Water Pollution Prevention Program.
- ***Treatment Control.*** Require that new development implement treatment control BMPs (or structural treatment BMPs) where the combination of site design and source control BMPs is not sufficient to protect water quality and comply with applicable water quality permits.

Stormwater treatment systems must meet the numeric sizing criteria established in the NPDES Permit, and must be operated and maintained in compliance with the NPDES Permit.

CO-I-10 **Countywide Water Pollution Prevention Program.** Continue to participate in the San Mateo Countywide Water Pollution Prevention Program.

The Program represents a collaborative effort amongst the County and its municipalities, consisting of five major areas of water pollution prevention and control:

- *Municipal maintenance activities*
- *Industrial and illicit discharge*
- *Public information and participation*
- *New development and construction controls*
- *Watershed monitoring*

CO-I-14 **Erosion Control.** Manage erosion in the Planning Area, particularly in watershed areas, though on-site erosion control.

Construction projects will be required to use appropriate erosion prevention techniques, sediment control measures, and best management practices in accordance with City Specifications and General Conditions of Approval and the San Mateo Countywide Water Pollution Prevention Program.

CO-I-19 **Oil and Hazardous Substance Spills.** Provide protection against the spillage of crude oil, gas, petroleum products, or hazardous substances in relation to any development of transportation of such materials.

For any accidental spills that do occur, the City will require effective containment and cleanup facilities and procedures.

CO-I-11 **Stormwater Discharge.** Ensure compliance with the Municipal Regional Permit, the Construction General Permit, and the Construction Dewatering Permit, which regulate stormwater discharge from new and existing development.

These permits are established by the National Pollutant Discharge Elimination System (NPDES) and administered by the Regional Water Quality Control Board. They require that new development incorporate Best Management Practices (BMPs) in site design, construction, and management to minimize storm water runoff rates and volumes, control water pollution, and maximize infiltration.

CO-I-15 **Minimize Site Disturbance.** In design and construction, require use of best practices that preserve natural resources, such as soil, trees, native plants, and permeable surfaces.

CO-I-13 **Infrastructure and Water Quality.** Ensure that the design and construction of new infrastructure elements does not contribute to stream bank or hillside erosion or creek or wetland siltation, and incorporates site design and source control BMPs, construction phase BMPs, and treatment control BMPs to minimize impacts to water quality, in compliance with the NPDES Permit.

Mitigation Measures

None required.

Impact

3.5-2 New development under the proposed General Plan would not deplete groundwater supplies or interfere substantially with rates of groundwater recharge due to increases in the amount of impervious surfaces, such that there would be a net deficit in aquifer volume or a lowering of the groundwater table. *(Less than Significant*)

New development proposed under the proposed General Plan could result in an increase in impervious surfaces such that a reduction in the amount of stormwater that infiltrates into underlying groundwater would occur. Infiltration rates can vary widely and largely depend on the characteristics of the exposed overlying soils and vegetation. In general, sandy soils have higher infiltration rates and can contribute to significant amounts of ground water recharge; clay soils tend to have lower percolation potentials; and impervious surfaces such as pavement substantially reduce infiltration capacity. The City of Pacifica receives its water supplies from the North Coast Water District, which purchases imported water supplies from San Francisco Public Utilities Commission and does not rely on groundwater resources. Regardless, as new development and redevelopment occurs, on-site drainage plans would be designed to retain, capture and convey increased runoff in accordance with the local City design standards, state requirements such as Provision C.3 site control features, and the proposed policies described below. These requirements generally require or encourage the use of LID features such as vegetated swales, permeable paving, use of landscaping for infiltration, and other measures that would retain runoff as much as possible and allow for onsite infiltration. As a result, stormwater flows generated from new development associated with the proposed Plan would remain unchanged or decrease following implementation of required source control measures, which would therefore not substantially affect underlying groundwater levels.

Therefore, considering the existing level of development, the fact that groundwater is not used for water supply purposes, and the regulatory framework that currently exists for new development, the impact on groundwater recharge from implementation of the proposed General Plan is less than significant.

