SEA LEVEL RISE VULNERABILITY ASSESSMENT

Pacifica, CA

Prepared for
The City of Pacifica

June 2018

Near-king tides and high surf at Beach Boulevard on November 30, 2017 (J. Jackson)

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June 2018

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1. INTRODUCTION

1.1. Background

The City of Pacifica is updating its Local Coastal Program, a planning document that regulates development in the City's Coastal Zone and establishes a long-range vision for the community. The California Coastal Act, passed in 1976, provides for coastal jurisdictions to adopt a Local Coastal Program (LCP) to ensure local implementation of Coastal Act priorities. The City adopted its current LCP in 1980 and is currently preparing a Local Coastal Plan (LCP) update to address sea level rise (SLR) and its effects on coastal erosion and flooding. Environmental Science Associates (ESA) performed this Vulnerability Assessment to address existing conditions and future vulnerability of the City of Pacifica and its social, economic and physical coastal resources to projected sea level rise, coastal flooding and erosion. The findings of this Assessment will enable ESA to assist the City with development of adaptation strategies to prepare for future impacts. Ultimately, the City, with assistance from ESA, will develop policy language for incorporation into the City's LCP Update.

ESA's coastal hazard analysis and vulnerability assessment is a planning-level assessment of the potential exposure Pacifica could face from sea level rise, flooding and erosion. The results of this Vulnerability Assessment informing the development of an Adaptation Plan and LCP policies in the next phases of the LCP update preparation process. This assessment therefore relies on reasonable assumptions and engineering judgement to simplify the analysis where needed and utilizes available coastal hazard mapping products that are discussed in Section 1.2 and Section 2.

Please note that this document incorporates the Existing Conditions Report deliverable detailed on ESA's work plan for the sea level rise assessment and adaption planning effort, removing the need for a separate Existing Conditions Report to be prepared.

The City received a number of comments on the draft vulnerability assessment from the public and both working groups (Community and Technical). These comments are compiled with responses and included in Appendix E of this report.

1.2. Past Studies on Coastal Flooding and Erosion

To conduct the Vulnerability Assessment, ESA relied on readily available data sources. The following studies examined coastal flooding and erosion impacts in Pacifica. The hazard maps and associated data produced from these studies are utilized in this Vulnerability Assessment (described in Section 2.2).

Sea Change San Mateo County

This Sea Change San Mateo County study established and executed a risk-informed methodology to assess SLR vulnerability and flood risk in San Mateo County (SMC 2017). The assessment used data from all three sources mentioned below for evaluating the vulnerability of the County and its assets to coastal hazards. One goal of this study is to remain consistent with the County-wide study. ESA used the same hazard data sources for the Vulnerability Assessment, which are described below.

Our Coast Our Future (OCOF)

Our Coast Our Future (Ballard et al. 2016) is a collaborative project that provides online maps and tools to help users understand, visualize and anticipate vulnerabilities to sea level rise (SLR) and storms. The project maps 40 different SLR and storm scenarios that were developed by the United States Geological Survey (USGS) using their Coastal Storm Modeling System[1] (CoSMoS 2.0, North-central California (outer coast)). The hazard maps are hosted in an interactive web environment that includes layers for flooding extent, depth, duration, wave heights, current velocity, as well as various infrastructure and ecology layers. ESA used various OCOF hazard mapping products to evaluate existing and future coastal flooding hazards due to SLR (for regular tidal inundation) and storm flooding (considering a 100-year coastal event) for this Vulnerability Assessment. Details on the SLR scenarios and descriptions of each type of coastal hazard are discussed in Section 0. OCOF/CoSMoS modeling for this area does not incorporate the long-term erosion of shorelines and bluffs the same way that CoSMoS 3.0 does for southern California and thus the flood layers may underestimate flood exposure. The modeling does however use recent (2013) topography that includes existing features such as the elevation of the Beach Boulevard seawall and the SPGC levee. While potential erosion is not included in the OCOF maps, flooding shown beyond these built features essentially represent conditions for the ongoing maintenance of these elements at their current location and elevation.

Pacific Institute Study

In 2009, Philip William and Associates, Ltd. (PWA, now ESA) was funded by the Ocean Protection Council to provide the technical hazards analysis supporting the Pacific Institute report on the "Impacts of Sea Level Rise to the California Coast" (PWA 2009; Pacific Institute 2009). In the course of this work, PWA projected future coastal flooding hazards for the entire state based on a review of existing Federal Emergency Management Agency (FEMA) hazard maps and projected future coastal erosion hazard areas for the northern and central California coastline, ending at Santa Barbara. These hazard areas were used in the Pacific Institute study, which evaluated potential socio-economic impacts of SLR. In order to maintain consistency with the Sea Change SMC study, ESA used the coastal erosion hazard maps in this Vulnerability Assessment to identify potential impacts to Pacifica. The erosion hazard zones produced for this study do not consider the effects of coastal armoring structures, but rather depict the potential extent of erosion in the case that armoring fails or is not maintained. It is important to understand the potential risk that coastal erosion poses to assets without assuming any given adaptation strategy, and the Pacific Institute erosion maps are the best available resource to do so in Pacifica. The purpose of this Vulnerability Assessment is to identify all potential assets at risk and understand where adaptation actions are needed, and then move into adaptation planning to address these risks. For example, understanding the amount of property and infrastructure at risk if the Beach Boulevard seawall were to fail can make the case for maintaining the seawall into the future (an adaptation alternative).

Coastal Regional Sediment Management Plan, San Francisco Littoral Cell (Draft)

A Coastal Regional Sediment Management Plan (CRSMP) is a guidance and policy document that discusses how Regional Sediment Management (RSM) can be applied in a rapid, cost-effective, and resource-protective manner. ESA (2015) completed a Draft CRSMP for a segment of the San Francisco Littoral Cell along the San Francisco

[1] Information on OCOF can be found at: http://data.pointblue.org/apps/ocof/cms/ and https://walrus.wr.usgs.gov/coastal_processes/cosmos/norcal/index.html

and San Mateo Counties Pacific coastline for the Coastal Sediment Management Workgroup (CSMW). The CSMW was a taskforce, co-chaired by the U.S. Army Corps of Engineers and the California Natural Resources Agency, and focused on the adverse impacts of coastal erosion on coastal habitats. Along with other federal, state and local/regional entities, the CSMW worked to implement RSM to augment or restore natural processes. The Draft CRSMP is a source of information and methods for Pacifica's LCP Update, including some asset data for the vulnerability assessment and shoreline modeling inputs and methodology for the adaptation analysis. The erosion hazard maps for the Draft CRSMP were produced by ESA using updated methodology originally developed for the Pacific Institute Study and include accelerated erosion in response to SLR, projections of future beach widths, and modifications for a range of potential adaptation alternatives including allow erosion, beach nourishment, beach nourishment with reef, armor, and hybrid approaches. The methods used to produce these erosion hazard maps (not the erosion hazards themselves) will be applied in the current study to assess the implications of different shoreline management options in the upcoming Adaptation Plan task of this project.

1.3. Existing Conditions

This document is focused on vulnerabilities of property and built assets in Pacifica that are exposed to coastal flooding and erosion now or may be exposed in the future due to projected sea-level rise. Existing land use, policy and zoning are not covered in this document. Existing natural resources are described in the following sub-areas.

The Pacifica coastal community consists of nearly 40,000 residents and has six miles of beaches and bluffs along the Pacific Ocean. Built and natural resources along Pacifica's coastline are currently vulnerable to coastal flooding and erosion. Vulnerabilities, and subsequently adaptation planning, are being evaluated for Pacifica's coastal sub-areas as defined in the draft LCP (with slight modifications by ESA). Following the organization of the Vulnerability Assessment (Section 3), existing conditions for each sub-area in Pacifica are discussed below, from north to south. Pacifica's sub-areas are shown in Figure 1. Sub-area descriptions include the existing exposure to coastal and riverine hazards considering FEMA hazard maps, physical characterization of the backshore, description of coastal protective devices (flooding and erosion) and general description of natural and built assets.

Pacifica LCP 170663

SOURCE: City of Pacifica, San Mateo County

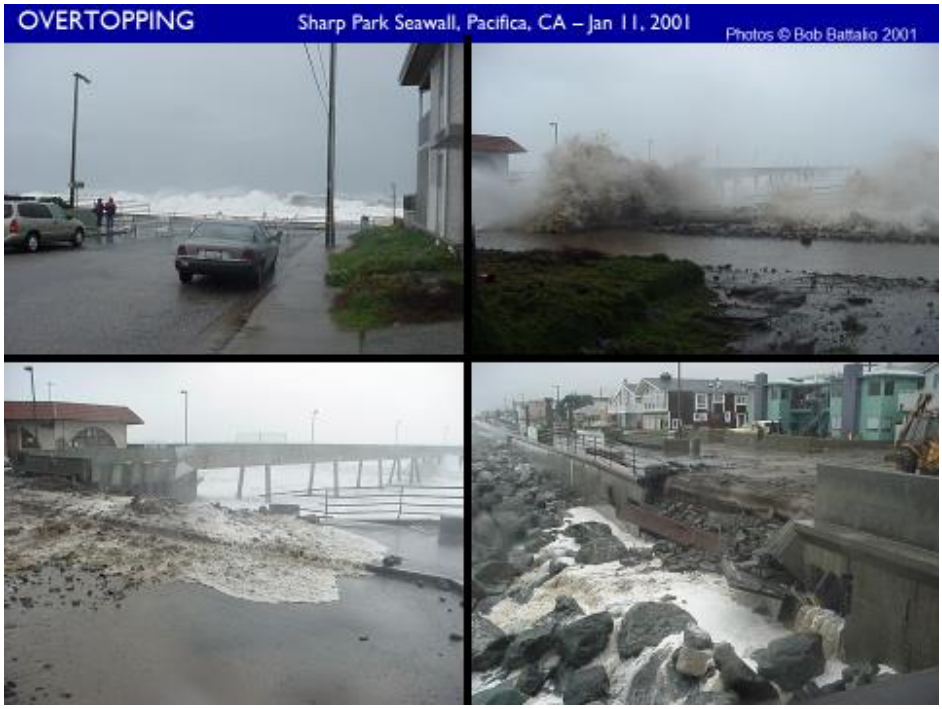
Figure 1
Pacifica Sub-areas

Existing exposure to coastal and fluvial hazards are based on past studies, observations and current FEMA flood insurance rate maps.

Observed coastal flooding and erosion events in Pacifica

Observations of coastal flooding and erosion events provide real world examples of the impacts that can be sustained by Pacifica, both in terms of the severity of a particular rain storm or wave event and the actual damages to infrastructure, property and other assets. One way to characterize the vulnerabilities that Pacifica faces with projected SLR is to estimate the return period[2] of observed events of flooding or erosion and predict how the frequency of these events (and damages) may increase in the future given climate change and SLR. For example, this is accomplished by choosing a flood event that is representative of impacts, estimating the return period for the event, and predicting future return periods at given times considering SLR. The following events provide examples of Pacifica's existing exposure to coastal flooding and erosion:

- Winter 1983: Large swell and precipitation
- El Nino 1997-1998: Large swell
- January 11, 2001: Wave event and overtopping at Sharp Park seawall and erosion damages to Beach Blvd seawall (photographs shown in Figure 2)
- Winter 2009-2010: Large swell and resulting bluff erosion at Pacific Manor
- January 21, 2016: Large swell (photographs in Figure 3)
- Others identified and documented by City staff (for example see account for January 2, 2006 in Figure 4)



Pacifica LCP 170663

SOURCE: B. Battalio

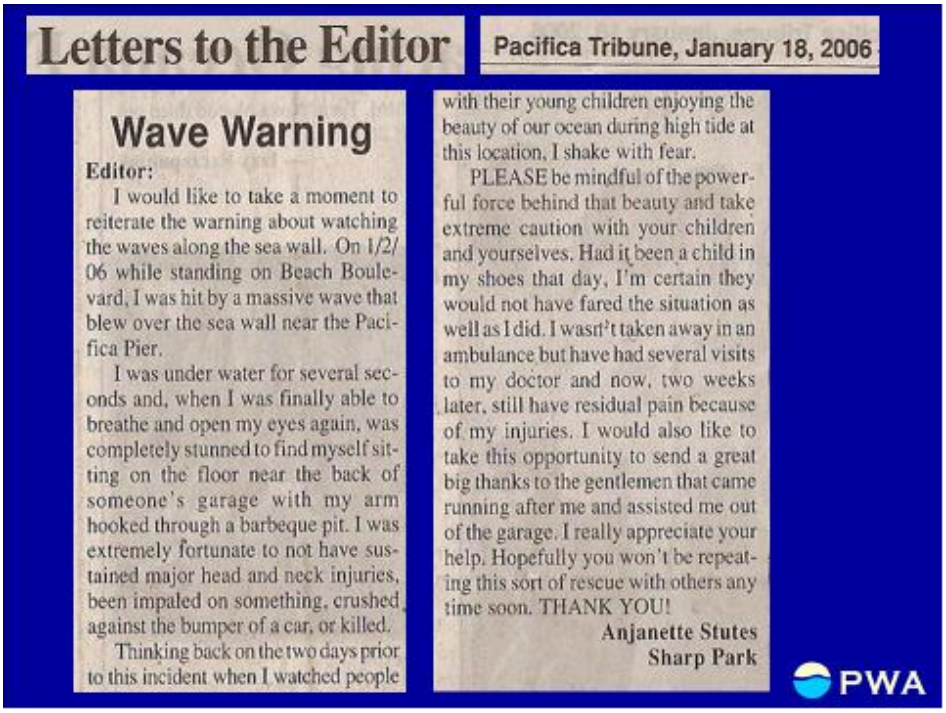
Figure 2
Observed flooding and erosion along Beach Blvd on January 11, 2001

[2] Return Period is an estimate of the time between individual events (e.g. precipitation or wave event) of a given severity.

Pacifica LCP 170663

SOURCE: B. Battalio

Figure 3
Observed flooding and erosion events at Pacifica on January 22, 2016



Letters to the Editor

Pacifica Tribune, January 18, 2006

Wave Warning

Editor:

I would like to take a moment to reiterate the warning about watching the waves along the sea wall. On 1/2/06 while standing on Beach Boulevard, I was hit by a massive wave that blew over the sea wall near the Pacifica Pier.

I was under water for several seconds and, when I was finally able to breathe and open my eyes again, was completely stunned to find myself sitting on the floor near the back of someone's garage with my arm hooked through a barbeque pit. I was extremely fortunate to not have sustained major head and neck injuries, been impaled on something, crushed against the bumper of a car, or killed.

Thinking back on the two days prior to this incident when I watched people with their young children enjoying the beauty of our ocean during high tide at this location, I shake with fear.

PLEASE be mindful of the powerful force behind that beauty and take extreme caution with your children and yourselves. Had it been a child in my shoes that day, I'm certain they would not have fared the situation as well as I did. I wasn't taken away in an ambulance but have had several visits to my doctor and now, two weeks later, still have residual pain because of my injuries. I would also like to take this opportunity to send a great big thanks to the gentlemen that came running after me and assisted me out of the garage. I really appreciate your help. Hopefully you won't be repeating this sort of rescue with others any time soon. THANK YOU!

Anjanette Stutes
Sharp Park

PWA

Pacifica LCP 170663

SOURCE: Pacifica Tribune

Figure 4
Reported wave overtopping at Pacifica on Jan 2, 2006

Sub-Area Descriptions

Each Pacifica sub-area (shown in Figure 1) is discussed below. Existing conditions maps were created for each sub-area (Appendix A). Each map shows stormwater and wastewater infrastructure, coastal armoring structures, existing FEMA flood hazard zones, and the latest available (2016) mean higher high tide shoreline. ESA reviewed current FEMA maps (shown in Appendix A) to assess existing flooding risk in Pacifica. FEMA flood hazard maps, which are used for the National Flood Insurance Program, present coastal and fluvial flood hazards. FEMA recently released updated coastal flood hazard maps for San Mateo County (effective 8/2/2017) according to the 2005 Pacific Coast Guidelines (FEMA 2005a). The latest FEMA National Flood Hazard Layer is hosted online via an ArcGIS webmap[3]. In the following sub-area descriptions, we will refer to existing coastal hazards using the following FEMA terms:

- BFE – Base Flood Elevation, the elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year.
- VE zone – The flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves.

In this report, elevations of FEMA flood zones and the Pacifica are referenced to the North American Vertical Datum of 1988 (NAVD), the vertical control datum established for vertical control surveying in the USA. For reference, mean sea level in Pacifica is approximately 3.2 ft NAVD, mean high tide is approximately 5.3 ft NAVD. Conditions of the coastline are generally described in terms of the following areas: the beach (sand or gravel); the backshore (dunes or bluffs that rise behind the beach); the bluff top; and inland areas.

Fairmont West

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SOURCE: Adelman & Adelman 2013

Figure 5
Fairmont West Sub-area
CA Coastal Records Photos

The Fairmont West sub-area includes 0.6 miles of shoreline at the northern most portion of the City of Pacifica that includes open space west of and residential development east of Palmetto Ave and Westline drive (Figure 5, Appendix A-1). Land use includes residential (single and multi-family), parks, and open space. The most seaward

[3] http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=cbe088e7c8704464aa0fc34eb99e7f30

assets in this sub-area are the north end of Palmetto Avenue and Westline Drive which are beyond 300 feet from the current bluff edge, and the Dollaradio station (100 Palmetto Avenue). The shoreline is comprised of mixed sand and gravel that can give way to exposed rocky shores depending on the season. The backshore is mostly characterized with undeveloped tall coastal bluffs (140-180 feet). Bluff erosion has recently exposed concrete piles and cap seaward of the Dollaradio station. A rock revetment was constructed along the bluff toe in front of Dollaradio in 2010. As of December 19, 2017, the beach is relatively high in this sub-area and only the top of the revetment is exposed, but this is believed by ESA to be a temporary condition associated with the dynamic beach environment. Due to the tall bluff, assets in this sub-area are not currently at risk to coastal flooding but are projected to be exposed to coastal erosion. FEMA coastal base flood elevations (BFEs) in this sub-area range from 27 to 28 feet NAVD, which is well below (lower) than the bluff tops.

South of Mussel Rock in Pacifica, the coastal bluff top near the north end of Palmetto Avenue supports one of the two largest remaining old climbing dune scrub habitats stands in Pacifica, including the only one with both persistent active blowouts and coastal scrub vegetation. The bluffs here also support landslide scarps with active groundwater seeps and slope wetlands. The wetlands include a hanging scarp wall with a seasonal to perennial groundwater-fed surface flows (waterfall to seep face), and consolidated willow-dominated riparian thickets (Arroyo willow, *Salix lasiolepis*; California waxmyrtle, *Myrica californica*; twinberry, *Ledebouria involucrata*; bee-plant, *Scrophularia californica*) and peripheral slope marsh patches (slough sedge, *Carex obnupta*; rushes, *Juncus lescurii, J. effusus*; Indian thistle, *Cirsium brevistylum*; stinging nettle, *Urtica dioica*). The dune scrub stands include blowouts bordered by early-succession dune forbs and grassland including Pacific wildrye and creeping wildrye populations (*Elymus pacificus, E. triticoides*), maritime brome (*Bromus carinatus*), beach evening-primrose (*Camisoniopsis cheiranthifolia*), beach strawberry (*Fragaria chiloensis*), dune bluegrass (*Poa douglasii*), varied lupine (*Lupinus variicolor*), as well as stable dune scrub elements (coyote-brush, *Baccharis pilularis*; dune knotweed, *Polygonum paronychia*), and deerweed (*Lotus scoparius*).

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SOURCE: J. Jackson, 20 Dec 2017

Figure 6
Dollaradio Station with rock at toe and Piles at top of bluff (Left)
Drainage pipes and terrestrial erosion of bluff south of Dollar Radio (Right)

West Edgemar and Pacific Manor

Pacifica LCP 170663

SOURCE: Adelman & Adelman 2013

Figure 7
West Edgemar and Pacific Manor Sub-area
CA Coastal Records Photos

This West Edgemar and Pacific Manor sub-area includes all land west of Highway 1, south of Dollaradio Station to and including the San Francisco RV Resort (Figure 7, Appendix A-2). Land uses include single and multi-family residential, commercial (including Manor Plaza), auto services, office, vacant, and other public or community uses. The sub-area includes 0.8 miles of coastline that consists of rip rap and a few short (100-400

feet) stretches of sandy beach. The backshore is characterized by tall bluffs (60-120 feet) with development on or near the edge of bluff. Approximately 80 percent of the backshore is currently armored in this sub-area, which highlights the erosion hazards posed to bluff top property and infrastructure. For example, the bluffs fronting the OceanAire Apartments (formerly called "Lands End Apartments"; 100 and 101 Esplanade Avenue) have eroded up to 90 feet in the last decade, prompting the construction of a concrete seawall at the bluff toe and re-sculpting and restoration of the bluff face and access path. This seawall has since failed (Figure 8). Erosion continues beyond the structure at both ends, and the area is currently under construction with large rocks placed on the beach.

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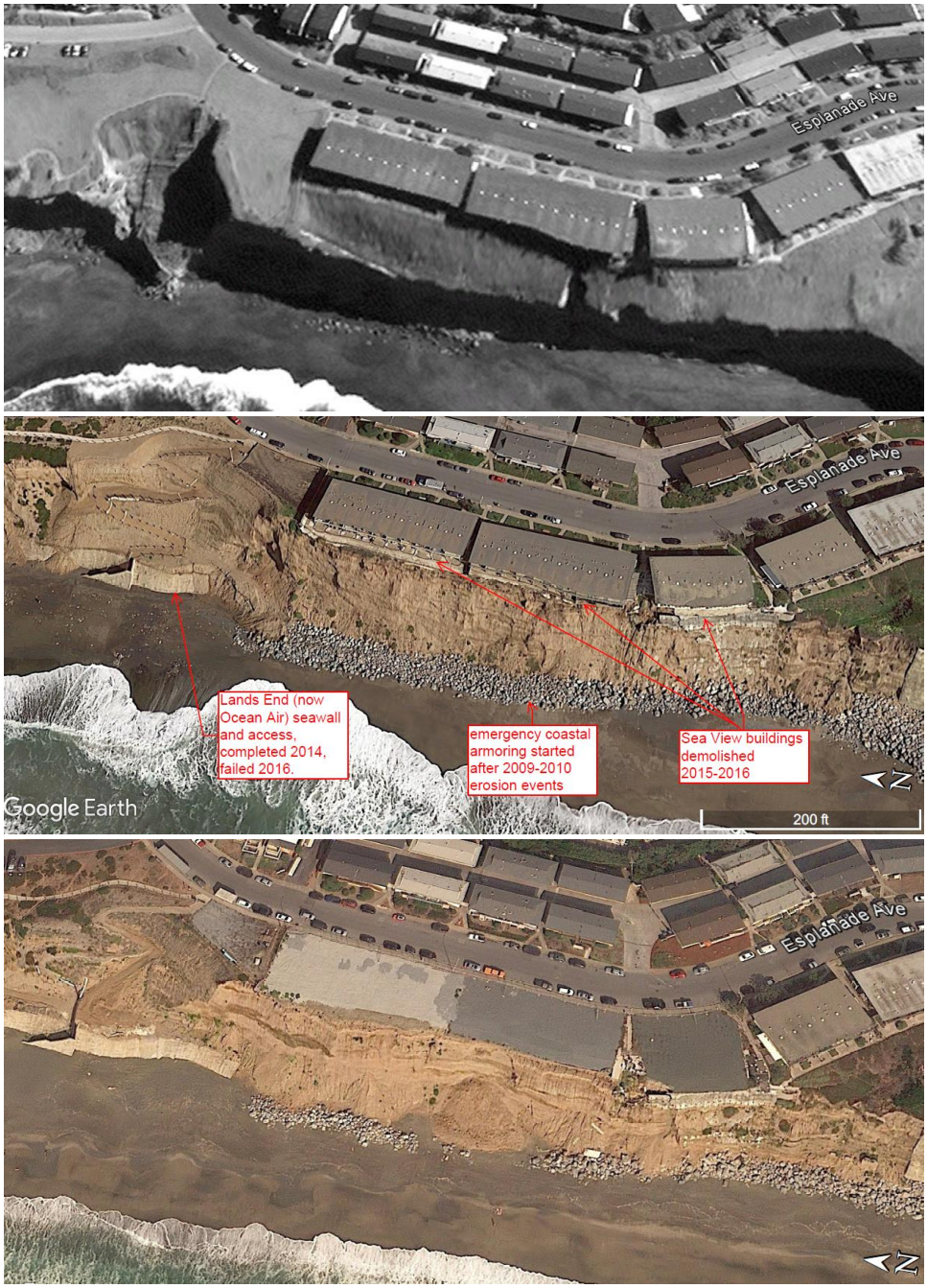
SOURCE: J Jackson, Dec 20, 2017

Figure 8

Failed seawall, showing partial collapse (right) and outflanking (left)

Immediately south, erosion of the bluff face has led to the removal of three multi-unit apartment buildings on Esplanade Avenue since 2015 (310, 320, 330 Esplanade Avenue) despite the presence of a rock revetment at the bluff toe. Existing coastal structures were upgraded since 2015 and expanded in the last to cover the entire bluff face at The Bluffs apartments (380 Esplanade Avenue). Erosion in northern Pacifica 2009-2016 led to a substantial expansion of coastal armoring as well as demolition of three apartment buildings and loss of public access to the beach. Figure 9 compares the progression and impacts of erosion along Esplanade Avenue in three aerial photographs taken in 2009, 2014, and 2016.



Pacifica LCP 170663

SOURCE: Google Earth

Figure 9
Erosion of bluffs in Pacifica at Sea View buildings
February 2009 (top), February 2014 (middle), November 2016 (bottom)

Just south of The Bluffs, undeveloped land along the 400 block of Esplanade Avenue atop Manor beach provides a buffer to Esplanade Avenue and sewer facilities. In 2010, an armored earth ramp connecting Esplanade Avenue to Manor beach was built to provide beach access for construction equipment.

Further south and during the 1998 El Nino storms, erosion undermined many of the single family residences along the western side of the 500 block of Esplanade Avenue, and all but two were demolished (528 and 532 Esplanade Avenue). A rock revetment was constructed under an emergency permit, and the City converted the property to open space with and bluff top trail. Erosion of the bluff has continued, and is now encroaching on the bluff-top trail (Figure 10). The last two remaining homes along the western side of the 500 block of Esplanade Avenue were acquired by the City of Pacifica and were recently demolished. The City of Pacifica is placing rock to armor the base of the bluff from erosion.

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SOURCE: B. Battalio, Dec 20, 2017

Figure 10
Bluff top trail at Esplanade Ave at risk of erosion (photograph Dec 20 2017)

The San Francisco RV Resort (700 Palmetto Avenue) armored their property with a rock revetment in 2016/2017, under an emergency permit. Bluff erosion caused the closure of the San Francisco RV Resort public access trail, which traverses the property at the bluff top. FEMA coastal BFEs in this sub-area are 24 to 28 feet NAVD, compared to bluff edges of 70 to 120 feet.

Pacifica LCP 170663

SOURCE: San Mateo County 2017

Figure 11

Bluff toe armoring and erosion at Esplanade blufftop apartments (top)
Bluff toe and face armoring at The Bluffs apartments (bottom)

A small climbing dune remnant occurs on the undeveloped blufftop parcel along Esplanade Avenue north of Manor Ave. This remnant has a distinct early succession coastal bluff scrub phase, including the only remaining natural population of silvery beach pea (*Lathyrus littoralis*) on the San Francisco peninsula, and one of the largest natural (not planted) populations of beach wildrye (*Elymus mollis*). These occur mixed with a population of Chamisso lupine (*Lupinus chamissonis*), yellow sand-verbena (*Abronia latifolia*), beach strawberry (*Fragaria chiloensis*), beach-bur (*Ambrosia chamissonis*) and iceplant (*Carpobrotus edulis x chilensis*).

Beach and dune habitats are largely absent south of Manor Ave. due to robust armoring of the bluff toe from Manor Ave. to just south of Avalon Ave. The top of the bluff is dominated by a monoculture of non-native iceplant; relict patches of native dune and scrub plants may be present in areas not covered in iceplant. South of Avalon Ave. seaward of an RV park, the bluff toe is unarmored except for the southernmost portion of the segment.

Northwest Sharp Park

Pacifica LCP 170663

SOURCE: Adelman & Adelman 2013

Figure 12
Northwest Sharp Park Sub-area
CA Coastal Records Photos

The Northwest Sharp Park sub-area includes land west of Highway 1 and between the SF RV Resort and Bella Vista Ave (Figure 12, Appendix A-3). Land uses include residential, industrial, commercial, school, mobile homes, office, auto services and mixed use. This sub-area is the northern portion of the West Sharp Park sub-area defined in the draft LCP. For this study, the West Sharp Park sub-area from the LCP was divided along the parcel boundaries between Shoreview Avenue and Paloma Avenue for two reasons. First, the backshore armoring infrastructure changes at this location from private to public. North of the divide, private homes are armored by rock revetments and gunnite covering the bluff face. South of the divide, a public walkway and Beach Boulevard runs along the bluff top which is protected by a seawall and fronting rock revetment. Secondly, flooding at the Sharp Park Golf Course (SPGC) affects residences surrounding the course. ESA and the City recognize this direct linkage and that any shoreline management strategies taken for SPGC will have implications for the neighborhood north of and adjacent to the golf course. Thus, the southern portion of West Sharp Park sub-area was combined with the Sharp Park sub-area in order to more clearly discuss existing conditions, evaluate vulnerability and develop adaptation strategies that account for this flooding linkage. The Sharp Park sub-area is discussed in the following section.

Northwest Sharp Park sub-area includes approximately 2,800 feet of shoreline from the south end of the San Francisco RV Resort to the north end of the Beach Boulevard seawall. The shoreline is almost entirely covered with rock or rubble; the beach is currently very narrow at the north end and disappears in front of the armored homes along Shoreview Avenue. Bluff top land use includes industrial, commercial, and residential uses. One of the residential uses includes The Cottages at Seaside (previously known as the Pacific Skies Estates mobile home park). The backshore is about 90 percent armored in this sub-area, owing to gaps in rubble along the northern bluffs. A damaged stormwater outfall is located at the north end of this sub-area (Figure 13). Along these areas of industrial use, scattered rubble and landfill material resulting from erosion of the bluff is present along the bluff toe. A rock revetment was built since 2010 along the private property situated in Industrial North Palmetto. The coastal armor at The Cottages at Seaside consists of rock, concrete piles and gunnite. Various rock revetments and gunnite cover the bluff along the Shoreview Avenue residences. New rock was observed on December 19, 2017 in and around the bluff notch at the south end of Shoreview Avenue. The new rock was placed in front of homes and the City stormwater outfall. The FEMA BFE in this sub-area is 32 feet NAVD, compared to bluff elevations of 34 to 68 feet NAVD.

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SOURCE: J. Jackson 20 Dec 2017

Figure 13
Damaged stormwater outfall in foreground, landfill and eroded rubble on narrow beach beyond

The bluffs in this sub-area between the RV park and 5th Ave. are partially armored and actively eroding elsewhere. There is a narrow beach in this area that provides limited habitat for beach invertebrates such as crabs, as well as foraging and roosting habitat for gulls and shorebirds. From 5th to the Shoreview neighborhood, a

robust rip-rap revetment (similar to that of the southernmost Manor segment) armors the bluff toe, with little to no beach seaward of the revetment.

Sharp Park, West Fairway Park and Mori Point

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SOURCE: Adelman & Adelman 2013

Figure 14
Sharp Park, West Fairway Park and Mori Point Sub-area
CA Coastal Records Photos

Pacifica LCP 170663

SOURCE: Adelman & Adelman 2013

Figure 15
Sharp Park, West Fairway Park and Mori Point Sub-area, continued
CA Coastal Records Photos

The Sharp Park, West Fairway Park and Mori Point sub-area (Figure 14 and Figure 15, Appendix A-4) includes land west of Highway 1 and contains the Palmetto Ave business district, Beach Boulevard Promenade, Fishing Pier, multiple City-owned parcels and landmarks, the Sharp Park Golf Course, West Sharp Park and West Fairway Park neighborhoods and Mori Point. Land use is diverse in this sub-area and includes residential, commercial, auto services, office, mixed use, industrial, church, public and community uses, parks, some vacant/undeveloped parcels and beach.

The draft LCP defined the "Sharp Park Golf Course, West Fairway Park and Mori Point" sub-area containing the named areas with the northern boundary along Clarendon Rd and Lakeside Ave, while the draft LCP sub-area "West Sharp Park" continues north and contains the business district and neighborhoods that can be affected by flooding at Sharp Park Golf Course (SPGC). In order to represent the flooding connectivity of the lower Sharp Park neighborhood with the SPGC, the "West Sharp Park" sub-area was split in two (as described for Northwest Sharp Park above). The southern portion of the "West Sharp Park" sub-area was added to the "Sharp Park Golf Course, West Fairway Park and Mori Point" sub-area to create a hybrid sub-area for this study so that any adaptation alternatives that address hazards along the SPGC would also be assessed for the effects the alternatives may have on the community north of the SPGC.

