County of San Mateo

Peninsula Resilience Planning

Safety Element Background Report

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INTRODUCTION

This Existing Conditions Background Report discusses the natural and human-caused hazards that can affect San Mateo County. Each issue identified in this report includes a general overview of each hazard, how/where the hazard affects the county and its residents, information on past hazard events, current programs, and regulatory frameworks in place to reduce the impacts associated with these hazards, as well as future conditions (including potential climate change impacts associated with these hazards). The intent of this report is to provide background information that informs how and why the goals, policies, and implementation actions within the updated General Plan Safety Element were developed.

The key issues considered relevant to San Mateo County include the following:

ISSUE 1: EMERGENCY PREPAREDNESS AND RESPONSE

General Overview

The County of San Mateo employs a multipronged approach for mitigating, responding to, and recovering from emergencies. This section reviews the county's major evacuation routes, emergency alert systems, and other emergency response programming. With advanced warning, evacuation can be effective in reducing injury and loss of life during a catastrophic event. State law (Senate Bill 99, or SB 99) requires that the San Mateo County Safety Element identify residential areas with only one way in and out, as these may be areas where evacuations are constrained. State law (Assembly Bill 747, or AB 747) also requires that the Safety Element identify potential evacuation routes and their capacity, safety, and viability.

Emergency Alert Systems

SMC Alert/Rave Mobile Safety

SMC Alert is the primary alert system in San Mateo County. Messages sent vary from agency to agency. SMC Alert can be used to issue flood, fire, severe weather, or tsunami warnings; notify the community about the locations of emergency shelters; provide information about available evacuation routes; and activate special teams within the community, such as Community Emergency Response Team (CERT) volunteers. Some cities also use the system for smaller alerts, such as traffic accidents, fires, street closures, flooding, and related incidents. Community members opt in to receive SMC Alert messages and can receive alerts via email, cell phones, and voice messages to landline phones. Alerts are available in a wide variety of languages other than English, including Chinese, Spanish, and Filipino (standardized

Tagalog), which are the primary languages in San Mateo County among households that are not fluent in English. Individuals can sign up for SMC Alert via the County's website at https://www.smart911.com/smart911/ref/reg.action?pa=smcgov.

Rave Mobile Safety was adopted by the County in December 2022 as the new alerting platform for SMC Alert.

Wireless Emergency Alerts

Another alert system includes Wireless Emergency Alerts (WEAs) which are short emergency messages from authorized public alerting authorities that can be broadcast from cell towers to any WEA-enabled mobile device in a locally targeted area. Wireless providers primarily use cell broadcast technology for WEA message delivery. WEA is a partnership among FEMA, the Federal Communications Commission and wireless providers to enhance public safety.

Genasys EVAC/Zonehaven

Public safety agencies throughout San Mateo County use the Genasys app (formerly known as Zonehaven) to communicate areas that are being evacuated due to fire or other emergencies. Genasys is not an alert and warning system, but its EVAC tool provides first responders and public safety workers with tools to navigate the evacuation process, including information about when it is safe to return. Many jurisdictions within San Mateo County host evacuation plans and maps on the Genasys platform.

The Genasys platform divides the community into a number of zones to provide information tailored to impacted areas. Users of the app can choose the zone or zones for which they would like to receive alerts.

Major Evacuation Routes

If an evacuation is necessary in East Palo Alto, it will be conducted by San Mateo County public safety officials. They will work closely with the Menlo Park Fire Department, the San Mateo County Department of Emergency Management, and emergency responders in neighboring communities to make sure that evacuations are conducted as quickly and safely as possible.

Currently, no standard plan covers evacuations throughout San Mateo County. The City is participating in the county-wide All-Hazards Evacuation Plan, which will analyze potential evacuation scenarios across San Mateo County, identify potential evacuation routes, and recommend improvements. This work began in 2024, and is expected to finish in 2025. The Safety Element will reference this study to meet the requirements of SB 99 and AB 747.

Evacuation Constraints

Under SB 99, jurisdictions updating the Housing Element of their General Plan are required to identify residential parcels with access to fewer than two evacuation routes as part of their Safety Element. All of these parcels are at least a half mile from a major roadway and have access to only one emergency evacuation route. Occupants and residents of these parcels may be unable to evacuate quickly in the event of an emergency and are therefore more vulnerable to sudden or fast-spreading emergency conditions such as flash floods and wildfire.

Potential Evacuation Routes

Primary emergency access and evacuation routes include State Route (SR-) 1, Highway 101, and Interstate (I-) 280, which run across the county from south to north, and other local roadways that connect to these primary evacuation routes. All evacuation routes in San Mateo County face a potential disruption from a

flooding or earthquake event that may block roadways, damage the roadway surface, or collapse bridges and overpasses. In the event of widespread disruption to local evacuation routes, remaining evacuation routes may become congested, slowing down evacuation of a community or specific neighborhoods. This issue may be compounded since evacuation routes for San Mateo County may also serve as evacuation routes for surrounding counties in some cases, so potential disruptions may have regional effects.

Disaster Preparedness

Disaster preparedness refers to coordinated efforts to respond to both natural and human-caused disasters. The County is required to use a Standardized Emergency Management System (SEMS) to be eligible for funding of their response-related personnel costs under State disaster assistance programs. State law establishes SEMS to standardize the response to emergencies involving multiple jurisdictions. SEMS is intended to be flexible and adaptable to the needs of all emergency responders in California. It requires emergency response agencies to use basic principles and components of emergency management, including the Incident Command System, multiagency or interagency coordination, the operational area concept, and established mutual-aid systems. The California Governor's Office of Emergency Services (CalOES) has extensive guidelines outlining the requirements of the San Mateo County SEMS.

The San Mateo County DEM prepares disaster plans for the county and coordinates required emergency services and facilities from all agencies and levels of government to meet emergency and disaster needs. The San Mateo County DEM supports local CERT that train to residents and members of the business community to increase disaster awareness and emergency response capability. The CERT program educates volunteers about disaster preparedness for the hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. CERT offers consistent volunteer training and organization that professional responders can rely on during disaster situations, allowing them to focus on more complex tasks. San Mateo County DEM provides materials and supplies to local CERT programs through various grant opportunities.

Existing Programs and Regulations

Preparedness and Response Programs

San Mateo County uses a variety of programs, plans, and initiatives to manage and guide emergency response. Resources and programs include both County-operated and volunteer programs, as well as participation in regional mutual-aid agreements.

The County of San Mateo is required under State law to prepare and maintain a SEMS Multi-hazard Functional Plan. CalOES provides guidelines outlining the requirements of the San Mateo County SEMS.

County Initiatives

Department of Emergency Management

San Mateo County DEM provides essential services that prepares and assists San Mateo County agencies in the event of a disaster or other emergency. DEM coordinates countywide preparedness, response, and protection services and activities for large-scale incidents and disasters. DEM is responsible for alerting and notifying appropriate agencies within the county's 20 cities when disaster strikes, coordinating all responding agencies, and ensuring resources are available and mobilized during disasters. DEM is responsible for developing and maintaining plans and procedures for all jurisdictions within San Mateo

County. In addition to creating plans, DEM develops exercises to evaluate operational and response capabilities.

During significant incidents or emergencies, DEM is responsible for activating the County of San Mateo Emergency Operations Center to support local jurisdictions as needed. DEM coordinates and contracts to CalOES and the Federal Emergency Management Agency (FEMA) during an emergency for federal and State support.

San Mateo County DEM is funded in part through a Joint Powers Authority (JPA) governed by the Emergency Services Council.

Coastside Resilient Infrastructure Strategic Plan

The San Mateo County Coastal Resilient Infrastructure Strategic Plan (CRISP) is a County led collaboration and coordination with special districts and cities within the San Mateo County Coastal region that would incorporate their infrastructure projects, identify new infrastructure projects, and create a cohesive and integrated approach under which coastal resilience can be achieved. This collaborative effort ensures that all stakeholders are aligned, resources are maximized, and infrastructure projects collectively contribute to the overall resilience and sustainability of the coastal area. Communities include La Honda, Pescadero, Kings Mountain, Half Moon Bay, Pacifica, and the unincorporated areas of the San Mateo County Coast. The plan enables emergency management agencies to anticipate, prepare for, and respond to climate-related disasters, safeguard and secure critical lifeline infrastructure, coordinate multi-agency efforts, engage the community, and achieve long-term risk reduction. By integrating climate change considerations into emergency management practices, the plan enhances the county's resilience and preparedness, ensuring the safety and well-being of coastal communities in the face of climate-related emergencies.

San Mateo County Operational Area Emergency Services Council

The San Mateo County Operational Area Emergency Services Council is a JPA composed of all local governments within the geographic area of the county, special districts, unincorporated areas, and participating nongovernmental entities. The Council is responsible for providing coordinated plans for the protection of people and property in the event of an emergency. The Council works in coordination with local government entities to review, approve, and recommend for adoption of emergency and mutual-aid plans and agreements, rules, ordinances, resolutions, and regulations by the Board of Supervisors and other legislative agencies.

Emergency Operations Plan and Center

The County's Emergency Operations Plan (EOP) establishes policies and procedures and assigns responsibilities to ensure the effective management of emergency operations within the San Mateo County Operational Area (SMOA), which is the County and all incorporated jurisdictions. The County Office of Emergency Services (OES) implements the EOP and activates the Emergency Operations Center (EOC).

The EOC provides a central location of authority and information and allows for face-to-face coordination among personnel who make emergency decisions. The following functions are performed in the San Mateo County Operational Area EOC:

- Coordinating emergency operations
- Releasing warning information
- Developing emergency policies and procedures

- Collecting and sharing information with county, city/town, special district, State agencies, military, federal agencies, and political representatives
- Maintaining maps, information display boards, and other data pertaining to emergency operations
- Analyzing and evaluating all data pertaining to emergency operations
- Directing and coordinating support of emergency response resources
- Maintaining contact and coordination with Disaster Operations Centers, San Mateo County's EOC, and the Coastal Region
- Providing emergency information and instructions to the public, making official releases to the news media and the scheduling of press conferences as necessary

The SMOA EOC is activated when local jurisdictions or County departments need emergency support. According to SEMS Regulations, the SMOA EOC must activate and SEMS must be used when the following conditions exist:

- A local government within the SMOA has activated its EOC and requests activation of the SMOA EOC to support its emergency operations.
- Two or more cities within the SMOA have declared a local emergency.
- The County and one or more cities have declared a local emergency.

The EOP assumes that cities and towns within the county will participate in the SMOA, that the SMOA is primarily responsible for emergency actions, and that the SMOA will make resources available to local agencies.

San Mateo County Emergency Managers Association

The San Mateo County Emergency Managers Association (SMCEMA) is composed of emergency managers/representatives from cities, towns, county departments, special districts, and community organizations within San Mateo County and is intended to support emergency management, training, and exercise planning.

Countywide Hazardous Materials Emergency Response Team

Hazardous materials response, mitigation, and cleanup for San Mateo County is managed by the Belmont Fire Protection District's Hazardous Materials team through a contractual agreement between the County of San Mateo, the Emergency Services Council, and the Belmont Fire Protection District.

San Mateo County Sheriff's Office Emergency Services Bureau

The Sheriff's Office Emergency Services Bureau is made up of sworn specialized units and volunteer forces to respond to emergency law enforcement activities, search and rescue missions, evidence searches, and requests for mutual aid. San Mateo County Search and Rescue (SMCSAR) is a professional volunteer force of the San Mateo County Sheriff's Emergency Services Bureau.

Multijurisdictional Hazard Mitigation Plan

San Mateo County DEM published San Mateo County's 2021 Multijurisdictional Local Hazard Mitigation Plan (MJLHMP), a large regional and cross-jurisdictional effort to plan for the reduction of risk from natural and human-made disasters. San Mateo County DEM led the 2021 MJLHMP effort, in coordination with County departments, all 20 cities, and regional special districts. A steering committee and robust public engagement informed the process.

The MJLHMP assesses hazard vulnerabilities and identifies mitigation actions that jurisdictions will pursue to reduce the level of injury, property damage, and community disruption that might otherwise result from such events. The MJLHMP addresses natural and human-caused hazards, including flooding, drought, wildfire, landslides, severe weather, terrorism, cyber threats, pandemic, and the impact of climate change on hazards, as well as other hazards.

Adoption of the plan helps the County remain eligible for various types of pre- and post-disaster community assistance, such as grants, from FEMA and the State government.

Disaster Debris Management Plan

Disasters can produce substantial volumes of debris, creating hazardous conditions that endanger the public and disrupt the essential daily lifestyle and economy of the community. The County of San Mateo Disaster Debris Management Plan (DDMP) provides a comprehensive framework for management of debris following a disaster. It addresses the roles and responsibilities of government organizations as well as private firms and nongovernmental organizations that might have a role in debris operations. [1] The County's Public Works Department serves as the lead department for debris management for unincorporated areas of the county.

County of San Mateo Health System

The County of San Mateo Health System operates Emergency Medical Services (EMS), which provides emergency medical resources in response to 911 calls countywide. As of 2019, EMS responded to 90 percent of requests for advanced life support within 6 minutes and 59 seconds in metro and urban areas and 11 minutes and 59 seconds in suburban and rural areas. EMS responded to 90 percent of ambulance transport requests within 12 minutes and 59 seconds in metro and urban areas and 19 minutes and 59 seconds in suburban and rural areas.

The health emergency preparedness unit (HEP) strengthens the community's ability to respond to all types of public health and medical incidents. The HEP team continually collaborates with community stakeholders and organizations to facilitate response and recovery for public health and medical emergencies.

The San Mateo County Healthcare Coalition (HCC) coordinates strategic planning activities amongst healthcare facilities of various healthcare delivery sectors, public health agencies, other government entities, and community partners to prepare for, respond to, and recover from emergencies and other incidents that impact public health.

San Mateo County Emergency Medical Services Agency uses ReddiNet as its county-wide emergency communications system. ReddiNet allows the County to track hospital status, mass casualty incidents, hospital bed count, and facility assessments and to locate family members through access to the Family Reunification Center.

Volunteer Programs

San Mateo County's Coastside Emergency Corps (CEC) is a community-based network of volunteers that assists public safety and health efforts in times of special need or disaster. Members of the CEC may also volunteer to promote community public health and emergency preparedness education. Specialized training of CEC members includes CERT, Ham radio, Medical (beyond first aid/CPR,) Large Animal Evacuation Group, ICS/EOC Operations, and Red Cross Shelter Operations.

Mutual-Aid Agreements

In some cases, local emergency responders may not have the staff, vehicles or equipment, or other resources to fully respond to an emergency in their jurisdiction. In these instances, the local emergency commanders can request assistance from other communities. This external assistance is known as mutual aid. The California Disaster and Civic Defense Master Mutual Aid Agreement, an arrangement between State agencies and local governments, establishes a framework for mutual aid.

Mutual aid regions are established under the Emergency Services Act. Six mutual aid regions numbered I-VI have been established within California. The San Mateo County Operational Area is part of the Mutual Aid Region II and the Coastal Administrative Region.

County Plans and Initiatives

San Mateo County Fire Department

The San Mateo County Fire Department (SMCFD) is a "full service all risk" agency, providing fire protection, medical response, hazardous materials response, fire safety inspections, fire marshal duties, community education, emergency preparedness, and planning for most unincorporated areas (those not covered by a municipal fire department or local fire district) of San Mateo County. This includes the communities of San Mateo Highlands (CSA 1), Emerald Lake Hills, Palomar Park, Kings Mountain, Sky Londa, La Honda, San Gregorio, Pescadero, Loma Mar, Middleton Tract, South San Mateo County Coast, and the Highway 280 corridor between Farm Hill Boulevard and Black Mountain Road. Table 1 lists unincorporated areas in San Mateo County served by various fire protection districts.