Proposed General Plan Policies that Reduce the Impact

Conservation Element

CO-I-16 Reduce **Impervious Surfaces.** Enable natural drainage by reducing the amount of impervious surfaces on a development site, whenever feasible.

Techniques that help accomplish this objective:

- *Designing medium and high density residential projects to share driveways;*
- *Placing parking lots under buildings, whenever feasible; and*
- *Using permeable paving materials on walkways and driveways, whenever possible.*

CO-I-17 **On-site Stormwater Management**. Continue to require all small projects and detached single-family home projects, as defined under the NPDES Permit, to incorporate site design measures that facilitate groundwater recharge and natural hydrological processes, allowing stormwater to infiltrate the ground on-site and/or be collected for reuse in landscaping and designated to on-site stormwater detention facilities.

Techniques for on-site stormwater management include use of:

- *"Rain gardens" or bioretention areas in yards, parks, and parking lots;*
- *Landscaped drainage swales along roadways;*
- *Green roofs;*
- *Permeable pavers for walkways and parking areas;*
- *Rain barrels for harvesting runoff from rooftops;*
- *Tree box filters for on-street filtration;*
- *Parking areas that allow stormwater flow into vegetated areas;*
- *Grading that lengthens flow paths and increases runoff travel time to reduce the peak flow rate; and*
- *Cisterns or sub-surface retention facilities that capture rainwater for use in irrigation and non-potable uses*

Mitigation Measures

None required.

Impact

3.5-3 New development under the proposed General Plan would not change existing drainage patterns, which could increase the volume of stormwater runoff resulting in erosion and flooding on- or off-site. *(Less than Significant)*

Approximately 1,000 housing units and 645,000 square feet of non-residential new development are anticipated with implementation of the proposed General Plan, as well as infrastructure improvements, which would change existing drainage patterns. The new development and improvements could occur on existing impervious surfaces, which would result in generally the same quantity as well as velocity of stormwater runoff as experienced in existing conditions.

All improved building sites are required to be in compliance with Provision C.3 in the NPDES permit and implementation of the required stormwater control measures would ensure that any changes to drainage patterns would be minimal. Project applicants would be required to include site design and source control stormwater measures into project plans. Further, new development would be required to adhere to the City's stormwater guidelines, which are part of the regional MS4 NPDES permit requirements, and select and design the stormwater solutions onsite to control the stormwater volume. Therefore, erosion, siltation or flooding impacts due to new development would not be noticeably greater than existing

conditions and would be controlled through adherence to existing requirements and regulations that address stormwater volumes and water quality.

New development is expected to involve greater human activity, vehicle traffic, and pesticide or fertilizer use associated with lawns or parks, which could be released to the City's drainage system. This impact would be minimized by implementation measures that manage activities to reduce waste, such as source control measures as part of the requirements of Provision C.3. Source control measures may include prohibition of illegal dumping to storm drain inlets and waterways, designating vehicle washing areas, and preparing and implementing a landscape plan to control any fertilizer or pesticide use and discharge into receiving waters. In addition, compliance with the following proposed General Plan policies would ensure the impact to water quality is less than significant.

Proposed General Plan Policies that Reduce the Impact

See Policies CO-G-1, CO-I-2, CO-I-10, CO-I-14, CO-I-11, CO-15, listed under Impact 3.5-1.

See Policy CO-I-17 listed under Impact 3.5-2.

CO-I-42 **Shoreline Protection.** Continue to prohibit new development requiring shoreline alterations.

Mitigation Measures

None required.

Impact

3.5-4 Implementation of the proposed General Plan would not substantially alter the existing drainage patterns that could increase the rates and amounts of stormwater runoff due to increases in impervious surfaces, and would not exceed the capacity of existing drainage facilities or provide additional sources of polluted runoff. *(Less than Significant)*

Implementation of the proposed General Plan could result in new development that would increase the total area of impervious surfaces. While many of the improvements could be located in developed areas with existing impervious surfaces, some new development may also occur in undeveloped areas that could result in a net increase in impervious surfaces. Increases in the amount of impervious surfaces would have the potential to increase rates and amounts of stormwater runoff, compared to existing conditions, which could exceed the capacity of current systems. However, local, regional, and state drainage control requirements would apply to most developments; both rates and volumes of runoff would be required to meet minimum thresholds so that that potential flood hazards are minimized. Once constructed, the NPDES Provision C.3 requirements for new development would include source control measures in site designs to limit the amount of off-site discharges during large storm events.