The shoreline in this sub-area is comprised of rip rap at the north end along the Beach Boulevard seawall, coarse grained sand from the pier to Mori Point, and exposed wave-cut platforms in bedrock around Mori Point. At the north end of this sub-area, the backshore consists of the Beach Boulevard seawall and fronting rock revetment that extend south of the Pacifica Pier and terminates north of Clarendon Avenue. The seawall elevation ranges from 25 to 31 feet NAVD north of the pier and 22 to 24 feet NAVD south of the pier. The seawall protects the pedestrian walkway, road and residential properties from its northern terminus to Montecito Avenue. South of Montecito Avenue there is open space and parking between the seawall/walkway and development that includes City owned and private parcels. The beach is mostly absent along northern Beach Boulevard (north of the pier), and emerges south of the Pacifica Fishing Pier and widens with distance south. This broader beach provides relatively larger areas of habitat for invertebrates, shorebirds, and gulls. Multiple stormwater outfalls exist south of the pier. Current coastal hazards along the Beach Boulevard seawall include erosion, wave run-up and overtopping (as seen in Figure 2 and Figure 3 and reported in Figure 4). While the updated FEMA maps depict limited wave overtopping of the seawall, overtopping has been observed to reach as far as the residences landward of Beach Boulevard. A portion of the seawall north of the pier was recently repaired after storm damage in 2016. Beyond the south end of the seawall, the City currently manages a sand berm to limit wave run-up and overtopping at the end of Clarendon Ave. The City also has a portable pump station deployed along Clarendon Rd to pump stormwater from swales out Clarendon Road and over the beach berm to the ocean (Figure 16).

Pacifica LCP 170663

SOURCE: B. Battalio

Figure 16
Portable stormwater pump station at Clarendon Road and Lakeside Avenue (1/9/2018)

South of Clarendon, the backshore consists of an earthen berm levee that spans south to the headlands of Mori Point (Figure 14 and Figure 15). The levee was built in the 1980s to protect the Sharp Park Golf Course. The fronting beach is approximately 200 feet wide with sparse vegetation along the back of beach. Approximately 1,150 feet of the northern portion of the levee are covered with rock, while the southern approximately 250 feet are armored by a revetment where the drainage outfall is located. The levee elevation ranges from 28 to 31 feet NAVD and is managed the City of San Francisco. The CA Coastal Commission recently approved Coastal Development Permit 2-17-0702 that authorized these after the fact amendments to the berm levee and authorizes armoring of the remainder of the berm. Behind the levee sits Sharp Park Golf Course and Laguna Salada, which drains a 1,200-acre watershed. A pump station is used to manage the water level in Laguna Salada. The pumping

is restricted to maintain minimum water levels in order to protect habitat in Laguna Salada. Flooding of the golf course and adjacent public and private property can result during rain events (ESA PWA et al 2011).

At Laguna Salada (Sharp Park Golf Course), the marine terrace slopes below sea level, creating a broad coastal lowland and valley gradient associated with Sanchez Creek. This is the location of a historic barrier beach and backbarrier lagoon wetland complex (Laguna Salada), formed by impoundment of freshwater runoff from the local watershed, and intermittent marine overwash, establishing a fresh-brackish non-tidal wetland gradient (ESA-PWA 2010). Laguna Salada is the only one of the three historic lagoon ecosystems of the San Francisco Peninsula (Lake Merced, Laguna Salada, and the former San Pedro Valley lagoon) that retains both extensive native wetland plant communities and hydrologic connections to the Pacific Ocean through its barrier beach.

The beach fronting the SPGC berm (Salada Beach) is a currently steep, coarse-grained, reflective beach that lacks the wide, dissipative medium-fine grained low tide terrace characteristic of Ocean Beach. The relative lack of intertidal space and foraging time restricts its habitat value for migratory shorebirds. The prevalence of coarse sand at the beach surface strongly restricts onshore wind-transport of sand today, and there is no significant foredune or sand shadow deposition along the beach crest or berm. A narrow fringe of mixed native foredune vegetation (mostly beach-bur) and non-native beach and upland weeds (sea-rocket, iceplant) occupies the toe of the erosional earthen berm in remaining exposed segments where rock armor has not been placed. Gulls and ravens are the most frequent birds on the beach, but Caspian terns that forage on fish in the lagoon also occasionally roost on Salada Beach. Marbled godwits, willets are also present on Salada Beach, but in relatively small numbers compared with flatter, wider finer-grained Linda Mar and Ocean Beach-Daly City sandy foreshores.

The modern Laguna Salada is an artificially drained managed pond (water surface elevations normally drawn down to near or below +7.0 ft NAVD due to pump discharge of beach-impounded freshwater inflows), with nearly most storm overwash excluded by an earthen berm constructed along the barrier beach crest. The lagoon wetlands are oligohaline (fresh-brackish, 2-4 parts per thousand salinity) despite flushing of freshwater inflows, due to residual sediment salinity, beach groundwater salt seepage, and evaporation. Most of the remaining unfilled portions of Laguna Salada's historic open water bed is managed (drained) to relatively stable, shallow water depth range that have allowed extensive encroachment of tule and cattail vegetation up to the depth of their flooding tolerance (approximately between 3 to 4 ft mean water depth).

Fresh-brackish emergent nontidal fringing marsh of the lagoon is mostly dominated by native tules (*Schoenoplectus californicus,* with local stands of *S. acutus*) and cattails (native *Typha latifolia*, European T. *angustifolia*), bordered by bulrush and rush (*Schoenoplectus pungens, Juncus lescurii*) and marsh silverweed (*Potentilla anserina*). The same dominant emergent marsh species that fringe the lagoon today were present during the agricultural phase of the lagoon's development, prior to golf course construction (ESA-PWA 2010). The seaward marsh edge grades into coastal scrub and iceplant-dominated vegetation; the landward marsh vegetation edge is routinely mown to the height of turgrass, with which it intergrades. No submerged aquatic vegetation has recently been detected at Laguna Salada, but it formerly supported submersed beds of wigeongrass (*Ruppia maritima*) and sago pondweed (*Stuckenia pectinata*) as recently as mid-20th century.

The mouth of Sanchez Creek discharges to Laguna Salada at the south end (Horse Stable Pond), through a dense willow riparian thicket (*Salix lasiolepis*). Local brackish marsh (pickleweed, *Sarcocornia pacifica*; saltgrass, *Distichlis spicata*; and fleshy jaumea , *Jaumea carnosa*) occurs along the seaward edge of an old sandy washover

fan a the central western shore of the lagoon, apparently influenced by seasonal beach groundwater seepage that also causes intermittent salt efflorescence and turfgrass dieback behind the berm (ESA-PWA 2010).

The eastern fringing marsh, Horse Stable Pond, and lower Sanchez Creek and riparian wetlands of Laguna Salada support a substantial breeding population of federally listed threatened California red-legged frog (*Rana draytonii*), as well as Sierra chorus/Pacific tree frog (*Pseudacris sierra*). The federally listed endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) inhabits the fringing marsh and adjacent upland and riparian habitats of Laguna Salada. The California red-legged frog and San Francisco Garter snake populations extend to a series of artificially constructed freshwater ponds (fringing freshwater marsh and submerged aquatic vegetation) bordering Laguna Salada at the toe of Mori Point slopes, on GGNRA lands. In addition to the California red-legged frog and San Francisco Garter Snake, Laguna Salada wetland complex supports other special-status species and species of conservation concern, including the northwestern pond turtle (*Clemmys marmorata*), San Francisco forktail damselfly (*Ischnura gemina*), salt marsh common yellowthroat (Geo*thlypus trichas*) and the dusky-footed woodrat (*Neotoma fuscipes*).

The landward end of the Laguna Salada wetland gradient (the freshwater end of the fresh-brackish lagoon wetland gradient) is occupied by an earthen fill of golf course originally constructed in the drained lagoon margins in the 1930s, and still in use. The western end of the lagoon and barrier beach has reverted to wetland and sandy beach-dune habitats formed on washover fans that buried former sections of turfgrass. The remnants of the Salada Beach barrier beach (relict washover terrace and low dune mounds) occur behind the earthen berm with patchy boulder armor that serves as a public trail along the beach crest. The washover terrace supports a skeletal "forest" of mostly dead Monterey cypress (*Hesperocyparis macrocarpa)*, extensive, dominant iceplant (*Carpobrotus*) mats, and patches of dune grassland (*Elymus mollis*), saltgrass (*Distichlis spicata*), and small amounts of native coastal scrub.

There are currently no data on fish assemblages in Laguna Salada, but threespine stickleback have been observed stranded in the pump outfall pool on the beach. Caspian tern foraging over the remaining open water areas of the lagoon in summer indicates the presence of substantial small forage fish populations. Great egrets, snowy egrets, and great blue herons also forage along marsh edges of the lagoon.

Laguna Salada wetland complex supports the highest concentration of special-status wetland wildlife species on the San Francisco Peninsula coast. The barrier beach and lagoon ecosystem that supports them is inherently subject to coastal geomorphic and fluvial processes (overwash, barrier narrowing and landward transgression/rollover, lagoon fluvial flooding and breaching) associated with shoreline retreat.

Mori Point (GGNRA) is a relatively resistant high rocky headland south of Laguna Salada, capped with non-resistant sediments and weak sandstones. Mori Point coastal habitats include nearshore emergent rocks, rocky intertidal habitats, coastal bluff scrub, and coastal grassland habitats. Seasonal freshwater wetland ponds have been constructed on and eastern plateau to support local foraging habitat for endangered San Francisco Garter Snakes. The coastal bluff grassland at Mori Point supports the largest populations of Nuttall's milkvetch (*Astragalus nuttallii*) and California saltbush (*Atriplex californica*) on the San Francisco Peninsula. The dynamics of coastal bluff habitats of Mori Point are relatively less sensitive to shoreline retreat processes (compared with Fort Funston and north Pacifica bluffs) because of the relatively resistant bedrock geology at the toe of the bluffs. Localized erosion and slope failure at the north end of Mori Point's unconsolidated sandy headland, however,

appears to be related to the recurrent winter saturation and streamflow of the Laguna Salada pump outfall, which forms a backbeach channel that often deflects south against the bluff toe.

Rockaway Beach, Quarry and Headlands

Pacifica LCP 170663

SOURCE: Adelman & Adelman 2013

Figure 17
Rockaway Beach, Quarry and Headlands Sub-area
CA Coastal Records Photos

This sub-area includes the vacant quarry site, Rockaway Beach, and Rockaway Headlands (Figure 17, Appendix A-5). Land use includes hotels, mixed use, commercial, residential, office, public and community use, and beach.

There are a few city-owned parcels in Rockaway Beach as well as the Calera Creek open space and land which houses the Calera Creek Water Recycling Plant located at the northeast end of the quarry site. The creek drains to the north end of Rockaway Beach; the 100-year floodplain is contained within the existing riparian corridor. South of the creek mouth, the backshore is armored with rock revetment and ranges from 20 to 22 feet NAVD with hotels and a restaurant situated 40 to 80 feet from the revetment. Of the 1,800 feet of shoreline at Rockaway Beach, 1,000 feet are backed by armoring structures that protect these commercial/hotel structures, parking, Rockaway Beach Avenue, promenade and pedestrian trail. South of the armored development, a small creek daylights from under the highway and flows onto the wider public beach which has parking and restrooms located at the landward side of the low terrace. There are two beach access points in this sub-area: one at the parking lot just south of Calera Creek mouth, and the other at Rockaway Beach.

Pacifica LCP 170663

SOURCE: J. Jackson 30 Nov 2017

Figure 18
Wave overtopping south at Sea Breeze Hotel parking lot (top) and at Rockaway Beach Ave and promenade (bottom)

The backshore of Rockaway Beach ranges from 21 to 24 feet NAVD and is exposed to coastal flooding via wave run-up and overtopping of the backshore (Figure 18). The FEMA VE-zone coastal BFEs along the backshore of Rockaway Beach are generally 24 feet NAVD at the north and south ends of the beach and 32 feet NAVD within the parking lot in front of the Sea Breeze motel (100 Rockaway Beach Avenue). The BFE is 49 feet NAVD

seaward of the revetment protecting Sea Breeze motel. It is not clear why this VE-zone steps down so dramatically landward of the rock revetment. The FEMA maps show overtopping of the backshore. In January of 2017, severe wave overtopping broke through the windows and damaged the building interior of Moonraker Restaurant (105 Rockaway Beach Avenue), shown bottom right photo of Figure 18 above. The Headlands (Figure 17), south of Rockaway Beach, is an undeveloped promontory that separates Rockaway Beach from Pacifica State Beach further south and is crossed by a scenic trail. Along these high bluffs, the FEMA BFEs are around 20 to 24 feet NAVD.

South of the Rockaway Quarry, Calera Creek forms a local freshwater marsh behind its narrow boulder-choked outlet to Rockaway Beach. The marsh is supplied with perennial freshwater discharges of treated wastewater. Red-sided garter snakes and San Francisco Garter snakes both occur along the marsh edge and adjacent uplands. The freshwater marsh is dominated by California tule (*Schoenoplectus californicus*), with chairmaker bulrush (*S. americanus*) and small-fruited bulrush (*Scirpus microcarpus*) and broadleaf cattail (*Typha latifolia*) abundant along the shallower edges. Horned pondweed (*Zannichellia palustris*) occurs locally in the bed of the creek. Mallard ducks frequently forage in the marsh, and the presence of ducklings some years suggests that breeding habitat is likely to recur.

Rockaway Beach is a steep, reflective, coarse-grained pocket beach between Mori Point and Rockaway Head. Like Salada Beach, it lacks a broad low tide terrace, but shorebird foraging habitat does occur, particularly in association with headland wave-sheltered extreme ends of the beach. The central portion of the beach in front of the parking lot is armored, and at high tide there is no beach exposed seaward of this revetment.

Rockaway Head is another relatively erosion-resistant headland like Mori Point, but its north-facing slope supports a well-preserved local ancient dune deposit with dune scrub remnants similar to those of Fort Funston and North Pacifica blufftop dunes. The mesa-like top of Rockaway Head also supports native species-rich coastal grassland remnants on sandstone, including an atypical and uncommon coastal bluff population of an annual paintbrush (*Castilleja densiflora*), and extensive Wight's paintbrush (*C. wightii*). Rockaway Head, like Mori Point, is similarly relatively resistant to erosional shoreline retreat compared with the soft sandy sediments of North Pacifica bluffs. The rocky intertidal zone of Rockaway Head supports intertidal and shallow subtidal surfgrass meadows (*Phyllospadix sp.*) at the extreme north end of Pacifica State Beach, similar to the meadows at the south end of the beach.

Pacifica State Beach

Pacifica LCP 170663

SOURCE: Adelman & Adelman 2013

Figure 19
Pacifica State Beach Sub-Area
CA Coastal Records Photos

This sub-area spans from the northeast end of Pacifica State Beach to the mouth of San Pedro Creek and includes land west of Highway 1 North (Figure 19, Appendix A-6). Land use is mostly beach, with public use at both parking lots and commercial use at the Taco Bell (5200 Coast Highway). The beach is currently 100 to 250 feet wide. The backshore is mostly comprised of low vegetated dunes habitat in the middle and north portions, while a low seawall fronts the northern pump station and parking lot at the southwest end of the sub-area. The backshore in this sub-area is approximately 15 percent armored.

FEMA coastal BFEs in this sub-area range from 17 feet NAVD at San Pedro Creek mouth to 20 feet NAVD at the north end of the beach. The beach, scenic trail, restaurant and north pump station are within the existing 100-year FEMA V-zone (high velocity zone). Current City management indicates that Pacifica State Beach is a valuable asset to the local community and visitors alike.

The condition of the southern beach shows what is possible when applying a managed retreat strategy for shoreline adaptation. A managed retreat project was implemented by the City of Pacifica in 2005[4]. The project removed built assets and fill that encroached onto the State Beach managed by the City of Pacifica. The project was funded primarily by the State of California from a variety of sources, and was coordinated by the San Pedro Creek enhancement project supported by the US Army Corps of Engineers.

Pacifica State Beach is a fringing pocket beach in the head of a shallow embayment formed between two headlands, Pedro Point and Rockaway Head. It was formerly a barrier beach enclosing a lagoon wetland complex and floodplain of San Pedro Valley, now filled and urbanized except along the channelized creek. Pacifica State Beach varies from medium-fine to coarse grained sand, forming a distinct berm profile with a relatively steep beachface. A cobble-boulder storm berm underlies the south end of the beach, exposed as a lag surface following storms, and locally in the intertidal erosional "delta" of the San Pedro Creek mouth. Natural boulder lag armor occupies the lower foreshore of the beach at the extreme south end, bordering the headland bluffs and rocky shore. An intertidal and shallow subtidal surfgrass meadow (*Phyllospadix sp*.) occupies the boulder lag foreshore, which is occasionally subject to partial burial by beach sand. Pacifica State Beach supports shorebird foraging and resting habitat. Western snowy plovers winter in the flat, back beach areas that experience low pedestrian use.

The mouth of San Pedro Creek Lagoon forms a small freshwater lagoon and marsh where artificial beach fill has been removed as part of a floodplain and creek restoration project by USACE[5]. The lagoon wetland complex is dominated by California tule (*Schoenoplectus californicus*) and broadleaf cattail (*Typha latifolia*), with shallower edges bordering the creek channel dominated by salt-intolerant species such as small-fruited sedge (*Scirpus microcarpus*) and water-parsley (*Oenanthe sarmentosa*). Fresh-brackish tolerant emergent marsh vegetation occupies the storm overwash zone on cobble and sand substrates, including salt rush (*Juncus lescurii*), bentgrass (*Agrostis stolonifera*) and wildryes (*Elymus triticoides, E. x vancouveriensis, E. mollis*). Salt spray-flagged willow (*Salix lasiolepis*) borders landward portions of the marsh.

No data on California red-legged frogs populations are currently available for the local lagoon, but they are present in a tributary drainage along San Pedro Road, and in the San Pedro Creek watershed upstream; they are presumed to be present in suitable habitats within the lagoon wetland complex. Tree frogs occupy the lagoon wetlands. Juvenile and adult red-sided garter snakes are present in at least upland habitats (gopher burrows) around the creek mouth and lagoon wetlands. Steelhead (federally listed threatened) are present in the stream channel mouth at least seasonally as migrants and kelts. Mallards and coots are frequently present in the shallow backbeach lagoon channel. Great egrets, snowy egrets, and great blue herons also forage along marsh edges of the lagoon and stream channel.

[4] Kershner, J. (2010). Restoration and Managed Retreat of Pacifica State Beach [Case study on a project of ESA PWA]. Product of EcoAdapt's State of Adaptation Program. Retrieved from CAKE: http://www.cakex.org/case-studies/restoration-and-managed-retreat-pacifi... (Last updated December 2010) http://www.cakex.org/case-studies/restoration-and-managed-retreat-pacifica-state-beach Last visited December 2016.

[5] USACE project information can be found here: http://www.spn.usace.army.mil/Missions/Projects-and-Programs/Projects-by-Category/Projects-for-Flood-Risk-Management/San-Pedro-Creek-Pacifica-Sec-205/

West Linda Mar

Pacifica LCP 170663

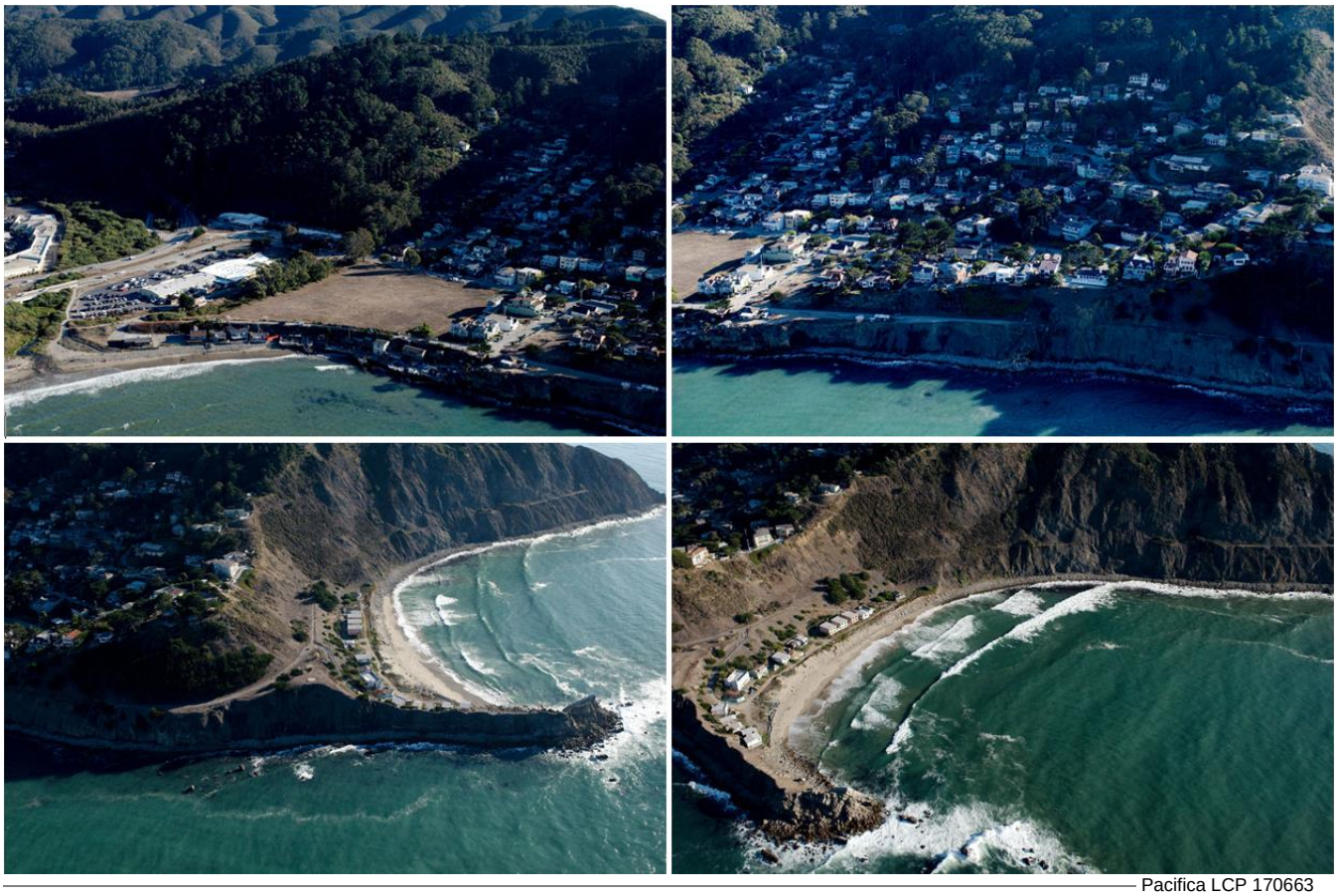
SOURCE: Adelman & Adelman 2013

Figure 20
West Linda Mar Sub-area
CA Coastal Records Photos

The West Linda Mar sub-area (Figure 20, Appendix A-7) is landward of Pacifica State Beach and reaches as far inland as the Linda Mar Blvd Fire Station and Oddstad City Park (1053 Crespi Drive). This study focuses primarily on the area west of Peralta Road as it is the most vulnerable to flooding. Land use in the area includes residential, commercial, industrial, public use, school, auto services, and hotel. The area includes the Pacifica Community Center and City-owned parcels, the Linda Mar Shopping Center and Crespi Center (580 Crespi Drive). The sub-area is not included within the coastal zone as defined in the City's LCP, but is included in this study because future conditions may further expose the neighborhood and commercial areas to flooding from both fluvial and coastal sources.

The sub-area does not currently experience direct coastal flooding, but it is low-lying and subject to local rainfall ponding as well as flooding from San Pedro Creek (Appendix A-7). The Linda Mar Shopping Center and auto services, Crespi Center, Pacifica Community Center (including the skate park and wet weather equalization basin (under construction)) and portions of the neighborhood are within the 100-year floodplain of San Pedro Creek. While not directly connected to the coastal flood source, high ocean water levels (extreme tides, storm surge or sea level rise) that occur during a rainfall event could increase flooding extents in the area. The low area was historically a lagoon subsequently filled for agriculture and then housing (ESA PWA, RSM, 2015).

Pedro Point and Shelter Cove



Pacifica LCP 170663

SOURCE: Adelman & Adelman 2013

Figure 21
Pedro Point and Shelter Cove Sub-area
CA Coastal Records Photos

The Pedro Point and Shelter Cove sub-area is the southernmost in Pacifica (Figure 21, Appendix A-8), is comprised of residential, mixed use and vacant lands, office, mixed use and commercial use (including Pedro Point Shopping Center), as well as parks (most of which are south of Pedro Point outside of Pacifica City limits). The shoreline in this sub-area stretches west from San Pedro Creek out around Pedro Point and includes Shelter Cove. The backshore is low adjacent to the creek with a few homes built seaward of the former Ocean Shore Railroad berm, two of which have boat ramps into the ocean. These homes are within the 100-year coastal flood zone and subject to wave run-up. Most of the homes have been fortified with timber sea walls. The coastal BFE in this area is 17 feet NAVD, while the beach home parcels are as low as 14 feet.

Behind the beach homes and berm are the Pedro Point shopping center and an undeveloped, privately owned site (315 San Pedro Avenue) which is as low as 14 feet NAVD. Rainfall runoff that enters the undeveloped site flows through an open ditch and discharges through a flap gate near the mouth of San Pedro Creek. West of the beach homes, the previous railway berm and road to Shelter Cove rises up the bluff to over 50 feet NAVD. A 500-foot section of the road failed in 1983, rendering Shelter Cove inaccessible by motor vehicles. Upslope of the road, homes are built into the steep hillside.

The Shelter Cove community consists of a cluster of houses on a single parcel. The homes are fronted by a narrow beach and low dunes. Most of the homes are within the VE-zone of the 100-year coastal floodplain. A wooden seawall is built in front of the northernmost homes. Due to restricted vehicular access and limited utilities, the City considers Shelter Cove an at-risk community. The FEMA coastal BFE is 26 feet NAVD in the hazard zone encompassing most homes along the cove.

2. DATA COLLECTION

This study seeks to maintain consistency with the San Mateo County SeaChange Study (SMC 2017) while also following the latest state guidance on SLR for coastal planning and applying methods needed to conduct the adaptation plan. SLR scenarios were selected that reflect the County study while adhering to updated state guidance on SLR. Existing hazard data mapping products were reviewed and specific hazard maps were chosen from each data source that best represent the selected SLR scenarios. ESA relied on many of the same data sources used in the County work and added a number of additional local asset datasets that were available.

2.1. Sea Level Rise

Detailed information on past and current state guidance on SLR are discussed in a memorandum prepared for the City titled "Future Conditions Scenarios for Pacifica LCP Update" (ESA 2017a). The planning horizons and sea level rise scenarios selected for this study are discussed below.

Planning Horizons

The planning horizons proposed for this project are 2050 and 2100, selected to be consistent with SLR policy guidance documents. The SeaChange study did not consider timeframes for impacts from SLR, but it is necessary to develop adaptation alternatives and to determine the economic implications of each. The 2050 and 2100 planning horizons are recommended so that decisions about land use can be matched to the timeframe for project lifespans and to facilitate the identification of triggers for adaptation measures. These planning horizons (years) determine the amounts of SLR that are applied to assess vulnerability to coastal flooding hazards and the timeframes over which coastal erosion hazards and consequent impacts are evaluated.

Future Projections for Sea-level Rise

Amounts of SLR were selected for the study planning horizons (2050 and 2100) following updated State guidance (CalNRA & OPC 2017). For any given year (planning horizon), State guidance recommends analyzing a range of SLR projections:

Because future projections of sea-level rise along California's coastline are uncertain (due to uncertainty associated with modeling and the trajectory of global emissions), it is critical to consider a range of projections to understand the consequences of various decisions, determine the tolerance for risk associated with those decisions, and to inform adaptation strategies necessary to prepare for change in the face of uncertainty.

In general, decision makers may have a higher tolerance for risk (or lower risk aversion) when considering projects with a shorter lifespan, minimal consequences, flexibility to adapt, or low economic burden as a result of sea-level rise. However, for longer lasting projects with less adaptive capacity and medium to high consequences should sea-level rise be underestimated, we suggest that decision makers take the more precautionary, more risk-averse approach of using the medium-high sea-level rise projections across the range of emissions scenarios. We further recommend incorporating the extreme scenario in planning and adaptation strategies for projects that could result in threats to public health and safety, natural resources and critical infrastructure.

A total of six SLR amounts were selected, including existing conditions (2018: no SLR), to perform the Vulnerability Assessment and subsequent adaptation plan. The SLR amounts are selected from the state-recommended projections:

- Low SLR projection – for low risk aversion projects (17% chance SLR projection is meet or exceeded), for example,
- Medium-High SLR projection – for high risk aversion projects (0.5% or 1 in 200 chance that SLR projection is meet or exceeded)
- Extreme SLR projection – for extreme risk aversion projects (probability n/a)

Values for 2100 were selected within the range of low and high emissions. Table 1 below presents the future SLR amounts based on the State-recommended projections. Background and additional information on SLR can be found in (ESA 2017).

Table 1
Proposed future Sea level rise (SLR) amounts for various scenarios with associated probability of occurrence (CalNRA & OPC 2017)

Year	Low (17% chance)	Med-High (0.5 % chance)	Extreme (n/a)*
2050	1 ft	2 ft	*2.7 ft*
2100	3 ft	6 ft	10 ft

* The 2050 Extreme SLR scenario was not examined and is only provided for consistency. SLR of 6 ft at 2075 shall be considered in place of 10 ft at 2100 to assess potential impacts under the Extreme scenario. This is required because of the lack of erosion and flooding data for 10 ft of SLR.

2.2. Coastal Flooding and Erosion

Consistent with the County study, existing and future coastal flooding was evaluated using the OCOF hazard mapping products, while future coastal erosion was evaluated using the Pacific Institute (PI) erosion maps. We will also utilize methods used in the Draft San Francisco Coastal Regional Sediment Management Plan (CRSMP) (ESA 2015) to enable the analysis of alternative adaptation options in the next task of this project. Table 2 presents the SLR amounts assumed for each hazard data source for comparison against the State-recommended values in the updated guidance document. Ranges shown for the data sources correspond to low and high SLR scenarios considered (PI and OCOF). Because this study is limited to the application of existing hazard data sources, SLR amounts assumed in these data sources do not exactly match the State-recommended SLR amounts, but are reasonably close given the uncertainty of SLR modeling and emissions scenarios.

Table 2
Comparison of SLR amounts assumed for guidance update and input data sources

Year	State-guidance SLR amount	PI erosion SLR amount	CRSMP erosion SLR amount	OCOF flood hazard SLR amount
2050	1 and 2 ft	1.4 and 1.5 ft	1.6 ft	0.8 and 1.6 ft
2100	3, 6 and 10* ft	3.3 and 4.6 ft	5 ft	3.3 and 5.7 ft

*We will analyze SLR of 6 ft at 2075 in place of 10 ft at 2100 to assess flooding impacts associated with this extreme SLR scenario. This is required because of the lack of erosion and flooding data for 10 ft of SLR.

The "PI erosion SLR amount" corresponds to SLR amounts assumed in the Pacific Institute study (PWA 2009). The "CRSMP erosion SLR amount" corresponds to the SLR amounts associated with the erosion hazard data that will be used to assess vulnerabilities for various adaptation alternatives. The "OCOF flood hazard SLR amount" corresponds to the amount of SLR assumed by OCOF data used to evaluate flooding impacts. Because the OCOF hazard data was developed for SLR increments of 25 cm, it is necessary to consider these slightly different SLR amounts in order to assess flooding impacts. In order to assess flooding impacts associated with the extreme SLR scenario of 10 feet at 2100, we apply the 6 feet OCOF flood hazards at 2075, which is when this SLR is reached under the extreme scenario.

Fluvial Flood Source

While CoSMoS flood mapping products do not include fluvial sources of flooding in Pacifica, it is important to consider these sources in the vulnerability assessment. Flooding from river sources is already a significant problem for two areas in Pacifica, as depicted in the existing FEMA flood hazard zones in Appendix A-4. San Pedro Creek is prone to flooding the Linda Mar neighborhood. Sanchez Creek drains into Laguna Salada, which can lead to flooding of the Sharp Park Golf Course and adjacent neighborhoods. Higher sea levels will exacerbate flooding in the lower portions of these creeks. Detailed hydraulic modeling to determine the effects of SLR on fluvial systems is outside the scope of work, so a simplified approach was taken to evaluate fluvial flooding potential for these two creeks. ESA reviewed available studies and FEMA maps to determine the baseline flooding potential for a 100-year event within each creek.