Table 1. Unincorporated Areas of San Mateo County Served by Fire Protection Districts

Unincorporated Area	Fire Protection District
Broadmoor	Colma Fire Protection District
El Granada	Coastside Fire Protection District
Emerald Lake Hills (Kensington Square, Oak Knoll)	Woodside Fire Protection District
Harbor Industrial Area	Belmont Fire Protection District
Ladera	Woodside Fire Protection District
Los Trancos Woods	Woodside Fire Protection District
Menlo Oaks	Menlo Park Fire Protection District
Miramar (El Granada)	Coastside Fire Protection District
Montara	Coastside Fire Protection District
Moss Beach	Coastside Fire Protection District
North Fair Oaks	Menlo Park Fire Protection District/Redwood City Fire Department
Princeton-by-the-Sea	Coastside Fire Protection District
Sequoia	Menlo Park Fire Protection District Woodside Fire Protection District
Stanford Lands (including Linear Accelerator, Webb Ranch, and Guernsey Field)	Woodside Fire Protection District
Unincorporated Colma	Colma Fire Protection District
University Heights (West Menlo Park)	Menlo Park Fire Protection District

Future Conditions

Climate change is expected to affect the frequency and severity of future natural hazards in San Mateo County, necessitating an adapted approach to emergency preparedness and response. The San Mateo County vulnerability assessment provides greater detail about the future of these hazard conditions.

ISSUE 2: FLOODING

General Overview

Flooding is the rising and overflowing of a body of water onto normally dry land. Flooding can be extremely dangerous, and even six inches of moving water can knock a person over in a strong current. Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide, significantly threatening the health and life of community members and causing substantial damage to structures, landscapes, and utilities. Floodwaters can damage buildings and infrastructure, carry off structures or vehicles, and bury property under sediment. Standing water can cause damage to roads, foundations, and electrical circuits, as well as spread vector-borne illnesses. Other problems connected with flooding and stormwater runoff include erosion, degradation of water quality, and loss of environmental resources.

Floods are usually caused by large amounts of stormwater, either from a period of very intense precipitation or a long period of steady precipitation. There are four types of flooding that primarily affect San Mateo County:

- Riverine flooding, the most common type of flood event, occurs when a watercourse such as a stream or creek overruns its banks.
- Stormwater flooding, sometimes called “ponding,” occurs when rainfall and runoff accumulates in low-lying areas or areas with insufficient drainage, forming standing water.
- Flash floods are sudden events, typically caused by intense and localized storms. There is often little or no warning of flash floods, making them particularly dangerous.
- Shoreline floods occur when the ocean inundates normally dry lands by ocean waters, often a result of storm surges, tsunamis, or extreme high tide events.

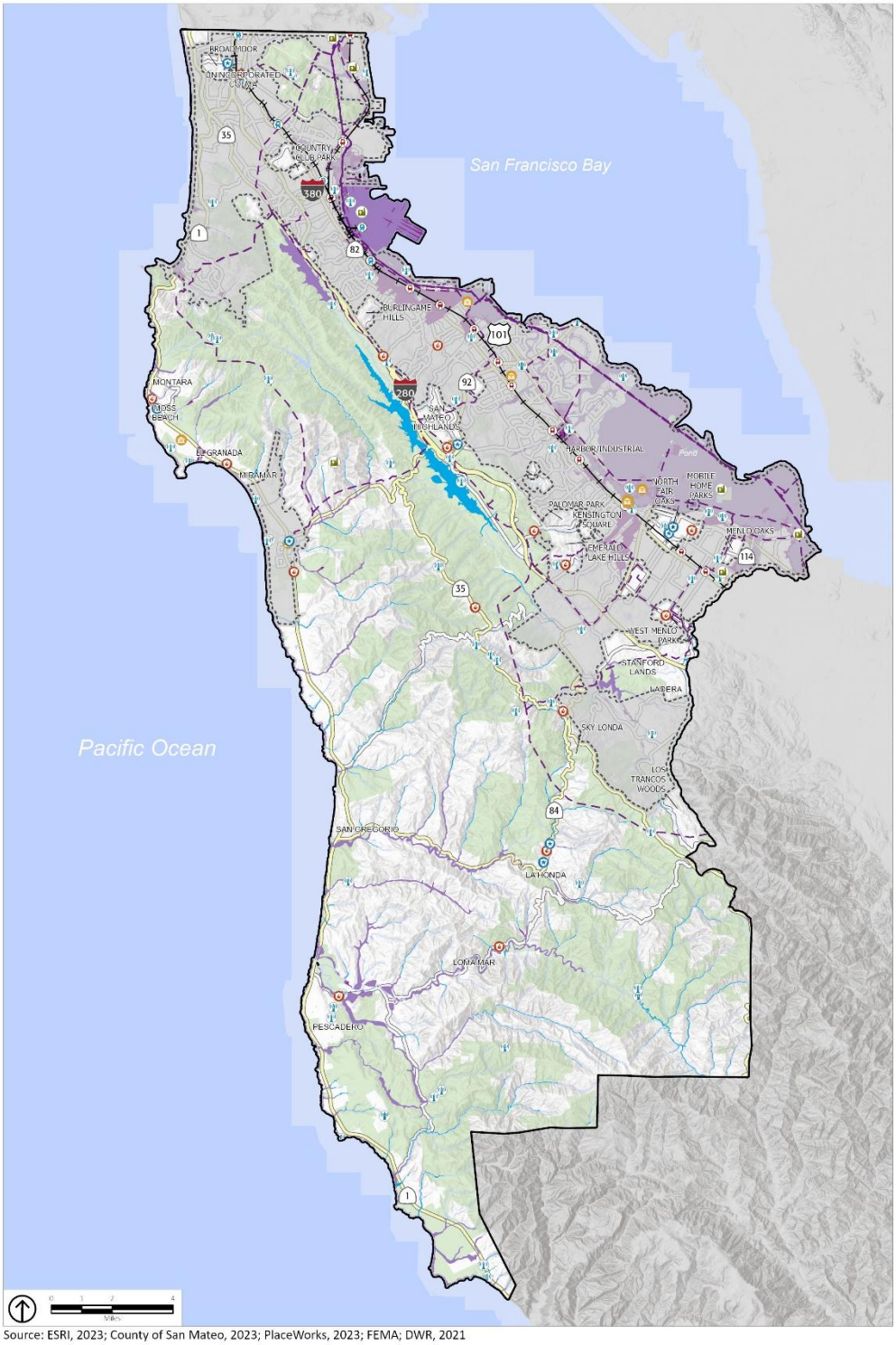
Another form of flooding, dam failure, is discussed in greater detail below.

FEMA Regulatory Flood Zones

Flood hazard areas, also called floodplains, are the areas that become inundated by a flood. They are usually adjacent to rivers, creeks, or lakes, or along the ocean. Floodplains are officially mapped by FEMA, using maps called Digital Flood Insurance Rate Maps (DFIRMs). The two main floodplains of concern are the 100-year floodplain and the 500-year floodplain. The 100-year floodplain is the area that has a 1 percent (1 in 100) chance of being flooded in any given year, also known as a base flood. The 500-year floodplain is the area that has a 0.2 percent (1 in 500 chance) of being flooded in any given year.

Figure 1 shows the mapped flood hazard zones within unincorporated San Mateo County.

Figure 1: Mapped Flood Hazard Zones



Principal Flooding Sources

In San Mateo County, several areas consisting of developed and undeveloped county lands are subject to flooding as a result of heavy seasonal rainfall, dam inundation, and canal or levee failure. A majority of these county flood-prone areas are specifically subject to inundation as a result of heavy rainfall and resulting stream overflows. Natural stream channels in rural parts of San Mateo County can typically accommodate average rainfall amounts and mild storm systems. However, severe floods occur in years of abnormally high rainfall or unusually severe storms. Principal flooding sources for San Mateo County as identified on FEMA flood maps include the following streams and water bodies:

- Alpine Creek
- Belmont Creek
- Butano Creek
- Colma Creek
- Crystal Springs Channel
- Denniston Creek
- El Granada Creek
- Holly Street Channel
- La Honda Creek
- Lomita Channel
- Montara Creek
- Pacific Ocean
- Pescadero Creek
- Pilarcitos Creek
- San Bruno Channel
- San Francisquito Creek
- San Gregorio Creek
- San Vincente Creek
- Woodhams Creek

Dam and Pipeline Failure

A dam failure is an uncontrolled release of water from a reservoir through a dam caused by damage or destruction to the dam or associated infrastructure. Water pipeline or aqueduct failures can create a similar sudden flood. These events can be the result of heavy rains that overwhelm the infrastructure, erosions or landslides, or other structural deficiencies because of structural failures or deficiencies in the dam, usually associated with intense rainfall or prolonged flooding. Dam and pipeline failures can range from minor to catastrophic and can potentially harm human life and property downstream from the failure. In addition, ecosystems and habitats can be destroyed by fast-moving floodwaters, debris, and sedimentation from inundation. Although dam and pipeline failures are very rare, these events are not unprecedented.

In a dam failure scenario, the greatest threat to life and property typically occurs in those areas immediately below the dam since flood depths and discharges generally decrease as the flood wave moves downstream. The primary danger associated with dam failure is the high-velocity flooding downstream of the dam and limited warning times for evacuation.

The Lower Crystal Springs Dam is the largest dam in San Mateo County, making it a higher priority for regulation and preventative maintenance by county, state, and federal officials. This dam impounds water to form the Lower Crystal Springs Reservoir, which serves as a water supply for San Francisco and most cities in San Mateo County. Although located directly on the San Andreas Fault, the dam survived both the 1906 San Francisco earthquake and 1989 Loma Prieta earthquake. In 2010, California's Division of Safety of Dams (DSOD) inspected the Lower Crystal Springs Dam to investigate effects of an 8.3 magnitude earthquake and determined dam failure to be a low probability. Despite this low probability, the County and dam owner, San Francisco Public Utilities Commission (SFPUC), have taken action to enhance safety and quality of the dam. Significant upgrades to the dam and a nearby overpass bridge occurred between 2010 and 2015 to restore maximum storage capacity of the reservoir. The project involved widening the spillway, raising the parapet wall, and replacing the stilling basin with a new and larger facility.

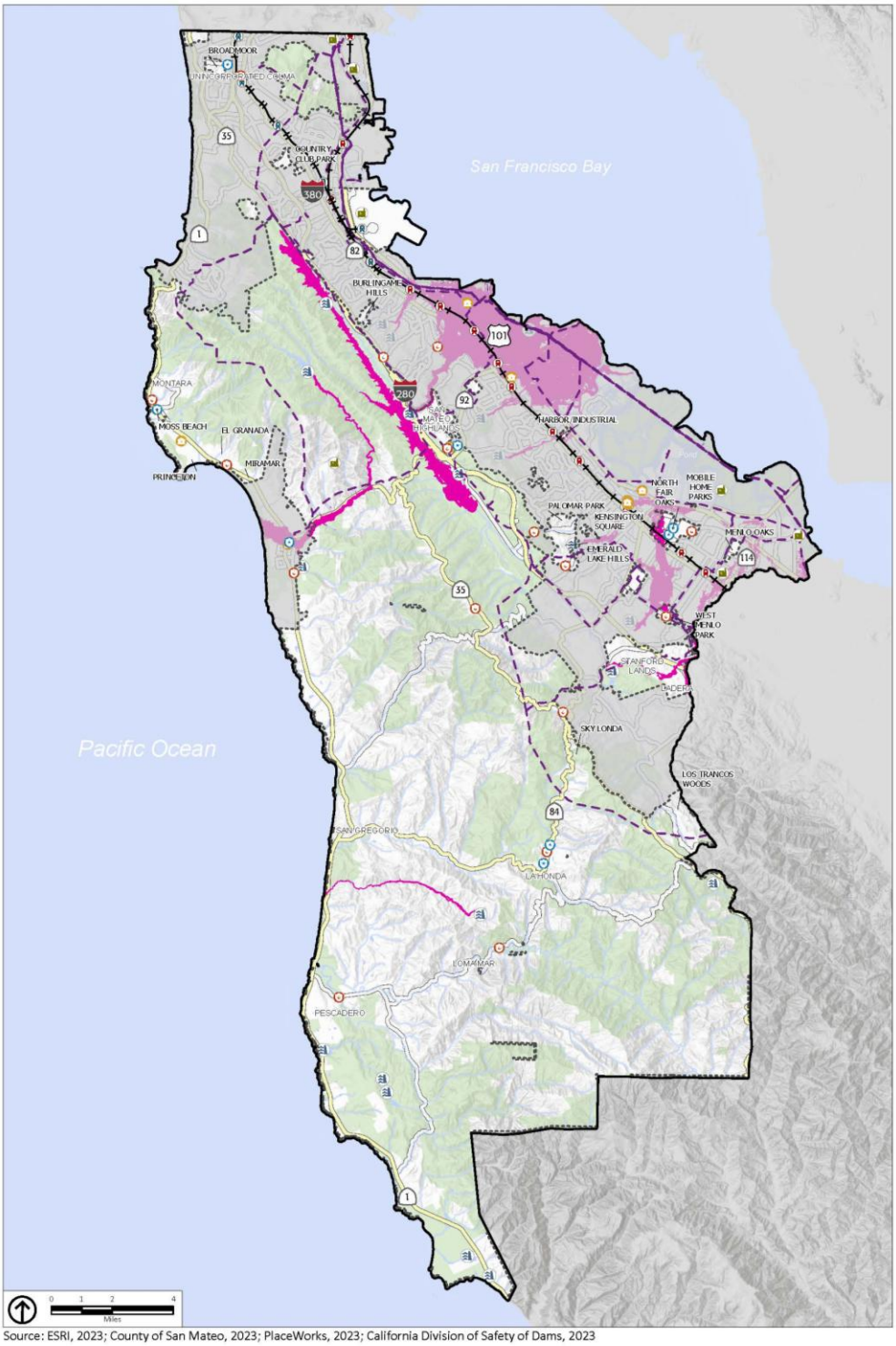
According to DSOD, 24 dams are in San Mateo County. Figure 2 illustrates areas in the county that would be affected by inundation if these dams failed. There are 12 dams, plus another nearby in Santa Clara County, which could endanger lives and property if an uncontrolled release or catastrophic failure occurs. Table 2 lists dams with potential to endanger lives and property in the county.

Table 2. San Mateo County Dams with Potential to Endanger Lives and Property

Name	Water Course	Owner	Year Built	Dam Type	Drainage Area (square miles)
Bear Gulch	Tributary, San Francisco Bay	California Water Service Company	1896	Earth	0.2
Emerald Lake 1 Lower	Lower Emerald Lake	Emerald Lake Country Club	1985	Earth	0.25
Felt Lake[a]	Tributary, Los Trancos Creek	Stanford University	1930	Earth	0.2
Lower Crystal Spring	San Mateo Creek	SFPUC Water Department	1988	gravity	28.71
Pilarcitos	Pilarcitos Creek	SFPUC Water Department	1866	Earth	3.8
San Andreas	Tributary, San Mateo Creek	SFPUC Water Department	1870	Earth	4.4
Searsville	Corte Madera Creek	Stanford University	1890	gravity	14.8
Spencer Lake	Tributary, San Francisco Bay	Town of Hillsborough	1876		0.2
Coastways[c]	-	Coastways Ranch	NA	-	-
Crocker	Sanchez Creek	Town of Hillsborough	1890	Earth	0.26
Laurel Creek	Laurel Creek	City of San Mateo	1969	Earth	0.9
Notre Dame	Belmont Creek	City of Belmont	NA[b]	Earth	0.53
Pomponio Ranch	-	Private Entity	-	-	-

a. Felt Lake is within Santa Clara County, approximately 1,300 feet from San Mateo boundary lines. It has been included here due to its proximity to the county.
b. Year built unavailable.
c. Coastways and Pomponio Ranch dams are not included in the national inventory.
Source: San Mateo County MJLHMP, 2021.