Regional MS4 NPDES drainage control requirements are in place to provide for adequate avoidance of potential impacts and implementation of preventative measures to limit or avoid substantial alteration of the existing drainage patterns of the Planning Area. Therefore, development and redevelopment is not anticipated to increase the rate or amount of surface runoff in a manner that would result in on- or off-site flooding, or have adverse effects on water quality. In some cases, adherence to these requirements may result in improved retention of stormwater rates and volumes, compared to existing conditions, through implementation of LID drainage control measures.

Ultimately, adherence to existing regulatory requirements, as well as the proposed policies listed below, would result in a less than significant impact related to exceeding drainage control capacities.

Proposed General Plan Policies that Reduce the Impact

Conservation Element

See Policy CO-I-11 listed under Impact 3.5-1.

See Policies CO-I-16 and CO-I-17 listed under Impact 3.5-2.

CO-I-20 **Wastewater Treatment Capacity.** Continue to monitor wastewater generation rates so decision-makers are aware of the impacts on the treatment plant on new development, and plan for additional capacity in advance of projected need.

Mitigation Measures

None required.

Impact

3.5-5 New development constructed under the proposed General Plan could place housing or new structures into the 100 year flood zone, but would not result in significant environmental impacts. (*Less than Significant*)

Despite efforts to improve drainage control infrastructure and existing surface water channels to minimize the potential for flooding, there are locations throughout the City that are susceptible to flooding during heavy storm events. **Figure 3.5-1** illustrates the 100-year flood hazard areas that are located within the Planning Area.

While the proposed General Plan would include relatively few new housing units, many of which would be placed outside these hazard areas, there are areas of new development or other structures that may be located within 100-year flood zone areas. Siting structures in flood zones can result in direct impacts on new development related to flooding and substantial damage can occur. In addition, structures that impede flood flows can cause a backwater effect by potentially raising flood levels, causing more severe flooding impacts to existing vulnerable areas or by exposing new areas that would not have previously flooded to new flooding impacts.

Should any developments be proposed in an area within the 100-year flood zone, they would be required to meet local, state and federal flood control design requirements. In general, flood control policies require new construction in flood prone areas to be built to flood safe standards, such as ensuring that ground levels of living spaces are elevated above anticipated flood elevations. In addition to design requirements with new development, there would be requirements for adequate storm drainage capacities and retention such that new development does not exacerbate any existing problem areas. Development in compliance with local floodplain requirements (Title 7 Public Works, Chapter 5 Flood Damage Prevention, Article 5 Provisions for Flood Hazard Reduction) and federal regulations (National Flood Insurance Program), would minimize the risk associated with housing in these areas. In addition, many ongoing improvements to flood protection infrastructure by the U.S. Army Corps of Engineers and the City's Flood Control Committee, for example, to areas of San Pedro Creek and the Sharp Golf Course, should help to minimize areas subject to flooding.[36]

Over the past century, the sea level has risen nearly eight inches along the California coast, and modeling suggests that future increases in sea level due to climate change may occur over the coming century. As a result, the frequency of flooding events may increase, and there may be an increase in the amount of area that is considered prone to a 100-year flood event. However, the amount and rate of sea level rise is not precisely known; estimates are even less reliable for dates further into the future. While FEMA continues to update its FIRM maps, adaptive management strategies such as increased coastal armoring are likely the most effective method to minimize the increased flood hazards.

Ultimately, given the floodplain development requirements, continued flood protection programs, adaptive management strategies, the drainage requirements as described above, and the proposed policies below, impacts to proposed development within the 100-year floodplain from implementation of the proposed General Plan are considered less than significant.

Proposed General Plan Policies that Reduce the Impact

Safety Element

SA-G-3 **Sea Level Rise Adaptation.** Establish policies to minimize the risk to persons and property posed by potential sea level rise.