As mentioned in Section 1.3, current FEMA maps for Sanchez Creek were created before the levee was constructed and are out of date. A study by Kamman Hydrology & Engineering (KHE 2009) established the peak 100-year flooding elevation within Laguna Salada to be 15 feet NAVD which assumed an initial water surface elevation of 6.8 feet NAVD (this elevation must be maintained for habitat function). To determine future peak flood levels with SLR, ESA first determined the volume corresponding to the peak flood level reached. For future conditions, the initial water surface was lifted with SLR and the 100-year peak volume was redistributed in the basin to determine the future peak flood levels. These updated existing and simplified future fluvial flood elevations were mapped within the Laguna Salada basin and added to the storm flooding layers from OCOF. For San Pedro Creek, which drains through Linda Mar, a similar approach was used. ESA determined the volume associated with the FEMA mapped ponded flooding, increased the flood level by raising the minimum terrain elevation with SLR and redistributed the ponded volume to determine the future flood levels. In both creek systems, the coastal flooding source becomes dominant with SLR greater than 3.3 feet. Table 3 lists the flooding elevations determined and mapped for each creek system for both medium and high SLR projections. Flood levels did not change significantly with 2050 SLR in San Pedro Creek due to the basin's geometry.

Table 3
Flood elevations for 100-year fluvial flood source for two Pacifica systems

	Sanchez Creek (Sharp Park)		San Pedro Creek (Linda Mar)	
Year	**Med SLR**	**High SLR**	**Med SLR**	**High SLR**
Existing	15 ft	15 ft	14 ft	14 ft
2050	15.2 ft	15.5 ft	14 ft	14 ft
2100	16 ft	17.6 ft	14.1 ft	15.0 ft

2.3. Assets

Asset data was collected from a number of sources including the City of Pacifica, San Mateo County (SeaChange study), local utilities, Caltrans, CA Energy Commission, US Fish and Wildlife Service, SF Draft CRSMP and others. The City of Pacifica has assets in the following categories that are currently or may become vulnerable to flooding and erosion due to SLR.

Built Assets

- Residential buildings
- Hotels, Offices
- Commercial buildings
- Industrial facilities
- City-owned buildings
- Buildings with affordable rental units
- Schools and Churches
- Senior centers
- Mobile home parks
- Emergency shelter sites
- Fire stations
- Police station
- Communications towers
- Hazardous material sites
- Health care facilities
- Highway bridges
- Highways
- Levees and floodwalls
- Natural gas pipelines
- Shoreline protection devices
- Closed landfill
- Community Services
- Roads (local)
- Storm drains
- Stormwater pump stations Outfalls
- Transmission lines
- Underground chemical storage tanks
- Wastewater pump stations
- Wastewater treatment plant
- Water distribution pipelines

Natural Assets

- Beaches
- Streams
- Surfgrass habitat
- Steelhead habitat
- Red-legged frog habitat
- SF garter snake habitat*
- Wetlands
- Marine (whale migration)*
- Western Snowy Plover*

Access and Recreation

- Vertical access to shore
- Lateral access to shore
- Viewpoints*
- Bluff top or promenade*
- Fishing pier
- Parks
- Trails
- Surfing areas*
- Golf course
- Parking, restrooms and other recreational facilities*
- Beaches

*Asterisk indicates GIS data for assets were not obtained for the study.

Data were reviewed with City asset managers for completeness and accuracy at an asset inventory meeting on 11/28/2017. More details on asset data collection can be found in a memo to the City: *Revised Asset Inventory Memo for Pacifica LCP Update* (ESA 2018). Additionally, feedback received during the public comment period of the Draft Vulnerability Assessment (January 12, 2018 to March 14, 2018) is incorporated into this Final Vulnerability Assessment; comments and responses are provided in Appendix E.

Data Gaps

While a large amount of asset data has been collected for the City of Pacifica, there remains a number of data gaps that shall be noted.

AT&T communications – AT&T provided electronic maps of their communications network, but not the underlying GIS data So they are not included in the assessment. Comcast infrastructure is included.

Natural gas and electricity – PG&E does not share data on their infrastructure network and remains a data gap in this assessment.

Public Access and Recreation –ESA has obtained data for parks areas, the golf course, and the fishing pier. Other recreational uses exist in Pacifica, including surfing, hang gliding, dog walking, though spatial data do not exist for these uses and cannot be explicitly included in the assessment. Additionally, spatial data on public restrooms, parking, showers, and other recreational amenities in the City do not exist.

Natural assets – ESA collected information on shoreline habitats, wetlands, and streams from the County study (SMC 2017) and the National Wetlands Inventory managed by USFWS. Critical habitat was obtained from the USFWS ECOS database, and included steelhead habitat in San Pedro Creek and CA red legged frog habitat outside of the coastal zone. It is our understanding that CA red-legged frog habitat exists in the Sharp Park golf course, but this is missing from the database. Also missing from the ECOS database is CA garter snake habitat. Where geospatial data are not available for natural assets, vulnerabilities are discussed qualitatively.

3. VULNERABILITY ASSESSMENT

This vulnerability assessment tabulates the exposure of assets to the flooding and erosion hazard scenarios under all six sea level rise scenarios chosen in this study (Table 1), including existing sea level. Consistent with the San Mateo County Sea Change project, asset exposures are grouped according to the following categories:

- Land Use (residential, commercial, etc.)
- Ecosystem
- Recreation
- Transportation
- Community
- Emergency Response
- Communication
- Water Distribution
- Hazardous Materials
- Stormwater
- Wastewater
- Coastal Structures

This vulnerability assessment focuses on asset exposures to flooding and erosion hazards while consequences are briefly discussed. Economic consequences (costs and benefits) will be further explored for various adaptation strategies in the Adaptation Plan.

3.1. Hazard Exposure Methodology

The sections below report hazard exposures for four groups: long-term erosion, long-term tidal inundation, storm wave damages and storm flooding. Long-term erosion includes both shoreline and bluff erosion. Long-term inundation is based on the OCOF SLR hazard layers that depict areas that are inundated by regular high tides. Storm wave impacts are based on the OCOF maximum inland wave run-up points for a 100-year storm that were generated along the shore at regularly spaced transects (points were interpolated along the shore to create polygons and manually edited for anomalies around headlands as needed). Storm flooding is based on the OCOF SLR hazard flooding layers that include a 100-year coastal storm as well as potential flooding extents from the fluvial sources for San Pedro Creek and Sanchez Creek (discussed in Section 2.2). These four hazards represent decreasing severity:

- Areas subject to long-term erosion would be lost entirely (employs Pacific Institute erosion layers)

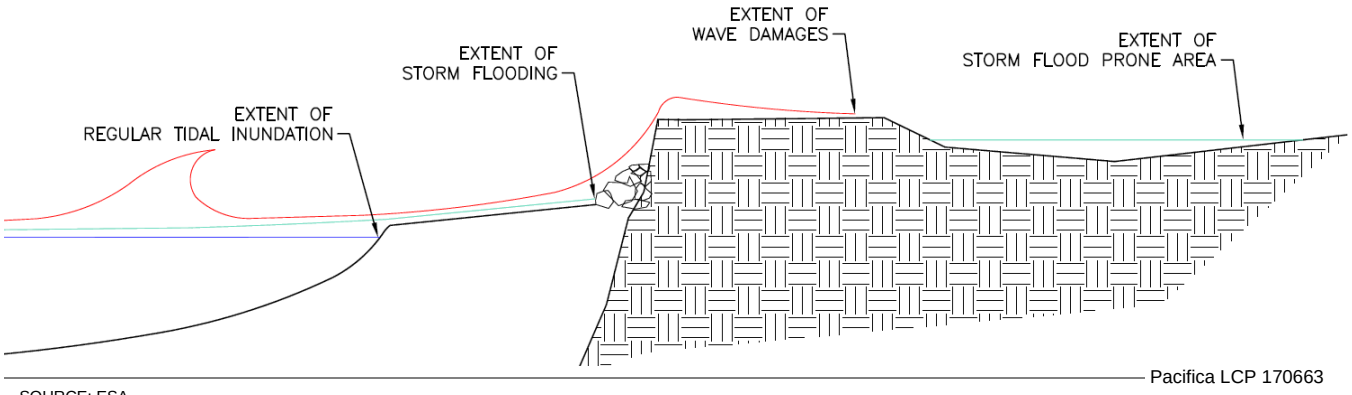
- Areas experiencing long-term tidal inundation would be regularly flooded by high tides. (employs CoSMoS inundation maps)

- Areas experiencing storm wave damages are likely damaged but could be recoverable. (employs CoSMoS wave run-up maps)

- Areas experiencing storm flooding are likely to return to service when floodwaters recede. (employs CoSMoS flooding maps)

Note that erosion impacts derived from the Pacific Institute do not account for existing coastal armoring structures, and are used to identify vulnerabilities under a worst case scenario. During the adaptation alternatives analysis of this work, vulnerabilities to erosion will be assessed using updated hazard maps that include cases with coastal armoring structures.

Coastal inundation and flooding hazards derived from the OCOF mapping products are shown in Figure 22. The figure depicts the various types of flooding hazards used in this study assuming existing conditions (future SLR would increase the elevation and extents of these hazards). The dark blue ocean level represents the regular high tide elevation, which simply raises with SLR. The teal ocean level represents areas that are flooded during a 100-year storm. SLR will increase the elevation and inland extents of coastal storm flooding, especially in areas with a low backshore (such as Sharp Park, Pacifica State Beach and Linda Mar). The red line represents the maximum wave run-up zone (similar to FEMA V-zones, discussed in Section 1.3) where water velocities are great enough to knock over people, move cars and damage buildings etc. Figure 22 shows an example of low lying areas near the coast that are prone to flooding from wave overtopping and fluvial sources (see Section 2.2). Depending on ground elevations and wave exposure, these low areas may become directly connected to the ocean during storms with SLR. Note that OCOF/CoSMoS modeling for this area does not incorporate the long-term erosion of shorelines and bluffs the same way that CoSMoS 3.0 does for southern California and thus the flood layers may underestimate flood exposure.



SOURCE: ESA

Figure 22
Schematic of OCOF Coastal Inundation and Storm Flooding Impacts

In addition to the tables summarizing the intersection of the hazard and asset layers, planners may also choose to review this study's hazard and asset layers using GIS software. Within the GIS environment, planners can select their area(s) of interest along the City's coastline, choose an appropriate viewing scale, and add other information, such as an aerial photograph as a basemap. The GIS files have been transmitted to the City and are also hosted by ESA on a webmapper[6] for the public to review and explore.

To assess the vulnerability of the City's assets, the assets in different categories were identified and intersected with each hazard layer. Point assets in each hazard zone are counted, linear assets (like roads and pipelines) are measured by feet, and planar assets (like ecosystem areas, land use types) are measured by acre. These results are reported in tables in the following sections.

[6] A link to the asset exposure webmapper is on the City's SLR webpage: http://www.cityofpacifica.org/depts/planning/sea_level_rise.asp

3.2. Regional and City-wide Asset Vulnerabilities

While asset exposures are tabulated per sub-area to facilitate more focused development of adaptation strategies and policies, some exposed assets in Pacifica serve more than one sub-area, as well as the region beyond Pacifica. These assets are summarized here from the individual sub-area vulnerabilities below.

Highway 1

Highway 1 is a critical transportation corridor for Pacifica and other coastal communities further south. Highway 1 is exposed to coastal flooding impacts with 5.7 feet (175 cm) of SLR in the two adjacent sub-areas of Pacifica State Beach and West Linda Mar (Appendix B-5). The highway is also exposed to coastal erosion impacts by 2100 in the West Edgemar and Pacific Manor sub-area and Northwest Sharp Park sub-area (Appendix B-2).

Pacifica sanitary sewer

Given the geography of Pacifica, impacts to certain elements of the sewer system would result in system failure upstream. Sewer pump stations are exposed to flooding and erosion in the Sharp Park, West Fairway Park, and Mori Point sub-area (Appendix B-3). A pump station is exposed to erosion in the Rockaway sub-area (Appendix B-4). Multiple pump stations are exposed to flooding and erosion in the Pacifica State Beach sub-area (Appendix B-5).

Beaches

Residents of Pacifica and beyond rely on the beaches for many recreational uses. Eroding beaches in Pacifica are vulnerable to sea-level rise especially if no action is taken, which will affect beach visitation and associated revenues at businesses and hotels. Beach vulnerabilities are greatest along the northern bluffs of Pacifica that are mostly armored. Pacifica beaches also serve as nesting and wintering habitat for federally listed Western Snowy Plover, and home to other species.

Sensitive species

A number of sensitive species live in Pacifica and can be vulnerable to sea-level rise and are summarized here. The **CA Red-Legged Frog** and **San Francisco Garter Snake** exist around Laguna Salada within the Sharp Park Golf Course (SPGC) and are potentially vulnerable. Laguna Salada has been largely cut off from the coastal flood source and managed into an artificially fresh water system. Sea level rise will lead to an increase in wave overtopping of the SPGC berm will introduce more saltwater into the system (as occurred historically) as will seepage of seawater through the beach. Existing inland/upland habitats are not vulnerable to sea-level rise. The **Western Snowy Plover** depends on beach habitat, where limited at northern bluffs, will diminish without nourishment in armored locations and habitat is expected to be lost without intervention. In other areas that are allowed to naturally migrate and respond to sea-level rise, such as Pacifica State Beach, snowy plover habitat is less vulnerable. **CA Steelhead** use San Pedro Creek, while sea-level rise may have an effect on flooding patterns of San Pedro Creek, access for salmonids is likely not vulnerable to sea-level rise in the near future. With higher amounts of sea-level rise, bed aggradation may occur and may possibly affect spawning habitat in the lowest reaches of the Creek, but a detailed assessment of this potential vulnerability is outside of the study scope.

3.3. Sub-area Asset Vulnerabilities

To be consistent with the organization of the City's draft LCP update, asset vulnerabilities are tallied and presented for each sub-area in Pacifica so that area-specific issues are clearly identified and suitable adaptation alternatives can be developed for each sub-area. Sub-areas are depicted in Figure 1 and described in Section 1.3. Coastal Hazards are depicted for each sub-area in Figure 23 through Figure 30 below. For reference, existing conditions for each sub-area are shown in Appendix A. The following Appendices contain maps showing each sub-area and with assets grouped in the following categories:

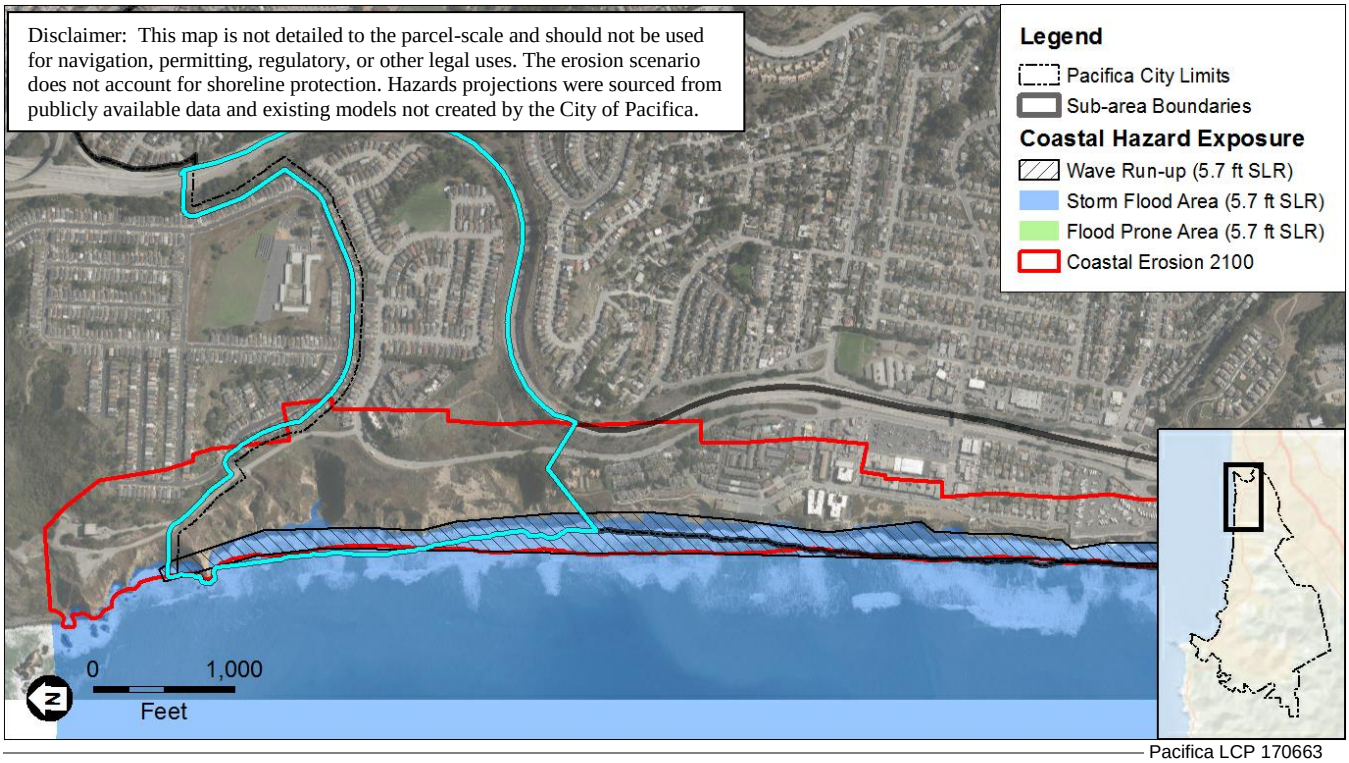
Appendix B – Hazard Mitigation Assets Exposure Maps. Includes coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials.

Appendix C – Community and Land Use Asset Exposure Maps. Includes existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets.

Appendix D – Public Access, Recreation and Ecology. Includes parks and trails, public access, habitats, sensitive species.

The multiple data sources for Figure 23 through Figure 30 below include San Mateo County Imagery (2017), Pacific Institute Erosion (2009) and OCOF Coastal Flooding (2014). The sub-area of focus in each figure is highlighted in light teal, compared to the black outlines of other adjacent sub-areas.

Fairmont West



SOURCE: Multiple

Figure 23
Fairmont West Sub-area – Coastal Hazards at 2100

Due to the high bluffs in the Fairmont West sub-area, few assets are exposed to flooding alone (sub-area shown in teal on Figure 23). Asset exposure to coastal erosion and flooding under existing conditions, and for Low Medium-High SLR projections at 2050 (i.e., 1 to 2 feet of projected future sea level rise) and 2100 (i.e., 3 to 6 feet of projected future sea level rise) are reported in Table 4. Asset exposures under Extreme SLR scenario can be estimated at 2075 using the exposures under Med-High SLR at 2100. Coastal flooding and erosion exposure to coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials are shown in Appendix B-1. Exposure to existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets are shown in Appendix C-1. Exposure to parks and trails, coastal access, habitats and sensitive species are shown in Appendix D-1.

Habitats, coastal armoring structures and parcels that extend onto the beach are exposed to coastal flooding under existing conditions. While coastal structures do not appear to be impacted by regular inundation with SLR, this hazard layer does not account for shoreline erosion which can lead to regular impacts to coastal structures. SLR may impact 6 to 10 parcels (open space) to coastal inundation and storm flooding, respectively. Beaches are exposed to flooding and erosion, but natural bluff erosion will help sustain a beach. Wetlands listed in Table 4 account for riverine habitats.

A total of 157 parcels are exposed to coastal erosion by 2100. Land uses include mostly undeveloped, parks, the Dollaradio station (a locally designated historic landmark), as well as single and multi-family residential. A total of 3020 feet of streets and 90 feet of Highway 1 are also exposed by 2100. Wastewater (1690 feet), water (1900 feet) and stormwater (2120 feet) pipelines are exposed by 2100. Both stormwater outfalls are exposed by 2050.

Asset exposures to coastal flooding under existing conditions, coastal erosion for 2050 and 2100, and coastal storm flooding and regular tidal inundation for a range of Medium to High SLR (shown as a range) at 2050 and 2100 are reported in the table below. For each asset, the total quantity within the sub-area (and percent of total within Pacifica) is provided for reference. Exposures are reported for the asset unit of measure and the percentage of that particular asset within the sub-area.

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Table 4
Fairmont West Asset Exposure for Existing and Future Sea-levels

Sub-area Asset Exposure Table Fairmont West				Existing Conditions (% of Sub-area)	2050 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*			2100 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*		
Category	**Asset**	**Units**	**Total in Sub-area (% of Pacifica)**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**
Coastal Structures	Armor Structures	feet	264.56 (1.6%)	188.238 (71.2%)	264.56 (100%)	-	188.24-188.24 (71.2% - 71.2%)	264.56 (100%)	-	188.24-188.24 (71.2% - 71.2%)
Coastal Structures	Levee	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Comcast Underground Conduit	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Towers Private	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Affordable Rentals	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Communities At Risk	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Healthcare Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Landmarks	count	1 (100%)	-	1 (100%)	-	-	1 (100%)	-	-
Community	Mobile Home Parks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Community	Senior Centers	count	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Beaches	acres	5.496 (9.4%)	5.397 (98.2%)	5.317 (96.7%)	1.40-1.65 (25.4% - 30.1%)	5.48-5.47 (99.7% - 99.5%)	5.317 (96.7%)	2.50-3.79 (45.5% - 68.9%)	5.49-5.48 (99.8% - 99.8%)
Ecosystem	CA Red Leg Frog Habitat	acres	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Steelhead Habitat	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Streams	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Surfgrass	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Wetlands	acres	1.323 (0.6%)	0.039 (3.0%)	0.931 (70.4%)	-	0.09-0.05 (7.1% - 4.0%)	1.182 (89.4%)	-	0.10-0.10 (7.6% - 7.3%)
Emergency Response	Fire	acres	0 (0.0%)	-	-	-	-	-	-	-
Emergency Response	Police	acres	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Cleanup Sites	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Solid Waste Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Underground Storage Tanks	count	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Auto Services	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Beach	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Commercial	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Hotels	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Industrial	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Mixed Use	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Mobile Homes	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Multi-Family	acres	9.034 (4.9%)	-	-	-	-	-	-	-
Land Use	Office	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Other Open Space	acres	15.963 (2.2%)	5.736 (35.9%)	-	3.20-3.41 (20.1% - 21.4%)	5.81-5.78 (36.4% - 36.2%)	-	3.98-4.85 (24.9% - 30.4%)	5.85-5.84 (36.7% - 36.6%)
Land Use	Other Public or Community Uses	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Parks & Accessible Open Space	acres	4.892 (0.2%)	-	-	-	-	-	-	-
Land Use	ROW	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Single Family Residential	acres	27.82 (1.6%)	0.107 (0.4%)	1.782 (6.4%)	-	0.09-0.09 (0.3% - 0.3%)	3.955 (14.2%)	-	0.09-0.13 (0.3% - 0.5%)
Land Use	Vacant/Undeveloped	acres	24.934 (2.3%)	4.345 (17.4%)	17.048 (68.4%)	0.90-1.03 (3.6% - 4.1%)	4.49-4.54 (18.0% - 18.2%)	21.751 (87.2%)	1.49-2.13 (6.0% - 8.5%)	4.44-4.64 (17.8% - 18.6%)
Lands	Pacifica City Limits	acres	113.895 (1.4%)	10.7 (9.4%)	32.285 (28.3%)	4.54-4.88 (4.0% - 4.3%)	10.90-10.93 (9.6% - 9.6%)	50.568 (44.4%)	5.93-7.47 (5.2% - 6.6%)	10.90-11.13 (9.6% - 9.8%)
Lands	Parcels	count	457 (3.5%)	9 (2.0%)	16 (3.5%)	6.00-6.00 (1.3% - 1.3%)	11.00-10.00 (2.4% - 2.2%)	157 (34.4%)	6.00-6.00 (1.3% - 1.3%)	11.00-11.00 (2.4% - 2.4%)
Lands	Parks Conservation	acres	24.878 (0.7%)	8.652 (34.8%)	17.064 (68.6%)	4.05-4.35 (16.3% - 17.5%)	8.75-8.75 (35.2% - 35.2%)	17.809 (71.6%)	5.24-6.50 (21.1% - 26.1%)	8.84-8.88 (35.5% - 35.7%)
Recreation	Access Lateral	feet	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Access Vertical	feet	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Fishing Pier	count	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Parks	acres	5.863 (0.2%)	-	-	-	-	-	-	-
Recreation	Trails	feet	109.477 (0.1%)	-	87.515 (79.9%)	-	-	109.477 (100%)	-	-
Stormwater	Pipes	feet	9480.924 (3.2%)	-	678.543 (7.2%)	-	-	2121.483 (22.4%)	-	-
Stormwater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Stormwater	Stormwater Outfalls	count	2 (1.8%)	-	2 (100%)	-	-	2 (100%)	-	-
Transportation	Bridge Local	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Bridge State	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Highway	feet	6010.539 (0.0%)	-	-	-	-	89.653 (1.5%)	-	-
Transportation	Streets City	feet	10525.866 (1.9%)	-	331.45 (3.1%)	-	-	3018.684 (28.7%)	-	-
Wastewater	Pipeline	feet	8460.077 (1.5%)	-	-	-	-	1689.686 (20.0%)	-	-
Wastewater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Water	NCCWD Pipelines	feet	11292.19 (1.6%)	-	-	-	-	1902.183 (16.8%)	-	-

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West Edgemar and Pacific Manor

SOURCE: Multiple

Figure 24
West Edgemar and Pacific Manor Sub-area – Coastal Hazards at 2100

Similar to Fairmont West, bluffs in the West Edgemar and Pacific Manor sub-area are high enough so that blufftop assets are not exposed to flooding, but are vulnerable to erosion in the future (sub-area shown in teal on Figure 24). Asset exposure to coastal erosion and flooding for existing conditions and Medium to High SLR at 2050 and 2100 are reported in Table 5. Asset exposures under Extreme SLR scenario can be estimated at 2075 using the exposures under Med-High SLR at 2100. Coastal flooding and erosion exposure to coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials are shown in Appendix B-2. Exposure to existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets are shown in Appendix C-2. Exposure to parks and trails, public access, habitats and sensitive species are shown in Appendix D-2.

Portions of parcels that extend beyond the bluff edge are exposed to flooding. Beaches are the main habitat that is exposed, 3.6 to 5.3 acres are exposed to inundation and storm flooding respectively. Most of the coastal armoring in this reach is exposed to storm flooding. Two stormwater outfalls are exposed to inundation while a third is exposed to storm flooding.

Asset exposures to coastal erosion are more prevalent. A total of 96 parcels may be affected by erosion in 2100. All parcels west of Esplanade Ave are exposed, including single and multi-family residential, and vacant lands. Erosion also threatens land west of Esplanade including single and multi-family residential, commercial and public use. The SF RV resort is also exposed. Approximately 1 mile of streets and 0.2 miles of Highway 1 are exposed by 2100. One health care facility is also exposed. Wastewater (1.4 miles of pipe), stormwater (0.6 miles

of pipe and 3 outfalls) and water (1.5 miles of pipe) are exposed to erosion by 2100. Recreational trails (0.9 miles) are also exposed by 2100.

Asset exposures to coastal flooding under existing conditions, coastal erosion for 2050 and 2100, and coastal storm flooding and regular tidal inundation for a range of Medium to High SLR (shown as a range) at 2050 and 2100 are reported in the table below. For each asset, the total quantity within the sub-area (and percent of total within Pacifica) is provided for reference. Exposures are reported for the asset unit of measure and the percentage of that particular asset within the sub-area.

Table 5
West Edgemar and Pacific Manor Asset Exposure for Existing and Future Sea-levels

Sub-area Asset Exposure Table West Edgemar, Pacific Manor				Existing Conditions (% of Sub-area)	2050 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*			2100 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*		
Category	**Asset**	**Units**	**Total in Sub-area (% of Pacifica)**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**
Coastal Structures	Armor Structures	feet	3857.539 (23.8%)	2411.07 (62.5%)	3857.539 (100%)	-	2125.01-2110.64 (55.1% - 54.7%)	3857.539 (100%)	54.57-507.51 (1.4% - 13.2%)	2197.83-2325.47 (57.0% - 60.3%)
Coastal Structures	Levee	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Comcast Underground Conduit	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Towers Private	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Affordable Rentals	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Communities At Risk	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Healthcare Facility	count	1 (50.0%)	-	-	-	-	-	-	-
Community	Landmarks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Mobile Home Parks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Community	Senior Centers	count	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Beaches	acres	5.384 (9.2%)	5.26 (97.7%)	5.384 (100%)	1.26-1.54 (23.4% - 28.7%)	5.30-5.28 (98.4% - 98.1%)	5.384 (100%)	2.36-3.68 (43.8% - 68.3%)	5.37-5.38 (99.7% - 99.9%)
Ecosystem	CA Red Leg Frog Habitat	acres	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Steelhead Habitat	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Streams	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Surfgrass	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Wetlands	acres	0.145 (0.1%)	0.02 (14.5%)	0.126 (87.3%)	-	0.02-0.02 (12.8% - 13.4%)	0.145 (100%)	-	0.02-0.02 (12.2% - 16.3%)
Emergency Response	Fire	acres	0 (0.0%)	-	-	-	-	-	-	-
Emergency Response	Police	acres	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Cleanup Sites	count	1 (12.5%)	-	-	-	-	-	-	-
Hazardous Waste	Solid Waste Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Underground Storage Tanks	count	1 (20.0%)	-	-	-	-	-	-	-
Land Use	Auto Services	acres	0.887 (18.5%)	-	-	-	-	0.183 (20.6%)	-	-
Land Use	Beach	acres	7.163 (15.7%)	6.766 (94.5%)	-	4.77-5.01 (66.6% - 69.9%)	6.77-6.73 (94.5% - 94.0%)	-	5.50-6.10 (76.8% - 85.1%)	6.79-6.88 (94.8% - 96.0%)
Land Use	Commercial	acres	17.535 (19.7%)	3.056 (17.4%)	-	2.08-2.15 (11.9% - 12.2%)	2.78-2.85 (15.9% - 16.3%)	-	2.30-2.49 (13.1% - 14.2%)	2.93-2.91 (16.7% - 16.6%)
Land Use	Hotels	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Industrial	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Mixed Use	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Mobile Homes	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Multi-Family	acres	26.418 (14.3%)	2.851 (10.8%)	-	0.53-0.64 (2.0% - 2.4%)	2.78-2.79 (10.5% - 10.6%)	-	0.87-1.23 (3.3% - 4.7%)	2.84-2.99 (10.7% - 11.3%)
Land Use	Office	acres	0.221 (5.1%)	-	-	-	-	-	-	-
Land Use	Other Open Space	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Other Public or Community Uses	acres	0.998 (1.3%)	-	-	-	-	0.715 (71.6%)	-	-
Land Use	Parks & Accessible Open Space	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	ROW	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Single Family Residential	acres	6.289 (0.4%)	0.021 (0.3%)	0.453 (7.2%)	-	0.01-0.02 (0.2% - 0.3%)	2.48 (39.4%)	-	0.01-0.03 (0.2% - 0.5%)
Land Use	Vacant/Undeveloped	acres	5.176 (0.5%)	0.499 (9.6%)	3.673 (71.0%)	-	0.49-0.46 (9.5% - 8.8%)	5.02 (97.0%)	0.00-0.04 (0.0% - 0.7%)	0.57-0.69 (11.0% - 13.3%)
Lands	Pacifica City Limits	acres	94.131 (1.2%)	15.69 (16.7%)	31.222 (33.2%)	8.33-8.84 (8.8% - 9.4%)	15.33-15.35 (16.3% - 16.3%)	61.146 (65.0%)	10.08-11.76 (10.7% - 12.5%)	15.63-15.99 (16.6% - 17.0%)
Lands	Parks Conservation	acres	10.571 (0.3%)	7.27 (68.8%)	9.57 (90.5%)	4.77-5.01 (45.1% - 47.4%)	7.26-7.20 (68.6% - 68.1%)	10.153 (96.0%)	5.50-6.14 (52.0% - 58.0%)	7.31-7.52 (69.2% - 71.2%)
Lands	Parcels	count	140 (1.1%)	36 (25.7%)	52 (37.1%)	7.00-7.00 (5.0% - 5.0%)	35.00-35.00 (25.0% - 25.0%)	96 (68.6%)	9.00-10.00 (6.4% - 7.1%)	35.00-37.00 (25.0% - 26.4%)
Recreation	Access Lateral	feet	998.07 (9.0%)	736.73 (73.8%)	998.07 (100%)	95.53-108.67 (9.6% - 10.9%)	659.21-625.13 (66.0% - 62.6%)	998.07 (100%)	115.24-144.55 (11.5% - 14.5%)	655.24-710.25 (65.7% - 71.2%)
Recreation	Access Vertical	feet	418 (16.5%)	12.47 (3.0%)	341.372 (81.7%)	-	23.18-4.26 (5.5% - 1.0%)	418 (100%)	-	13.99-27.78 (3.3% - 6.6%)
Recreation	Fishing Pier	count	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Parks	acres	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Trails	feet	4834.075 (2.6%)	-	3243.786 (67.1%)	-	-	4834.075 (100%)	-	-
Stormwater	Pipes	feet	9354.452 (3.2%)	218.73 (2.3%)	834.723 (8.9%)	121.25-127.83 (1.3% - 1.4%)	206.10-201.44 (2.2% - 2.2%)	2959.798 (31.6%)	161.49-181.97 (1.7% - 1.9%)	230.14-233.51 (2.5% - 2.5%)
Stormwater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Stormwater	Stormwater Outfalls	count	4 (3.7%)	3 (75.0%)	3 (75.0%)	2.00-2.00 (50.0% - 50.0%)	3.00-3.00 (75.0% - 75.0%)	3 (75.0%)	2.00-2.00 (50.0% - 50.0%)	3.00-3.00 (75.0% - 75.0%)
Transportation	Bridge Local	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Bridge State	count	2 (22.2%)	-	-	-	-	-	-	-
Transportation	Highway	feet	6953.771 (0.0%)	-	-	-	-	1250.61 (18.0%)	-	-
Transportation	Streets City	feet	11703.863 (2.1%)	-	1019.373 (8.7%)	-	-	5339.903 (45.6%)	-	-
Wastewater	Pipeline	feet	14226.711 (2.6%)	-	1824.392 (12.8%)	-	-	7265.406 (51.1%)	-	-
Wastewater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Water	NCCWD Pipelines	feet	13558.454 (1.9%)	-	1115.193 (8.2%)	-	-	7941.885 (58.6%)	-	-