Figure 2: Dam Inundation Areas



Past Events

San Mateo County has undergone 35 significant flooding events since 1996, most of which have been flash floods. Some of the most significant flooding occurred during the winter of 2022/2023, which saw widespread flooding throughout San Mateo County. During this period, some locations saw more than 4 inches of rain in a single day. Flooding from the storms displaced close to 100 people, including many from mobile homes in unincorporated areas in the County. The storms also toppled trees across San Mateo County and caused several mudslides.

Table 3 lists recent San Mateo County flood events identified in the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) Severe Storms Database (dating back to 1996), as well as previous flood events affecting the county for which federal disaster declarations were issued.

Table 3: History of Recent Flood Events

Date	Event	Locations
February 13, 2000	Flash Flood	Pescadero
December 31, 2005	Flood	Countywide
January 1, 2006	Flood	Countywide
January 25, 2008	Flash Flood	Moss Beach
February 16, 2009	Flood	Pescadero
January 19, 2010	Flood	Ladera
January 20, 2010	Flood	Pescadero, San Carlos, San Carlos Airport
December 23, 2012	Flash Flood	Pescadero, Loma Mar
December 2/11, 2014	Flash Flood, Flood	Belmont, San Bruno, San Mateo County
February 6, 2015	Flood	Atherton, West Menlo Park
December 10, 2016	Flood	East Palo Alto
January 10/20, 2017	Flood	Sterling Park, North Fair Oaks, Burlingame
February 7, 2017	Flood	San Carlos Apartments
February 20-21, 2017	Flood	Atherton, Ladera
March 01, 2018	Flood	Sterling Park, Bayshore, Baden
April 07, 2018	Flood	San Carlos Apartments, San Mateo, Lomita Park
November 23/29, 2018	Flood	Baden, San Carlos Apartments
January 6/16, 2019	Flood	Bayshore, Tanforan, Atherton
February 13-14, 2019	Flood	Bayshore, Burlingame
November 30, 2019	Flood	San Carlos Apartment
January 16, 2020	Flood	Belmont, Colma, Henderson, Lomita Park, Bayshore, Atherton
January 26, 2021	Flood	Belmont
December 13, 2021	Flood	Bayshore, Belmont
December 31, 2022	Flood	Bayshore
March 28, 2023	Flood	North Fair Oaks

February 6, 2015

A strong winter storm impacted California following nearly a month and a half of no rain and the driest January on record. The storm brought heavy rain, gusty winds, and damage to trees and power lines, along with some minor flooding of urban areas. Rainfall amounts were heaviest in the mountains, with 5 to 10 inches or more occurring. Heavy rain resulted in flooding of Southbound Highway 101 offramp in Atherton.

December 2015/January 2016

A series of storms caused widespread flooding throughout San Mateo County. San Mateo County Department of Public Works and cities in the county set up two dozen sites where community members could pick up free sandbags to mitigate impacts of flooding. [2]

El Niño rains in January 2016 brought more rain into the Bay Area in two days than the previous three Januarys combined.[3] La Honda recorded the largest amount of rainfall in the county at 1.5 inches. Other than debris, some power outages, and transportation accidents, San Mateo County did not report any major issues.

March 1, 2018

An upper-level system with a strong cold front moved through the Bay Area. This system brought widespread rainfall causing localized roadway flooding, strong winds, lightning, and small hail. Gusts in the mountains reached 60 miles per hour (mph) and hail was recorded at a half-inch in diameter. A majority of the precipitation and subsequent impacts were seen in early March 2018.[4]

April 7, 2018

A late season atmospheric river impacted San Mateo County in early April 2018. Enough rain fell to cause minor/nuisance flooding across much of the region. Numerous flood advisories were issued. Storm total rainfall amounts up to seven inches were reported.[5]

January 16, 2020

A potent cold front swept through the region on January 16, 2020, bringing widespread rain, gusty winds, low elevation snow, and thunderstorms. This system caused roadway flooding, downed trees, small hail, and snow at elevations as low as 2,400 feet. Numerous flights were delayed or canceled at San Francisco International Airport.[6]

December 13, 2021

An atmospheric river impacted the Bay Area on December 31, 2021, resulting in significant rainfall across the San Francisco Bay Area. During the morning, a surface low developed west of San Francisco and the river stalled over the Bay Area. This resulted in significant rainfall totals for many Bay Area communities. Most notably, downtown San Francisco received 5.46 inches of rain, which is the second-wettest day on record. The Oakland Museum received its wettest day since records began in 1970, with 4.75 inches of rain.

December 31, 2022

A low-pressure system descended from the Gulf of Alaska southward along the entire Pacific Coast and tapped into subtropical moisture originating from the Central Pacific to drop heavy rain throughout the state. The system brought rainfall over a two-day period totaling 10 inches in the coastal mountains. A

flash flood watch was issued for the Santa Lucia Mountains and Dolan Burn Scar area, where up to 12 inches of rain fell. Roadway flooding caused a hard closure of SR-92 between SR-35 and SR-1.

March 28, 2023

A cold front and associated upper-level low came through the Bay Area and Central Coast. The front brought steady precipitation to the region, while the upper-level low gave the area convective showers. Pea-sized hail was reported across portions of the region. Street flooding was reported on Highway 92 in Spanishtown near Half Moon Bay. One-way traffic controls were in effect as firefighters dealt with the flooding.

Dam Events

The only recorded dam failure in San Mateo County was the failure of a small dam in the community of El Granada in 1926. According to the 2018 State of California Multi-Hazard Mitigation Plan, there have been nine failures of federally regulated dams elsewhere in the state since 1950. Overtopping caused two of the nine dam failures in the state, and the others were caused by seepage or leaks. The most catastrophic event was the failure of the St. Francis Dam in Los Angeles County, which failed in 1928 and killed an estimated 450 people.

The state's most recent dam emergency occurred in February 2017 when the Oroville Dam in Butte County was on the verge of overflow. The dam's concrete spillway was damaged by erosion and a massive hole developed. The auxiliary spillway was used to prevent overtopping of the dam, although it also experienced erosion problems. Evacuation orders were issued in advance of a potential large uncontrolled release of water from Lake Oroville, although ultimately no release occurred. Following this incident, State officials ordered that flood-control spillways be reinspected on 93 dams with potential geologic, structural, or performance issues that could jeopardize their ability to safely withstand a flood event. The San Andreas Dam near Millbrae and San Bruno was one of the dams reinspected.

Existing Programs and Regulations

Flood Control Agencies and Activities

Agencies responsible for flood control in San Mateo County include the Unites States Army Corps of Engineers (USACE), FEMA, San Mateo County Flood and Sea Level Rise Resiliency District (OneShoreline), SFPUC, Federal Insurance Administration, and the California Department of Water Resources (DWR).

- The USACE identifies the need for and constructs major flood-control facilities. It also develops flood- and dam-inundation maps and reports.
- FEMA manages the National Flood Insurance Program, providing insurance to the public in communities that participate in the program. FEMA is the main federal government agency contact during natural disasters and publishes the DFIRMs, which identify the extent of flood potential in flood-prone communities based on a 100-year flood (or base flood) event.
- OneShoreline, formerly known as the San Mateo Flood Control District, plays a crucial role in protecting the county and its residents from floods. Established in 1959, it operates within specific flood zones and works towards several key objectives, which include controlling and mitigating flood risks, maintaining the health of waterways, planning for future flood events, and collaborating with other agencies to address regional flood control issues.
- OneShoreline maintains several flood-control structures, such as levees, seawalls, and pump stations, to protect vulnerable areas from flooding. OneShoreline creates and updates flood maps

to identify areas at risk and inform development decisions. They also conduct risk assessments to evaluate potential flood impacts and guide mitigation efforts.

- The Federal Insurance Administration is the primary agency that delineates potential flood hazard areas and floodways through the DFIRMs and the Flood Boundary and Floodway Map. Flood insurance is required of all homeowners who have federally subsidized loans and own homes in FEMA-designated flood plains.
- DWR is responsible for managing and protecting California's water. DWR works with other agencies to benefit the state's people and to protect, restore, and enhance the natural and human environments. DWR also works to prevent and respond to floods, droughts, and catastrophic events that would threaten public safety, water resources and management systems, the environment, and property.

San Mateo County has mitigated some of its vulnerability to coastal flooding through a series of levees originally installed for salt evaporation ponds in the southeastern part of the county and for flood protection in the north and central parts of the county.

County Plans and Regulations

The County requires stringent building codes, based on the newest edition of the California Building Standards Code, which is updated every three years, including standards for construction in all areas of special flood hazards. Requirements include standards for anchoring, construction materials and methods, elevation and floodproofing, nonresidential construction, flood openings, garages, utilities, subdivisions, manufactured homes, floodways, and coastal high hazard areas.

Future Conditions

Climate change is expected to affect the frequency and severity of future flooding in San Mateo County. Please review the San Mateo County Vulnerability Assessment Report for details.

ISSUE 3: SEA LEVEL RISE

General Overview

Sea level rise is an increase in the ocean's surface height relative to the land. The two major causes of sea level rise are thermal expansion caused by warming of the ocean (since water expands as it warms) and increased melting of land-based ice, such as glaciers and ice sheets. Sea level rise (which includes increases in the levels of San Francisco Bay) is a gradual process, taking place over years or decades, affecting coastal communities and those along the bay shoreline. Sea level rise has the potential to inundate homes, businesses, and infrastructure near shorelines and to cause erosion of shorelines over time. The sea level in the San Francisco Bay Area rose during the twentieth century at a rate of 2.0 millimeters per year, and projections suggest that it will rise at a higher rate during the twenty-first century. This is comparable to a global average during the twentieth century of 1.4 millimeters per year—a pace that has not been exceeded in any century since at least 2,800 years ago.[7] Rising seas increase the risk of flooding, storm surge inundation, erosion and shoreline retreat, and wetland loss. The cities and infrastructure that line many shorelines are already vulnerable to damage from storms, which will likely increase as the sea level continues to rise and inundate areas further inland.

Rising sea levels can cause the shoreline to flood more frequently and severely during storms or king tide events because ocean levels are higher during normal conditions. The most damaging events over the next

few decades are likely to be dominated by large storm events in combination with high tides and large waves. Additionally, rising sea levels can cause inland areas in the watershed to flood. Impacts will generally become more frequent and more severe in the latter half of this century.

San Mateo County is highly vulnerable to the effects of rising sea levels. The San Francisco Bay Area is one of the top hotspots for sea level rise in the nation, and the economic value of property located in San Mateo County at risk from sea level rise exceeds that of any other county in the Bay Area.[8] When population projections are taken into account, the County is one of six counties in the nation (and the only one on the west coast) with over 100,000 people living in an area affected by three feet of sea level rise.[9] If left unmanaged, future flooding and shoreline erosion could pose considerable risks to life, safety, critical facilities, the County's natural and recreational assets, and the economy. Flooding, erosion, and sea level rise directly threaten people and property in the sea level rise hazard areas. The county is currently exposed to coastal flooding when large rain events coincide with high tides on the San Francisco Bay, making it imperative to take steps to reduce risk.[10]

Emergent groundwater is a consequence of sea level rise. It occurs when groundwater is pushed upward by denser saline water that travels further inland, raising the water level and in some places causing the groundwater to emerge to the surface, where causes temporary or permanent inundation.[11] Higher groundwater levels, even if it does not emerge to the surface, can infiltrate storm drains, destabilize pipes, spread soil or groundwater contamination, undermine building foundations, corrode infrastructure not designed for saline groundwater, and increase liquefaction hazards.[12] Groundwater levels are expected to rise at the same rate as sea level rise in areas within half a mile from the shoreline. However, in areas where groundwater is being actively pumped, this rise could extend further inland, meaning that the effects of sea level rise on groundwater might spread beyond this half-mile zone.

Sea Level Rise: San Mateo County

The county is already exposed to present-day flooding when large rain events coincide with high tides on the San Francisco Bay. The county becomes more highly vulnerable to flooding when considering the effects of rising sea levels. Higher water levels causes changes in wave activity leading to increased shoreline erosion and waves overtopping shoreline protection. Though the Bayshore is mostly protected from erosion, the entire Coastside of the county is exposed to daily wave action and erosion. Future flooding and coastal erosion could pose considerable risks to life, safety, critical infrastructure, the county's natural and recreational assets, and the economy. To address the issue, the County performed a regional sea level rise vulnerability assessment (SLR VA) to evaluate the potential impacts of future flooding and inundation. The SLR VA identifies that the assessed value of parcels in the project area exposed to near-term (present-day) flooding exceeds $1 billion, that the assessed value of parcels exposed to erosion and flooding in the long term (50–100 years) totals roughly $39.1 billion, and that more than 30,000 residential parcels and 3,000 commercial parcels may also be vulnerable in the long term. In 2022, the County prepared the South Coast Sea Level Rise Vulnerability and Adaptation Report (South Coast SLR VA) to assess current and future risks from coastal hazards and sea level rise along San Mateo County's South Coast. This report builds on the 2018 Sea Change Vulnerability Analysis, which examined the Bayshore and the Coastside north of Half Moon Bay, by providing a technical analysis of South Coast assets exposed to coastal hazards exacerbated by sea level rise.

The Coastside features steep cliffs, bluffs, and low-lying beaches and dunes that are highly vulnerable to erosion from sea level rise and increased wave action. While many dune areas remain open space, bluff areas often contain buildings and infrastructure at risk of damage or destruction. Bluff erosion is especially hazardous, as bluffs can collapse suddenly and without warning, endangering people and community assets both above and below. According to the SLR VA, approximately 537 acres of land south of Half Moon Bay is currently at risk of dune erosion, which is projected to increase by 478 acres at 0.8 feet of sea level rise, an additional 170 acres with 1.6 feet of sea level rise, and an additional 430 feet with 4.9 feet of sea level rise.[13] The bluffs between Half Moon Bay and Pacifica are projected to erode at a similar rate. State Route 1, essential recreation areas, and homes and apartments are in coastal erosion zones, which can undermine the foundations of these structures or cause dunes to retreat and flood waters to move farther inland during storms. Furthermore, flooding, erosion, and sea level rise not only directly threaten people and property in the sea level rise hazard areas, but they also affect all communities in the county, even those on high ground. Such indirect effects are present because assets and infrastructure in the sea level rise areas provide critical services and functions to communities outside these areas. See Figures 3 through 5 for projected sea level rise scenarios for the County, and the Mid Coast and South Coast regions, respectively.

Given the severity of the risks from sea level rise in the county, actions to prepare for risks and reduce them are necessary. A combination of shoreline protection strategies, individual property and facility modifications, land use policies, and emergency flood preparedness actions will be needed to reduce impacts over the near and long term. Through the OOS/Climate Ready Initiative, OneShoreline will facilitate coordination between the County and local jurisdictions on sea level rise policies, building standards, and the development of a countywide sea level rise strategy.