SA-I-22 **Sea Level Rise Model.** When an adequate model with sufficient local detail is available to project the impacts of sea level rise, take into account potential erosion caused by sea level rise by the year 2050 in the determination of developable area and the assessment of whether coastline-altering structures would be needed in the future to protect new development.

SA-I-23 **Floodplain Management.** Continue to manage floodplains through zoning, development requirements, and ordinances, and take other actions necessary, in order to remain within the National Flood Insurance Program.

[36] Note that Draft Policy CO-I-45 discusses a natural management strategy to flood protection which would prioritize alternatives to further armoring or heightening of the levee at Sharp Park. See discussion of levees below.

SA-I-24 **Flood Map Review.** Periodically review maps prepared by FEMA and the State Department of Water Resources to identify changes in mapping of areas subject to flooding and amend the General Plan or Municipal Code as warranted.

SA-I-25 **NDPES Enforcement.** Enforce NPDES permits, as well as the San Mateo Countywide Water Pollution Prevention Program, to mitigate potential flooding risks.

SA-I-26 **Flood Hazard Reduction.** Continue to enforce Provisions for Flood Hazard Reduction in the Municipal Code.

SA-I-27 **Flood Insurance.** Inform households and businesses located in flood-prone areas about opportunities to purchase federal flood insurance.

SA-I-28 **Flood Control Maintenance.** Regularly maintain flood control structures, including, but not limited to drainage channels, pipes, culverts, and stream beds.

SA-I-29 **Flood Control Structures.** Require flood control devices that alter streams to incorporate best mitigation measures feasible, and only permit them 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.

SA-I-30 **Storm Drainage Impact Assessment. Require** developers to provide an assessment of a project's potential impacts on the local storm drainage system as part of the development review process.

If development is found to have a negative impact on storm drainage, the City should require applicable and effective mitigation measures, such as the creation of permanent or temporary detention or retention basins, provision of additional landscaped areas and green roofs, installation of pump stations, and the use of permeable paving in driveways, walkways and parking areas.

SA-I-31 **No Adverse Impact Approach.** Update the Flood Hazard Reduction regulations to establish a "No Adverse Impact" standard to floodplain and coastal development.

No building permits should be issued for projects that increase the potential for flooding or erosion on and off site, degrade water quality, or increase potential public service costs for things such as emergency personnel and storm-water management, unless such projects are designed and completed in such a way that they will not:

- *pose a threat to public safety; and*
- *substantially increase flood or storm damage risk to public or private property.*

SA-I-33 **Critical Facilities Location.** Site critical public facilities including hospital and healthcare facilities, emergency shelters, police and fire stations, and emergency communications facilities outside of the tsunami evacuation zone and 100-year flood plains.

SA-I-34 **Infrastructure.** Evaluate existing public infrastructure, including the wastewater and stormwater distribution systems, for vulnerability to coastal flooding and erosion and identify areas in need of protection.

SA-I-35 **Sea Level Rise Surveys.** Periodically conduct surveys of sea level rise studies to determine the expected frequency and extent of coastal flooding and the rate of coastal erosion, with a focus on at-risk areas, and propose General Plan amendments, as warranted.

SA-I-36 **Managed Retreat.** Incorporate "managed retreat" strategies into master planning for public land and large projects in the Coastal Zone.

Conservation Element

CO-I-4 **Coastal Protection Projects.** Evaluate coastal protection projects, such as flood protection and beach nourishment for potential impacts to beaches, wetlands and other habitats and impose mitigation to minimize impacts.

Open Space and Community Facilities Element

OC-I-43 **Adjustment of Lateral Shoreline Easements.** Require that new lateral shoreline easements, where required, automatically adjust as needed to move in response to changes to the shoreline ("rolling easements").

When sea level rise models are available with sufficient detail for local land use planning, new development must demonstrate that lateral access can be maintained for the expected life of the building. Alternatively, the Planning Director may determine that lateral public access is not necessary.

Mitigation Measures

None required.