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Northwest Sharp Park

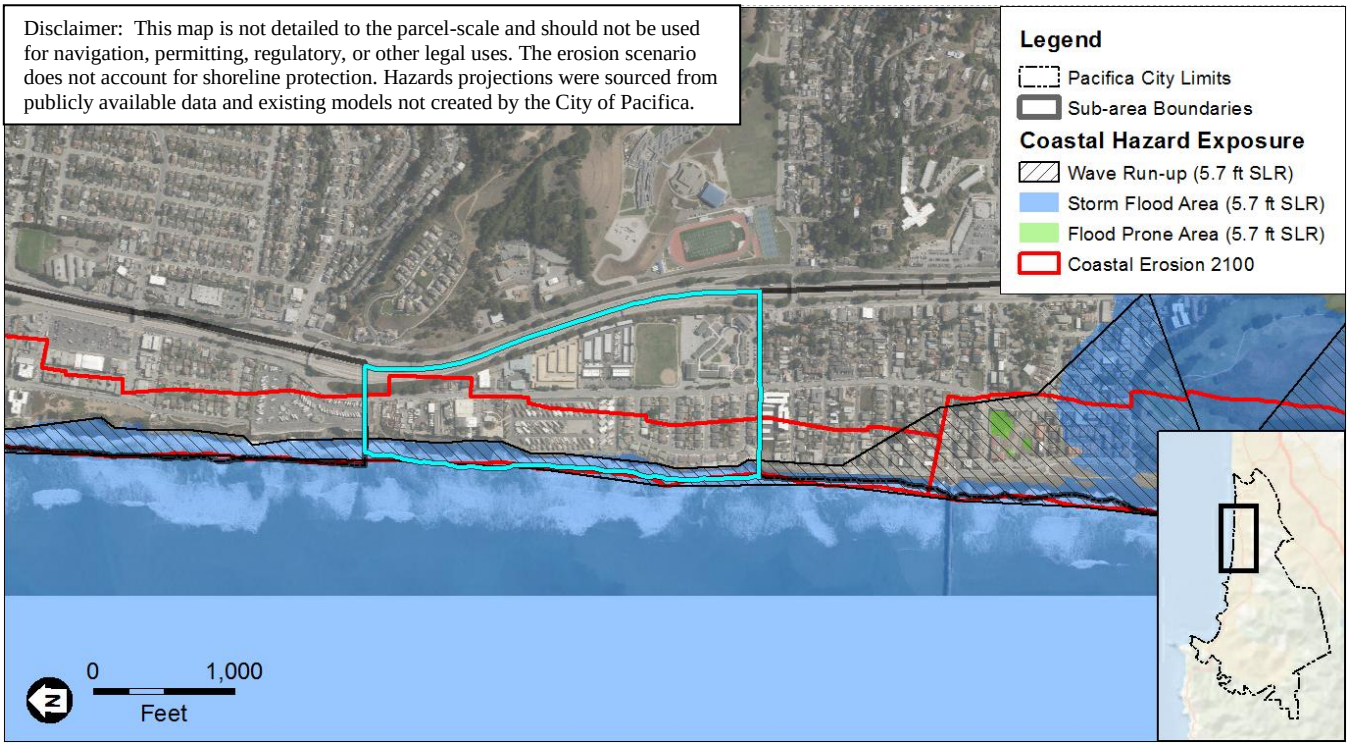

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Figure 25
Northwest Sharp Park Sub-area – Coastal Hazards at 2100

Lower bluffs in the Northwest Sharp Park sub-area lead to higher asset vulnerabilities from coastal flooding (sub-area shown in teal on Figure 25). Asset exposure to coastal erosion and flooding for existing conditions and Medium to High SLR at 2050 and 2100 are reported in Table 6. Asset exposures under Extreme SLR scenario can be estimated at 2075 using the exposures under Med-High SLR at 2100. Coastal flooding and erosion exposure to coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials are shown in Appendix B-2. Exposure to existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets are shown in Appendix C-2. Exposure to parks and trails, public access, habitats and sensitive species are shown in Appendix D-2.

Beaches (over 5 acres) and coastal armoring (0.2-0.4 miles) are exposed to inundation and flooding on the shore by 2100. Seaward portions of parcels are exposed to inundation (72) while 80 are exposed to wave damage and 79 are exposed to storm flooding by 2100. Local streets (0.1 mi) are also exposed to wave impacts. One stormwater outfall is exposed to coastal flooding by 2100.

A total of 125 parcels are exposed to coastal erosion by 2100. This includes industrial north Palmetto, with industrial, residential, office, commercial and auto services. The mobile home park and residential parcels along Shoreview Ave are exposed. Recreational trails (0.2 mi) and local streets (1 mi) are exposed to coastal erosion by 2100, while Highway 1 is barely exposed at 2100. Utilities are also exposed; 0.4 miles of communications conduit, 0.3 miles of stormwater pipes and 0.6 miles of wastewater pipes are exposed by 2100 as well as 2 stormwater outfalls and 0.7 miles of water pipes. All 0.6 miles of coastal armor are exposed by 2100.

Asset exposures to coastal flooding under existing conditions, coastal erosion for 2050 and 2100, and coastal storm flooding and regular tidal inundation for a range of Medium to High SLR (shown as a range) at 2050 and 2100 are reported in the table below. For each asset, the total quantity within the sub-area (and percent of total within Pacifica) is provided for reference. Exposures are reported for the asset unit of measure and the percentage of that particular asset within the sub-area.

Table 6
Northwest Sharp Park Asset Exposure for Existing and Future Sea-levels

Sub-area Asset Exposure Table Northwest Sharp Park				Existing Conditions (% of Sub-area)	2050 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*			2100 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*		
Category	**Assets**	**Units**	**Total in Sub-area (% of Pacifica)**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**
Coastal Structures	Armor Structures	feet	3601.654 (22.2%)	2238.838 (62.2%)	3601.654 (100%)	-	1853.75-1988.95 (51.5% - 55.2%)	3601.654 (100%)	-	2067.92-2273.42 (57.4% - 63.1%)
Coastal Structures	Levee	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Comcast Underground Conduit	feet	3007.378 (2.0%)	-	1013.721 (33.7%)	-	-	1895.112 (63.0%)	-	-
Communication	Towers Private	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Affordable Rentals	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Communities At Risk	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Healthcare Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Landmarks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Mobile Home Parks	count	1 (100%)	-	1 (100%)	-	-	1 (100%)	-	-
Community	Schools	acres	10.653 (4.5%)	-	-	-	-	-	-	-
Community	Senior Centers	count	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Beaches	acres	3.318 (5.7%)	3.304 (99.6%)	3.317 (100%)	0.77-0.99 (23.2% - 29.8%)	3.32-3.31 (100% - 99.8%)	3.317 (100%)	1.56-2.40 (47.1% - 72.2%)	3.32-3.32 (99.9% - 100%)
Ecosystem	CA Red Leg Frog Habitat	acres	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Steelhead Habitat	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Streams	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Surfgrass	feet	y	-	-	-	-	-	-	-
Ecosystem	Wetlands	acres	0 (0.0%)	-	-	-	-	-	-	-
Emergency Response	Fire	acres	0 (0.0%)	-	-	-	-	-	-	-
Emergency Response	Police	acres	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Cleanup Sites	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Solid Waste Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Underground Storage Tanks	count	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Auto Services	acres	0.114 (2.4%)	-	-	-	-	0.106 (93.2%)	-	-
Land Use	Beach	acres	1.887 (4.1%)	1.789 (94.8%)	-	0.92-1.02 (48.8% - 54.2%)	1.84-1.83 (97.6% - 96.8%)	-	1.29-1.55 (68.3% - 82.3%)	1.84-1.87 (97.4% - 99.0%)
Land Use	Commercial	acres	2.672 (3.0%)	0.326 (12.2%)	-	0.01-0.03 (0.4% - 1.2%)	0.28-0.29 (10.6% - 11.0%)	-	0.09-0.16 (3.3% - 6.1%)	0.27-0.29 (10.2% - 10.9%)
Land Use	Hotels	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Industrial	acres	11.9 (64.9%)	1.269 (10.7%)	-	0.12-0.16 (1.0% - 1.4%)	1.24-1.24 (10.4% - 10.4%)	-	0.30-0.59 (2.5% - 5.0%)	1.19-1.27 (10.0% - 10.6%)
Land Use	Mixed Use	acres	0.3 (8.5%)	-	-	-	-	-	-	-
Land Use	Mobile Homes	acres	8.842 (100%)	1.699 (19.2%)	-	0.62-0.76 (7.0% - 8.6%)	1.65-1.64 (18.6% - 18.5%)	-	1.00-1.28 (11.3% - 14.5%)	1.71-1.81 (19.3% - 20.4%)
Land Use	Multi-Family	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Office	acres	0.132 (3.0%)	-	-	-	-	-	-	-
Land Use	Other Open Space	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Other Public or Community Uses	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Parks & Accessible Open Space	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	ROW	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Schools	acres	10.653 (4.5%)	-	-	-	-	-	-	-
Land Use	Single Family Residential	acres	9.933 (0.6%)	0.746 (7.5%)	4.026 (40.5%)	-	0.66-0.66 (6.6% - 6.6%)	6.561 (66.1%)	0.03-0.14 (0.3% - 1.4%)	0.72-0.86 (7.3% - 8.6%)
Land Use	Vacant/Undeveloped	acres	1.259 (0.1%)	0.441 (35.0%)	0.849 (67.4%)	0.08-0.11 (6.5% - 9.1%)	0.40-0.41 (31.6% - 32.7%)	1.259 (100%)	0.18-0.24 (13.9% - 19.3%)	0.38-0.41 (30.4% - 32.3%)
Lands	Pacifica City Limits	acres	63.824 (0.8%)	7.507 (11.8%)	17.224 (27.0%)	2.80-3.21 (4.4% - 5.0%)	7.30-7.30 (11.4% - 11.4%)	29.2 (45.8%)	4.10-5.21 (6.4% - 8.2%)	7.36-7.73 (11.5% - 12.1%)
Lands	Parcels	count	155 (1.2%)	81 (52.3%)	96 (61.9%)	68.00-69.00 (43.9% - 44.5%)	82.00-82.00 (52.9% - 52.9%)	125 (80.6%)	70.00-72.00 (45.2% - 46.5%)	82.00-82.00 (52.9% - 52.9%)
Lands	Parks Conservation	acres	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Access Lateral	feet	737.758 (6.6%)	737.758 (100%)	737.758 (100%)	-	737.7-737.7 (100% - 100%)	737.758 (100%)	-	737.76-737.76 (100% - 100%)
Recreation	Access Vertical	feet	148.553 (5.9%)	26.725 (18.0%)	148.553 (100%)	-	1.09-8.46 (0.7% - 5.7%)	148.553 (100%)	-	-
Recreation	Fishing Pier	count	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Parks	acres	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Trails	feet	2965.264 (1.6%)	-	147.566 (5.0%)	-	-	1318.32 (44.5%)	-	-
Stormwater	Pipes	feet	6931.722 (2.4%)	168.348 (2.4%)	814.997 (11.8%)	-	137.61-146.79 (2.0% - 2.1%)	1262.228 (18.2%)	2.67-22.36 (0.0% - 0.3%)	161.55-188.22 (2.3% - 2.7%)
Stormwater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Stormwater	Stormwater Outfalls	count	2 (1.8%)	1 (50.0%)	2 (100%)	-	1.00-1.00 (50.0% - 50.0%)	2 (100%)	-	1.00-1.00 (50.0% - 50.0%)
Transportation	Bridge Local	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Bridge State	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Highway	feet	4072.648 (0.0%)	-	-	-	-	125.933 (3.1%)	-	-
Transportation	Streets City	feet	9857.95 (1.8%)	-	2675.965 (27.1%)	-	-	5329.645 (54.1%)	-	-
Wastewater	Pipeline	feet	8265.525 (1.5%)	-	1103.251 (13.3%)	-	-	3327.011 (40.3%)	-	-
Wastewater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Water	NCCWD Pipelines	feet	8894.445 (1.3%)	-	1059.602 (11.9%)	-	-	3789.539 (42.6%)	-	-

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Sharp Park, West Fairway Park and Mori Point

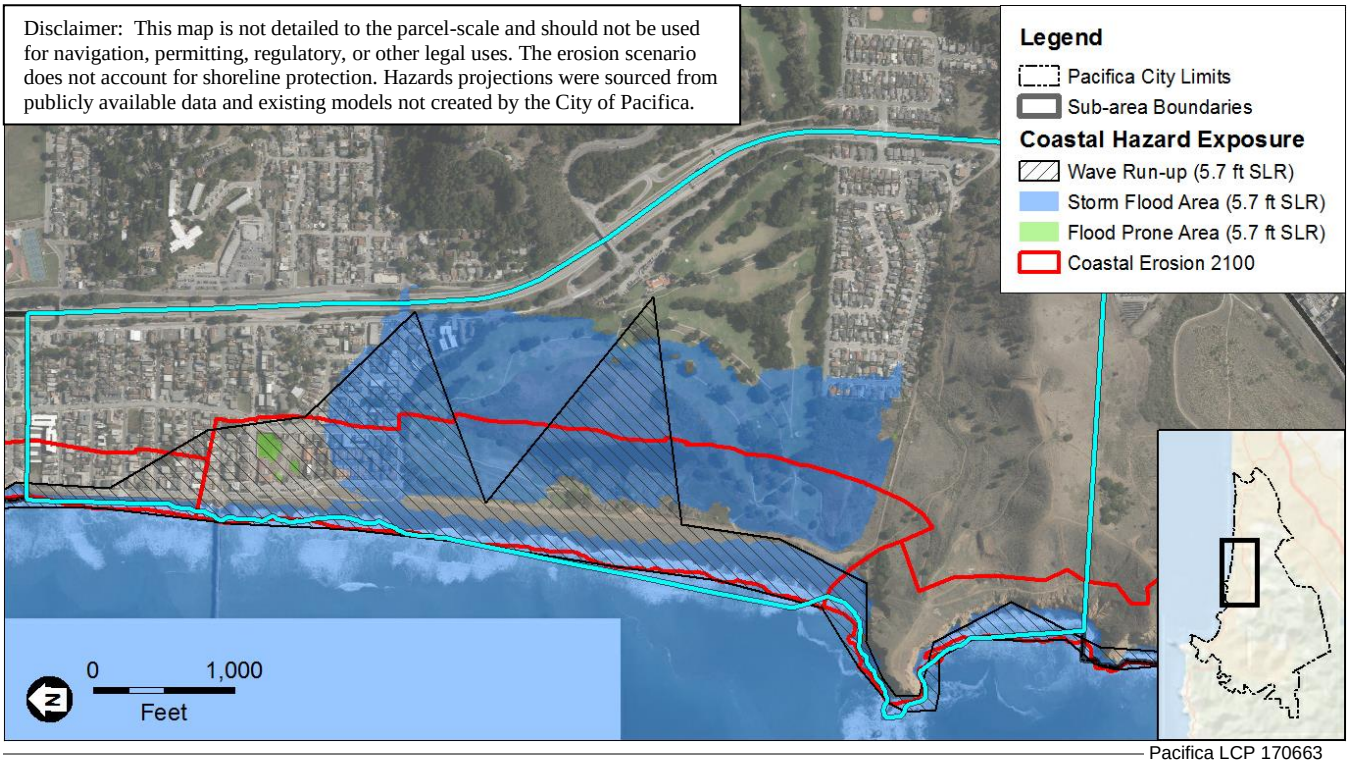

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Figure 26

Sharp Park, West Fairway Park and Mori Point Sub-area – Coastal Hazards at 2100

Inundation and flooding can have a significant impact on the Sharp Park, West Fairway Park and Mori Point sub-area with SLR (sub-area shown in teal on Figure 26). Asset exposure to coastal erosion and flooding for existing conditions and Medium to High SLR at 2050 and 2100 are reported in Table 7. Asset exposures under Extreme SLR scenario can be estimated at 2075 using the exposures under Med-High SLR at 2100. Coastal flooding and erosion exposure to coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials are shown in Appendix B-3. Exposure to existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets are shown in Appendix C-3. Exposure to parks and trails, public access, habitats and sensitive species are shown in Appendix D-3.

Up to 230 parcels are exposed to coastal storm wave impacts, while 156 parcels will be impacted by sustained flooding. Exposed land uses include residential, commercial, city-owned public use and parks, mixed use, vacant land, SPGC, one industrial parcel. An affordable rental unit is among the exposed. Beaches (7.6 to 20.4 acres) and wetlands in/around the golf course are exposed to coastal flooding. Surfgrass habitat (0.1 mi) is also exposed. The fishing pier is exposed to storm impacts from wave run-up. Up to 0.9 miles of recreational trail and 82.4 acres of parks are exposed to storm flooding. One affordable rental unit is exposed. Utilities are also exposed. Communications conduit (0.7-0.8 mi) are exposed to storm flooding. Coastal inundation impacts 0.1 mi of stormwater pipes and 4 outfalls, while storm flooding impacts up to 2 miles of pipe and 7 outfalls. Wastewater pipelines are also exposed (1.9 to 2.7 miles) while one to two wastewater pump stations are exposed to storm

flooding and wave impacts, respectively. Coastal armoring structures are exposed to storm flooding (0.3 miles) and wave run-up (1 miles).

A total of 203 parcels may be impacted by coastal erosion. All 1.1 miles of coastal armoring structures are exposed to coastal erosion. This includes residential (single and multi-family), vacant parcels, City Over 44 acres of wetlands are exposed, including 20.4 acres of beach. Of the utilities in the area, 0.7 miles of conduit, 1.2 miles of stormwater, 1.6 miles of water pipes and 2.4 miles of wastewater pipelines, one wastewater pump station and 8 stormwater outfalls are exposed. A total of 1.4 miles of streets and 2.1 miles of trails are also exposed to erosion.

Populations of San Francisco garter snake and California Red-Legged Frog and associated habitat within Laguna Salada are vulnerable to increasing salinity from wave overtopping of the berm and saltwater seepage through the beach associated with sea-level rise. Both populations reside on lands that are owned and managed by the City of San Francisco (Sharp Park) and the National Park Service (Mori Point).

Asset exposures to coastal flooding under existing conditions, coastal erosion for 2050 and 2100, and coastal storm flooding and regular tidal inundation for a range of Medium to High SLR (shown as a range) at 2050 and 2100 are reported in the table below. For each asset, the total quantity within the sub-area (and percent of total within Pacifica) is provided for reference. Exposures are reported for the asset unit of measure and the percentage of that particular asset within the sub-area.

Table 7
Sharp Park, West Fairway Park and Mori Point Asset Exposure for Existing and Future Sea-levels

Sub-area Asset Exposure Table Sharp Park, West Fairway Park, and Mori Point				Existing Conditions (% of Sub-area)	2050 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*			2100 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*		
Category	**Asset**	**Units**	**Total in Sub-area (% of Pacifica)**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**
Coastal Structures	Armor Structures	feet	5745.243 (35.4%)	5303.68 (92.3%)	5705.658 (99.3%)	-	5459.00-5459.00 (95.0% - 95.0%)	5705.658 (99.3%)	-	5459.00-5459.00 (95.0% - 95.0%)
Coastal Structures	Levee	feet	3149.267 (100%)	1707.391 (54.2%)	3149.267 (100%)	-	1247.50-1263.90 (39.6% - 40.1%)	3149.267 (100%)	-	2028.50-2115.12 (64.4% - 67.2%)
Communication	Comcast Underground Conduit	feet	12976.887 (8.8%)	1848.454 (14.2%)	1462.363 (11.3%)	-	3909.10-3063.65 (30.1% - 23.6%)	3920.002 (30.2%)	-	5545.68-5694.46 (42.7% - 43.9%)
Communication	Towers Private	count	5 (19.2%)	-	-	-	-	-	-	-
Community	Affordable Rentals	count	1 (20.0%)	-	-	-	-	-	-	-
Community	Communities At Risk	acres	0 (0.0%)	-	-	-	-	-	-	-
Community	Healthcare Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Landmarks	count	4 (44.4%)	-	-	-	-	-	-	-
Community	Mobile Home Parks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Schools	acres	0.093 (0.0%)	-	-	-	-	-	-	-
Community	Senior Centers	count	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Beaches	acres	20.531 (35.2%)	20.353 (99.1%)	20.379 (99.3%)	2.76-3.38 (13.4% - 16.5%)	20.20-20.01 (98.4% - 97.5%)	20.378 (99.3%)	4.88-7.61 (23.8% - 37.1%)	20.51-20.51 (99.9% - 99.9%)
Ecosystem	CA Red Leg Frog Habitat	acres	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Steelhead Habitat	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Streams	feet	1700.067 (1.5%)	-	-	-	-	-	-	-
Ecosystem	Surfgrass	feet	329.821 (2.0%)	329.821 (100%)	2.406 (0.7%)	329.82-329.82 (100% - 100%)	329.82-329.82 (100% - 100%)	2.406 (0.7%)	329.82-329.82 (100% - 100%)	329.82-329.82 (100% - 100%)
Ecosystem	Wetlands	acres	31.712 (14.8%)	30.459 (96.0%)	2.61 (8.2%)	4.73-6.03 (14.9% - 19.0%)	30.47-30.50 (96.1% - 96.2%)	14.349 (45.2%)	20.10-28.76 (63.4% - 90.7%)	30.68-30.70 (96.7% - 96.8%)
Emergency Response	Fire	acres	0 (0.0%)	-	-	-	-	-	-	-
Emergency Response	Police	acres	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Cleanup Sites	count	1 (12.5%)	-	-	-	-	-	-	-
Hazardous Waste	Solid Waste Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Underground Storage Tanks	count	1 (20.0%)	-	-	-	-	-	-	-
Land Use	Auto Services	acres	0.586 (12.2%)	-	-	-	-	-	-	-
Land Use	Beach	acres	2.245 (4.9%)	2.236 (99.6%)	-	0.12-0.17 (5.5% - 7.4%)	2.24-2.24 (100% - 100%)	-	0.28-0.61 (12.6% - 27.1%)	2.24-2.24 (100% - 100%)
Land Use	Commercial	acres	2.204 (2.5%)	0.234 (10.6%)	-	-	0.23-0.23 (10.6% - 10.6%)	-	-	0.30-0.35 (13.5% - 15.9%)
Land Use	Hotels	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Industrial	acres	0.296 (1.6%)	-	-	-	-	-	-	-
Land Use	Mixed Use	acres	1.672 (47.5%)	0.221 (13.2%)	-	-	0.76-0.39 (45.3% - 23.6%)	-	-	0.76-0.76 (45.3% - 45.3%)
Land Use	Mobile Homes	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Multi-Family	acres	17.381 (9.4%)	3.457 (19.9%)	-	-	5.31-6.55 (30.5% - 37.7%)	-	-	8.62-9.05 (49.6% - 52.1%)
Land Use	Office	acres	0.934 (21.5%)	-	-	-	-	-	-	-
Land Use	Other Open Space	acres	0.088 (0.0%)	0.088 (100%)	-	-	0.07-0.07 (78.3% - 85.0%)	-	-	0.09-0.09 (100% - 100%)
Land Use	Other Public or Community Uses	acres	7.332 (9.6%)	0.011 (0.1%)	2.293 (31.3%)	-	3.53-0.49 (48.1% - 6.6%)	3.728 (50.8%)	-	4.20-4.31 (57.2% - 58.7%)
Land Use	Parks & Accessible Open Space	acres	266.781 (9.6%)	114.524 (42.9%)	63.688 (23.9%)	19.94-22.18 (7.5% - 8.3%)	112.07-113.11 (42.0% - 42.4%)	92.665 (34.7%)	43.15-71.84 (16.2% - 26.9%)	120.73-128.38 (45.3% - 48.1%)
Land Use	ROW	acres	0.64 (7.7%)	0.007 (1.1%)	0.564 (88.0%)	-	0.64-0.64 (100% - 100%)	0.64 (100%)	-	0.64-0.64 (100% - 100%)
Land Use	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Single Family Residential	acres	43.819 (2.5%)	1.174 (2.7%)	2.659 (6.1%)	-	2.94-3.58 (6.7% - 8.2%)	5.211 (11.9%)	-	5.51-6.79 (12.6% - 15.5%)
Land Use	Vacant/Undeveloped	acres	3.24 (0.3%)	0.234 (7.2%)	1.097 (33.9%)	-	0.67-0.66 (20.7% - 20.4%)	1.44 (44.5%)	-	0.87-1.03 (26.9% - 31.9%)
Lands	Pacifica City Limits	acres	410.471 (5.1%)	129.269 (31.5%)	78.924 (19.2%)	19.00-21.34 (4.6% - 5.2%)	138.61-137.68 (33.8% - 33.5%)	120.09 (29.3%)	42.74-72.72 (10.4% - 17.7%)	157.40-168.37 (38.3% - 41.0%)
Lands	Parks Conservation	acres	269.053 (7.4%)	116.787 (43.4%)	65.932 (24.5%)	20.07-22.35 (7.5% - 8.3%)	114.34-115.39 (42.5% - 42.9%)	94.91 (35.3%)	43.43-72.45 (16.1% - 26.9%)	123.00-130.65 (45.7% - 48.6%)
Lands	Parcels	count	683 (5.2%)	111 (16.3%)	136 (19.9%)	5.00-5.00 (0.7% - 0.7%)	169.00-203.00 (24.7% - 29.7%)	207 (30.3%)	9.00-15.00 (1.3% - 2.2%)	241.00-263.00 (35.3% - 38.5%)
Recreation	Access Lateral	feet	4967.416 (44.6%)	4799.061 (96.6%)	4967.416 (100%)	-	4536.29-4490.74 (91.3% - 90.4%)	4967.416 (100%)	-	4965.54-4967.42 (100% - 100%)
Recreation	Access Vertical	feet	739.208 (29.2%)	393.876 (53.3%)	739.208 (100%)	-	574.42-577.78 (77.7% - 78.2%)	739.208 (100%)	-	617.47-617.53 (83.5% - 83.5%)
Recreation	Fishing Pier	count	12 (1200.0%)	1 (8.3%)	1 (8.3%)	-	1.00-1.00 (8.3% - 8.3%)	1 (8.3%)	-	1.00-1.00 (8.3% - 8.3%)
Recreation	Parks	acres	131.383 (4.5%)	83.299 (63.4%)	29.465 (22.4%)	5.10-6.66 (3.9% - 5.1%)	80.66-81.52 (61.4% - 62.0%)	48.591 (37.0%)	26.18-52.28 (19.9% - 39.8%)	86.11-93.54 (65.5% - 71.2%)
Recreation	Trails	feet	25646.832 (13.8%)	3041.175 (11.9%)	7417.929 (28.9%)	-	3152.82-3111.24 (12.3% - 12.1%)	10838.471 (42.3%)	-	4493.83-5049.88 (17.5% - 19.7%)
Stormwater	Pipes	feet	23201.914 (7.9%)	5461.811 (23.5%)	3123.029 (13.5%)	-	6050.14-6263.43 (26.1% - 27.0%)	4652.522 (20.1%)	473.54-1851.89 (2.0% - 8.0%)	7576.66-8060.68 (32.7% - 34.7%)
Stormwater	Pump Stations	count	3 (33.3%)	1 (33.3%)	3 (100%)	-	3.00-3.00 (100% - 100%)	3 (100%)	-	3.00-3.00 (100% - 100%)
Stormwater	Stormwater Outfalls	count	12 (11.0%)	9 (75.0%)	6 (50.0%)	1.00-1.00 (8.3% - 8.3%)	9.00-9.00 (75.0% - 75.0%)	8 (66.7%)	3.00-6.00 (25.0% - 50.0%)	10.00-10.00 (83.3% - 83.3%)
Transportation	Bridge Local	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Bridge State	count	4 (44.4%)	-	-	-	-	-	-	-
Transportation	Highway	feet	9263.799 (0.0%)	-	-	-	-	-	-	59.19-69.87 (0.6% - 0.8%)
Transportation	Streets City	feet	36633.25 (6.5%)	5342.075 (14.6%)	4464.635 (12.2%)	-	8409.84-7611.58 (23.0% - 20.8%)	7491.986 (20.5%)	31.69-439.18 (0.1% - 1.2%)	11250.25-12410.01 (30.7% - 33.9%)
Wastewater	Pipeline	feet	44760.047 (8.1%)	10253.233 (22.9%)	8223.478 (18.4%)	-	14853.43-13875.01 (33.2% - 31.0%)	12827.066 (28.7%)	-	17534.30-19141.75 (39.2% - 42.8%)
Wastewater	Pump Stations	count	2 (33.3%)	1 (50.0%)	1 (50.0%)	-	2.00-1.00 (100% - 50.0%)	1 (50.0%)	-	2.00-2.00 (100% - 100%)
Water	NCCWD Pipelines	feet	35373.134 (5.1%)	4364.073 (12.3%)	4949.698 (14.0%)	-	7526.46-7352.81 (21.3% - 20.8%)	8235.167 (23.3%)	-	10918.07-12148.84 (30.9% - 34.3%)

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Rockaway Beach, Quarry and Headlands

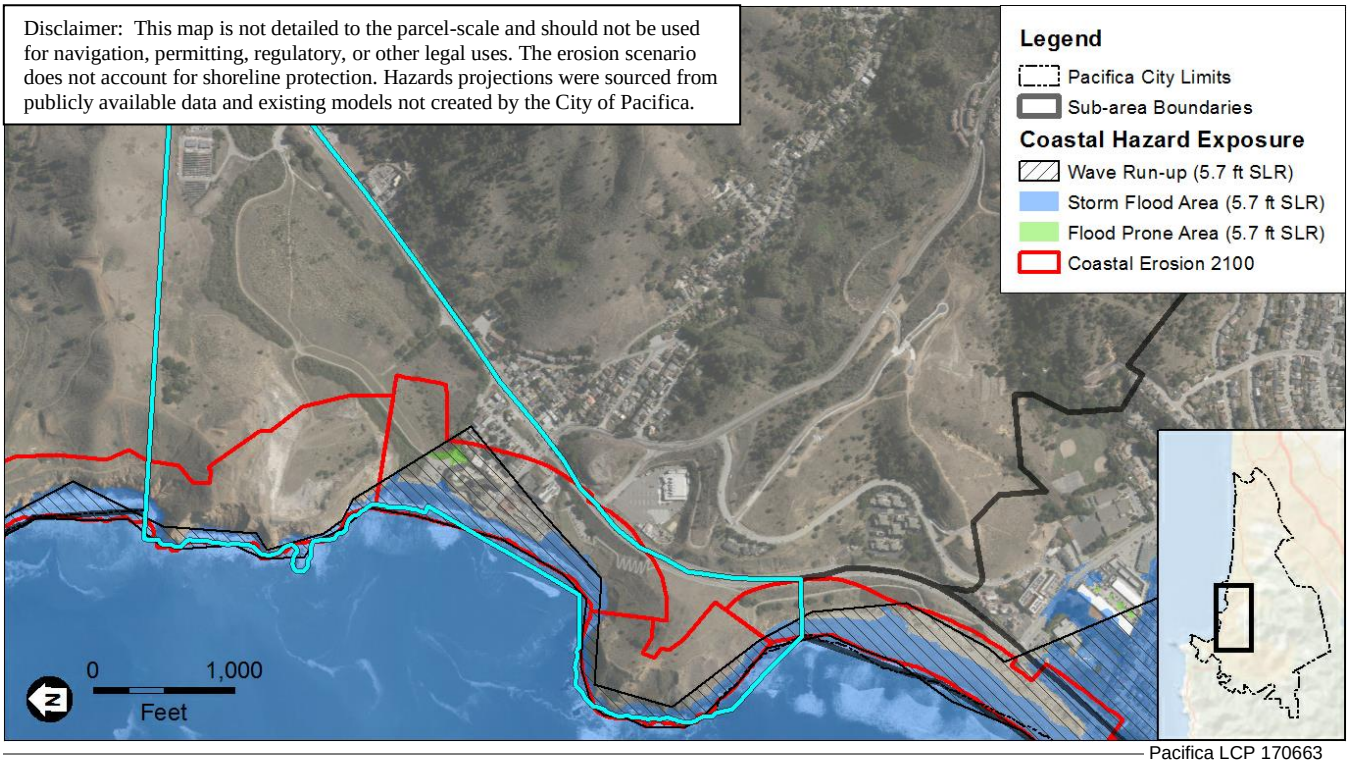

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Figure 27

Rockaway Beach, Quarry and Headlands Sub-area – Coastal Hazards at 2100

The Rockaway sub-area asset vulnerabilities are concentrated at Rockaway Beach where the low backshore is more densely developed than the higher open space at the Quarry and Headlands (sub-area shown in teal on Figure 27). Asset exposure to coastal erosion and flooding for existing conditions and Medium to High SLR at 2050 and 2100 are reported in Table 8. Asset exposures under Extreme SLR scenario can be estimated at 2075 using the exposures under Med-High SLR at 2100. Coastal flooding and erosion exposure to coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials are shown in Appendix B-4. Exposure to existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets are shown in Appendix C-4. Exposure to parks and trails, public access, habitats and sensitive species are shown in Appendix D-4.