The at-risk unincorporated community areas based on the SLR VA include the following:

- El Granada
- Bayside Harbor/Industrial Area
- Miramar
- Mobile Home Parks along East Bayshore Road between Redwood City and Menlo Park
- Montara
- Moss Beach
- North Fair Oaks
- Olympic Country Club
- Princeton/Pillar Point Harbor
- San Francisco International Airport
- South Coast/Pescadero area
- Additional unincorporated areas (outside named community areas)

The SLR VA identifies what is vulnerable to sea level rise among built and natural assets, explores public health and risks from cascading impacts, and discusses what these factors mean for policy and planning purposes. The County has also prepared the *Climate Ready North Fair Oaks Climate Risk Assessment* to evaluate the vulnerability of North Fair Oaks and the broader mid and lower peninsula to sea level rise and flooding. The report identified several key findings:

- Areas closely tied to North Fair Oaks, including downtown Redwood City, East Palo Alto, and Redwood Shores could experience large direct economic losses, potentially impacting the local economy and regional services.
- Mobile homes may be disproportionately impacted by flooding, potentially reducing options for affordable housing.
- Accessibility to critical services like food distribution centers is multi-faceted and involves more than just proximity.
- Although it helps enrich our understanding of indirect impacts, impacts on access to amenities for those living and owning businesses in North Fair Oaks is not able, but not significant.
- Many communities that may not face direct flooding may still face indirect impacts. These impacts will exacerbate existing vulnerabilities.

In addition to flood risks, emergent groundwater poses a significant challenge for several unincorporated communities in the region. The communities facing the most significant impacts from emergent groundwater are Pescadero, El Granada, Montara, Moss Beach, North Fair Oaks, unincorporated mobile home parks near Redwood City, the Harbor/Industrial area, Olympic Country Club, County Club Park, and the San Francisco International Airport. Though the exact level of future sea level rise is uncertain, it is expected to increase the frequency, duration, and magnitude of flood events and push groundwater to emergent levels further inland.

Sea Level Rise and Coastal Erosion: Scenarios

The SLR VA used three sea level rise scenarios and one future erosion scenario to evaluate potential impacts to communities. These four scenarios are referenced when discussing potentially affected assets and infrastructure within the community.[14]

The methodology employed used existing data on projections of sea level rise and coastal erosion hazards to understand the geographic extent to which the county could be exposed to inundation and coastal erosion. Table 4 shows the three sea level rise scenarios and one future erosion scenario selected for the evaluation.

Table 4. Sea Level Rise and Erosion Scenarios

BASELINE SCENARIO	1% annual chance flood (present-day extreme flood)" to "1% annual chance flood (present-day extreme flood also known as 100 year flood)
MID-LEVEL SCENARIO	1% annual chance flood + 3.3 feet of sea level rise
HIGH-END SCENARIO	1% annual chance flood + 6.6 feet of sea level rise
COASTAL EROSION	The projected extent of coastal erosion expected with 4.6 feet of sea level rise

The SLR VA used sea level rise inundation data from the United States Geological Survey (USGS) and from Point Blue's *Our Coast, Our Future* tool, which provided the best available data at the time, though it has

been updated since then. The best available science on sea level rise projections at the time was the National Research Council's *Sea Level Rise for the Coasts of California, Oregon, and Washington*. The erosion data are from the Pacific Institute Study developed by Philip Williams and Associates, Ltd. in 2009. The erosion scenario illustrates potential future erosion with 4.5 feet of sea level rise and assumes no shoreline protective devices. The modeling does not show shoreline protection over the next 50 to 100 years because the continuation of protection infrastructure is a shoreline management decision beyond the scope of the erosion modeling.

The scenarios were also informed by regional sea level rise guidance documents, such as the California Coastal Commission's August 2015 *Sea Level Rise Guidance, Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits*. The methodology incorporated strategies from the San Francisco Bay Conservation and Development Commission's *Adapting to Rising Tides* (ART) project.

The scenarios indicate the projected extent of flooding should the project area experience a 1 percent chance annual storm plus sea level rise. The baseline scenario shows the possible extent of flooding with a 1 percent annual chance storm. The mid-level scenario shows the possible extent of flooding during a 1 percent chance annual storm plus 3.3 feet of sea level rise. The high-end scenario shows the possible extent of flooding during a 1 percent chance annual storm plus 6.6 feet of sea level rise. However, each parcel shown to be affected within a given scenario may not necessarily be inundated. The scenarios only show what kind of flooding is possible. In the event of a storm, inundation may take place in a variable and unpredictable manner. According to California's 2024 guidance on sea level rise, communities should plan for as much as approximately 3 feet (36 inches) of sea level rise by 2070, and as much as 6.6 feet (79.2 inches) by 2100.[15]

The report findings highlight that many of the assets have cross-cutting vulnerabilities (i.e., multiple and indirect sources of vulnerability) and may have more than one point of exposure to sea level rise. Additional information from the SLR VA is available here: https://www.smcsustainability.org/wp-content/uploads/2018-03-12_SLR_VA_Report_2.2018_WEB_FINAL.pdf

El Granada

El Granada is not vulnerable under any of the erosion or sea level rise scenarios.

Bayside Harbor/Industrial Area

The Bayside Harbor/Industrial area is a 61-acre area between Belmont and San Carlos, near Highway 101. The area has no acres inundated in the baseline scenario, two acres inundated in the mid-level scenario, and 21 acres inundated in the high-end scenario. In the mid-level scenario, approximately two acres of land area is inundated, none of the area's population is affected, one communication tower is inundated, and 25 percent of the shoreline protection (0.1 of 0.4 miles) is affected. In the high-end scenario, 50 percent of streams (0.1 of 0.2 miles) are inundated, nearly all people living in the area are affected, one communication tower is inundated, 25 percent of shoreline protection, nearly 50 percent of local roads, and 30 of storm drains are affected.

Miramar

Miramar is not vulnerable under any of the sea level rise scenarios. However, erosion is the greatest concern for the community. The community consists of 5 acres at risk in the erosion scenario. Of particular

concern is the Mirada Road area, where a portion of the road is at risk from erosion. In Miramar, 3 percent of the road and 5 percent of the population living in the area are located within the erosion scenario.

East Bayshore Road Mobile Home Parks

The Mobile Home Parks area is a 19-acre area adjacent to East Bayshore Road, with 16 acres inundated in the baseline scenario and all 19 acres inundated in the mid and high-end scenarios. The area has 59 parcels, and all parcels are inundated in all scenarios. The area is located next to the Bayfront Canal and the Cargill salt ponds between Redwood City and Menlo Park, and it has flooded in recent storms, such as in December 2014. In the Mobile Home Parks unincorporated area, 100 percent of the population living in the area are affected, as well as 100 percent of the levees and floodwalls, roads, storm drains, and transmission lines. This area also experienced significant flooding during the winter of 2022/2023, damaging approximately 80 homes and displacing residents.

Montara

Montara has three acres inundated in the baseline scenario, four acres inundated in the mid-level scenario, and seven acres inundated in the high-end scenario. Half of the parks (two of four) are inundated by the mid-level and the high-end scenario. All of the beaches and the surfgrass (a type of plant critical to the health of some coastal marine ecosystems) could be affected under all three inundation scenarios. The erosion scenario impacts State Route 1 and over 150 parcels, including 89 residential and 11 commercial properties. In Montara, 8 percent of the area's population and 10 percent of its land are within the affected area. Nearly 80 percent of trails and all four parks fall within the erosion scenario, while all beaches and surfgrass could be affected by the erosion scenario.

Moss Beach

Moss Beach has two acres inundated in the baseline scenario, and three acres inundated in the mid-level and high-end scenarios. In all three inundation scenarios, less than 1 percent of land area and population are at risk. Less than 15 percent of wetlands are inundated in all three inundation scenarios. Wetlands and other natural assets could serve a role in helping the area adapt to sea level rise, though it is unclear what capacity there is for the natural assets to withstand sea level rise because of the presence of high bluffs and other shoreline characteristics. In the erosion scenario, 45 acres of the community are inundated. In Moss Beach, the affected area includes 20 percent of the land, nearly 15 percent of the population, and the entire 0.1 miles of levees and floodwalls.

North Fair Oaks

In the unincorporated area of North Fair Oaks, no land is inundated in the baseline scenario, eight acres are inundated in the midlevel scenario, and 50 acres are inundated in the high-end scenario. In the baseline scenario, 35 parcels are inundated, and portions of Bay Road are affected. One underground chemical storage site is vulnerable in the mid-level scenario. Roads and storm drains (approximately 2 percent and 4 percent, respectively) are also vulnerable in the midlevel scenario. In the high-end scenario, the extent of inundation includes parts of the Spring Street area. Less than 1 percent of the neighborhood’s population is vulnerable under the mid-level scenario.

Olympic Country Club

The Olympic Country Club is a private athletic club and golf course, located mostly in San Francisco, with a portion in San Mateo County. The portion of the Olympic Club in San Mateo County has six acres inundated in the baseline and mid-level scenario, and seven acres inundated in the high-end scenario. Less

than 3 percent of land is inundated in all three inundation scenarios. The beach in this area could be 100 percent affected by all three inundation scenarios, though it is unclear what capacity there is for this natural asset to withstand sea level rise. The erosion scenario impacts 65 acres of the community, affecting 30 percent of the land area. It also threatens 40 percent of highways (0.4 miles) and all trails (0.5 miles).

Princeton/Pillar Point Harbor

Princeton has one acre inundated in the baseline scenario, two acres in the mid-level scenario, and 23 acres in the high-end scenario, with no land in the erosion scenario. In the baseline scenario, less than 2 percent of land area is at risk. Also, in the baseline scenario, all of the beach area is inundated, the built shoreline is overtopped, and 4 percent of roads (0.1 of 2.3 miles) and the one fishing pier are inundated. In the mid-level scenario, less than 3 percent of land area is at risk, and 20 percent of the wetland area becomes inundated. In the high-end scenario, about 35 percent of the land area is inundated and just over 30 percent of the population, with all of the population inundated considered part of a community of concern, or where the individuals or households have characteristics that affect ability to prepare for, respond to, and recover from a disaster. In the high-end scenario, roughly 75 percent of the wetlands are inundated. The wetlands will serve a role in helping the area adapt to sea level rise, though it is unclear what capacity there is for this natural asset to withstand sea level rise because of bluff elevations and other shoreline characteristics.

San Francisco International Airport

San Francisco International Airport (SFO) is owned and operated by the City and County of San Francisco and located in unincorporated San Mateo County. SFO has 197 acres inundated in the baseline scenario, 2,044 acres inundated in the mid-level scenario, and 2,141 acres inundated in the high-end scenario. Within the boundaries of the airport is also approximately 145 acres of wetlands, 130 of which (or 90 percent) are vulnerable in the midlevel scenario. These wetlands may be a significant asset in SFO adapting to sea level rise, and it is unclear the extent to which these wetlands may withstand sea level rise. The airport is taking an active role in reducing the flood risk of its facility.

Other Unincorporated Areas

Additional unincorporated areas include nearly 56,000 acres of unincorporated land in the county that is not specifically named and not addressed above. In the baseline scenario, 39 acres of this area are inundated, 72 acres are inundated in the mid-level scenario, and 105 acres are inundated in the high-end scenario. Most vulnerable assets in the mid-level scenario within the additional unincorporated areas of the county are natural assets and/or recreational in nature. These assets include one park, limited trail miles, and one boat launch. However, 1.4 miles of built shoreline (that does not include levees) and less than 1 percent of storm drains will be affected. Less than 2 percent of the unincorporated areas' wetlands are vulnerable.

Under the erosion scenario, 10 of 22 parks and a small percentage of trail miles in unincorporated areas will be affected. Erosion may also impact 6 percent of communications towers and 4 percent of built flood protection infrastructure. The coastal bluffs in unincorporated areas have experienced significant erosion in recent decades, particularly during winter storms. According to a study conducted by San Mateo County Parks, the Pillar Point bluffs are eroding at a rate of approximately 1.5 feet per year (San Mateo County Parks 2016).

South Coast Unincorporated Areas

Sea level rise poses a significant threat to the agricultural community of Pescadero, where two creeks are influenced by coastal conditions, and to Martin's Beach, which sits directly on the shoreline. As sea levels rise, flooding in the low-lying areas of Pescadero is expected to become more extensive, deeper, and longer-lasting, further impacting agricultural land. Coastal erosion also threatens 412 acres of agricultural land, including 30 acres of planted fields. Throughout the study area, vulnerable agricultural lands are at risk, with bluff-top grazing areas being the most affected.

Cultural sites and materials of Native Peoples, particularly in Pescadero, Año Nuevo, and Franklin Point, are also at risk from rising sea levels. State Route 1, a critical transportation corridor for the South Coast region, is already experiencing impacts from sea level rise and faces increasing threats from erosion and flooding. With 4.9 feet of sea level rise, over four miles of the highway will be at risk. Some areas are already eroding, and as sea levels continue to rise, the structural integrity of the roadway may be compromised, requiring stabilization or relocation. The most significant impacts are concentrated in the central portion of the study area, with notable effects beginning around 1.6 feet of sea level rise. By 4.9 feet of sea level rise, approximately 4.5 miles of State Route 1 will be vulnerable to coastal erosion. Additionally, increasing flood and erosion impacts on coastal trails, parking lots, and restrooms will reduce public access to the coast in the future.

Coastal Aquifers

In areas overlying coastal aquifers, rising seas may enter aquifers and contribute to rising groundwater levels, or emergent groundwater (see Figures 6 through 8 for emergent groundwater projections across the County and in the Mid Coast and South Coast regions). Groundwater rise will contribute to inland flooding in low-lying coastal communities, with impacts often occurring earlier, and farther inland, than coastal flooding from overtopping of the bay shoreline. Rising groundwater can degrade underground infrastructure, mobilize contaminants, and increase liquefaction hazards.