Impact

3.5-6 Implementation of the proposed Plan would not expose people to a significant risk of loss, injury, or death involving flooding from failure of a dam or levee. *(Less than Significant)*

Counties are required by state regulation to map potential dam inundation areas and prepare emergency plans and procedures for preparing and responding to a dam breach as part of their Multi-Hazard Mitigation Plans (Cal. Code Regs., tit. 19 § 2575). There are no dams located within the Planning Area that fall under the jurisdiction of the state of California or are owned and operated by a federal agency.[37] In addition, there are no dams located outside of the Planning Area with inundation areas that could affect the Planning Area. Therefore, there

[37] Association of Bay Area Governments (ABAG), Dam Inundation Area Map for Pacifica California, http://www.abag.ca.gov/cgi-bin/pickdamx.pl, accessed July 24, 2013.

are no mapped inundation areas that would affect any proposed improvements by the failure of a dam. However, Pacifica's water supply system includes the use of 14 water storage tanks including one on Milagra Ridge, the Christian Hill tank on Skyline Boulevard, the Royce tank off Fassler Avenue, and smaller tanks at lower elevations. As such, there is a proposed policy that would address the potential for a ruptured water tank in the event of a catastrophic failure from a seismic event.

Substantial precipitation, major storm events, or seismic events have the potential to cause the levee failure. However, according to a response by the City of Pacifica to a 2006-2007 Grand Jury report on emergency planning for levee failure in San Mateo County, the City of Pacifica is no longer listed as containing a qualifying levee.[38] The levee was removed as part of the Army Corps of Engineers' San Pedro Creek and Wetland Ecosystem Restoration Project in 2000.[39] The response does not discuss the levee protecting Laguna Salada. However, even if this levee were to fail, the lagoon is surrounded by the Sharp Golf Course and no proposed improvements as part of the proposed General Plan would be located in this area.

Therefore, the proposed General Plan would have a less than significant impact related to flooding as a result of failure of a dam or levee.

Proposed General Plan Policies that Reduce the Impact

Conservation Element

CO-I-50 **Sharp Park Beach.** Work with other public agencies, to implement a "natural management" strategy and refrain from further armoring or heightening of the levee to protect the beach from erosion, allowing the beach and lagoon system to reestablish itself.

This approach has been formally recommended by the Sharp Park Working Group, as part of the San Francisco Recreation & Parks Department's Significant Natural Resource Areas Management Plan.

Safety Element

SA-I-13 **Water Tank Rupture.** Work with the NCCWD to determine areas potentially affected by flooding from ruptured water tanks in the event of a seismic event and inform property owners.

Mitigation Measures

None required.

---

[38] San Mateo County, *Summary of Emergency Action Plans for San Mateo County Attachment 2,* March 12, 2012.

[39] *Ibid.*

Impact

3.5-7 Implementation of the proposed Plan would not expose people to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow. *(Less than Significant)*

A seiche is a standing wave in an enclosed or partly enclosed body of water. Seiches are normally caused by an earthquake or high wind activity and can affect harbors, bays, lakes, rivers and canals. The only enclosed or semi-enclosed body of water located within the City of Pacifica is the Laguna Salada, which is within the Sharp Golf Course with no proposed improvements that could potentially be affected by seiche waves.

Tsunamis are a series of large waves created by an underwater disturbance such as an earthquake, landslide, volcanic eruption, or meteorite. In general, a tsunami can move hundreds of miles per hour in the open ocean and reach land with waves as high as 100 feet or more. A total of 51 tsunamis have been recorded or observed within the San Francisco Bay Area since 1850.[40],[41] Of these, only the tsunamis generated by the 1960 Chile earthquake and the 1964 Alaska earthquake caused damage in San Francisco Bay. The 1964 tsunami event caused the most damage of the two most notable events and had a recorded amplitude of approximately 3.7 feet (1.1 meters) at the Presidio in San Francisco. The most significant recorded tsunami wave that has reached Pacifica was related to the 1964 earthquake and resulted in a 4.5 foot (1.37 m) run-up at Pacifica.