By 2100 considering high SLR, ten parcels are exposed to flooding,12 parcels are exposed to storm flooding, and 34 parcels are exposed to wave damages. Land uses include vacant and open space, hotels, office, commercial and mixed use, single and multi-family residential and public use. Beaches here are exposed to inundation and flooding with SLR (2.9 to 3.7 acres respectively). Wetlands in Calera Creek are also exposed to SLR. Surfgrass habitat (0.4 miles) along the rocky shores are exposed. Nearly all coastal structures are exposed to flooding, all are exposed to wave damages. Trails (0.2 miles) are exposed to wave impacts, 3.5 acres of parks are exposed to inundation and 4 acres are exposed to flooding. Stormwater pipelines (0.3 miles) are within the wave damage zone, as are 0.3 miles of communications lines. A total of three outfalls are exposed to flooding and inundation.

A total of 36 parcels in this sub-area are exposed to erosion. Land uses include vacant and open space, hotels, commercial and mixed use, single and multi-family residential and public use. Erosion threatens 3.7 acres of beach, 0.8 miles of trails, and 5.1 acres of parks. Local streets (0.6 miles), Highway 1 (0.2 miles) and of communications lines (0.5 miles) are exposed by 2100. Stormwater infrastructure is exposed, including five outfalls and 0.6 miles of pipelines. A wastewater pump station is also exposed along with 1.1 miles of sewer pipes and 0.6 miles of water pipes. All 0.3 miles of coastal structures are exposed to erosion.

Asset exposures to coastal flooding under existing conditions, coastal erosion for 2050 and 2100, and coastal storm flooding and regular tidal inundation for a range of Medium to High SLR (shown as a range) at 2050 and 2100 are reported in the table below. For each asset, the total quantity within the sub-area (and percent of total within Pacifica) is provided for reference. Exposures are reported for the asset unit of measure and the percentage of that particular asset within the sub-area.

Table 8
Rockaway Beach, Quarry and Headlands Asset Exposure for Existing and Future Sea-levels

Sub-area Asset Exposure Table Rockaway Beach, Quarry, and Headlands				Existing Conditions (% of Sub-area)	2050 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*			2100 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*		
Category	**Asset**	**Units**	**Total in Sub-area (% of Pacifica)**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**
Coastal Structures	Armor Structures	feet	1490.051 (9.2%)	1441.935 (96.8%)	1490.051 (100%)	58.36-106.16 (3.9% - 7.1%)	1104.58-1420.62 (74.1% - 95.3%)	1490.051 (100%)	261.33-469.41 (17.5% - 31.5%)	1490.05-1490.05 (100% - 100%)
Coastal Structures	Levee	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Comcast Underground Conduit	feet	3097.362 (2.1%)	423.371 (13.7%)	1673.873 (54.0%)	-	-	2402.337 (77.6%)	-	1258.58-1429.77 (40.6% - 46.2%)
Communication	Towers Private	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Affordable Rentals	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Communities At Risk	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Healthcare Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Landmarks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Mobile Home Parks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Community	Senior Centers	count	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Beaches	acres	3.72 (6.4%)	3.035 (81.6%)	3.72 (100%)	0.86-1.20 (23.1% - 32.1%)	2.87-3.26 (77.2% - 87.6%)	3.72 (100%)	1.89-2.90 (50.8% - 77.9%)	3.70-3.71 (99.5% - 99.7%)
Ecosystem	CA Red Leg Frog Habitat	acres	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Steelhead Habitat	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Streams	feet	4365.341 (3.8%)	484.352 (11.1%)	1134.514 (26.0%)	56.17-69.36 (1.3% - 1.6%)	184.10-487.12 (4.2% - 11.2%)	1571.187 (36.0%)	104.46-149.04 (2.4% - 3.4%)	635.30-667.64 (14.6% - 15.3%)
Ecosystem	Surfgrass	feet	2230.281 (13.8%)	2230.281 (100%)	1067.956 (47.9%)	2218.28-2228.09 (99.5% - 99.9%)	2230.28-2230.28 (100% - 100%)	1065.95 (47.8%)	2230.28-2230.28 (100% - 100%)	2230.28-2230.28 (100% - 100%)
Ecosystem	Wetlands	acres	3.292 (1.5%)	0.072 (2.2%)	0.403 (12.2%)	0.00-0.01 (0.1% - 0.2%)	0.03-0.07 (1.0% - 2.2%)	0.568 (17.2%)	0.02-0.04 (0.5% - 1.3%)	0.10-0.12 (3.0% - 3.6%)
Emergency Response	Fire	acres	0 (0.0%)	-	-	-	-	-	-	-
Emergency Response	Police	acres	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Cleanup Sites	count	1 (12.5%)	-	-	-	-	-	-	-
Hazardous Waste	Solid Waste Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Underground Storage Tanks	count	1 (20.0%)	-	-	-	-	-	-	-
Land Use	Auto Services	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Beach	acres	10.993 (24.1%)	9.367 (85.2%)	-	7.42-7.76 (67.5% - 70.6%)	9.50-9.59 (86.5% - 87.2%)	-	8.38-9.24 (76.3% - 84.1%)	10.29-10.27 (93.6% - 93.4%)
Land Use	Commercial	acres	2.069 (2.3%)	0.628 (30.4%)	-	0.14-0.16 (6.6% - 7.5%)	0.52-0.55 (25.0% - 26.5%)	-	0.19-0.22 (9.3% - 10.8%)	0.63-0.72 (30.5% - 34.8%)
Land Use	Hotels	acres	4.384 (67.2%)	1.924 (43.9%)	-	-	-	-	-	3.18-3.18 (72.6% - 72.6%)
Land Use	Industrial	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Mixed Use	acres	0.721 (20.5%)	0.079 (10.9%)	-	-	-	-	-	0.31-0.34 (43.1% - 46.8%)
Land Use	Mobile Homes	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Multi-Family	acres	0.197 (0.1%)	-	-	-	-	-	-	-
Land Use	Office	acres	0.53 (12.2%)	-	-	-	-	-	-	-
Land Use	Other Open Space	acres	10.346 (1.4%)	1.055 (10.2%)	-	-	0.10-1.06 (1.0% - 10.3%)	-	-	1.14-1.26 (11.0% - 12.2%)
Land Use	Other Public or Community Uses	acres	1.35 (1.8%)	-	1.342 (99.4%)	-	-	1.35 (100%)	-	0.03-0.01 (1.9% - 1.1%)
Land Use	Parks & Accessible Open Space	acres	0.465 (0.0%)	0.465 (100%)	0.465 (100%)	0.08-0.09 (17.1% - 19.5%)	0.25-0.46 (53.2% - 100%)	0.465 (100%)	0.12-0.17 (26.7% - 37.6%)	0.46-0.46 (100% - 100%)
Land Use	ROW	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Single Family Residential	acres	0.286 (0.0%)	0.213 (74.4%)	0.023 (8.1%)	-	-	0.27 (94.3%)	-	0.29-0.29 (100% - 100%)
Land Use	Vacant/Undeveloped	acres	113.419 (10.3%)	7.996 (7.0%)	33.817 (29.8%)	3.32-3.53 (2.9% - 3.1%)	7.54-8.17 (6.7% - 7.2%)	50.496 (44.5%)	4.00-4.59 (3.5% - 4.0%)	8.27-8.86 (7.3% - 7.8%)
Lands	Pacifica City Limits	acres	191.834 (2.4%)	23.09 (12.0%)	56.477 (29.4%)	10.95-11.53 (5.7% - 6.0%)	18.51-23.25 (9.7% - 12.1%)	79.9 (41.7%)	12.69-14.34 (6.6% - 7.5%)	26.51-27.79 (13.8% - 14.5%)
Lands	Parcels	count	56 (0.4%)	23 (41.1%)	30 (53.6%)	9.00-9.00 (16.1% - 16.1%)	12.00-23.00 (21.4% - 41.1%)	36 (64.3%)	9.00-10.00 (16.1% - 17.9%)	24.00-34.00 (42.9% - 60.7%)
Lands	Parks Conservation	acres	56.995 (1.6%)	12.625 (22.2%)	25.372 (44.5%)	7.09-7.52 (12.4% - 13.2%)	12.31-12.96 (21.6% - 22.7%)	32.703 (57.4%)	8.43-9.77 (14.8% - 17.1%)	13.78-13.95 (24.2% - 24.5%)
Recreation	Access Lateral	feet	697.125 (6.3%)	353.412 (50.7%)	697.125 (100%)	-	297.32-483.38 (42.6% - 69.3%)	697.125 (100%)	24.40-539.05 (3.5% - 77.3%)	697.13-697.13 (100% - 100%)
Recreation	Access Vertical	feet	180.778 (7.1%)	64.368 (35.6%)	180.778 (100%)	-	-	180.778 (100%)	-	95.43-88.69 (52.8% - 49.1%)
Recreation	Fishing Pier	count	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Parks	acres	5.848 (0.2%)	3.27 (55.9%)	5.115 (87.5%)	2.31-2.51 (39.5% - 42.9%)	3.41-3.50 (58.3% - 59.8%)	5.113 (87.4%)	2.86-3.46 (48.9% - 59.2%)	4.21-4.17 (71.9% - 71.3%)
Recreation	Trails	feet	7556.328 (4.1%)	890.873 (11.8%)	3538.016 (46.8%)	-	505.79-874.93 (6.7% - 11.6%)	4373.516 (57.9%)	-	1039.21-1154.56 (13.8% - 15.3%)
Stormwater	Pipes	feet	1886.323 (0.6%)	440.692 (23.4%)	771.39 (40.9%)	14.26-17.63 (0.8% - 0.9%)	154.76-424.95 (8.2% - 22.5%)	898.762 (47.6%)	17.63-19.20 (0.9% - 1.0%)	565.80-589.00 (30.0% - 31.2%)
Stormwater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Stormwater	Stormwater Outfalls	count	9 (8.3%)	3 (33.3%)	5 (55.6%)	1.00-1.00 (11.1% - 11.1%)	2.00-3.00 (22.2% - 33.3%)	5 (55.6%)	1.00-3.00 (11.1% - 33.3%)	3.00-3.00 (33.3% - 33.3%)
Transportation	Bridge Local	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Bridge State	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Highway	feet	6820.728 (0.0%)	-	-	-	-	913.9 (13.4%)	-	-
Transportation	Streets City	feet	4143.432 (0.7%)	800.581 (19.3%)	2003.12 (48.3%)	-	34.59-775.23 (0.8% - 18.7%)	2738.07 (66.1%)	-	1563.67-1895.06 (37.7% - 45.7%)
Wastewater	Pipeline	feet	13089.767 (2.4%)	1643.448 (12.6%)	3755.142 (28.7%)	-	137.21-1635.19 (1.0% - 12.5%)	5757.214 (44.0%)	-	2486.49-3516.82 (19.0% - 26.9%)
Wastewater	Pump Stations	count	2 (33.3%)	1 (50.0%)	1 (50.0%)	-	-	1 (50.0%)	-	1.00-1.00 (50.0% - 50.0%)
Water	NCCWD Pipelines	feet	5567.154 (0.8%)	645.537 (11.6%)	2058.559 (37.0%)	-	-	2976.446 (53.5%)	-	1549.16-2486.16 (27.8% - 44.7%)

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Pacifica State Beach

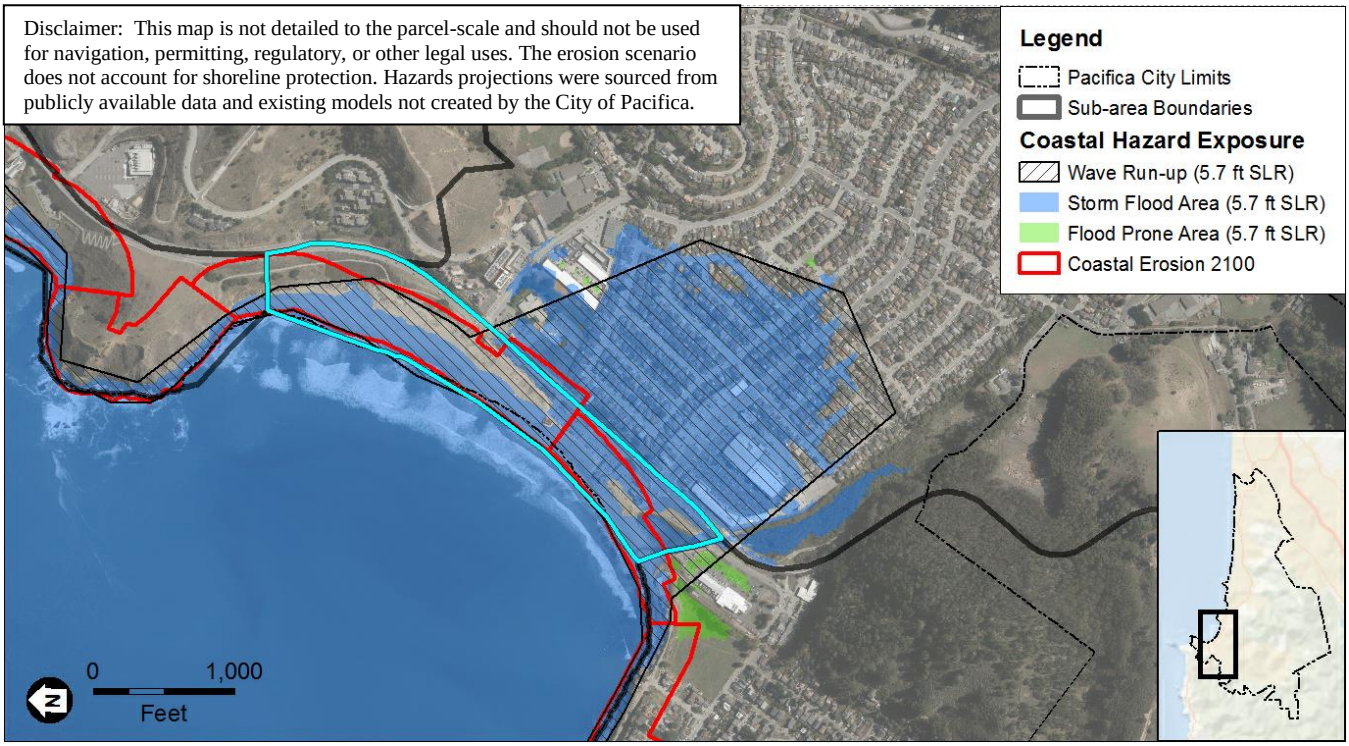

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Figure 28
Pacifica State Beach Sub-area – Coastal Hazards at 2100

While the Pacifica State Beach sub-area is mostly beach, there are a number of key assets that are vulnerable (sub-area shown in teal on Figure 28). Asset exposure to coastal erosion and flooding for existing conditions and Medium to High SLR at 2050 and 2100 are reported in Table 9. Asset exposures under Extreme SLR scenario can be estimated at 2075 using the exposures under Med-High SLR at 2100. Coastal flooding and erosion exposure to coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials are shown in Appendix B-5. Exposure to existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets are shown in Appendix C-5. Exposure to parks and trails, public access, habitats and sensitive species are shown in Appendix D-5.

Eighteen parcels are exposed to coastal flooding, and include beach, commercial and public uses and multiple City-owned parcels. Beaches are exposed to inundation (7.4 acres) and storm flooding and waves (14.5 to 16.5 acres). Wetlands at San Pedro Creek are also exposed along with the creek itself which supports critical steelhead habitat (less than 0.1 miles, does not appear in table). Parks (Pacifica State Beach) are exposed to inundation (2.2 acres), flooding (9 acres) and wave impacts (15.6 acres). Highway 1 is exposed to flooding and storm impacts (0.8 miles). The stormwater and wastewater systems are particularly exposed in this sub-area. Two stormwater pump stations with a total of six pumps are exposed to storm flooding and waves, while 0.3 miles of pipe are exposed. Two outfalls are exposed. One wastewater pump station is exposed to flooding along with 1 mile of pipe. The entire seawall is exposed to flooding and wave impacts.

Erosion threatens 18 parcels that are exposed to flooding impacts. Over 16 acres of parks are exposed to erosion along with nearly 16 acres of beach. Highway 1 is also exposed (0.3 miles). Both stormwater pump stations and the wastewater pump station are exposed to erosion in addition to 0.3 miles of storm drains, two outfalls, 0.1 miles of water pipes, and 0.8 miles of sewer. The seawall is also exposed to erosion. A total of 18 parcels are exposed to erosion.

Asset exposures to coastal flooding under existing conditions, coastal erosion for 2050 and 2100, and coastal storm flooding and regular tidal inundation for a range of Medium to High SLR (shown as a range) at 2050 and 2100 are reported in the table below. For each asset, the total quantity within the sub-area (and percent of total within Pacifica) is provided for reference. Exposures are reported for the asset unit of measure and the percentage of that particular asset within the sub-area.

Table 9
Pacifica State Beach Asset Exposure for Existing and Future Sea-levels

Sub-area Asset Exposure Table Pacifica State Beach				Existing Conditions (% of Sub-area)	2050 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*			2100 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*		
Category	**Asset**	**Units**	**Total in Sub-area (% of Pacifica)**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**
Coastal Structures	Armor Structures	feet	676.819 (4.2%)	676.819 (100%)	676.819 (100%)	-	676.82-676.82 (100% - 100%)	676.819 (100%)	12.05-85.11 (1.8% - 12.6%)	676.82-676.82 (100% - 100%)
Coastal Structures	Levee	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Comcast Underground Conduit	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Towers Private	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Affordable Rentals	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Communities At Risk	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Healthcare Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Landmarks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Mobile Home Parks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Community	Senior Centers	count	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Beaches	acres	16.582 (28.4%)	16.565 (99.9%)	15.188 (91.6%)	2.10-2.88 (12.7% - 17.4%)	16.10-16.32 (97.1% - 98.4%)	15.79 (95.2%)	4.35-7.43 (26.2% - 44.8%)	16.34-16.58 (98.6% - 100%)
Ecosystem	CA Red Leg Frog Habitat	acres	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Steelhead Habitat	feet	471.474 (1.8%)	217.775 (46.2%)	112.679 (23.9%)	-	371.40-471.47 (78.8% - 100%)	178.251 (37.8%)	193.83-471.47 (41.1% - 100%)	471.47-471.47 (100% - 100%)
Ecosystem	Streams	feet	55.514 (0.0%)	55.514 (100%)	55.514 (100%)	-	55.51-55.51 (100% - 100%)	55.514 (100%)	29.52-55.51 (53.2% - 100%)	55.51-55.51 (100% - 100%)
Ecosystem	Surfgrass	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Wetlands	acres	0.346 (0.2%)	0.133 (38.5%)	0.067 (19.2%)	0.00-0.01 (1.0% - 2.2%)	0.26-0.32 (75.5% - 92.2%)	0.106 (30.6%)	0.10-0.33 (28.6% - 93.9%)	0.33-0.35 (95.6% - 99.6%)
Emergency Response	Fire	acres	0 (0.0%)	-	-	-	-	-	-	-
Emergency Response	Police	acres	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Cleanup Sites	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Solid Waste Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Underground Storage Tanks	count	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Auto Services	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Beach	acres	23.219 (51.0%)	21.563 (92.9%)	-	1.77-2.37 (7.6% - 10.2%)	17.85-18.83 (76.9% - 81.1%)	-	3.80-7.42 (16.4% - 32.0%)	18.93-21.71 (81.5% - 93.5%)
Land Use	Commercial	acres	0.676 (0.8%)	0.676 (100%)	-	-	0.68-0.68 (100% - 100%)	-	0.00-0.14 (0.2% - 20.9%)	0.68-0.68 (100% - 100%)
Land Use	Hotels	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Industrial	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Mixed Use	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Mobile Homes	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Multi-Family	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Office	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Other Open Space	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Other Public or Community Uses	acres	3.172 (4.1%)	3.172 (100%)	0.685 (21.6%)	-	3.17-3.17 (100% - 100%)	2.866 (90.4%)	0.06-0.28 (1.7% - 8.9%)	3.17-3.17 (100% - 100%)
Land Use	Parks & Accessible Open Space	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	ROW	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Single Family Residential	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Vacant/Undeveloped	acres	0 (0.0%)	-	-	-	-	-	-	-
Lands	Pacifica City Limits	acres	38.93 (0.5%)	28.973 (74.4%)	17.854 (45.9%)	1.45-1.96 (3.7% - 5.0%)	25.41-26.57 (65.3% - 68.3%)	27.653 (71.0%)	3.51-9.31 (9.0% - 23.9%)	26.79-30.75 (68.8% - 79.0%)
Lands	Parcels	count	18 (0.1%)	18 (100%)	17 (94.4%)	4.00-6.00 (22.2% - 33.3%)	18.00-18.00 (100% - 100%)	18 (100%)	14.00-16.00 (77.8% - 88.9%)	18.00-18.00 (100% - 100%)
Lands	Parks Conservation	acres	23.219 (0.6%)	21.563 (92.9%)	16.856 (72.6%)	1.77-2.37 (7.6% - 10.2%)	17.85-18.83 (76.9% - 81.1%)	21.139 (91.0%)	3.80-7.42 (16.4% - 32.0%)	18.93-21.72 (81.5% - 93.5%)
Recreation	Access Lateral	feet	3427.209 (30.8%)	3427.209 (100%)	3427.209 (100%)	-	3427.21-3427.21 (100% - 100%)	3427.209 (100%)	113.71-1229.88 (3.3% - 35.9%)	3427.21-3427.21 (100% - 100%)
Recreation	Access Vertical	feet	827.978 (32.7%)	820.757 (99.1%)	485.192 (58.6%)	-	657.19-689.90 (79.4% - 83.3%)	794.732 (96.0%)	5.30-62.78 (0.6% - 7.6%)	686.51-827.98 (82.9% - 100%)
Recreation	Fishing Pier	count	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Parks	acres	16.91 (0.6%)	15.254 (90.2%)	12.491 (73.9%)	0.04-0.10 (0.2% - 0.6%)	11.54-12.52 (68.2% - 74.1%)	16.245 (96.1%)	0.40-2.27 (2.4% - 13.5%)	12.62-15.41 (74.7% - 91.1%)
Recreation	Trails	feet	4054.032 (2.2%)	2067.633 (51.0%)	1289.389 (31.8%)	-	1584.05-1617.99 (39.1% - 39.9%)	2162.422 (53.3%)	-	1648.99-2355.41 (40.7% - 58.1%)
Stormwater	Pipes	feet	1723.793 (0.6%)	1723.793 (100%)	999.451 (58.0%)	168.40-214.37 (9.8% - 12.4%)	1723.79-1723.79 (100% - 100%)	1518.014 (88.1%)	334.67-586.96 (19.4% - 34.1%)	1723.79-1723.79 (100% - 100%)
Stormwater	Pump Stations	count	6 (66.7%)	6 (100%)	3 (50.0%)	-	6.00-6.00 (100% - 100%)	6 (100%)	-	6.00-6.00 (100% - 100%)
Stormwater	Stormwater Outfalls	count	2 (1.8%)	2 (100%)	2 (100%)	2.00-2.00 (100% - 100%)	2.00-2.00 (100% - 100%)	2 (100%)	2.00-2.00 (100% - 100%)	2.00-2.00 (100% - 100%)
Transportation	Bridge Local	count	1 (25.0%)	-	-	-	1.00-1.00 (100% - 100%)	-	-	1.00-1.00 (100% - 100%)
Transportation	Bridge State	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Highway	feet	4412.671 (0.0%)	1905.395 (43.2%)	-	-	1759.57-1759.57 (39.9% - 39.9%)	748.381 (17.0%)	-	1780.09-2195.19 (40.3% - 49.7%)
Transportation	Streets City	feet	667.241 (0.1%)	326.01 (48.9%)	-	-	414.81-437.96 (62.2% - 65.6%)	-	-	451.88-667.24 (67.7% - 100%)
Wastewater	Pipeline	feet	6404.812 (1.2%)	4904.812 (76.6%)	2295.334 (35.8%)	-	3664.57-3712.85 (57.2% - 58.0%)	4158.117 (64.9%)	113.61-906.63 (1.8% - 14.2%)	3709.19-4910.86 (57.9% - 76.7%)
Wastewater	Pump Stations	count	1 (16.7%)	1 (100%)	-	-	1.00-1.00 (100% - 100%)	1 (100%)	-	1.00-1.00 (100% - 100%)
Water	NCCWD Pipelines	feet	1348.493 (0.2%)	614.794 (45.6%)	106.19 (7.9%)	-	706.10-775.03 (52.4% - 57.5%)	370.374 (27.5%)	4.99-199.00 (0.4% - 14.8%)	816.75-1213.67 (60.6% - 90.0%)

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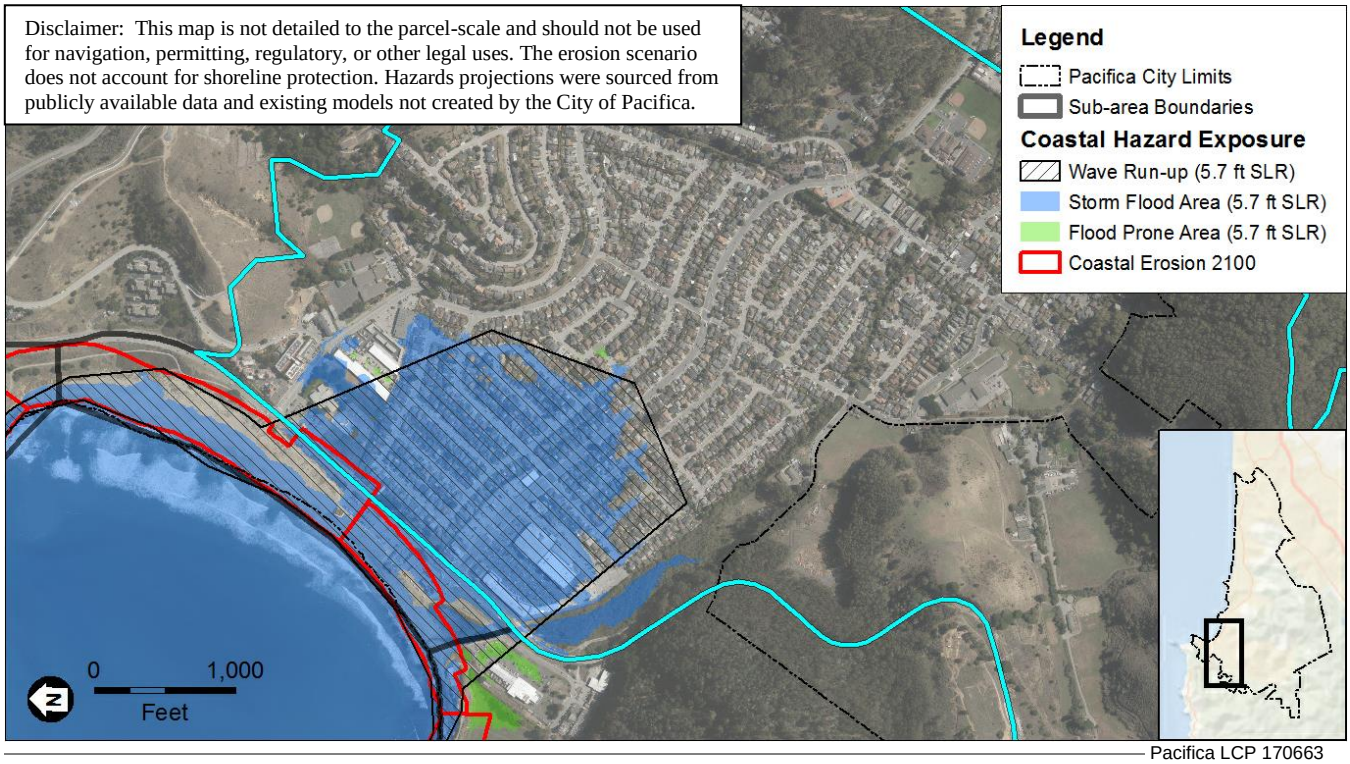
West Linda Mar



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SOURCE: Multiple

Figure 29
West Linda Mar Sub-area – Coastal Hazards at 2100

The coastal hazards posed to West Linda Mar are shown in Figure 29 (sub-area shown in teal). Asset exposure to coastal erosion and flooding for existing conditions and Medium to High SLR at 2050 and 2100 are reported in Table 10. Asset exposures under Extreme SLR scenario can be estimated at 2075 using the exposures under Med-High SLR at 2100. Coastal flooding and erosion exposure to coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials are shown in Appendix B-5. Exposure to existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets are shown in Appendix C-5. Exposure to parks and trails, public access, habitats and sensitive species are shown in Appendix D-5.

Coastal flooding may impact as many as 362 parcels in West Linda Mar. Vulnerable land uses include residential, commercial, auto services, public use and open space. One landmark, the Pacifica Community Center, is exposed to storm flooding and wave damages. One affordable rental unit, a senior center and one school are exposed to flooding. Wetlands and streams in San Pedro Creek are exposed to storm flooding (0.2 and 0.1 acres respectively). Local streets and Highway 1 totaling 3 miles are also exposed as well as both bridges over San Pedro Creek (Hwy 1 and San Pedro Ave). Underground conduit (0.4 miles) are exposed to flooding. There are two hazardous materials clean up sites in Linda Mar that are exposed to flooding. While there are no pump stations in West Linda Mar, those exposed in Pacifica State Beach will also affect storm drainage in this sub-area. There are 3 miles of stormwater drains and 2.6 miles of sewer lines that are exposed to flooding in this sub-area. The new stormwater Equalization Basin is also exposed to flooding.

Erosion may affect only a few assets in this sub-area by 2100. Four parcels are exposed that include residential and public use. A total of 0.1 miles of Highway 1 and 0.1 miles of stormwater drains and 0.1 miles of water pipes are exposed. A total of 1.2 acres of lands, including 4 parcels, are exposed to erosion by 2100 in this sub-area.

Asset exposures to coastal flooding under existing conditions, coastal erosion for 2050 and 2100, and coastal storm flooding and regular tidal inundation for a range of Medium to High SLR (shown as a range) at 2050 and 2100 are reported in the table below. For each asset, the total quantity within the sub-area (and percent of total within Pacifica) is provided for reference. Exposures are reported for the asset unit of measure and the percentage of that particular asset within the sub-area.