Figure 3: County-Wide Projected Sea Level Rise

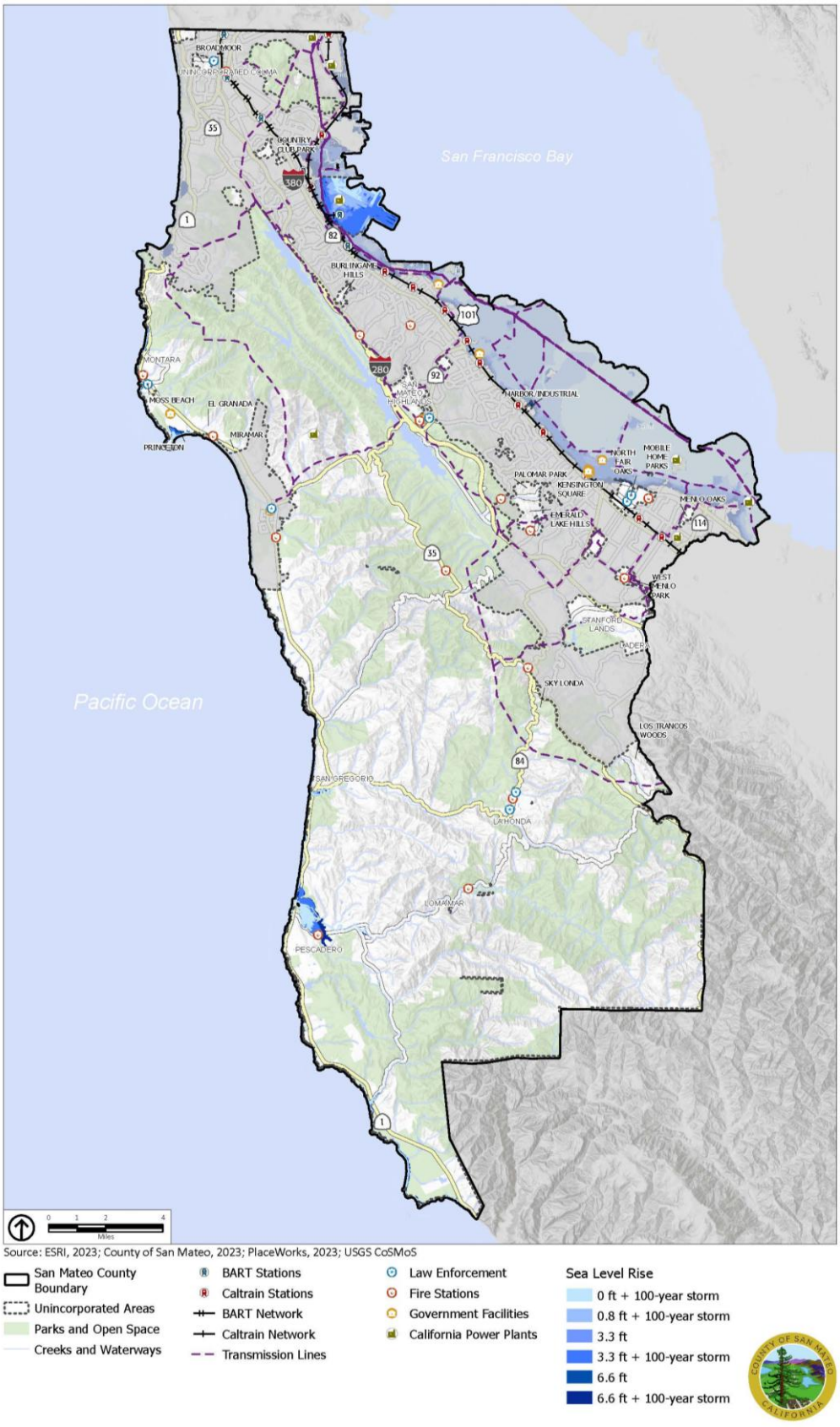


Figure 4: Mid Coast Projected Sea Level Rise

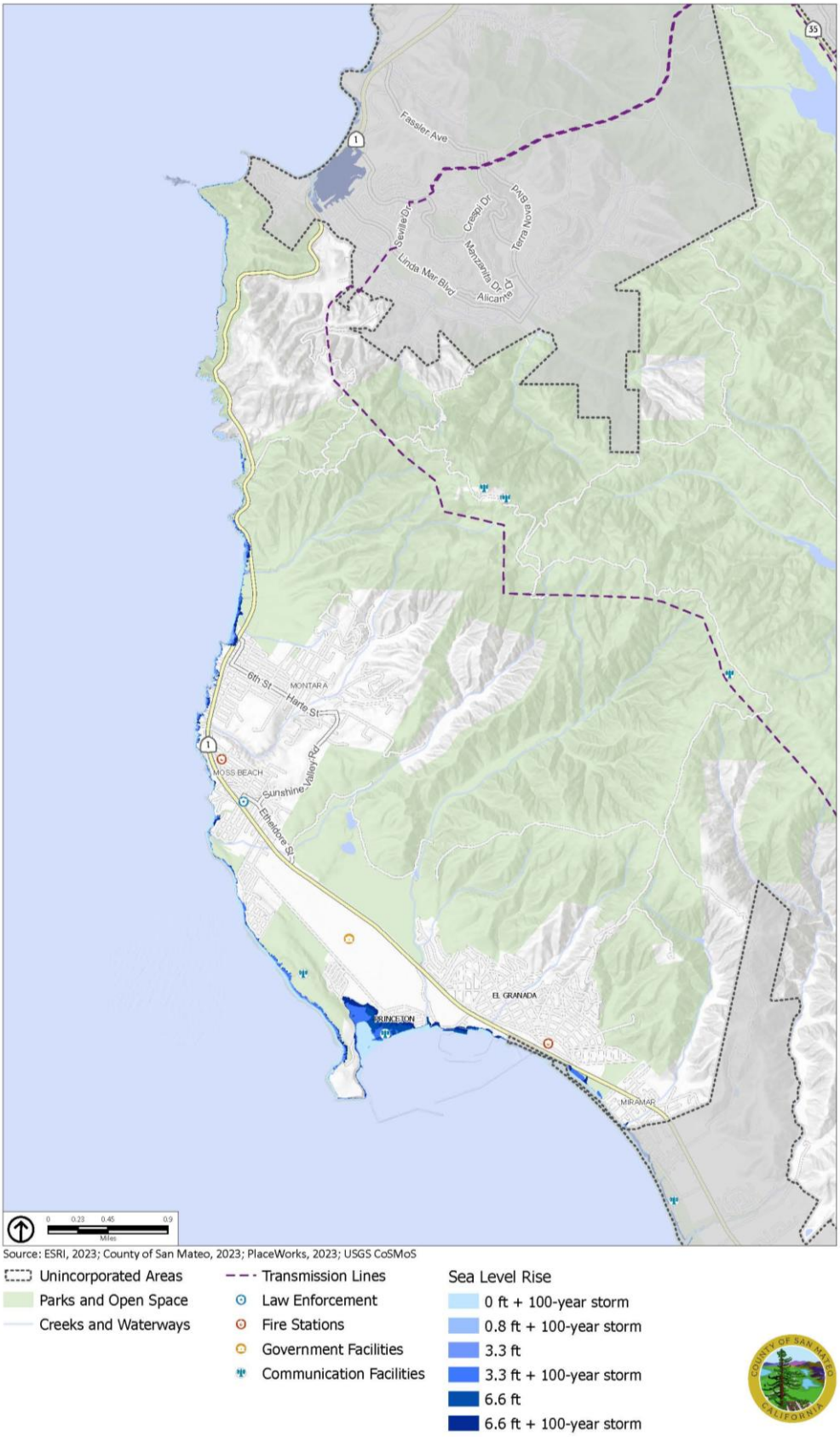


Figure 5: South Coast Projected Sea Level Rise

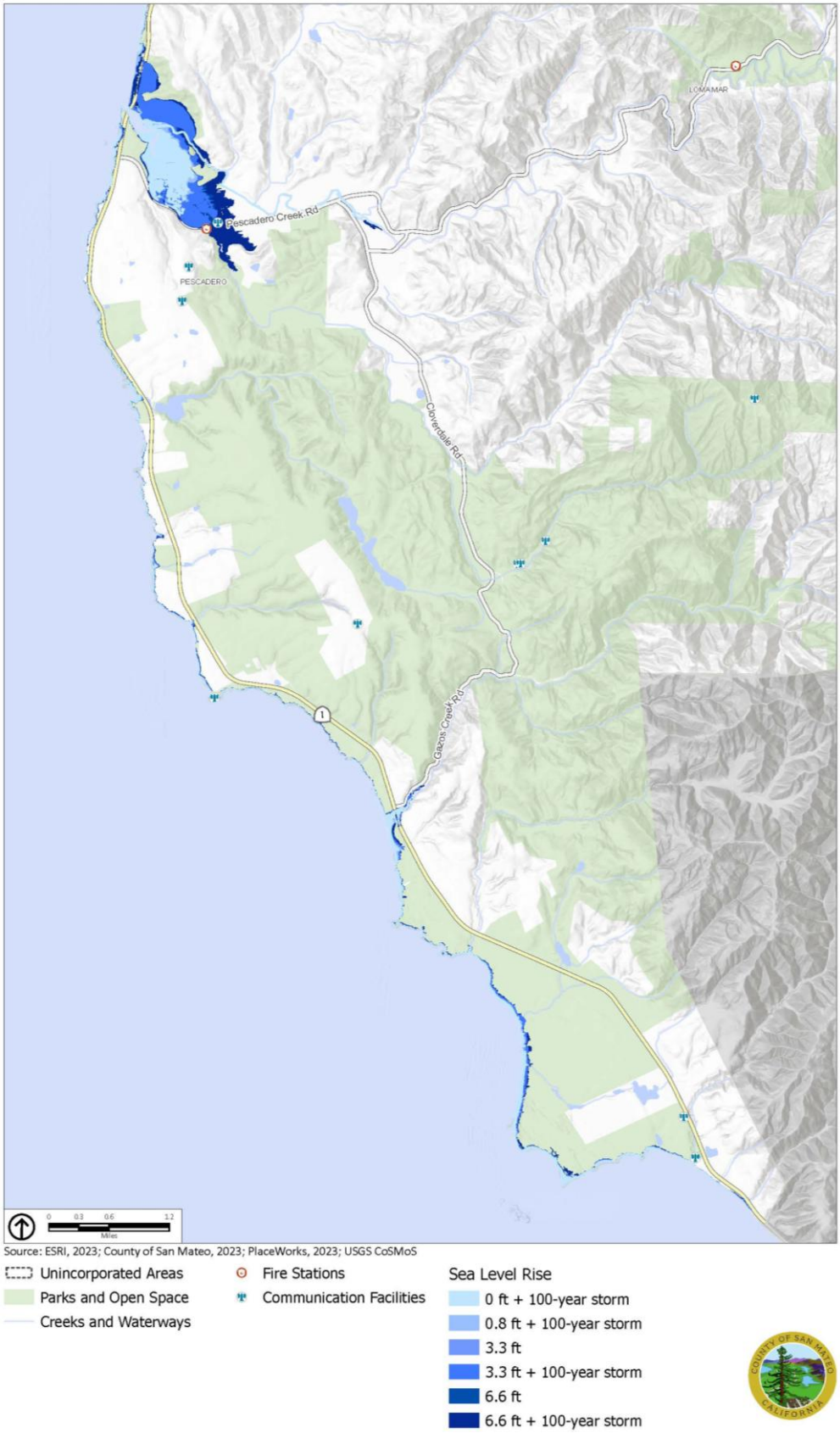


Figure 6: County-Wide Emergent Groundwater Projections, High-End Scenario

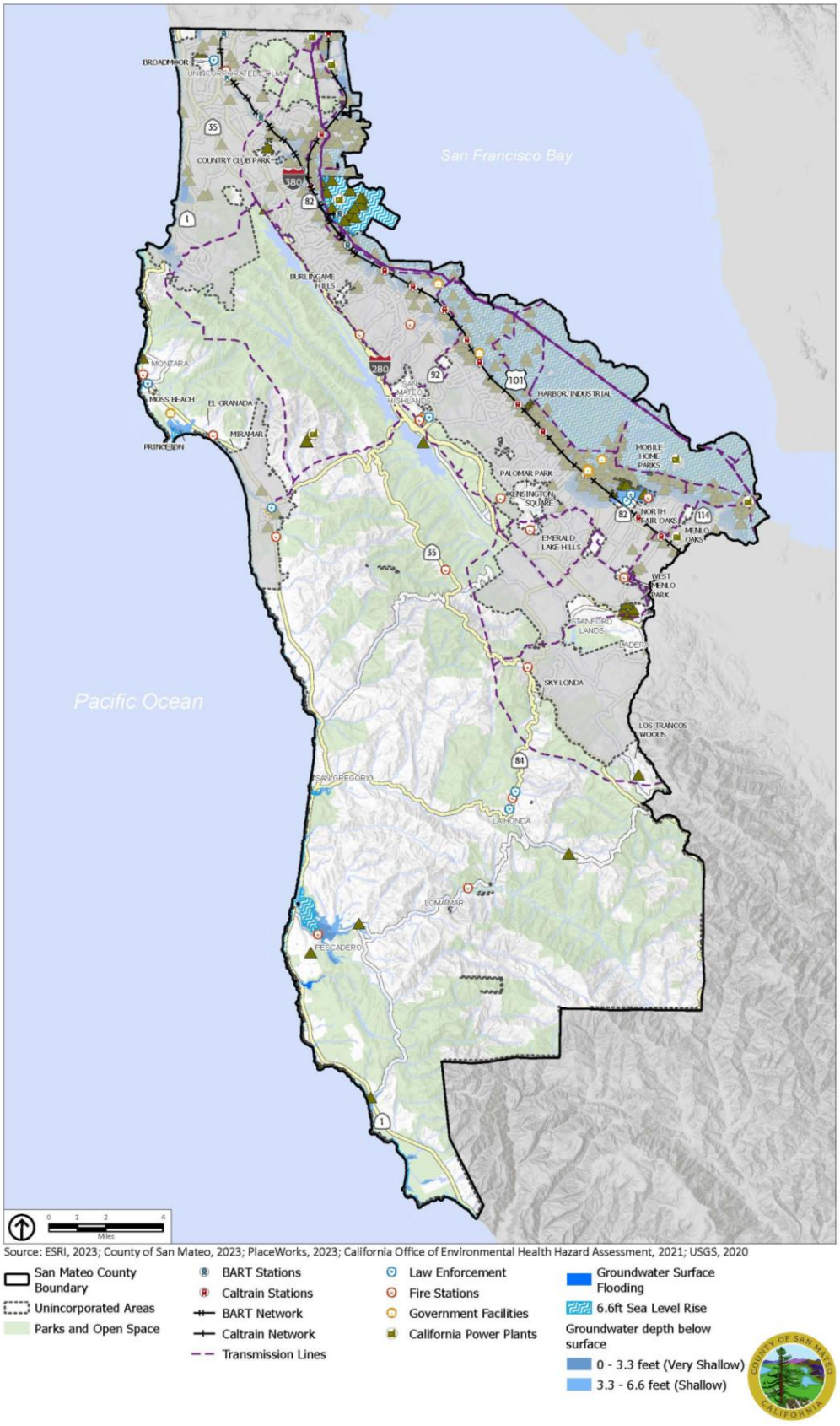


Figure 7: Mid Coast Emergent Groundwater Projections, High-End Scenario

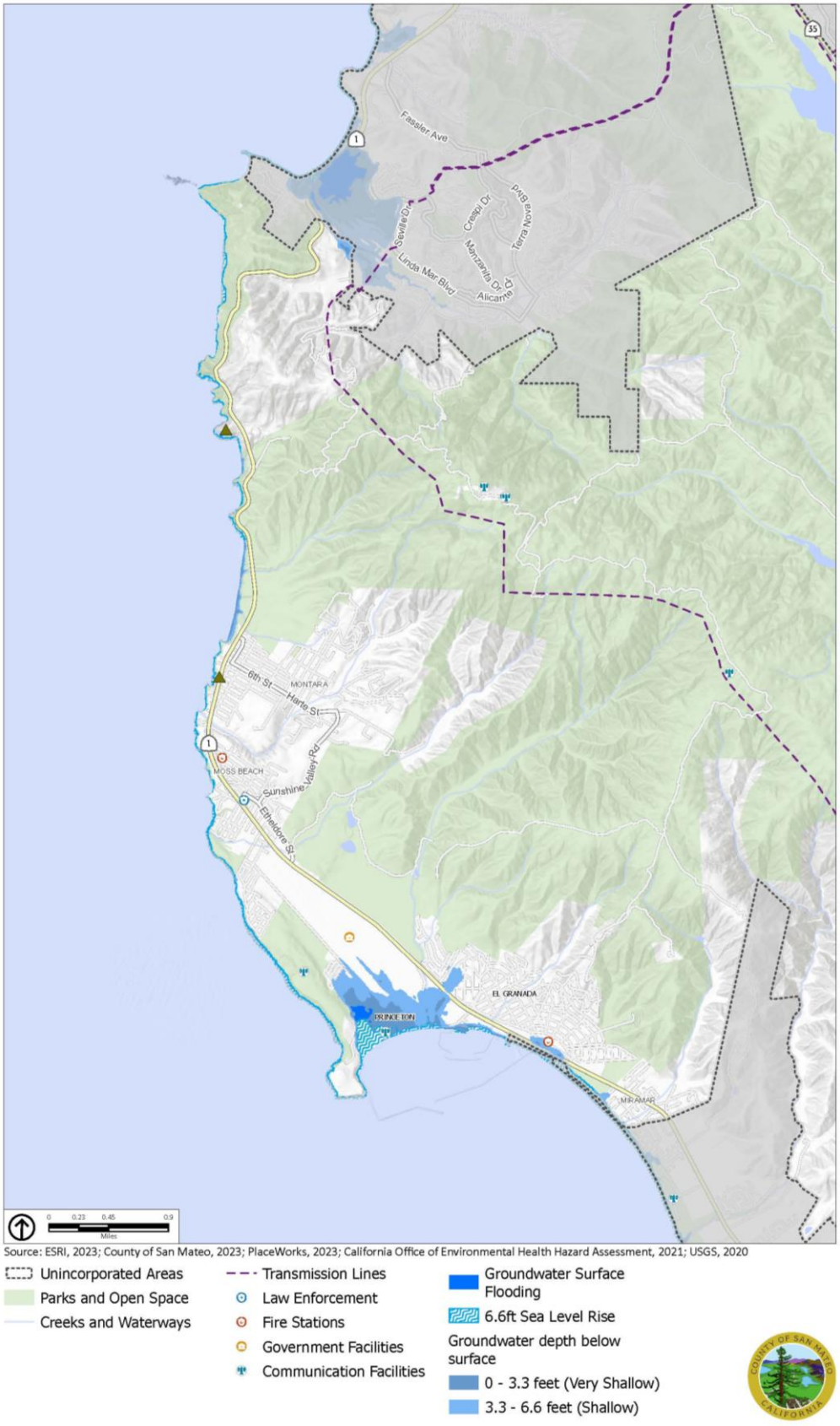
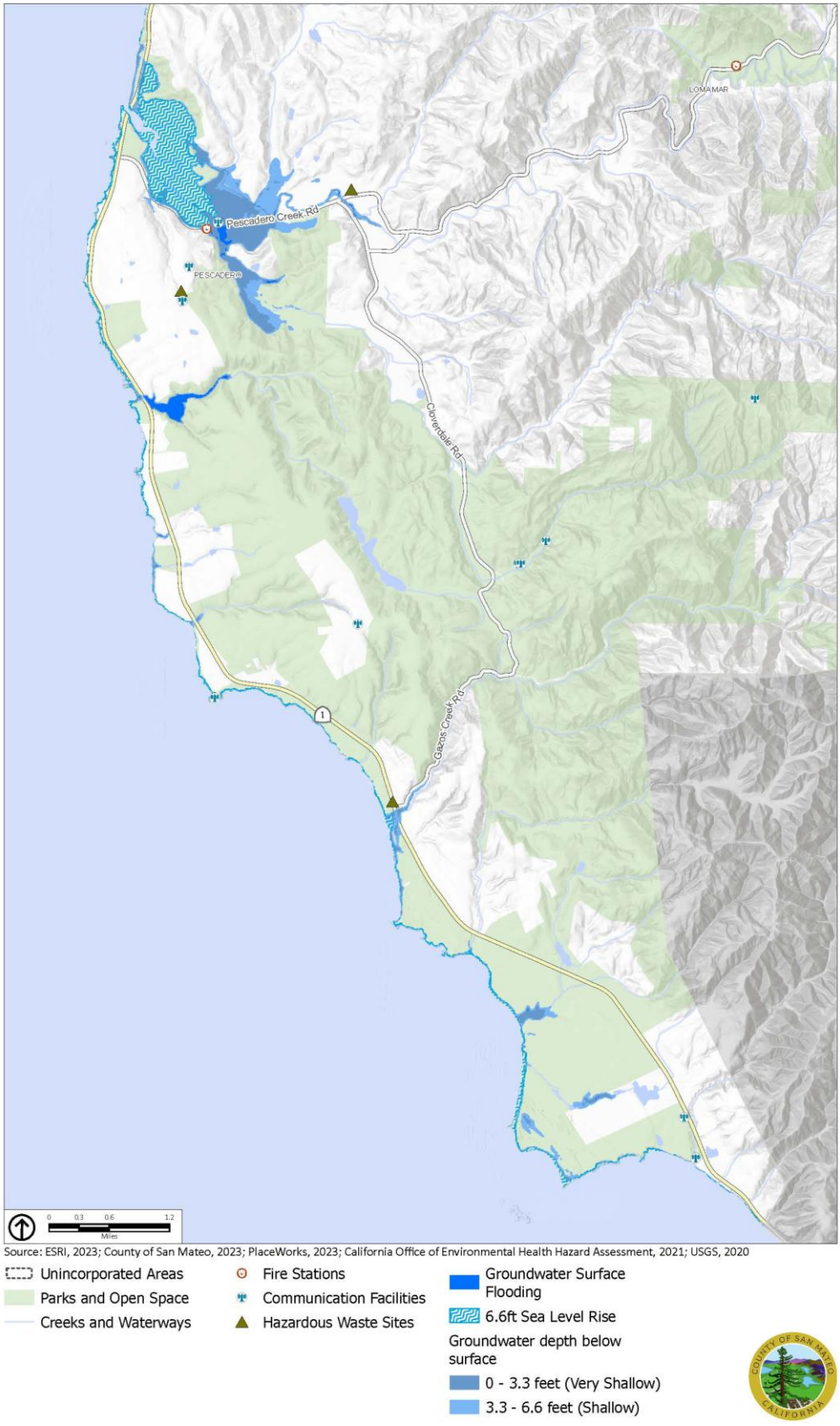


Figure 8: South Coast Emergent Groundwater Projections, High-End Scenario



Past Events

Sea level rise is a dynamic phenomenon that is constantly evolving, the impacts of which are not associated or reported as singular events. This phenomenon is already making its presence felt in Bay Area communities. Over the past century, the water levels in San Francisco Bay have risen by eight inches.

Existing Programs and Regulations

Sea Level Rise Management Agencies and Activities

A number of agencies in San Mateo County and within the greater Bay Area participate in the process of planning for and managing sea level rise, including the Bay Conservation and Development Commission, Adapting to Rising Tides, Bay Adapt, OneShoreline, and the San Mateo County Resource Conservation District. Major reports and initiatives developed by these agencies include the County of San Mateo South Coast Sea Level Rise Vulnerability Assessment & Adaptation Report, County of San Mateo Sea Level Rise Vulnerability Assessment, and the report Sea Level Rise & Overtopping Analysis for San Mateo County's Bayshore.

The San Mateo County Flood and Sea Level Rise Resiliency District (known as OneShoreline) began operating in 2020 to coordinate countywide efforts to combat the harms of sea level rise caused by climate change. OneShoreline provides expertise in the complex process of designing and building for sea level rise, working with cities and developers to build resilience through planning and coordinating multi-jurisdictional flood mitigation projects. OneShoreline's County of San Mateo Sea Level Rise Vulnerability Assessment provides an overview of what is at risk from current and future flooding and erosion in the county.

The County of San Mateo South Coast Sea Level Rise Vulnerability Assessment & Adaptation Report documents the projected extents of coastal hazards, projected impacts to assets, and economic impacts to different resource sectors, then begins to identify feasible adaptation strategies and approaches that may reduce sea level rise risk over time.

Adapting to Rising Tides (ART) is a program of San Francisco Bay Conservation and Development Commission. The ART Program works with local, State, regional, and federal agencies and organizations to gather, develop, and analyze the data needed to understand the impacts of a changing climate on Bay Area communities, infrastructure, services, and natural resources.

The Sea Level Rise & Overtopping Analysis for San Mateo County's Bayshore presents an assessment of San Mateo County's shoreline exposure to flooding or inundation from sea level rise scenarios of 0 to 66 inches and extreme tide events from the 1-year to the 100-year extreme tide event. This analysis, completed by AECOM, uses BCDC's ART methodology.

The Bay Conservation and Development Commission's Climate Ready Program is a critical initiative aimed at protecting the San Francisco Bay from the impacts of climate change, particularly sea level rise. Key initiatives of the Climate Ready Program include Bay Adapt and Living Shorelines. Bay Adapt is a regional agreement to protect the Bay Area from rising sea levels. Bay Adapt aims to develop a coordinated approach to adaptation planning and implementation across the nine-county Bay Area. Living Shorelines is focused on nature-based solutions that use native plants and materials to protect shorelines from erosion and rising water levels.

Bay Adapt is convened in partnership with a broad range of Bay Area leaders. Bay Adapt's Regional Shoreline Adaptation Plan is a comprehensive strategy to guide coordinated, locally planned sea level rise adaptation actions that work together to meet regional goals for the San Francisco Bay shoreline.

San Mateo County Sea Level Rise Policy for County-Owned Assets

The intent of this policy is to understand the vulnerability of County-owned property and assets over their life cycle; develop an incremental approach to adaptation based on the current and future level of risk; and coordinate with other communities on developing regional solutions. Based on this policy, all new facility projects funded by the County shall be sited, designed, constructed, and adaptively managed to minimize sea level rise risks over the life of the project. Following a baseline assessment of sea level rise vulnerability, existing facilities and properties will be subject to this policy during the Capital Improvement Planning or acquisition process, if major renovations or replacement of existing facilities and infrastructure are located in areas at risk from sea level rise beyond what will be protected through local or regional planned sea level rise adaptation projects.

Implementation of this policy will provide critical information on near term risks occurring before 3.3 feet of sea level rise and allow for planning and adaptation strategies over the life of the property. The goal of this approach is to ensure actions are taken when needed and will encourage fiscally responsible decisions.

San Francisco International Airport's SFO Shoreline Protection Program

The San Francisco International Airport's Shoreline Protection Program is an effort to protect the airport's assets and operations from flooding from a 100-year storm surge and future sea level rise due to climate change. This program includes the development of a shoreline protection system to:

- Protect travelers and workers, Airport operations, and City and County of San Francisco assets.
- Protect against a 100-year storm event, as defined by the Federal Emergency Management Agency (FEMA) and remove the Airport from the FEMA Flood Insurance Rate Map 100-year floodplain.
- Protect against future sea level rise by incorporating 42 inches for sea level rise into the design in addition to the 2-foot freeboard FEMA requirement above the 100-year still water level.