Tsunami risks in Pacifica have been identified as lower than other areas in northern California. Recorded tsunami run-up magnitude is generally lower at Pacifica than other locations likely because of offshore bathymetry and shoreline alterations along the City.[42] In addition, many potential sources of tsunami are distantly located, which can allow for time to prepare and evacuate hazard areas. San Mateo County has an established emergency plan for tsunamis and the City of Pacifica has identified tsunami hazards in its local annex to the Association of Bay Area Government's Multi-Jurisdictional Local Hazard Mitigation Plan for the Bay Area. Combined with the proposed Plan policies, the potential impact from tsunamis is less than significant.

Mudflows are characterized by a downhill movement of soft wet earth and debris, made fluid by rain or melted snow and often building up great speed. Mudflows occur on steep slopes where vegetation is not sufficient to prevent rapid erosion, but can occur on gentle slopes if other conditions are met. Other factors are heavy precipitation in short periods and an easily erodible source material. Mudflows can be generated in any climatic regime but are most common in arid and semiarid areas and can be associated with volcanic events. Considering

---

[40] This total does not include the more recent March 2011 earthquake in Japan, which produced a small but noticeable tsunami wave at the coast of Pacifica, but caused no reported damage.

[41] California Geological Survey (CGS), *Tsunamis*, www.consrv.ca.gov/cgs/geologic_hazards/tsunami/pages/about_tsunamis.aspx, compiled in 2005.

[42] Coastal Environments, Tsunami risks in the City of Pacifica, California: A probabilistic approach, final Report by Hany Elwany June 2007.

the geologic context of the Planning Area, the potential for mudslides to affect proposed improvements from the proposed General Plan would be considered very low, and thus a less than significant impact.

Proposed General Plan Policies that Reduce the Impact

Safety Element

SA-G-2 **Development in Hazardous Areas.** Protect new development in 100-year floodplains and tsunami hazard zones with flood damage prevention programs.

SA-I-32 **Tsunami Evacuation Zone.** For new development in the tsunami evacuation zone, require use of low impact engineering techniques, such as elevating structures above projected water levels, to mitigate impacts to people and structures.

SA-I-9 **Maintain Restrictions on Hazardous Areas.** Continue enforcing the existing Coastal Zone Combing District and Hillside Preservation District regulations that restrict development in hazardous areas where access is impractical and areas prone to hillside and coastal erosion, landslides, seismic shaking, tsunami inundation, or flooding.

SA-I-10 **Soil Study.** Require any geotechnical studies to include study of expansive and creeping soils, as well as analysis of erosion, seismic, tsunami, and other geotechnical hazards and make recommendations, as warranted.

Mitigation Measures

None required.

CUMULATIVE IMPACTS

Impact

3.5-8: Increased construction activity and new development facilitated by the proposed General Plan, in conjunction with past, present, reasonably foreseeable future development in the San Francisco Peninsula, would not significantly affect stormwater flows and water quality. *(Less than Significant)*

Implementation of the proposed Plan, together with past, present, and other reasonably foreseeable future projects in the region, could cumulatively increase stormwater runoff and pollutant loading to receiving waters. The proposed Plan and other future projects in the region would be required to comply with drainage and grading requirements intended to control runoff and regulate water quality at each development site. Additionally, new projects would be required to demonstrate that stormwater volumes could be managed by stormwater conveyance facilities designed to control onsite stormwater flows. New development projects would also be required to comply with MS4 NPDES permitting requirements.

Implementation of the proposed Plan, together with past present and other reasonably foreseeable future projects in the vicinity, could expose people and/or property to flooding from a 100-year event and sea level rise. These effects could occur through increases in stormwater runoff and during high tide in a 100-year storm event along with sea level rise. The proposed project and other future projects in the vicinity would be required to comply with flood control requirements intended to provide flood protection. Additionally, new projects would be required to demonstrate that stormwater volumes could be managed by stormwater conveyance facilities designed to control onsite stormwater flows. New development projects would be required to comply with local flood control requirements, and these may be strengthened as needed to address sea level rise, as directed by Plan policies. The proposed Plan, in combination with other cumulative projects, would not result in a significant cumulative impact to people and/or property from a 100-year event in combination with sea level rise. The proposed Plan would have a less than cumulatively considerable impact, and cumulative effects, therefore, would be less than significant.

Mitigation Measures

None required.