Table 10
West Linda Mar Asset Exposure for Existing and Future Sea-levels

Sub-area Asset Exposure Table West Linda Mar				Existing Conditions (% of Sub-area)	2050 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*			2100 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*		
Category	**Asset**	**Units**	**Total in Sub-area (% of Pacifica)**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**
Coastal Structures	Armor Structures	feet	0 (0.0%)	-	-	-	-	-	-	-
Coastal Structures	Levee	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Comcast Underground Conduit	feet	24319.476 (16.5%)	696.486 (2.9%)	-	-	1202.13-879.13 (4.9% - 3.6%)	-	-	1344.86-3049.67 (5.5% - 12.5%)
Communication	Towers Private	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Affordable Rentals	count	1 (20.0%)	-	-	-	-	-	-	-
Community	Communities At Risk	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Healthcare Facility	count	1 (50.0%)	-	-	-	-	-	-	-
Community	Landmarks	count	2 (22.2%)	1 (50.0%)	-	-	1.00-1.00 (50.0% - 50.0%)	-	-	1.00-1.00 (50.0% - 50.0%)
Community	Mobile Home Parks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Schools	acres	43.66 (18.6%)	-	-	-	-	-	-	-
Community	Senior Centers	count	1 (100%)	-	-	-	-	-	-	-
Ecosystem	Beaches	acres	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	CA Red Leg Frog Habitat	acres	181.271 (0.5%)	-	-	-	-	-	-	-
Ecosystem	Steelhead Habitat	feet	5492.985 (21.1%)	-	-	-	12.59-45.75 (0.2% - 0.8%)	-	-	104.30-219.81 (1.9% - 4.0%)
Ecosystem	Streams	feet	7214 (6.3%)	-	-	-	23.43-44.85 (0.3% - 0.6%)	-	3.94-44.85 (0.1% - 0.6%)	291.02-571.00 (4.0% - 7.9%)
Ecosystem	Surfgrass	feet	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Wetlands	acres	7.614 (3.5%)	-	-	-	0.00-0.00 (0.0% - 0.0%)	-	0.00-0.00 (0.0% - 0.0%)	0.02-0.15 (0.3% - 1.9%)
Emergency Response	Fire	acres	1.646 (83.6%)	-	-	-	-	-	-	-
Emergency Response	Police	acres	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Cleanup Sites	count	2 (25.0%)	1 (50.0%)	-	-	1.00-1.00 (50.0% - 50.0%)	-	-	2.00-2.00 (100% - 100%)
Hazardous Waste	Solid Waste Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Underground Storage Tanks	count	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Auto Services	acres	0.42 (8.8%)	0.42 (100%)	-	-	0.42-0.42 (100% - 100%)	-	-	0.42-0.42 (100% - 100%)
Land Use	Beach	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Commercial	acres	18.242 (20.5%)	8.587 (47.1%)	-	-	8.57-8.57 (47.0% - 47.0%)	-	0.01-3.08 (0.0% - 16.9%)	8.86-12.29 (48.5% - 67.4%)
Land Use	Hotels	acres	1.891 (29.0%)	-	-	-	-	-	-	-
Land Use	Industrial	acres	0.983 (5.4%)	-	-	-	-	-	-	-
Land Use	Mixed Use	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Mobile Homes	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Multi-Family	acres	7.102 (3.8%)	-	-	-	-	-	-	-
Land Use	Office	acres	1.03 (23.7%)	-	-	-	-	-	-	-
Land Use	Other Open Space	acres	28.739 (3.9%)	0.001 (0.0%)	-	-	0.37-1.42 (1.3% - 4.9%)	-	0.06-1.12 (0.2% - 3.9%)	2.61-3.79 (9.1% - 13.2%)
Land Use	Other Public or Community Uses	acres	15.133 (19.8%)	3.477 (23.0%)	-	0.00-0.17 (0.0% - 1.1%)	3.45-3.45 (22.8% - 22.8%)	0.283 (1.9%)	0.60-2.30 (4.0% - 15.2%)	3.51-4.72 (23.2% - 31.2%)
Land Use	Parks & Accessible Open Space	acres	21.858 (0.8%)	1.797 (8.2%)	-	0.00-0.09 (0.0% - 0.4%)	1.70-1.70 (7.8% - 7.8%)	-	0.53-1.43 (2.4% - 6.6%)	1.71-1.96 (7.8% - 8.9%)
Land Use	ROW	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Schools	acres	59.795 (25.2%)	-	-	-	-	-	-	-
Land Use	Single Family Residential	acres	289.447 (16.4%)	22.696 (7.8%)	-	0.00-0.02 (0.0% - 0.0%)	24.94-23.96 (8.6% - 8.3%)	0.24 (0.1%)	1.32-11.45 (0.5% - 4.0%)	26.72-43.62 (9.2% - 15.1%)
Land Use	Vacant/Undeveloped	acres	155.432 (14.1%)	-	-	-	-	-	-	-
Lands	Pacifica City Limits	acres	575.807 (7.1%)	50.619 (8.8%)	-	0.00-0.34 (0.0% - 0.1%)	53.31-52.63 (9.3% - 9.1%)	1.174 (0.2%)	4.58-28.14 (0.8% - 4.9%)	58.57-85.77 (10.2% - 14.9%)
Lands	Parcels	count	1953 (15.0%)	242 (12.4%)	-	2.00-3.00 (0.1% - 0.2%)	251.00-235.00 (12.9% - 12.0%)	4 (0.2%)	44.00-142.00 (2.3% - 7.3%)	268.00-386.00 (13.7% - 19.8%)
Lands	Parks Conservation	acres	31.942 (0.9%)	2.455 (7.7%)	-	0.00-0.26 (0.0% - 0.8%)	2.35-2.36 (7.4% - 7.4%)	0.246 (0.8%)	1.10-2.11 (3.5% - 6.6%)	2.37-2.61 (7.4% - 8.2%)
Recreation	Access Lateral	feet	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Access Vertical	feet	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Fishing Pier	count	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Parks	acres	27.819 (1.0%)	-	-	-	-	-	-	-
Recreation	Trails	feet	10318.582 (5.6%)	-	-	-	-	-	-	-
Stormwater	EQ Basin	acres	0.401 (100%)	0.401 (100%)	-	-	0.40-0.40 (100% - 100%)	-	0.00-0.40 (1.0% - 100%)	0.40-0.40 (100% - 100%)
Stormwater	Pipes	feet	33229.948 (11.4%)	6495.865 (19.5%)	-	-	7119.92-6780.20 (21.4% - 20.4%)	329.144 (1.0%)	1181.51-4152.38 (3.6% - 12.5%)	7395.02-9702.32 (22.3% - 29.2%)
Stormwater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Stormwater	Stormwater Outfalls	count	9 (8.3%)	-	-	-	-	-	-	-
Transportation	Bridge Local	count	2 (50.0%)	-	-	-	-	-	-	-
Transportation	Bridge State	count	2 (22.2%)	-	-	-	-	-	-	-
Transportation	Highway	feet	7470.476 (0.0%)	1841.48 (24.7%)	-	-	1760.11-1760.11 (23.6% - 23.6%)	681.753 (9.1%)	-	
Transportation	Streets City	feet	81165.088 (14.4%)	11074.088 (13.6%)	-	-	11168.60-10552.81 (13.8% - 13.0%)	-	1540.09-6145.19 (1.9% - 7.6%)	11713.44-14641.42 (14.4% - 18.0%)
Wastewater	Pipeline	feet	83553.921 (15.1%)	10563.016 (12.6%)	-	-	11153.23-10357.97 (13.3% - 12.4%)	-	1483.14-6265.44 (1.8% - 7.5%)	11610.32-14360.48 (13.9% - 17.2%)
Wastewater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Water	NCCWD Pipelines	feet	104890.026 (15.0%)	13683.684 (13.0%)	-	-	13750.52-13134.35 (13.1% - 12.5%)	721.172 (0.7%)	2008.47-7938.78 (1.9% - 7.6%)	14454.34-18861.96 (13.8% - 18.0%)

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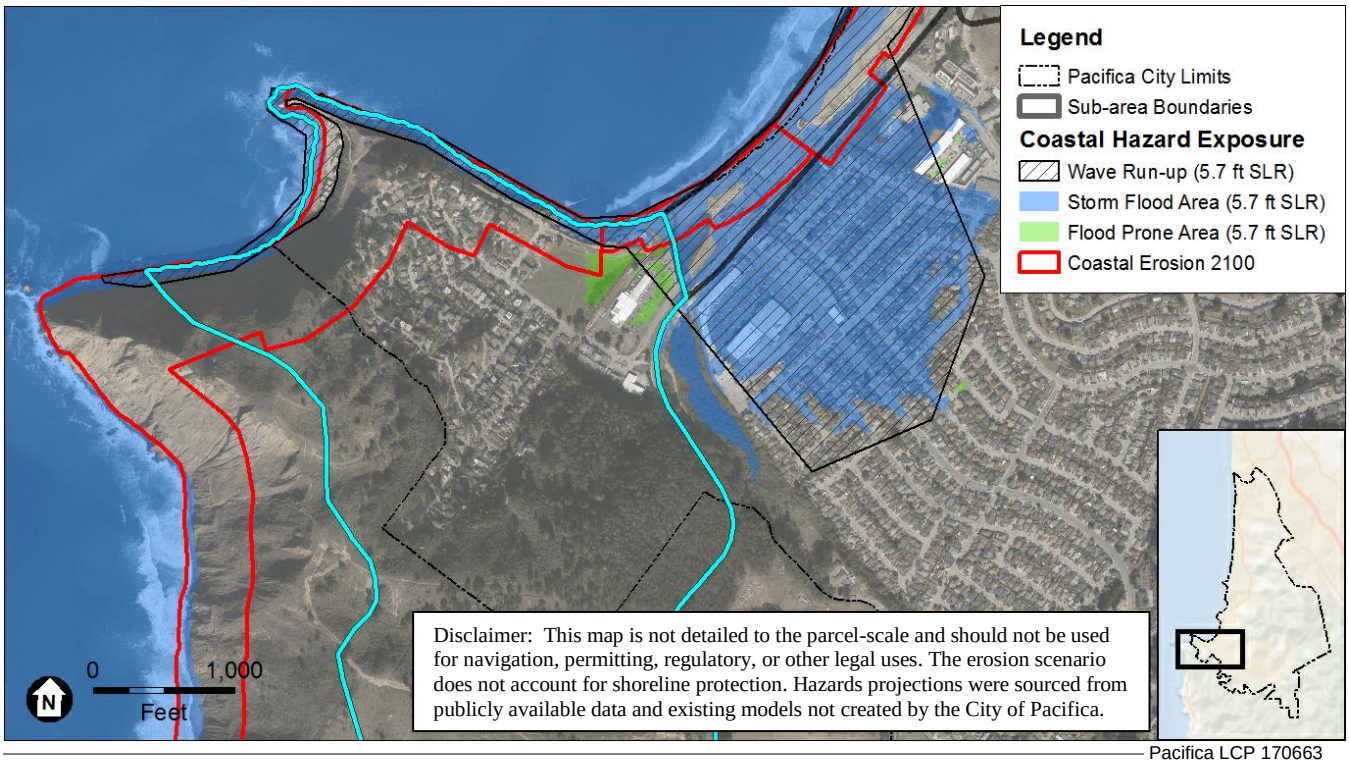
Pedro Point and Shelter Cove



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SOURCE: Multiple

Figure 30
Pedro Point and Shelter Cove Sub-area – Coastal Hazards at 2100

The Pedro Point and Shelter Cove sub-area is mostly high above sea level, thereby limiting its vulnerability to flooding and wave damages (sub-area shown in teal on Figure 30). Asset exposure to coastal erosion and flooding for existing conditions and Medium to High SLR at 2050 and 2100 are reported in Table 11. Asset exposures under Extreme SLR scenario can be estimated at 2075 using the exposures under Med-High SLR at 2100. Coastal flooding and erosion exposure to coastal armoring structures, stormwater and wastewater infrastructure, essential/emergency services, and hazardous materials are shown in Appendix B-5. Exposure to existing land use, City-owned parcels, landmarks, local streets, utilities, senior centers, affordable rentals and other community assets are shown in Appendix C-5. Exposure to parks and trails, public access, habitats and sensitive species are shown in Appendix D-5.

Fifteen parcels are exposed to coastal storm flooding, including residential homes along the boat docks, the commercial Pedro Point Shopping center, vacant lands, and the Shelter Cove community. Beaches in this sub-area are exposed to both inundation (1.2 acres) and storm flooding (1.4 acres). Surf grass is also exposed to inundation (0.4 miles) and flooding (0.5 miles). This sub-area includes a portion of San Pedro Creek wetlands that are exposed to flooding. Shelter Cove, an identified community at risk, is exposed to flooding and wave damages. All 0.1 miles of coastal structures are exposed to flooding and wave damages.

Erosion poses a greater threat to this sub-area. A total of 91 parcels are exposed that are mostly residential and some vacant land. Local streets are exposed (1.4 miles). Shelter Cove is exposed to erosion. Sewer lines are also

exposed (0.5 miles) as are water pipes (0.6 miles). All coastal structures are exposed, including timber structures at Shelter Cove and along the boat dock homes.

Asset exposures to coastal flooding under existing conditions, coastal erosion for 2050 and 2100, and coastal storm flooding and regular tidal inundation for a range of Medium to High SLR (shown as a range) at 2050 and 2100 are reported in the table below. For each asset, the total quantity within the sub-area (and percent of total within Pacifica) is provided for reference. Exposures are reported for the asset unit of measure and the percentage of that particular asset within the sub-area.

Table 11
Pedro Point and Shelter Cove Asset Exposure for Existing and Future Sea-levels

Sub-area Asset Exposure Table Pedro Point and Shelter Cove				Existing Conditions (% of Sub-area)	2050 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*			2100 Exposure Count (Percent of sub-area total) *Exposure Range for inundation and flooding is for Low to Medium-High SLR*		
Category	**Asset**	**Units**	**Total in Sub-area (% of Pacifica)**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**	**Coastal Erosion**	**Regular Tidal Inundation**	**Storm Flooding**
Coastal Structures	Armor Structures	feet	583 (3.6%)	583 (100%)	459.654 (78.8%)	148.00-182.04 (25.4% - 31.2%)	583.00-583.00 (100% - 100%)	465.862 (79.9%)	293.44-481.65 (50.3% - 82.6%)	583.00-583.00 (100% - 100%)
Coastal Structures	Levee	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Comcast Underground Conduit	feet	0 (0.0%)	-	-	-	-	-	-	-
Communication	Towers Private	count	1 (3.8%)	-	-	-	-	-	-	-
Community	Affordable Rentals	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Communities At Risk	count	1 (100%)	1 (100%)	1 (100%)	-	1.00-1.00 (100% - 100%)	1 (100%)	1.00-1.00 (100% - 100%)	1.00-1.00 (100% - 100%)
Community	Healthcare Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Landmarks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Mobile Home Parks	count	0 (0.0%)	-	-	-	-	-	-	-
Community	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Community	Senior Centers	count	0 (0.0%)	-	-	-	-	-	-	-
Ecosystem	Beaches	acres	1.364 (2.3%)	1.364 (100%)	0.718 (52.7%)	0.56-0.68 (40.8% - 50.1%)	1.36-1.36 (99.7% - 100%)	0.723 (53.0%)	0.93-1.24 (67.9% - 90.7%)	1.36-1.36 (100% - 100%)
Ecosystem	CA Red Leg Frog Habitat	acres	131.996 (0.4%)	-	-	-	-	-	-	-
Ecosystem	Steelhead Habitat	feet	164.418 (0.6%)	16.955 (10.3%)	16.955 (10.3%)	6.95-14.70 (4.2% - 8.9%)	118.59-151.58 (72.1% - 92.2%)	16.955 (10.3%)	68.74-151.58 (41.8% - 92.2%)	159.42-162.67 (97.0% - 98.9%)
Ecosystem	Streams	feet	578.161 (0.5%)	178.346 (30.8%)	86.258 (14.9%)	17.62-24.95 (3.0% - 4.3%)	465.21-521.01 (80.5% - 90.1%)	151.421 (26.2%)	290.61-527.82 (50.3% - 91.3%)	562.56-571.35 (97.3% - 98.8%)
Ecosystem	Surfgrass	feet	3053.368 (19.0%)	2899.113 (94.9%)	2286.177 (74.9%)	1690.87-1724.11 (55.4% - 56.5%)	2647.60-2888.54 (86.7% - 94.6%)	2286.718 (74.9%)	1790.98-2370.48 (58.7% - 77.6%)	3018.00-3053.37 (98.8% - 100%)
Ecosystem	Wetlands	acres	5.568 (2.6%)	0.021 (0.4%)	0.661 (11.9%)	0.01-0.01 (0.1% - 0.2%)	0.03-0.04 (0.5% - 0.8%)	1.934 (34.7%)	0.02-0.03 (0.3% - 0.6%)	0.78-1.23 (13.9% - 22.2%)
Emergency Respons	Fire	acres	0 (0.0%)	-	-	-	-	-	-	-
Emergency Respons	Police	acres	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Cleanup Sites	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Solid Waste Facility	count	0 (0.0%)	-	-	-	-	-	-	-
Hazardous Waste	Underground Storage Tanks	count	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Auto Services	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Beach	acres	0.028 (0.1%)	0.028 (100%)	-	0.00-0.00 (0.2% - 0.4%)	0.03-0.03 (100% - 100%)	-	0.02-0.03 (75.3% - 99.5%)	0.03-0.03 (100% - 100%)
Land Use	Commercial	acres	6.228 (7.0%)	0.003 (0.1%)	-	-	0.09-0.12 (1.4% - 2.0%)	-	0.04-0.12 (0.7% - 2.0%)	0.31-1.35 (5.0% - 21.6%)
Land Use	Hotels	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Industrial	acres	0.521 (2.8%)	-	-	-	-	-	-	-
Land Use	Mixed Use	acres	0.34 (9.7%)	-	-	-	-	-	-	-
Land Use	Mobile Homes	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Multi-Family	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Office	acres	0.114 (2.6%)	-	-	-	-	-	-	-
Land Use	Other Open Space	acres	138.996 (18.8%)	0.558 (0.4%)	-	0.00-0.01 (0.0% - 0.0%)	0.50-0.44 (0.4% - 0.3%)	-	0.04-0.15 (0.0% - 0.1%)	0.55-0.57 (0.4% - 0.4%)
Land Use	Other Public or Community Uses	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Parks & Accessible Open Space	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	ROW	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Schools	acres	0 (0.0%)	-	-	-	-	-	-	-
Land Use	Single Family Residential	acres	55.984 (3.2%)	3.323 (5.9%)	18.076 (32.3%)	0.15-0.22 (0.3% - 0.4%)	2.04-3.50 (3.6% - 6.3%)	25.415 (45.4%)	0.46-0.99 (0.8% - 1.8%)	3.79-4.40 (6.8% - 7.9%)
Land Use	Vacant/Undeveloped	acres	29.344 (2.7%)	0.397 (1.4%)	0.699 (2.4%)	0.00-0.00 (0.0% - 0.0%)	0.35-0.44 (1.2% - 1.5%)	2.513 (8.6%)	0.05-0.21 (0.2% - 0.7%)	1.31-1.77 (4.5% - 6.0%)
Lands	Pacifica City Limits	acres	152.832 (1.9%)	9.41 (6.2%)	25.457 (16.7%)	4.35-4.69 (2.8% - 3.1%)	8.09-10.15 (5.3% - 6.6%)	36.903 (24.1%)	5.49-6.80 (3.6% - 4.4%)	11.78-14.28 (7.7% - 9.3%)
Lands	Parcels	count	328 (2.5%)	13 (4.0%)	46 (14.0%)	5.00-5.00 (1.5% - 1.5%)	14.00-15.00 (4.3% - 4.6%)	91 (27.7%)	11.00-13.00 (3.4% - 4.0%)	17.00-18.00 (5.2% - 5.5%)
Lands	Parks Conservation	acres	139.023 (3.8%)	0.586 (0.4%)	9.682 (7.0%)	0.00-0.01 (0.0% - 0.0%)	0.53-0.47 (0.4% - 0.3%)	12.638 (9.1%)	0.06-0.17 (0.0% - 0.1%)	0.57-0.60 (0.4% - 0.4%)
Recreation	Access Lateral	feet	314.619 (2.8%)	314.619 (100%)	314.619 (100%)	-	314.62-314.62 (100% - 100%)	314.619 (100%)	129.41-314.62 (41.1% - 100%)	314.62-314.62 (100% - 100%)
Recreation	Access Vertical	feet	214.12 (8.5%)	186.572 (87.1%)	105.896 (49.5%)	-	168.65-185.83 (78.8% - 86.8%)	171.468 (80.1%)	35.11-159.72 (16.4% - 74.6%)	194.63-214.12 (90.9% - 100%)
Recreation	Fishing Pier	count	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Parks	acres	0 (0.0%)	-	-	-	-	-	-	-
Recreation	Trails	feet	9023.361 (4.9%)	50.189 (0.6%)	-	-	35.60-75.83 (0.4% - 0.8%)	37.207 (0.4%)	-	109.99-366.15 (1.2% - 4.1%)
Stormwater	Pipes	feet	3660.637 (1.3%)	-	-	-	-	-	-	-
Stormwater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Stormwater	Stormwater Outfalls	count	7 (6.4%)	-	-	-	-	-	-	-
Transportation	Bridge Local	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Bridge State	count	0 (0.0%)	-	-	-	-	-	-	-
Transportation	Highway	feet	2532.49 (0.0%)	-	-	-	-	-	-	-
Transportation	Streets City	feet	18371.055 (3.3%)	-	4641.309 (25.3%)	-	2.63-25.48 (0.0% - 0.1%)	7107.297 (38.7%)	-	116.18-167.25 (0.6% - 0.9%)
Wastewater	Pipeline	feet	16624.544 (3.0%)	-	281.566 (1.7%)	-	52.85-462.31 (0.3% - 2.8%)	2574.016 (15.5%)	14.00-293.82 (0.1% - 1.8%)	603.40-992.64 (3.6% - 6.0%)
Wastewater	Pump Stations	count	0 (0.0%)	-	-	-	-	-	-	-
Water	NCCWD Pipelines	feet	17062.759 (2.4%)	-	837.747 (4.9%)	-	14.12-18.35 (0.1% - 0.1%)	3313.556 (19.4%)	-	24.87-165.87 (0.1% - 1.0%)

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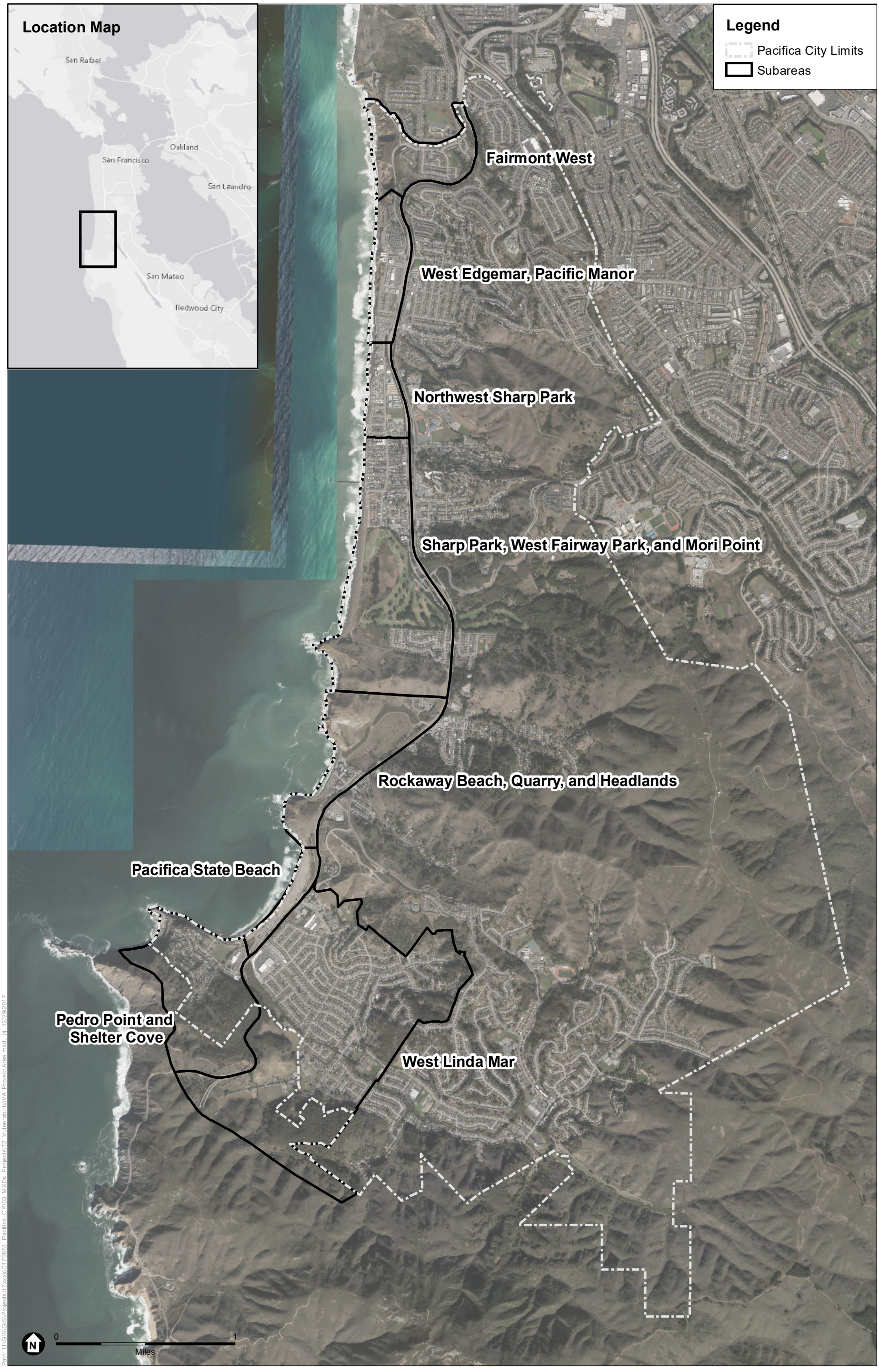
Pacifica Sea-level Rise Vulnerability Assessment
Appendix A
Existing Conditions Hazard Maps



SOURCE: City of Pacifica

Pacifica LCP Update . 170663.00

Figure 1
Project Area
and Assessment Subareas

ESA

SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); FEMA Flood Hazard Areas (2017)

Pacifica LCP Update . 170663.00

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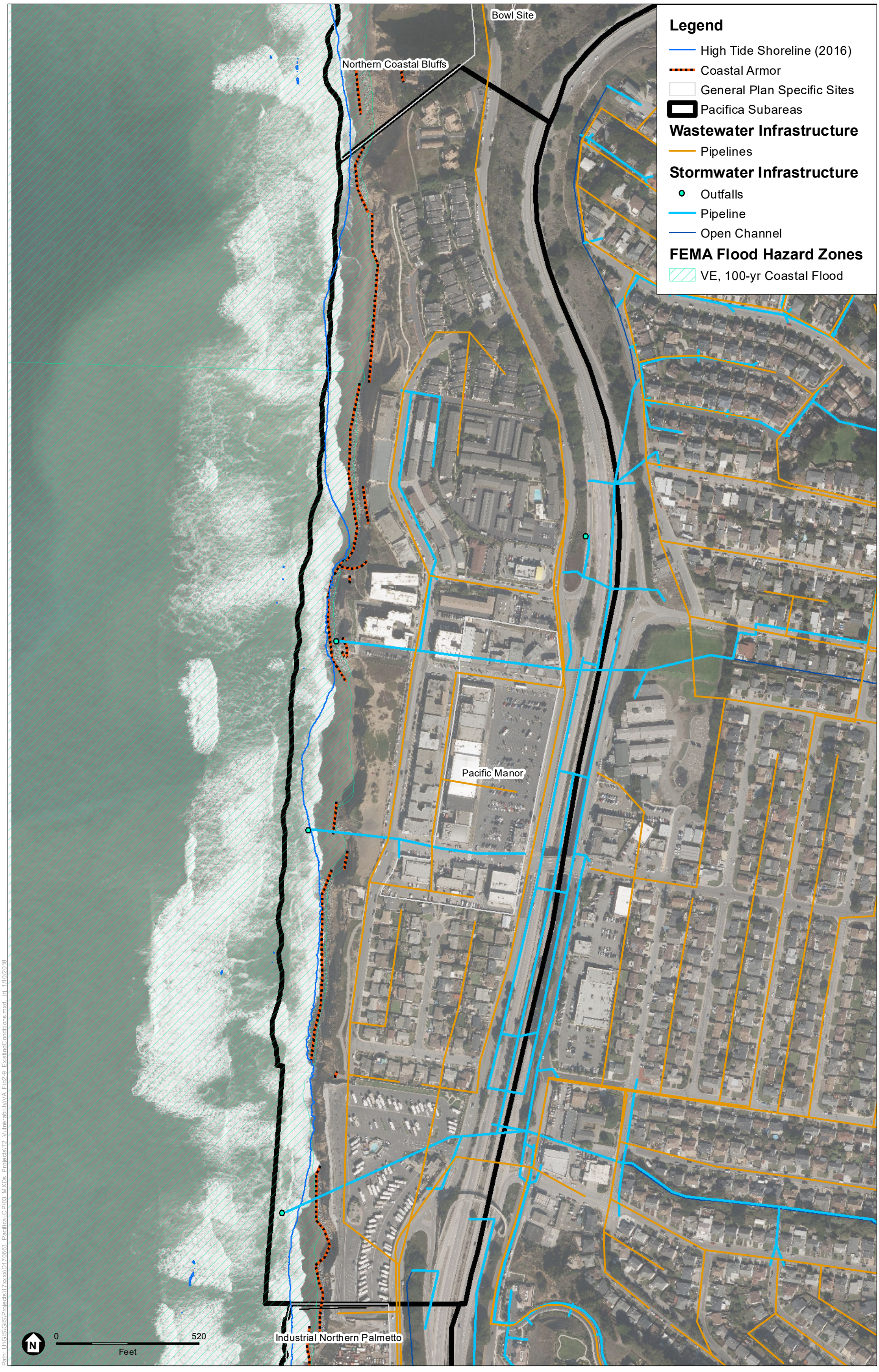
Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.