- Ensure seismic stability of shoreline protection per California Building Standards Code.

Future Conditions

Climate change is expected to affect the frequency and severity of future sea level rise in San Mateo County. Please review the San Mateo County Vulnerability Assessment Report for details.

ISSUE 4: SEISMIC HAZARDS

General Overview

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust as stress builds up along sections of the crust. When the stress exceeds the strength of the rocks or the friction holding the halves of the fault together, the crust breaks and snaps to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds.

Geologists have found that earthquakes reoccur along faults, which are zones of weakness in the earth's crust. When a fault experiences an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake can still occur. In fact, relieving stress along one part of a fault may increase it in another part. California is seismically active because of movement of the North American Plate and the Pacific Plate to the west. The major boundary between these plates, the San Andreas Fault, runs through San Mateo County. The majority of the seismic hazards are associated with well-known active faults. However, inactive faults, where no displacements have been recorded, also have the potential to cause earthquakes.

The sliding movement of the surface of the earth on either side of a fault is called fault rupture. Fault rupture begins below the ground surface at the earthquake hypocenter, typically between 3 and 10 miles below the ground surface in California. If an earthquake is large enough, the fault rupture will travel to the ground surface, potentially destroying structures built across its path.

Faults are more likely to experience earthquakes if they have more rapid rates of movement, have experienced recent earthquakes, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. "Active" faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). "Potentially active" faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years).

Earthquake Classification

Earthquakes are typically classified by the amount of energy released, measured as magnitude, or by the impact on people and structures, measured as intensity.

Magnitude

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. Magnitude is commonly expressed by ratings on the moment magnitude scale (Mw), the most common scale used today.[16] This scale is based on the distance a fault moved and the force required to move it. The scale is presented in Table 5.

Table 5: Moment Magnitude Scale

Classification	Magnitude
Great	8 or greater
Major	7.0 to 7.9
Strong	6.0 to 6.9
Moderate	5.0 to 5.9
Light	4.0 to 4.9
Minor	3.0 to 3.9
Micro	Less than 3

Intensity

The most commonly used intensity scale is the modified Mercalli intensity scale. Ratings of the scale as well as the perceived shaking and damage potential for structures are shown in Table 6. The modified Mercalli intensity scale is generally represented visually using shake maps, which show the expected ground shaking at any given location produced by an earthquake with a specified magnitude and epicenter. The intensity of an earthquake varies depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A shake map shows the variation of ground shaking in a region immediately following significant earthquakes.

Table 6: Mercalli Scale and Peak Ground Acceleration Comparison

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage	
		Resistant Buildings	Vulnerable Buildings
I	Not felt	None	None
II to III	Weak	None	None
IV	Light	None	None
V	Moderate	Very Light	Light
VI	Strong	Light	Moderate
VII	Very Strong	Moderate	Moderate/Heavy
VIII	Severe	Moderate/Heavy	Heavy
IX	Violent	Heavy	Very Heavy
X to XII	Extreme	Very Heavy	Very Heavy

Fault Locations

San Mateo County is in a region of high seismicity because of the presence of the San Andreas Fault that bisects the county, the Hayward Fault across the bay to the east, and the San Gregorio Fault to the west (see Figure 9). The primary seismic hazard for the county is potential ground shaking from these three large faults.

San Andreas Fault

The San Andreas Fault spans the boundary of the Pacific and North American plates, running 810 miles from the Gulf of California through the Mendocino fracture zone off the shore of northern California.

The San Andreas Fault has three segments. The southern segment extends from the Gulf of Mexico to Parkfield, in Monterey County. The central segment extends from Parkfield to Hollister, in San Benito County. The northern segment extends northwest from Hollister, through San Mateo County, including Daly City and San Bruno, to its junction with the Mendocino fracture zone and the Cascadia subduction zone in the Pacific Ocean. The San Andreas Fault has a 21 percent chance of generating a magnitude 6.7 or greater earthquake in the next 30 years.

A rupture along the peninsula would cause extremely violent ground shaking throughout the county. The bay margins are likely to experience liquefaction in a major earthquake.

Hayward Fault

The Hayward Fault is a 45-mile-long fault that parallels the San Andreas Fault in the East Bay. The Hayward Fault extends through some of the Bay Area's most populated areas, including San Jose, Oakland, and Berkeley.

The Hayward Fault has a 31-percent chance of producing a magnitude 6.7 or greater earthquake in the next 30 years. An earthquake of this magnitude has regional implications for the entire Bay Area, as the Hayward Fault crosses numerous transportation and resource facilities, such as highways and the Hetch Hetchy Aqueduct. Disruption of the Hetch Hetchy system has the potential to severely impair water service to San Mateo County. The Hayward Fault is increasingly becoming a hazard priority throughout the Bay region because of its increased chance for activity and its intersection with multiple highly populated areas and critical facilities.

San Gregorio Fault

The San Gregorio Fault is a northwest-trending right-lateral slip deformation near the western edge of San Mateo County, crossing briefly over uninhabited land in San Mateo County around Pillar Point at Half Moon Bay. The fault runs from southern Monterey Bay through Bolinas Bay, where its north section intersects with the San Andreas Fault offshore north of San Francisco. San Gregorio is the principal active fault west of the San Andreas for the Bay Area region.

The San Gregorio Fault is one of the less studied fault lines, the result of its primary location offshore and its proximity to the better-known San Andreas Fault and Hayward Fault. Its probability of experiencing a magnitude 6.7 or greater earthquake within the next 30 years is 6 percent—significantly less than San Andreas Fault or Hayward Fault. However, the location of the fault poses a significant threat to San Mateo County.

Earthquake-Related Hazards

According to the USGS Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect people's normal activities. In addition to shaking and surface rupture, this can also include landslides, liquefaction, and tsunamis.

Liquefaction

Soil liquefaction occurs when water-saturated sands, silts, or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a puddinglike liquid. Building and foundations lose load-bearing strength and may sink into what was previously solid ground. Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people.

Figure 10 shows the areas facing an elevated liquefaction risk in San Mateo County.

Figure 9: Regional Faults

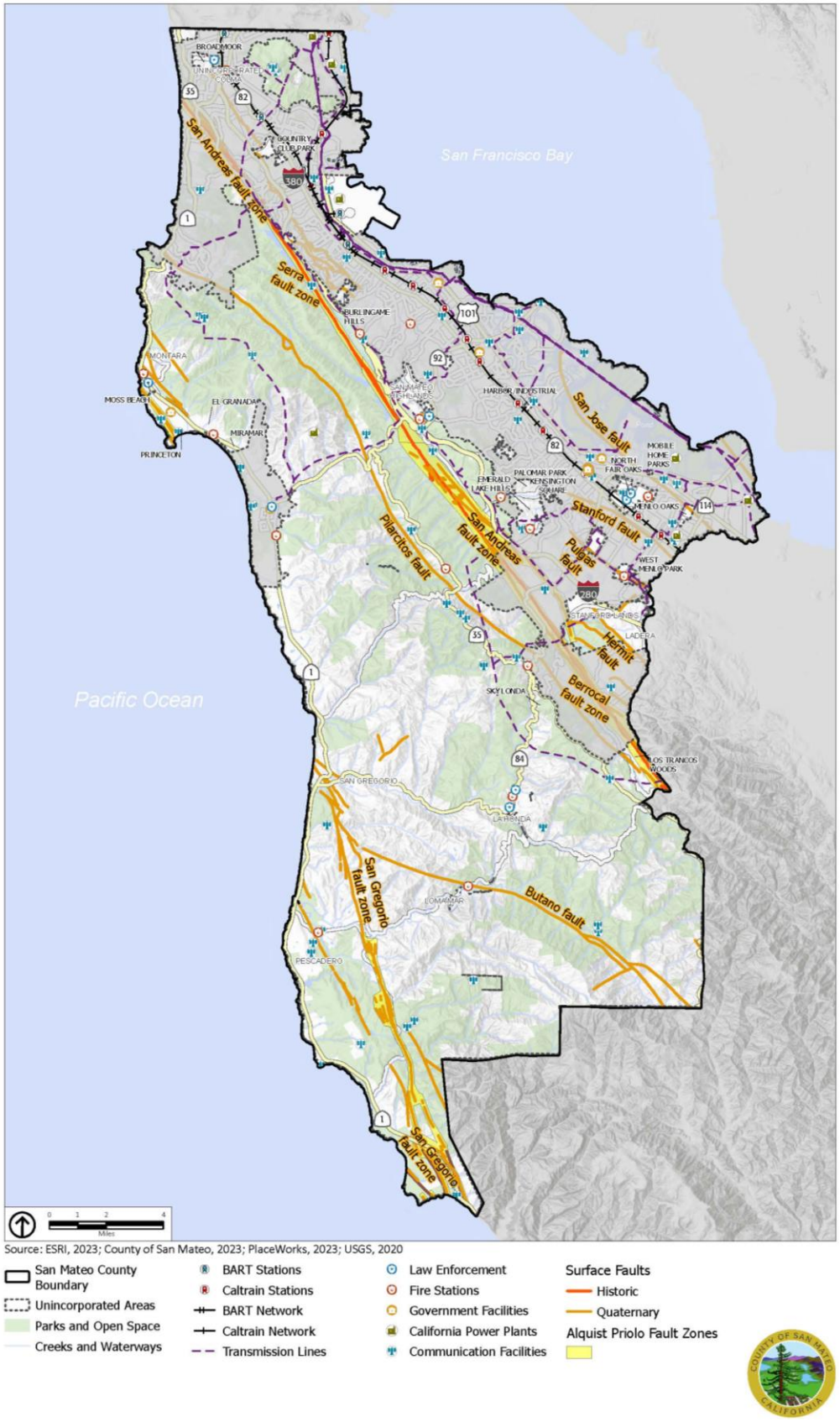
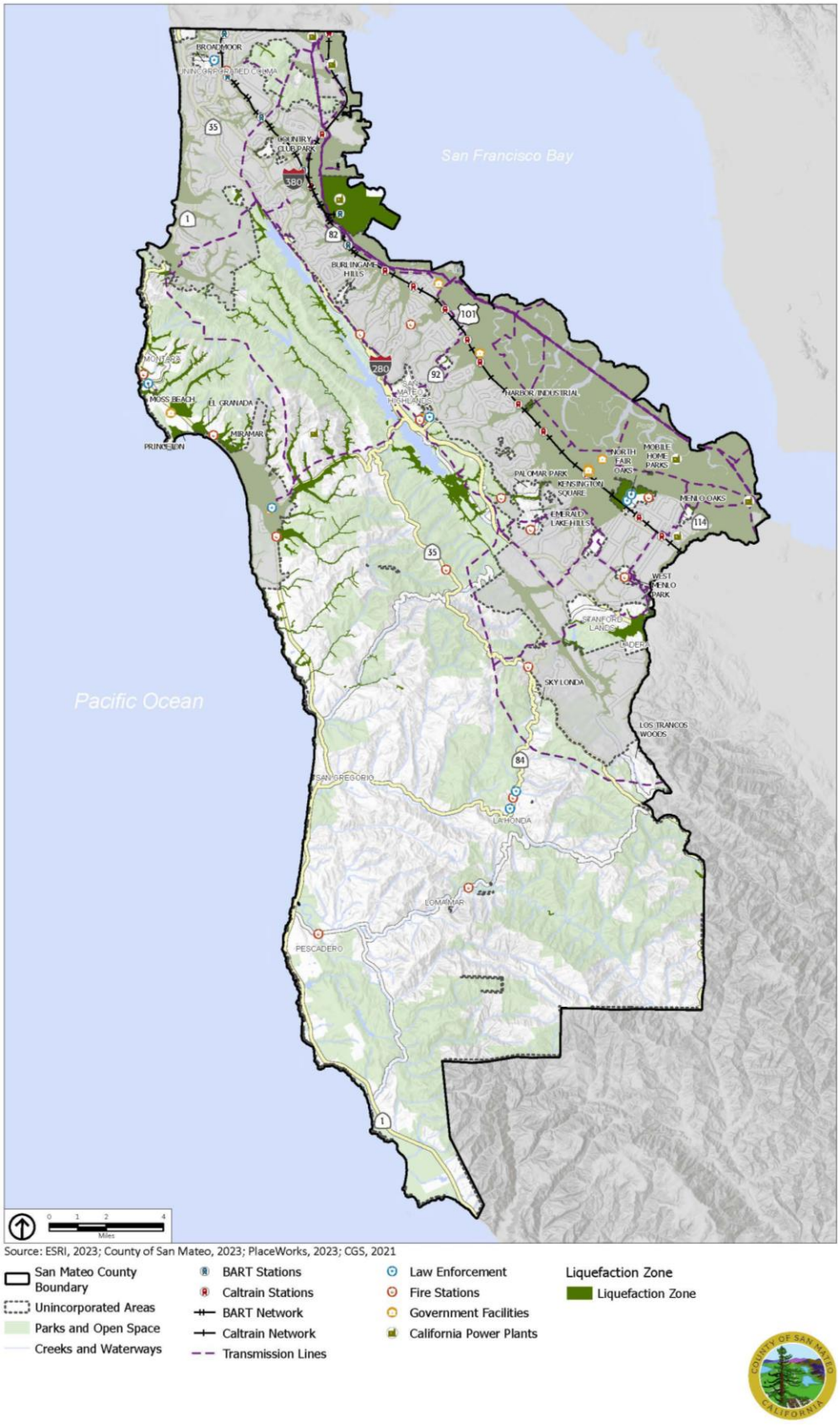


Figure 10: Liquefaction Hazard Areas



Tsunami

A secondary hazard of earthquakes are tsunamis, which have the potential to affect the shoreline areas of San Mateo County. A tsunami is a series of high-energy waves that radiate outward like pond ripples from an area where a generating event occurs, arriving at shorelines over an extended period. Tsunamis can be induced by earthquakes, landslides, and submarine volcanic explosions.

At some locations, the advancing turbulent wave front will be the most destructive part of the tsunami wave. In other situations, the greatest damage will be caused by the outflow of water back to the sea between crests, sweeping away items on the surface and undermining roads, buildings, bulkheads, and other structures. This outflow action can carry enormous amounts of highly damaging debris, resulting in further destruction. Ships and boats may be forced against breakwaters, wharves, and other craft, or be washed ashore and left grounded after the withdrawal of the seawater.

Tsunamis are often referred to as local or distant. The type of tsunami depends on the location of the source of the tsunami and where it may strike land. The source of a local tsunami is close to the coast or shoreline and may arrive in less than one hour. The danger is greatest for local tsunamis because warning time is limited.[17]

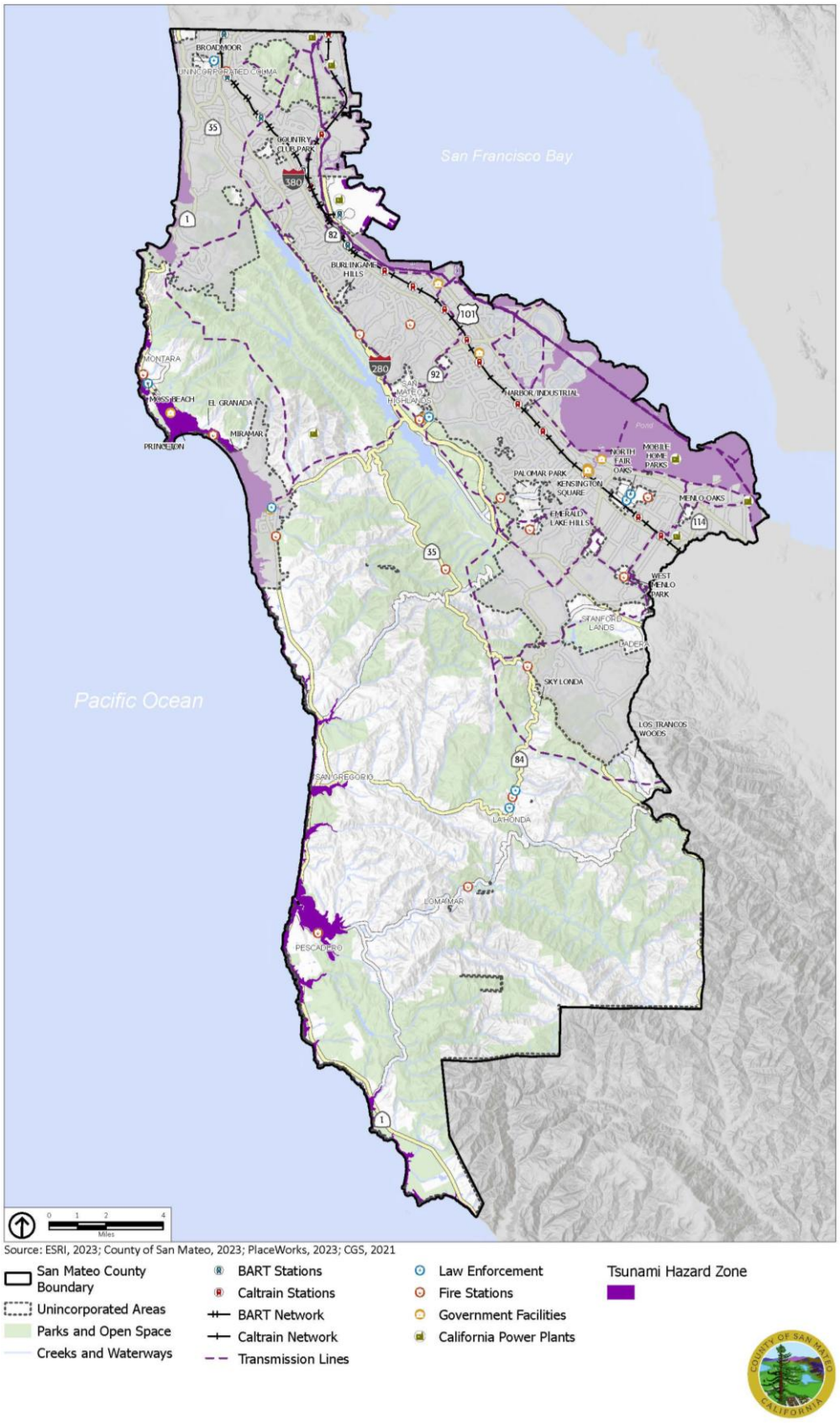
Although earthquake magnitude is one factor that affects tsunami generation, there are other important factors to consider. The earthquake must be a shallow marine event that displaces the seafloor. Thrust earthquakes, such as those in subduction zones that cause up or down movements (as opposed to strike-slip earthquakes, which cause side-to-side movement) are far more likely to generate tsunamis, but small tsunamis have occurred in a few cases from large (magnitude eight or greater) strike-slip earthquakes. Tsunamis affecting the Bay Area are most likely to be generated by very distant subduction faults such as those in Washington and Alaska, but local tsunamis can be generated from strike-slip faults (such as the small one that was triggered by the 1906 earthquake). The nearest subduction zone to San Mateo County is the Cascadia Subduction Zone, which runs from Vancouver Island in Canada to Cape Mendocino in Humboldt County (about 220 miles from San Mateo County). Smaller earthquakes produce fewer damaging tsunamis, and those with magnitudes below 6.5 are very unlikely to trigger a tsunami. The 2011 Honshu, Japan, earthquake caused tsunami damage in Santa Cruz, Crescent City, and Berkeley marinas.[18]

CalOES has prepared a series of maps showing the potential inundation line for a tsunami runup along the San Francisco Bay shoreline from a number of extreme, yet realistic, tsunami data sources.

Seiches are a potential secondary hazard from tsunamis. Seiches are standing waves oscillating in a body of water, and they can form in any enclosed or semi-enclosed body of water, including San Francisco Bay. They typically result from strong winds and rapid changes in atmosphere pressure, which push the water from one end of the enclosure to the other. When the wind stops, the water rebounds to the other side and then continues to oscillate for hours or days. Earthquakes and severe storm fronts can also cause seiches.

Figure 11 illustrates the area that may be subject to inundation from tsunamis in San Mateo County.

Figure 11: Tsunami Hazard Areas



Past Events

Table 7 lists recent earthquakes with a magnitude of 5.0 or greater within 100 miles of San Mateo County. The last significant (greater than magnitude 6.0) seismic event in the San Mateo vicinity was the 7.1 magnitude San Andreas Loma Prieta Earthquake in 1989, which originated 10 miles northeast of Santa Cruz. Other significant local earthquakes include the 1906 earthquake in San Francisco and the 2014 Napa earthquake. Although the 1906 earthquake is most associated with the City of San Francisco, San Mateo County was also greatly affected.