Appendix A-1
Existing Conditions Map
Fairmont West



SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); FEMA Flood Hazard Areas (2017)

Pacifica LCP Update . 170663.00

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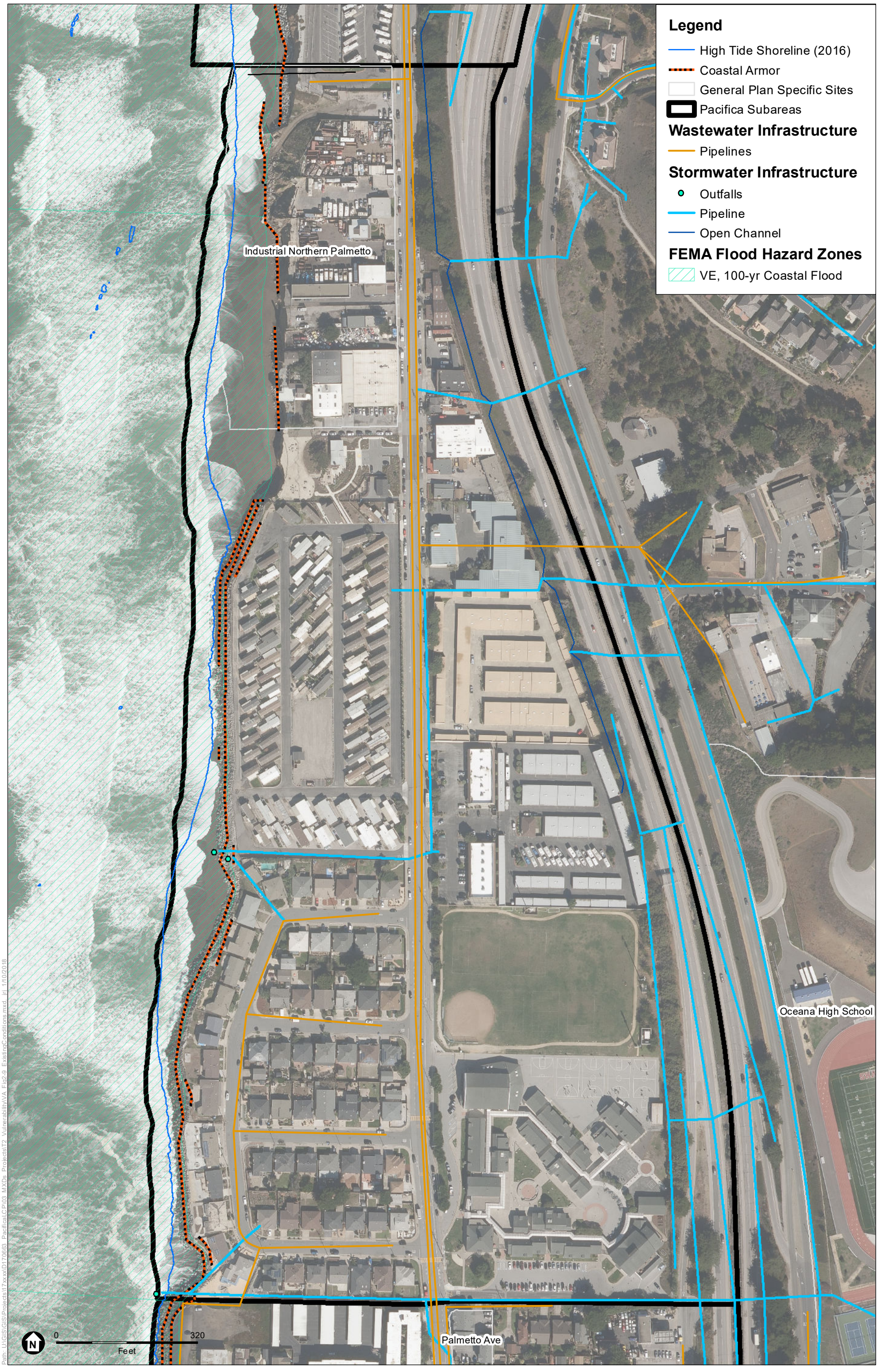
Appendix A-2
Existing Conditions Map
West Edgemar, Pacific Manor



SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); FEMA Flood Hazard Areas (2017)

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Appendix A-3
Existing Conditions Map
Northwest Sharp Park

SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); FEMA Flood Hazard Areas (2017)

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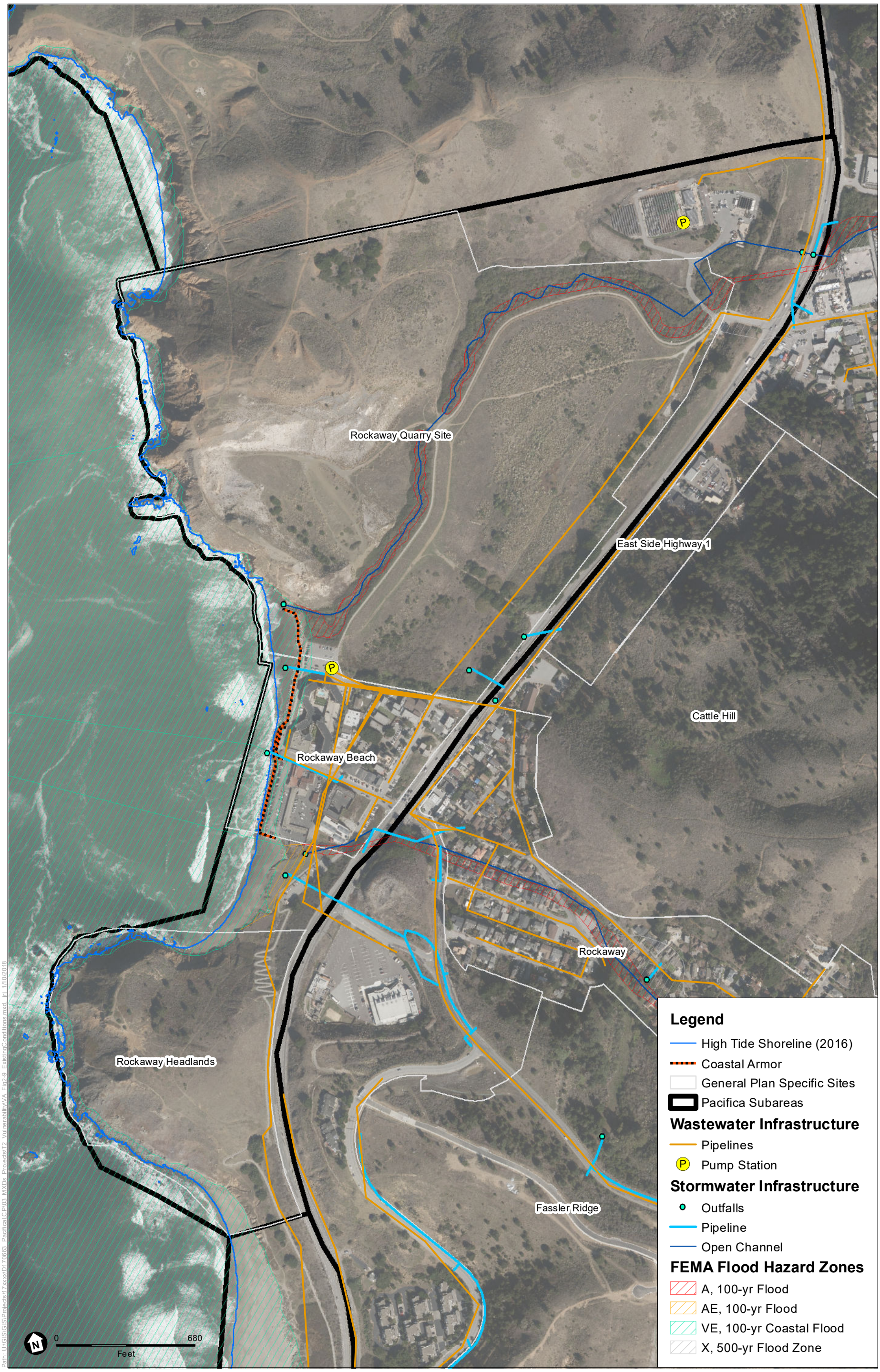
Appendix A-4
Existing Conditions Map
Sharp Park, West Fairway Park, and Mori Point



SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); FEMA Flood Hazard Areas (2017)

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Appendix A-5
Existing Conditions Map
Rockaway Beach, Quarry, and Headlands

SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); FEMA Flood Hazard Areas (2017)

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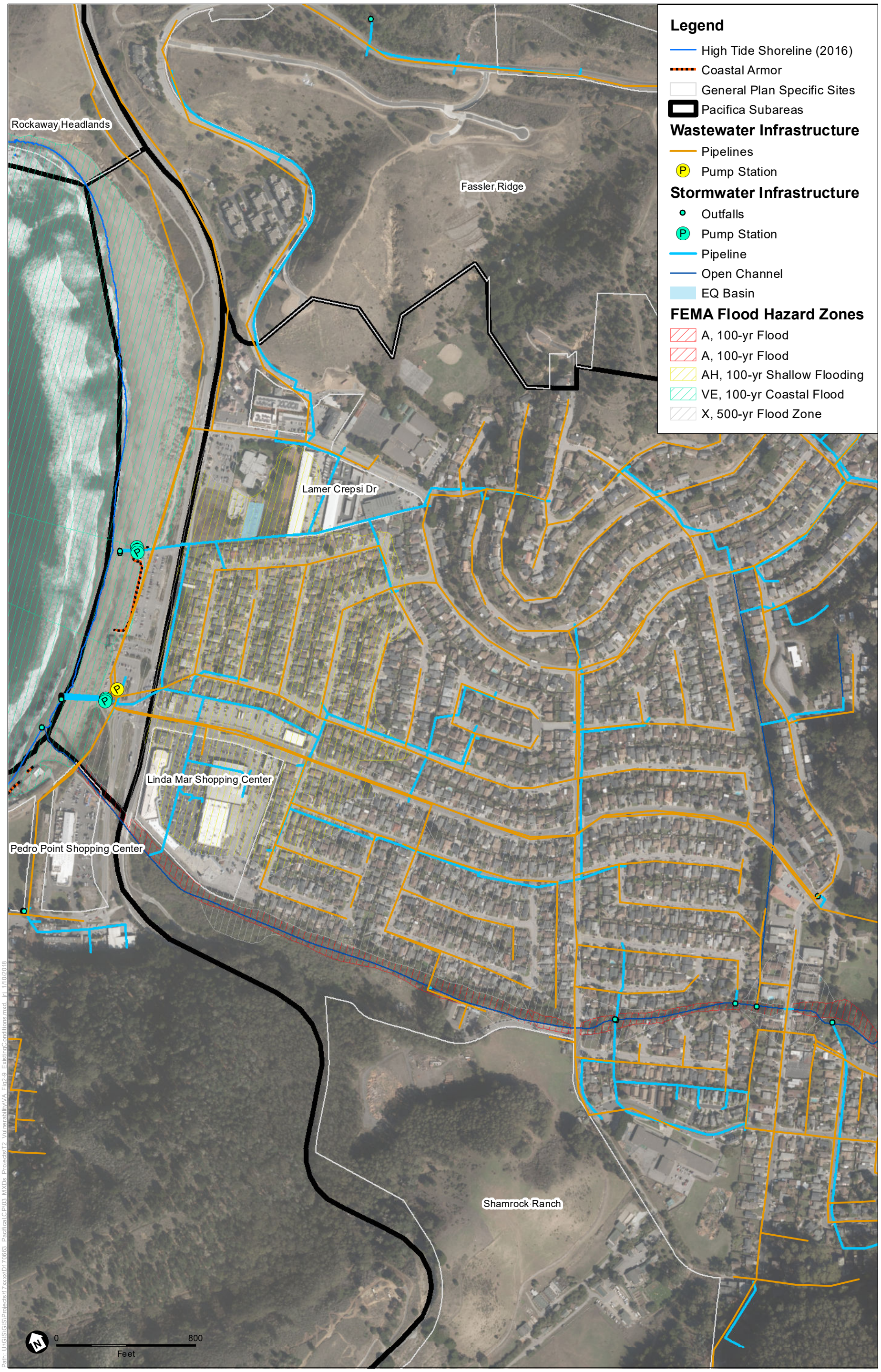
Appendix A-6
Existing Conditions Map
Pacifica State Beach



SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); FEMA Flood Hazard Areas (2017)

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Appendix A-7
Existing Conditions Map
West Linda Mar

SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); FEMA Flood Hazard Areas (2017)

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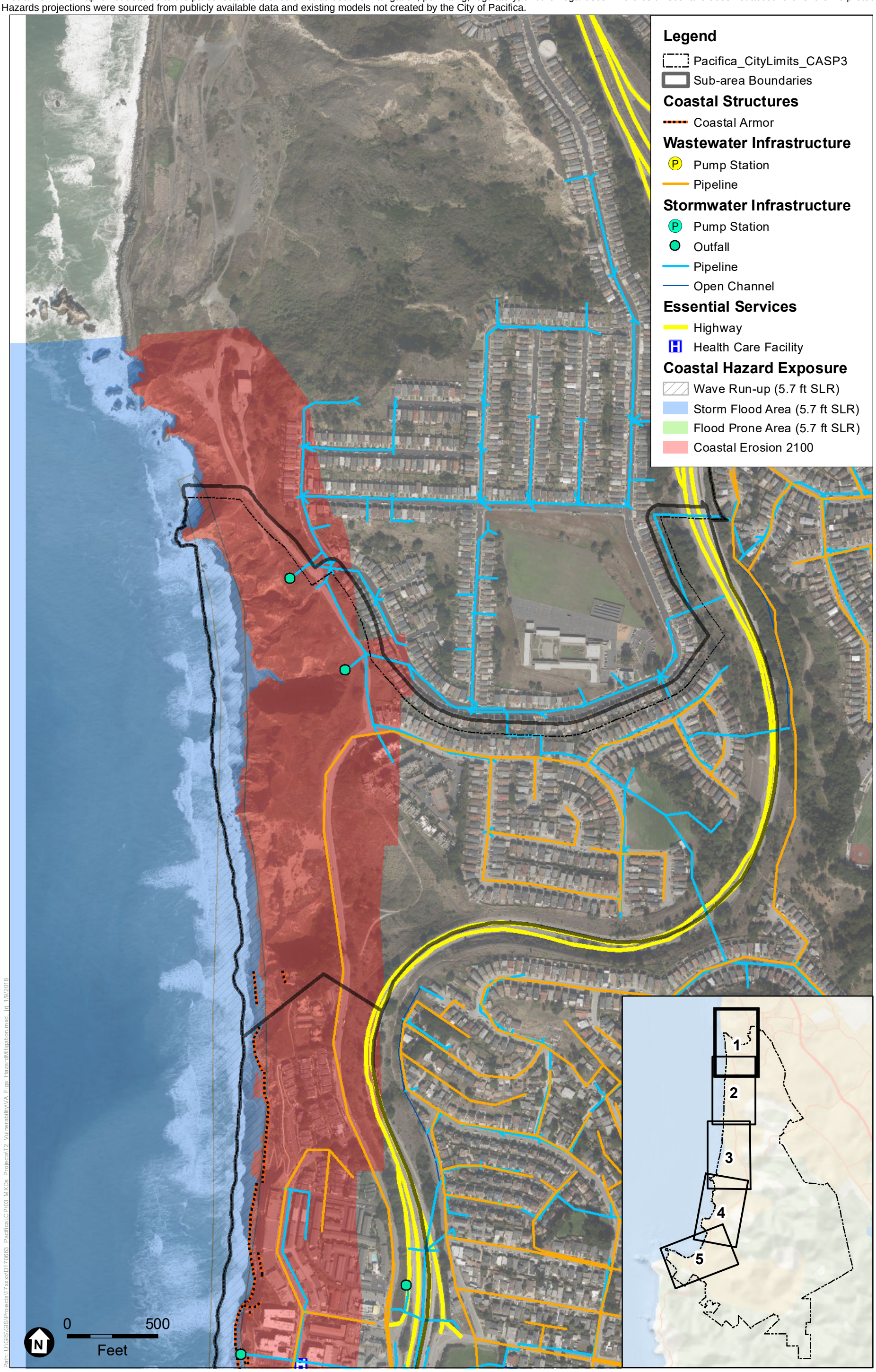
Appendix A-8
Existing Conditions Map
Pedro Point and Shelter Cove

Pacifica Sea-level Rise Vulnerability Assessment
Appendix B
Hazard Mitigation Asset Exposure Maps for
2100 High SLR

Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.

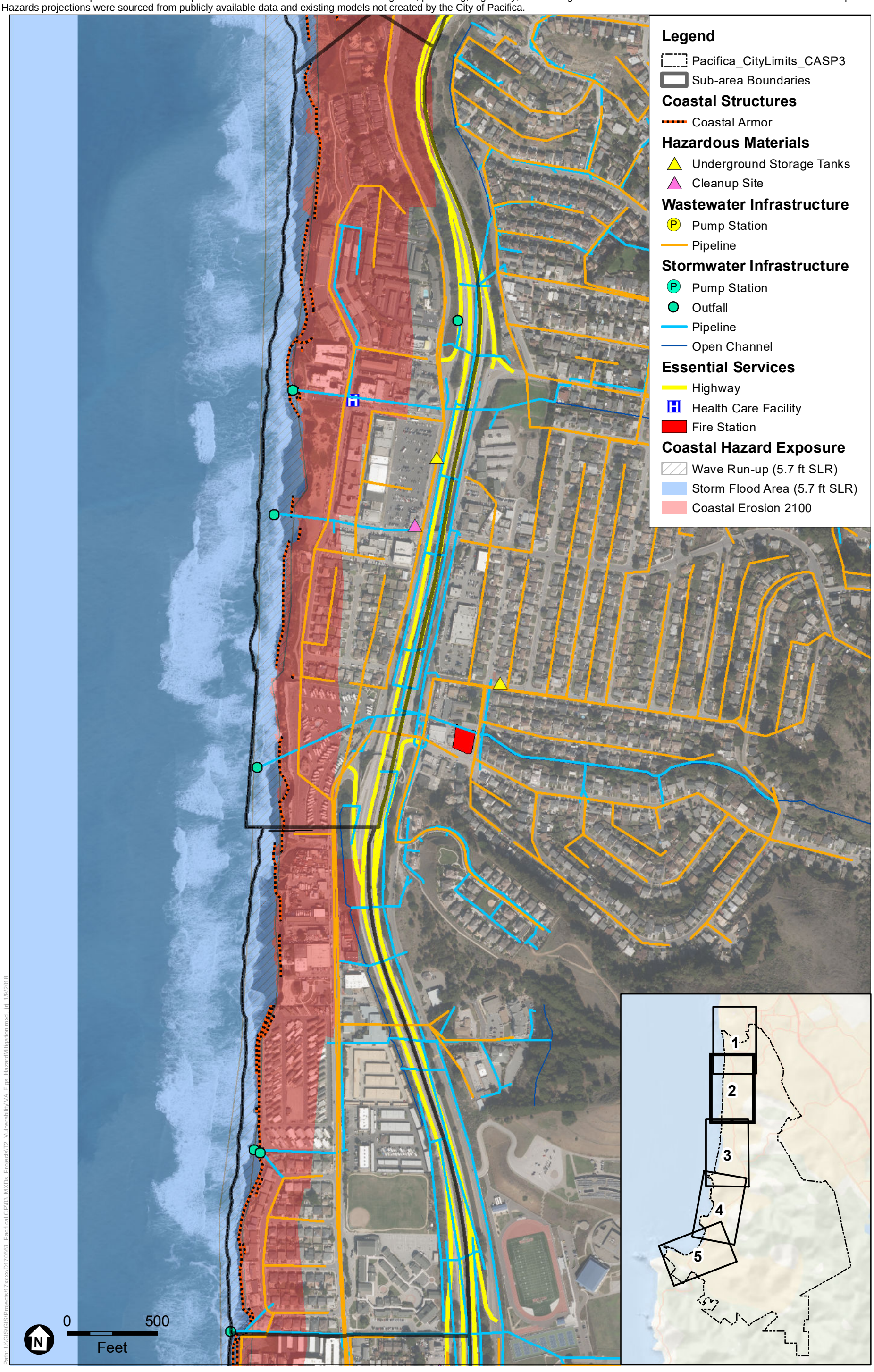


SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

ESA

Appendix B-1
Hazard Mitigation - Asset Exposure Map
Fairmont West

Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.



SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

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Appendix B-2
Hazard Mitigation - Asset Exposure Map
West Edgemar and Pacific Manor; Northwest Sharp Park

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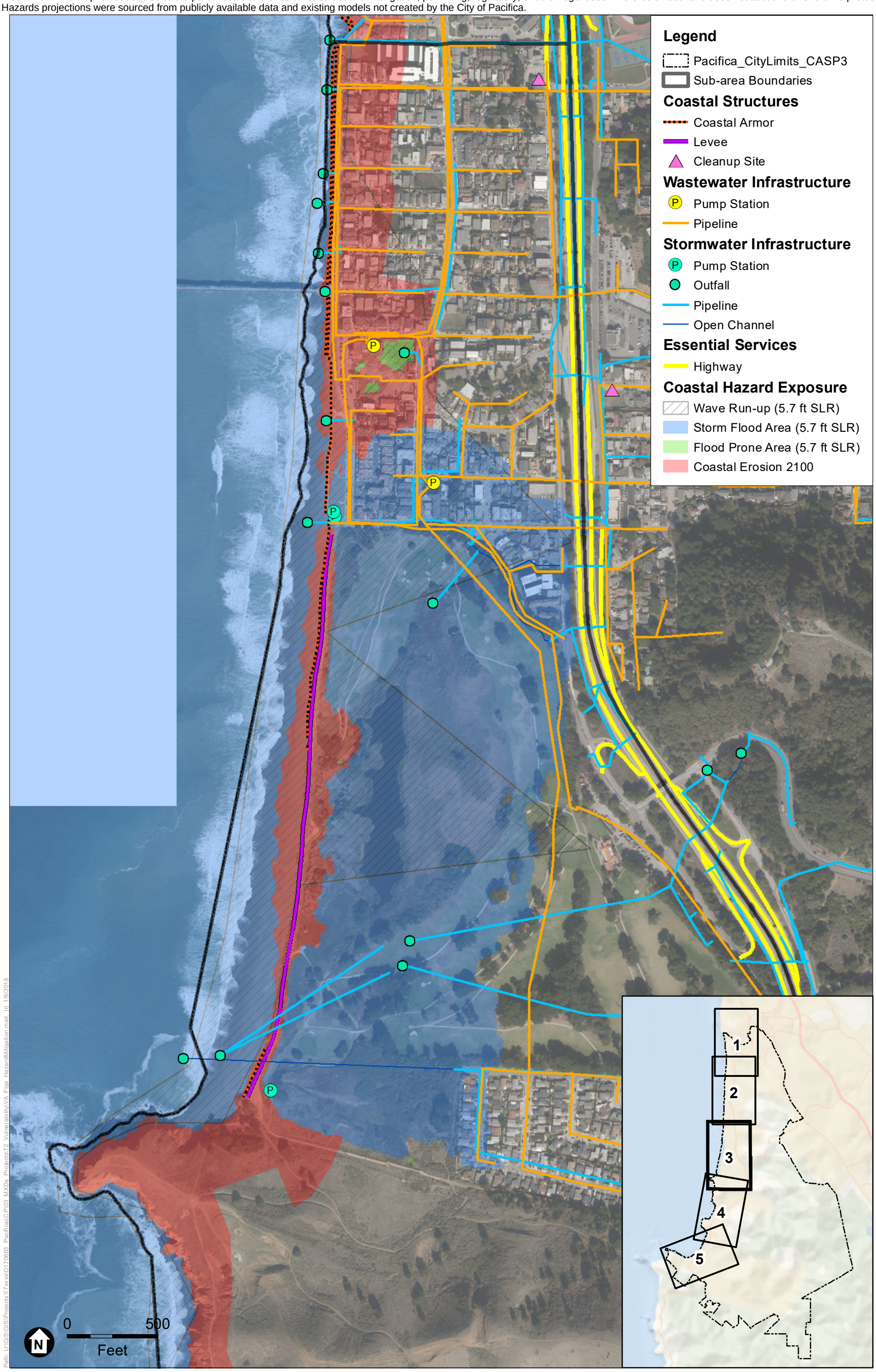

SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

Pacifica LCP Update . 170663.00

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Appendix B-3
Hazard Mitigation - Asset Exposure Map
Sharp Park, West Fairway Park, and Mori Point

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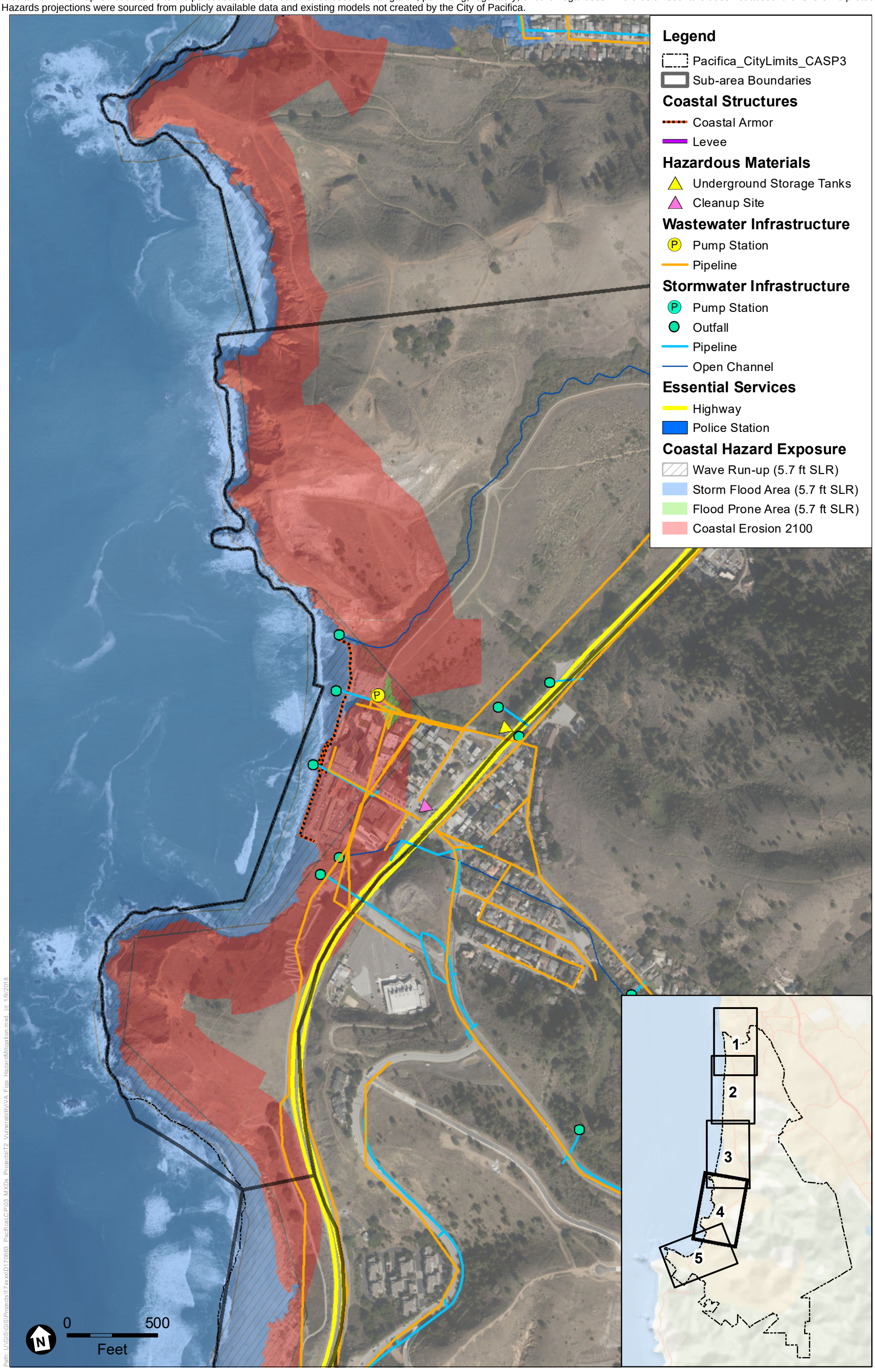

SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

Pacifica LCP Update . 170663.00

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Appendix B-4
Hazard Mitigation - Asset Exposure Map
Rockaway Beach, Quarry and Headlands

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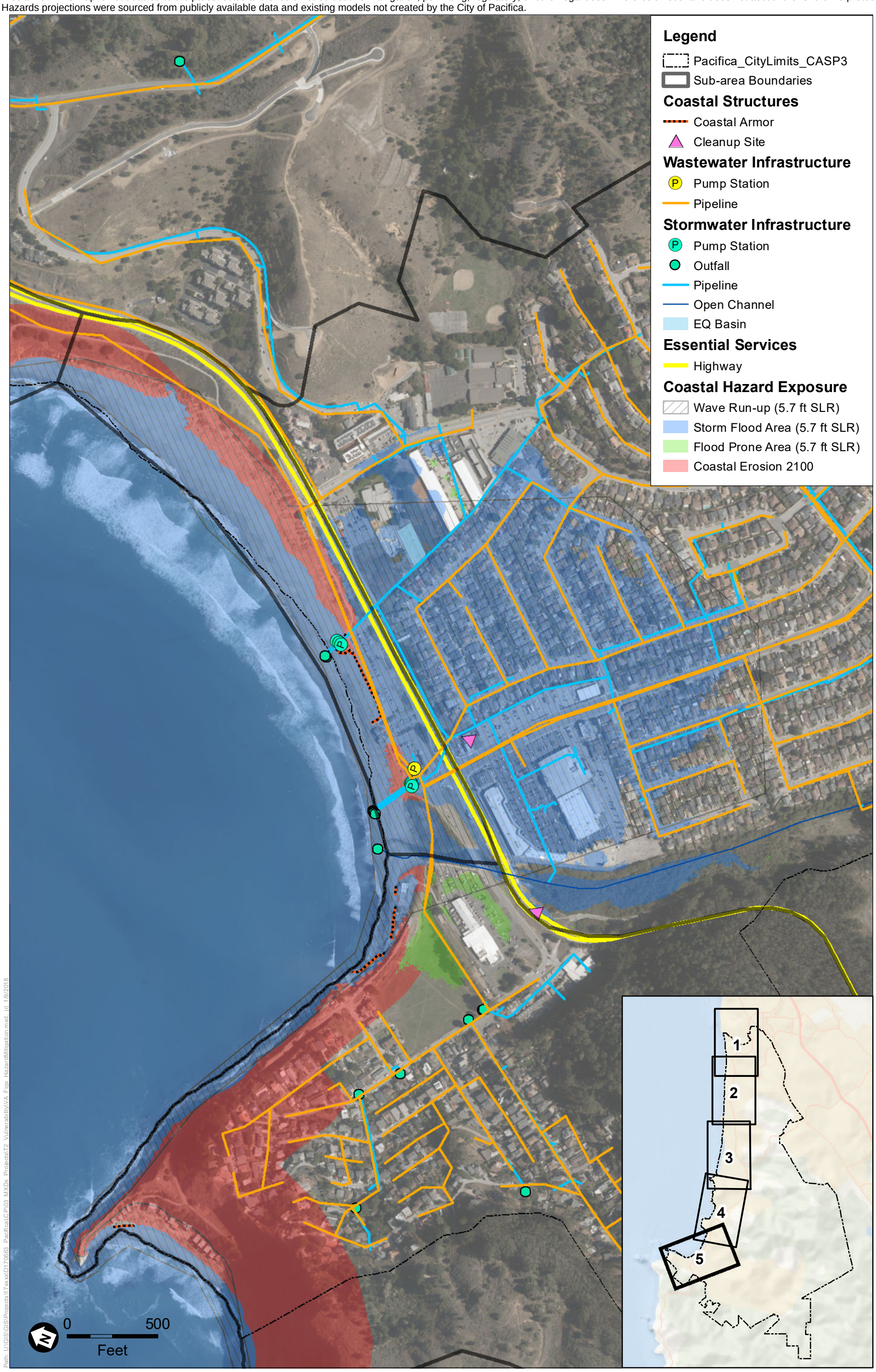

SOURCE: San Mateo County 2017 Imagery; City of Pacifica Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

Pacifica LCP Update . 170663.00

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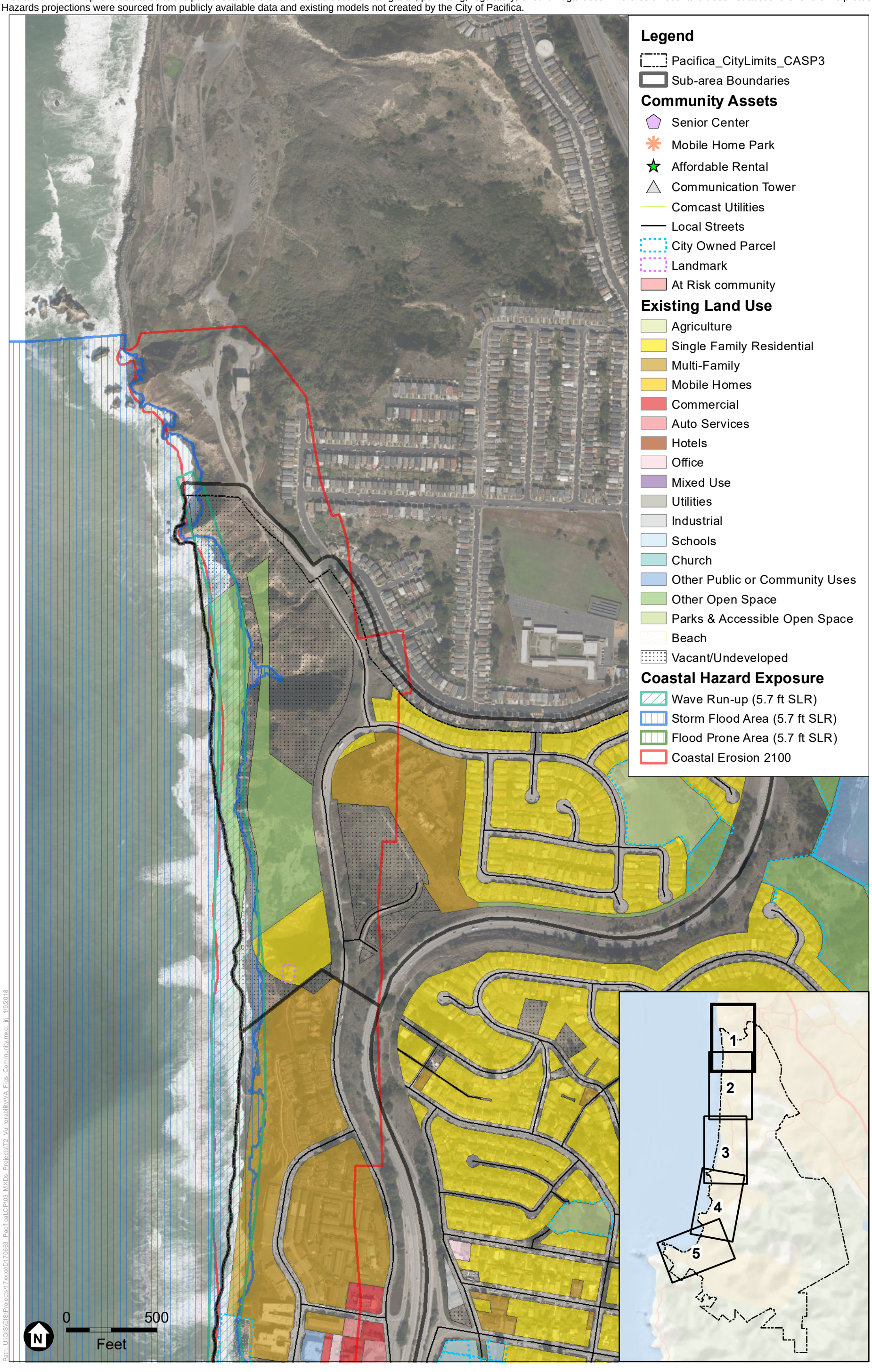
Appendix B-5
Hazard Mitigation - Asset Exposure Map
Pacifica SB; West Linda Mar; Pedro Point and Shelter Cove

Pacifica Sea-level Rise Vulnerability Assessment
Appendix C
Community and Land Use Asset Exposure Maps
for 2100 High SLR

Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.



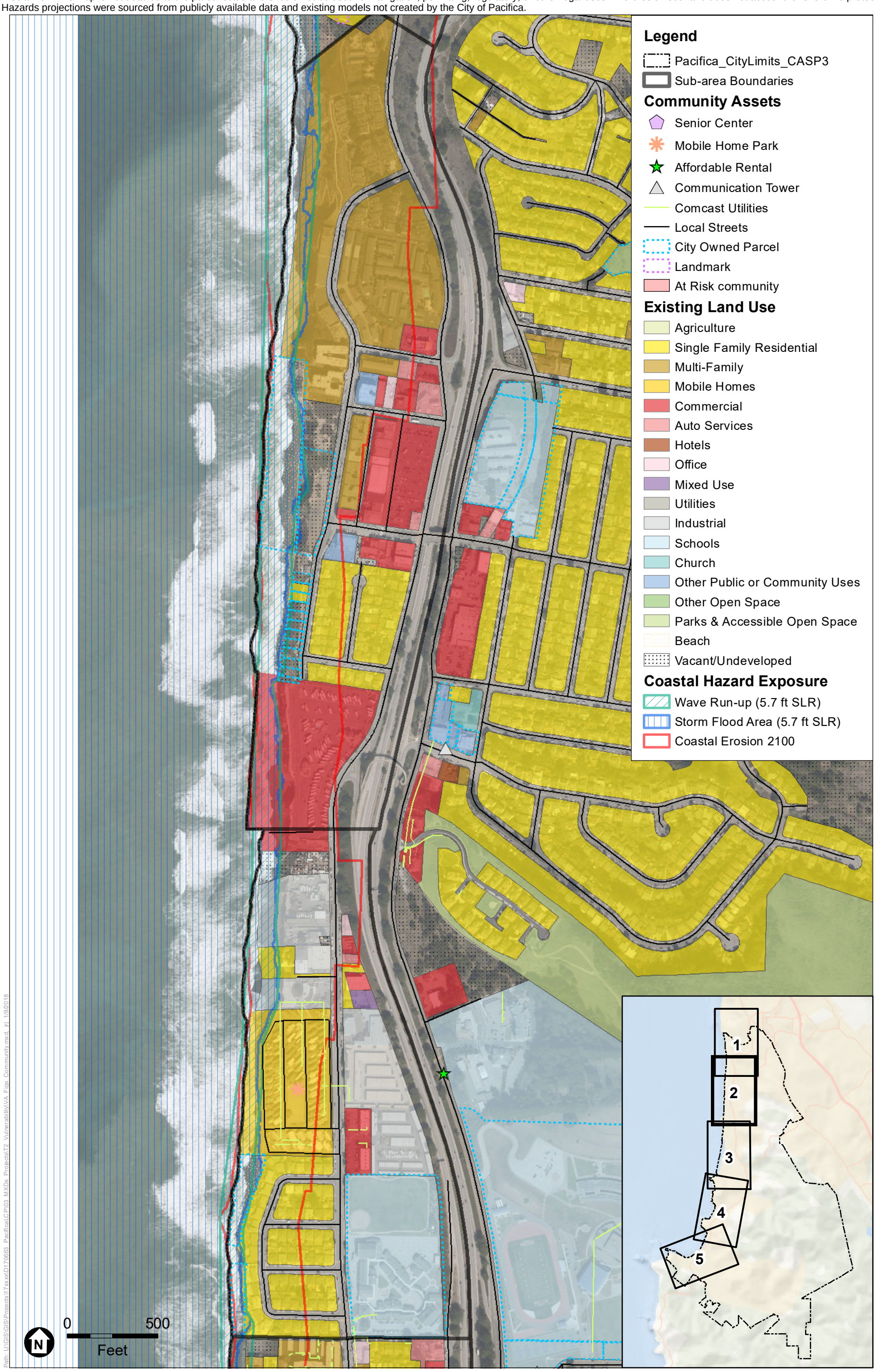
SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

Pacifica LCP Update . 170663.00

ESA

Appendix C-1
Community and Land Use - Asset Exposure Map
Fairmont West

Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.



SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

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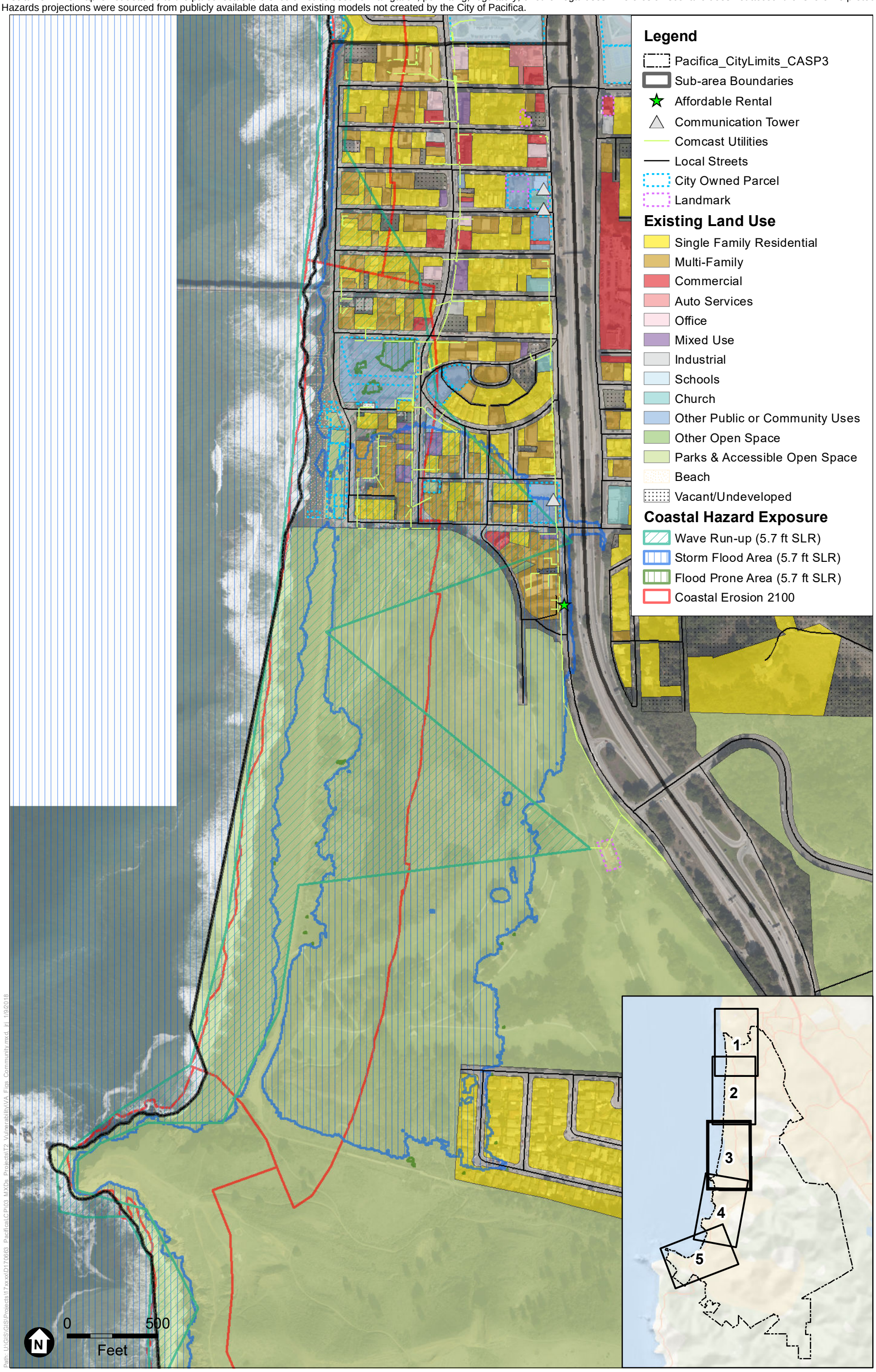
Appendix C-2
Community and Land Use - Asset Exposure Map
West Edgemar and Pacific Manor; Northwest Sharp Park

Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.



SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

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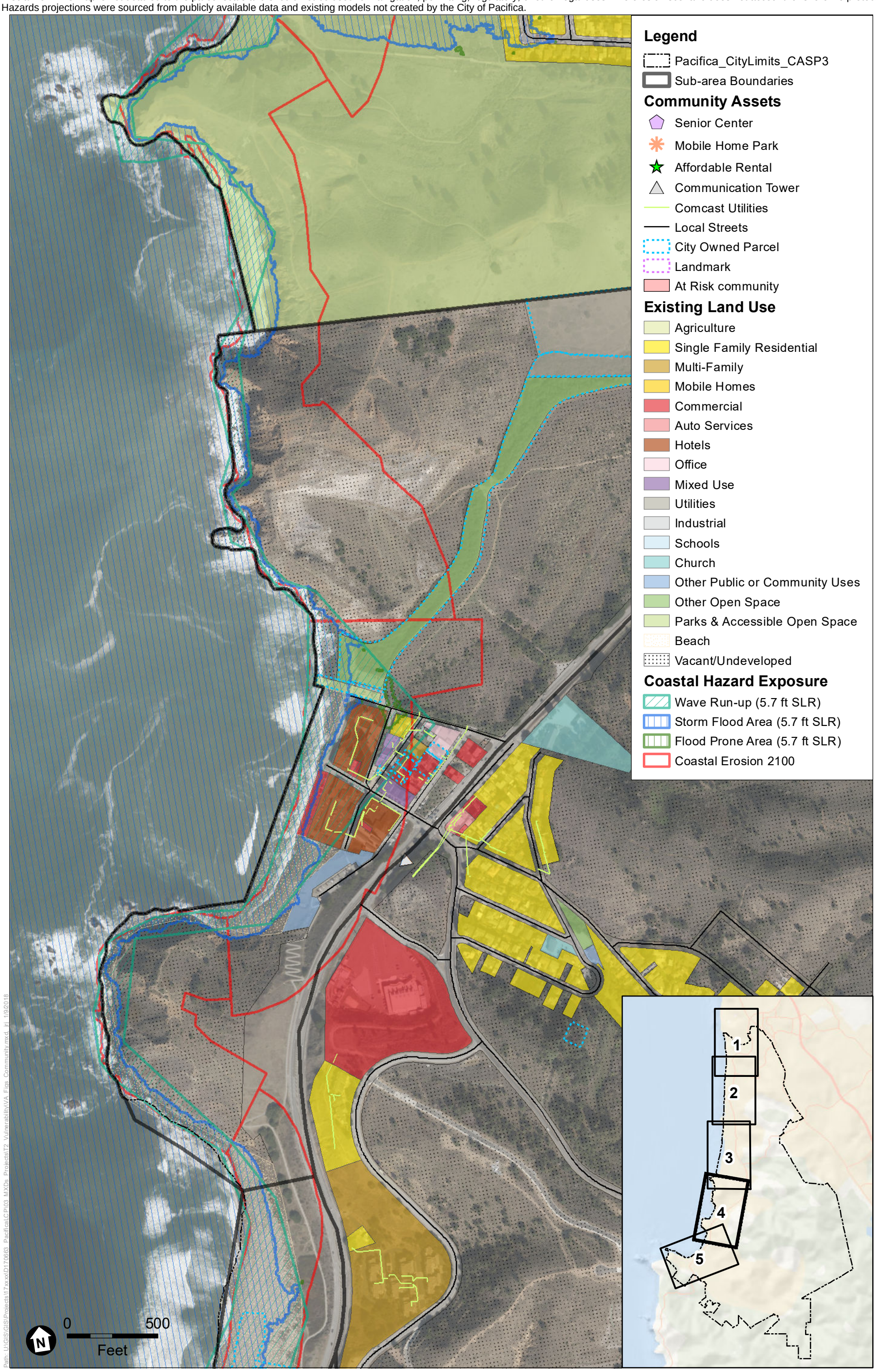
Appendix C-3
Community and Land Use - Asset Exposure Map
Sharp Park, West Fairway Park, and Mori Point

Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.



SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

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Appendix C-4
Community and Land Use - Asset Exposure Map
Rockaway Beach, Quarry and Headlands

Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.

Path: U:\GIS\GIS\Projects\17xxxx\D170663_PacificaLCP\03_MXDs_Projects\T2_Vulnerability\VA_Figs_Community.mxd_ iri_ 1/9/2018

SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017); Pacific Institute Erosion (2009); OCOF Coastal Flooding (2014)

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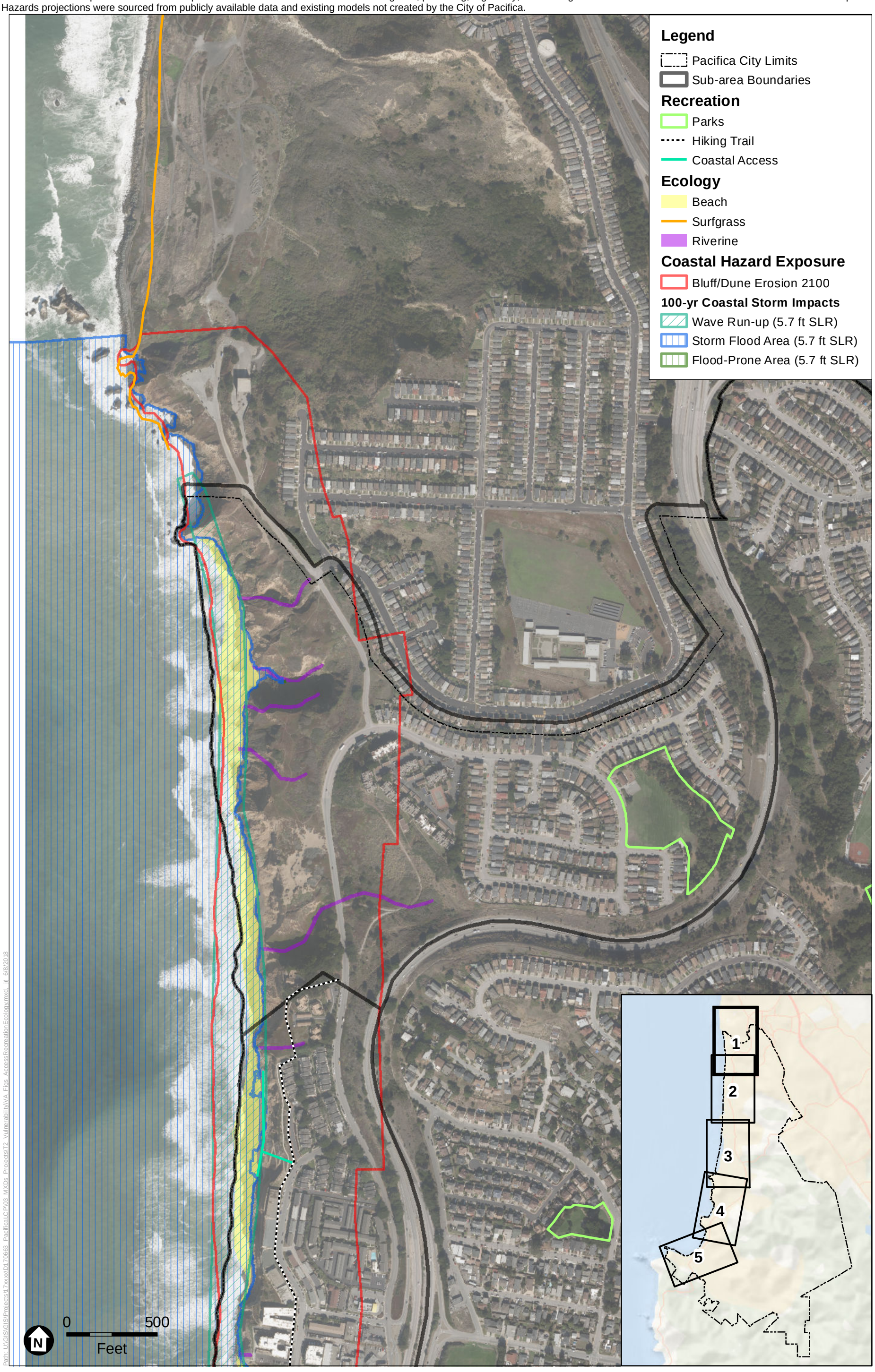
Appendix C-5
Community and Land Use - Asset Exposure Map
Pacifica SB; West Linda Mar; Pedro Point and Shelter Cove

Disclaimer: This map is not detailed to the parcel-scale and should not be used for navigation, permitting, regulatory, or other legal uses. The erosion scenario does not account for shoreline protection. Hazards projections were sourced from publicly available data and existing models not created by the City of Pacifica.



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SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017);
Pacific Institute Erosion of bluff or dune crest without armoring (2009); OCOF Coastal Flooding from 100-yr storm (2014)

DISCLAIMER: Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this figure. There is no attempt in this figure to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. A margin of error is inherent in this figure; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

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Appendix D-1
Public Access, Recreation and Ecology - Asset Exposure Map
Fairmont West

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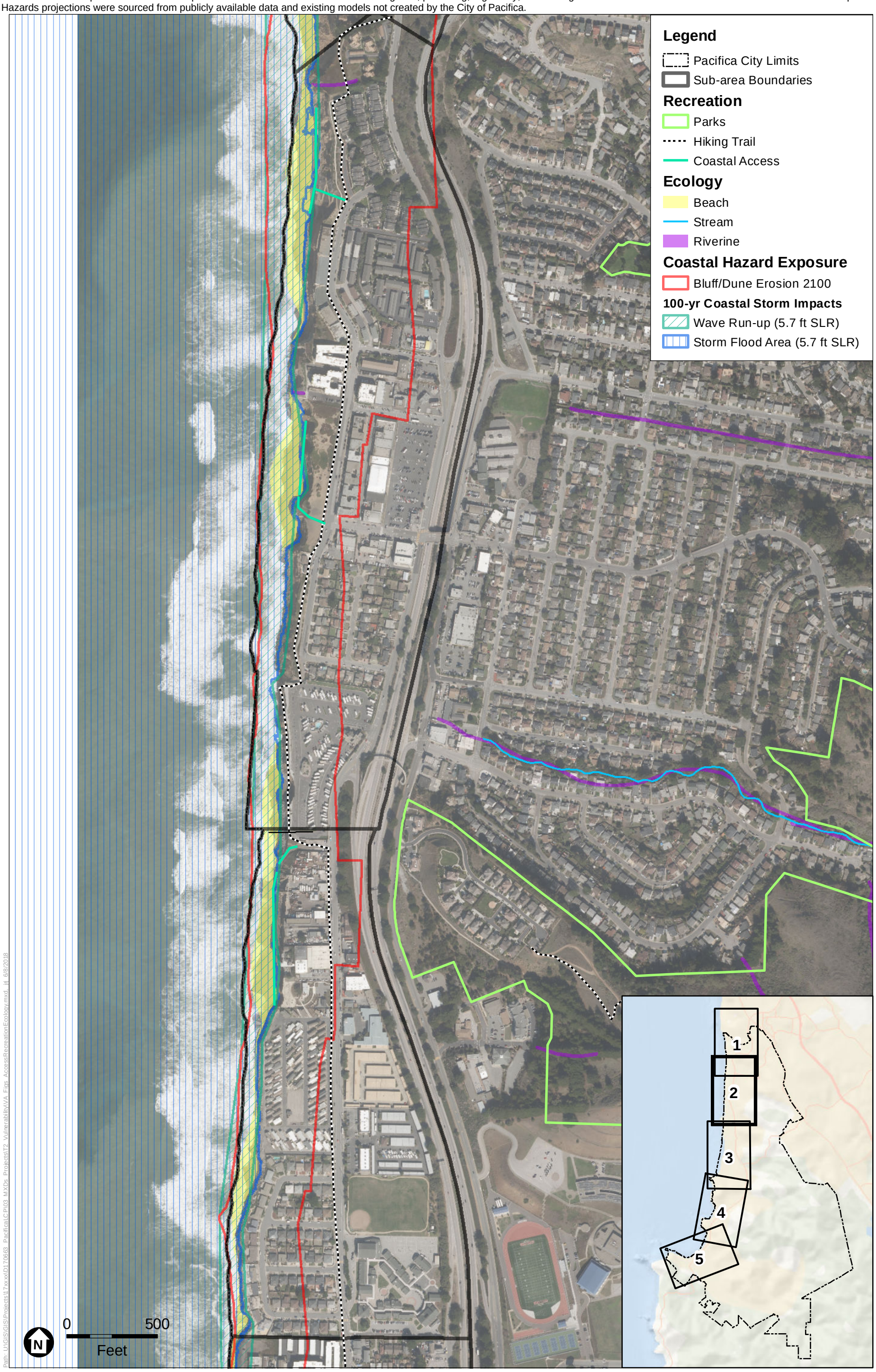

SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017);
Pacific Institute Erosion of bluff or dune crest without armoring (2009); OCOF Coastal Flooding from 100-yr storm (2014)

DISCLAIMER: Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this figure. There is no attempt in this figure to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. A margin of error is inherent in this figure; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

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Appendix D-2
Public Access, Recreation and Ecology - Asset Exposure Map
West Edgemar and Pacific Manor; Northwest Sharp Park

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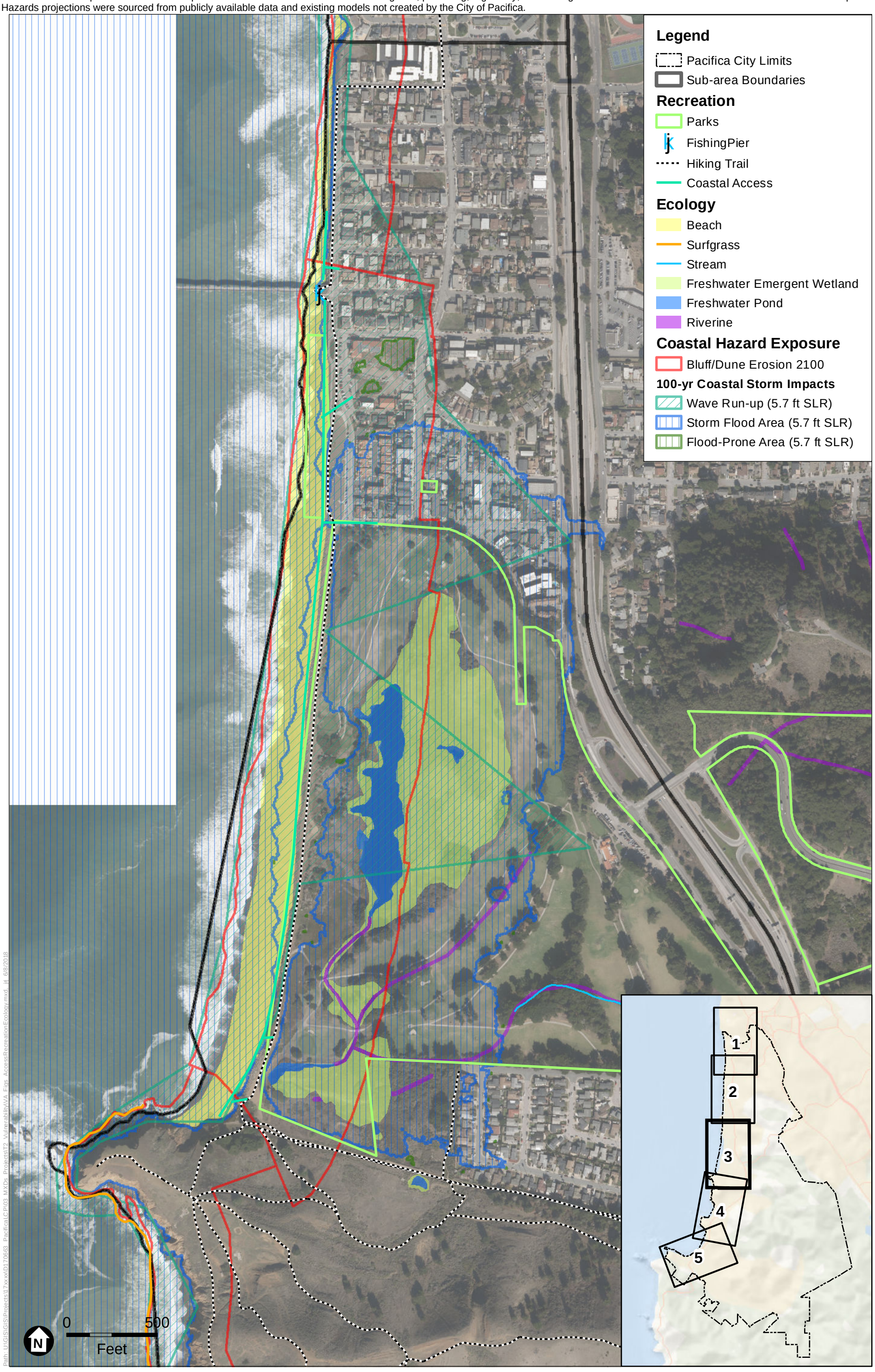

SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017);
Pacific Institute Erosion of bluff or dune crest without armoring (2009); OCOF Coastal Flooding from 100-yr storm (2014)

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Appendix D-3
Public Access, Recreation and Ecology - Asset Exposure Map
Sharp Park, West Fairway Park, and Mori Point

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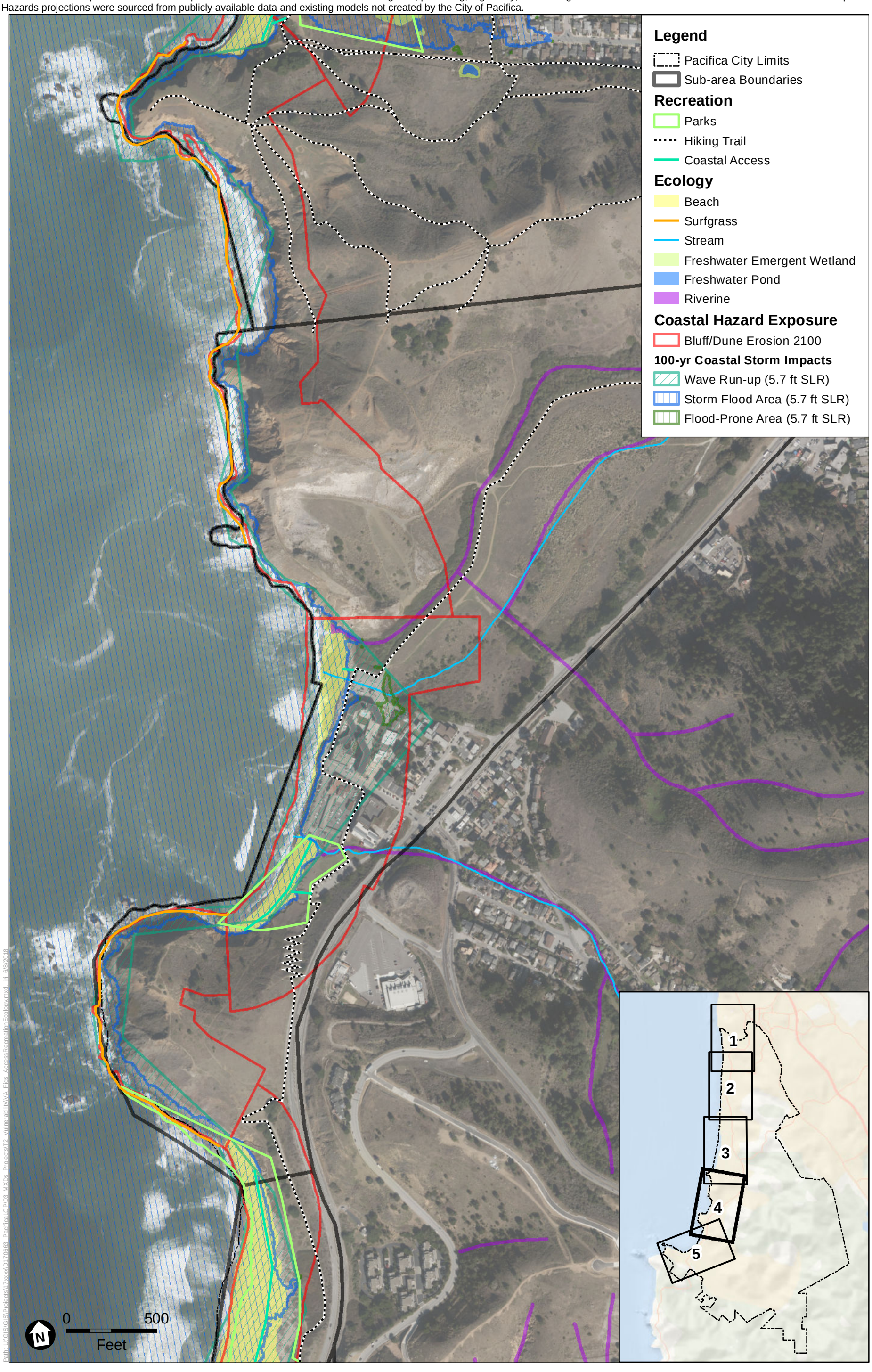

SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017);
Pacific Institute Erosion of bluff or dune crest without armoring (2009); OCOF Coastal Flooding from 100-yr storm (2014)

DISCLAIMER: Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this figure. There is no attempt in this figure to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. A margin of error is inherent in this figure; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

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Appendix D-4
Public Access, Recreation and Ecology - Asset Exposure Map
Rockaway Beach, Quarry and Headlands

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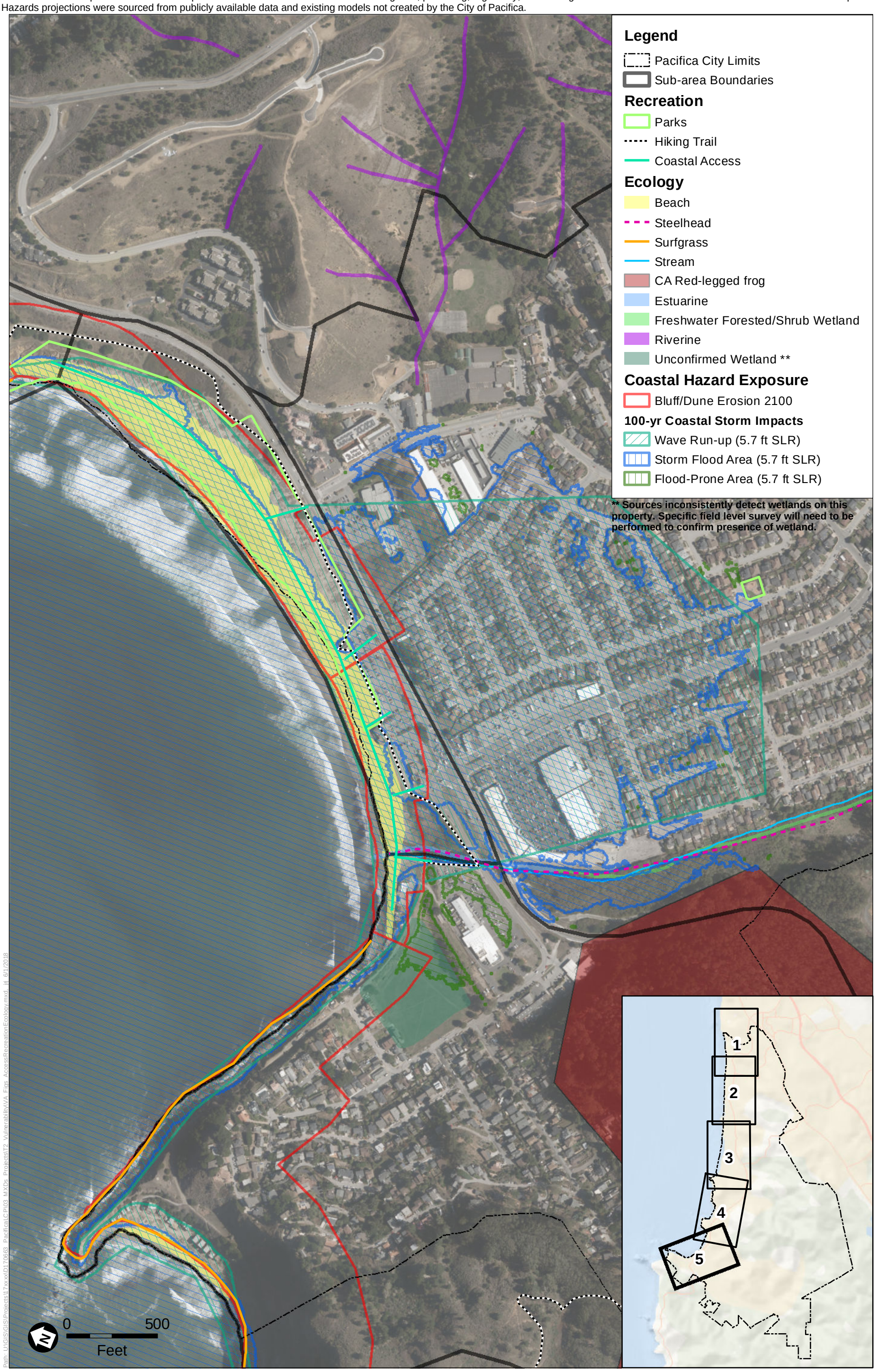

SOURCE: San Mateo County 2017 Imagery; City of Pacific and SMC Assets (2017);
Pacific Institute Erosion of bluff or dune crest without armoring (2009); OCOF Coastal Flooding from 100-yr storm (2014)

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Appendix D-5
Public Access, Recreation and Ecology - Asset Exposure Map
Pacifica SB; West Linda Mar; Pedro Point and Shelter Cove