Table 7: Recent Earthquakes Magnitude 5.0 or Larger Within 100-Mile Radius of San Mateo County

Date	Location	Epicenter Location
3/22/1957	5.3	Daly City
3/31/1986	5.70	12 miles east-northeast of Milpitas, CA
10/17/1989	7.1	10 miles northeast of Santa Cruz, CA
9/3/2000	5.17	8 miles northwest of Napa, CA
8/10/2001	5.50	9 miles west of Portola, CA
10/31/2007	5.6	10 miles northeast of San Jose, CA
8/24/2014	6.0	6 miles southwest of Napa, CA

Tsunami Events

Table 8 lists known tsunami events that have struck the county or one of its jurisdictions since 1859.

Table 8: Tsunami Events in San Mateo County

Date	Description
9/24/1859	A tsunami originating in Northern California hit Half Moon Bay, with a wave 4.6 meters high.
4/1/1946	An M-7.3 earthquake in the East Aleutian Islands of Alaska triggered a tsunami that struck California. Wave heights of 2.6 meters were recorded in Half Moon Bay.
5/22/1960	An M-9.5 earthquake in Central Chile triggered a tsunami that reached San Mateo County. Wave heights of 1.2 meters were recorded in Pacifica.
3/28/1964	An M-9.2 earthquake off the Gulf of Alaska triggered a tsunami that reached San Mateo County. Wave heights of 1.4 meters were recorded in Pacifica.
2/27/2010	An M-8.8 earthquake in Central Chile triggered a tsunami that reached San Mateo County. Wave heights of 0.6 meters were recorded in Half Moon Bay.
3/11/2011	A magnitude 8.9 earthquake near Honshu, Japan generated a tsunami significantly affecting California on March 11, 2011. Wave heights were recorded at 0.7 meters in Half Moon Bay and 1 meter in Pacifica.

Existing Programs and Regulations

Section 6762. Special Hazard Areas Design Criteria of the County's zoning regulations contains supplemental design criteria shall apply to developments that fall within the Special Hazard Areas defined in the Conservation and Open Space, and Seismic Safety/Safety Elements of the County's General Plan. This section requires that in all areas defined in the Seismic Safety/Safety Element as hazard areas, all development shall be designed to standards which achieve the following:

a) maintenance of the health, safety and welfare of County residents.
b) compliance with the requirements of the Seismic Safety/Safety Element.
c) consistency with the uses proposed.
d) minimal likelihood of direct damage to the uses, and minimal indirect threat to public health and safety in the event of a major seismic event

The County's Local Coastal Program applies regulations for development in geologic hazard areas such as Section 6326.2 – Seismic Fault/Fracture Area Criteria of the Resource Management Zoning Ordinance. This requires geologic reports prepared by a certified engineering geologist for all proposed development. Policy 9.10 of the LCP requires the County Geologist or an independent consulting certified engineering geologist to review all building and grading permits in designated hazardous areas for evaluation of potential geotechnical problems and to review and approve all required investigations for adequacy.

Future Conditions

The frequency and severity of future seismic hazards in San Mateo County is expected to continue.

ISSUE 5: GEOLOGIC HAZARDS

General Overview

Landslide

Geologic hazards, such as landslides and erosion, depend on the geologic composition of the area. A landslide is a mass of rock, earth or debris moving down a slope. They occur when a slope loses its structural integrity and can no longer hold itself together. Landslides can move slowly or very quickly. Mudslides, a type of landslide, are rivers of rock and soil saturated with water. They develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall. Landslides in hillside terrain can pose a serious hazard to downslope property and structures. They can disrupt roadways and other infrastructure lifelines, destroy private property, and cause flooding, bank erosion, and rapid channel migration. Landslides can travel miles from their source, growing as they descend and pick up debris.

The degree of local landslide hazard depends on soil type and steepness of slope. Soil type is a key indicator for landslide potential and is used by geologist and geotechnical engineers to determine soil stability for construction standards. Other factors that increase landslide risk include a slope greater than 33 percent, a history of landslide activity in the last 10,000 years, and stream or wave activity, which can cause erosion and undercut a bank and cause the surrounding land to become unstable. Wildfire can also make landscapes more susceptible to landslides, flash floods, and debris flows.

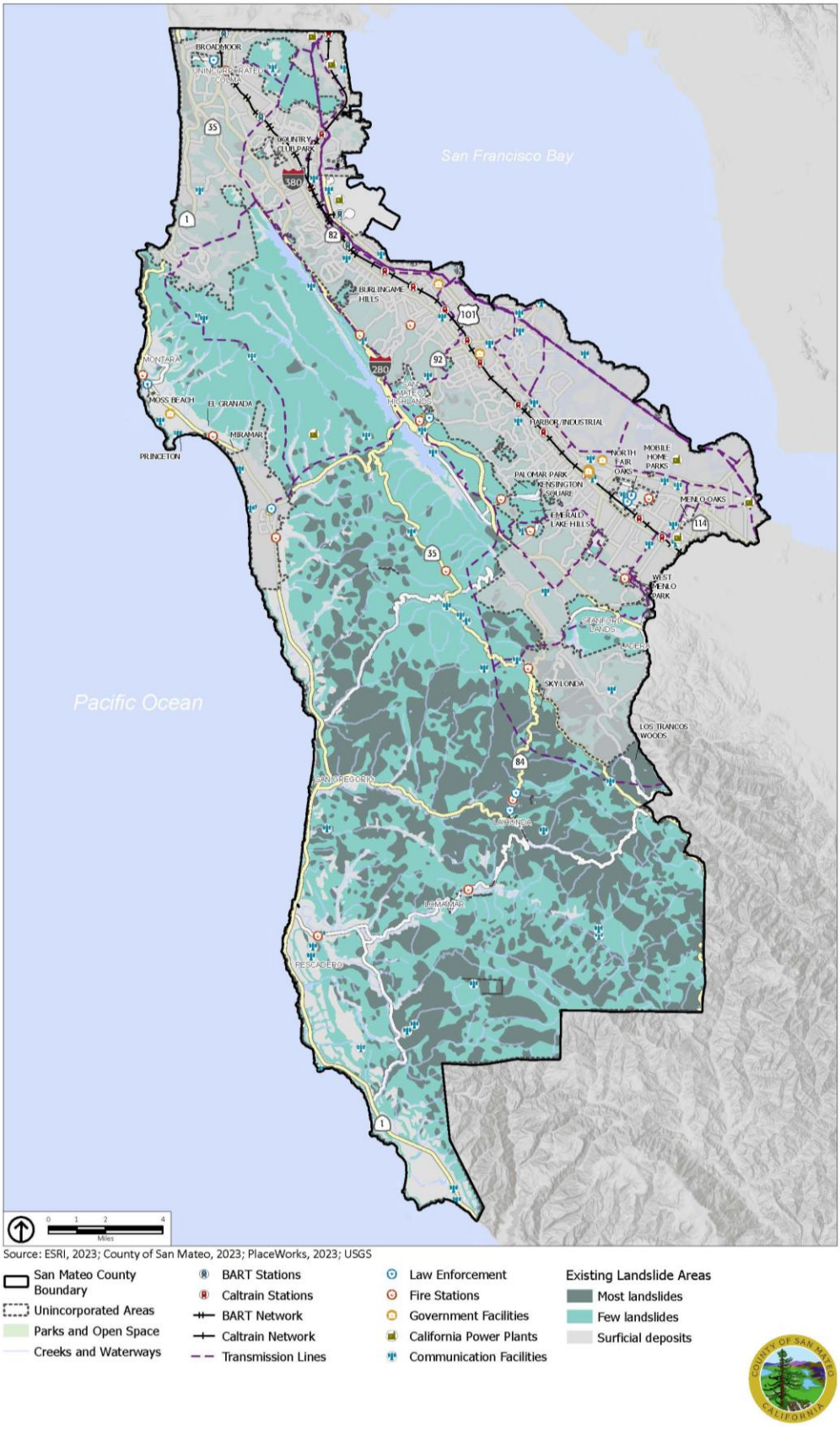
Slides are caused by a combination of geological and climate conditions and the influence of urbanization. They can be initiated by storms, earthquakes, fires, or human modification of the land. The sites of large landslides are typically areas of previous landslide movement that are periodically reactivated by significant precipitation or seismic events. The many types of landslides are categorized based on form and type of movement. They range from slow-moving rotational slumps and earth flows, which can damage and stress structures over time but are less threatening to personal safety, to fast-moving rock avalanches and debris flows that are a serious threat to structures and have been responsible for most fatalities during landslide events. Many large landslides are complex and a combination of more than one landslide type. In San Mateo County, landslides typically occur during and after severe storms that saturate

steep, slide-prone soils. Most weather-induced landslides in the county occur in the winter after the water table has risen. Landslides that result from earthquakes can occur at any time. The probability of a landslide in the county in any given year is high.

Landslide-susceptible areas are characterized by steep slopes, downslope creep of surface materials, and unstable soil conditions. Landslides range from small, shallow deposits made up of soil and weak bedrock materials to large, deep landslides involving a large amount of bedrock. Landslides may occur on slopes of 15 percent or less, but the probability is greater on steeper slopes. Above 30 percent, conventional single pad type construction is unsuitable, and construction requires substantial grading and retaining walls. Figure 12 illustrates areas in San Mateo County that are most susceptible to landslides. Climate change is expected to increase the frequency of debris flows, or fast-moving landslides, on the slopes of San Mateo County as storms and fires become more frequent. These events can occur suddenly, and debris can flow for miles and result in extensive damage.

San Mateo County is also susceptible to hazards related to erosion, or the geological process in which earthen materials are worn away and transported by natural forces, such as water or wind, causing the soil to deteriorate. Eroded topsoil can be transported into streams and other waterways. Water erosion is the removal of soil by water and transportation of the eroded materials away from the point of removal. The severity of water erosion is influenced by slope, soil type, soil water storage capacity, nature of the underlying rock, vegetation cover, and rainfall intensity and period. The impact of soil erosion on water quality becomes significant, particularly as soil surface runoff. Highly erosive soils can damage roads, bridges, buildings, and other structures.

Figure 12: Landslide Hazard Areas



Past Events

Landslides have occurred regularly within San Mateo County. One landslide killed three children in 1982, and several landslides have required apartment evacuations along coastal bluffs. The County experienced an unprecedented amount of rain through the end of 2022 and into 2023, which resulted in several roadway failures, slip-outs, and flooding. Table 9 lists known landslide events that affected San Mateo County since 2000.

Table 9: Past Landslide Events in San Mateo County

Date	Event Type
December 17, 2005, to January 12, 2006	A series of winter storms caused flooding, landslides, and mudslides in the region. Damage estimates for the San Mateo County region exceeded $100 million. Three homes were nearly wiped out by mudslides.
April 2006	Severe storms resulted in debris flows across the county. The hardest hit areas were water-soaked hillsides in Brisbane, Broadmoor, and El Granada. In total, 83 damage sites were documented throughout San Mateo County. Damage was estimated at nearly $13 million, with at least $6 million charged to county road damage. A slide caused SR-1 at Devil's Slide to be closed for several months. A landslide also blocked lanes on SR-84.
Winter 2017	A series of severe winter storms caused flooding and mudslides across San Mateo County.
March 2023	Highway 84 between Foxhill Road and Portola Road was closed due to landslide triggered by severe weather. The slide resulted in the failure of approximately 250 feet of roadway on March 8, 2023. A temporary one-way traffic control opened on July 27, 2023, with the full reopening of SR-84 tentatively scheduled for December 2023. On March 22, 2023, a landslide on the 600 to 800 blocks of Patrol Road in Woodside impacted approximately 30 homes. Residents were urged to evacuate and Patrol Road was closed.
September 8, 2023	A landslide shut down eastbound SR-84 west of SR-35. The road was closed for several hours.

In addition to the one-time events listed in Table 9, some parts of San Mateo County have experienced recurring landslide events:

- The southwestern portion of the county has experienced repeated damage from debris flows, including the Tunitas Creek, San Gregorio, and Pescadero watersheds. Debris flows are widespread on the natural slopes west of Skyline Ridge. They have been observed at Alpine Road, Crystal Springs, San Bruno Mountain, and Point San Pedro, as well as the county's coastal sea cliffs.
- SR-1 has been closed by landslides multiple times at Devils Slide. In 1995 and 2006, landslides led to extended closures. The new Tom Lantos Tunnel, opened in March 2013, allows the highway to bypass Devils Slide and reduce vulnerability.

Existing Programs and Regulations

Chapter 5, Article 1, of the County's Municipal Code contains requirements pertaining to excavation, grading, filling, and clearing. It sets forth rules and regulations to control excavation, land disturbances, land fill, soil storage, and erosion and sedimentation resulting from such activities.

Chapter 19.5 – Geologic Hazard District Regulations of the County's zoning regulations intends to safeguard life, limb, property and the public welfare by regulating land development in areas determined to be hazardous for development because of geologic factors. Section 6295.3 – Geotechnical Investigations and Development Requirements requires that prior to designating an area a Geologic Hazard District, a geotechnical report for the area shall be prepared by a certified engineering geologist under the direction of, or subject to review by, the County Geologist

The County's Local Coastal Program applies regulations for development in geologic hazard areas such as Section 6326.2 – Seismic Fault/Fracture Area Criteria of the Resource Management Zoning Ordinance. This requires geologic reports prepared by a certified engineering geologist for all proposed development. Policy 9.10 of the LCP requires the County Geologist or an independent consulting certified engineering geologist to review all building and grading permits in designated hazardous areas for evaluation of potential geotechnical problems and to review and approve all required investigations for adequacy.

Future Conditions

The frequency and severity of future geologic hazards in San Mateo County is expected to continue. The San Mateo County Vulnerability Assessment provides details about future landslide hazards in San Mateo County, considering the expected effects of climate change.

ISSUE 6: FIRE HAZARDS

General Overview

Fire hazards include both wildfires and urban fires. The combination of complex terrain, Mediterranean climate, and productive natural plant communities, along with ample natural ignition sources, has created conditions for extensive wildfires. Historically, the fire season extended from early summer through late fall of each year during the hotter, dryer months, although it is increasingly a hazard that can occur year-round. Fire conditions arise from a combination of high temperatures, low-moisture content in the air and plant matter, an accumulation of vegetation, and high winds.

Wildfire/Wildland-Urban Interface

Wildfire is any uncontrolled fire on undeveloped land that requires fire suppression. Wildfires can occur naturally and are important to many ecosystem processes; however, most are started by people. Wildfires occur on mountains, hillsides, and grasslands. Fuel, weather, and topography are primary factors that affect how wildland fires spread. The climate of San Mateo County and the surrounding area keeps the grass dry and more readily combustible during fire season.

The wildland-urban interface (WUI) is an area where buildings and infrastructure mix with areas of flammable wildland vegetation, allowing wildland fires to easily spread to buildings and structures. Hundreds of homes now border major forests and brush areas in California. Human-caused fires are the leading cause of wildland fires, and with thousands of people living near and visiting wildland areas, the probability of human-caused fires is growing.

Structural Fires

Structural fires occur in built-up environments, destroying buildings and other human-made structures. These disasters are often due to faulty wiring or mechanical equipment, or combustible construction materials. The absence of fire alarms and sprinkler systems can exacerbate the damages associated with a structural fire. Structural fires are largely from human accidents, although deliberate fires (arson) may

be a cause of some events. Older buildings that lack modern fire safety features may face greater risk of damage from fires. To minimize fire damage and loss, the local Fire Code, based on the State Fire Code, sets standards for building and construction. They require the provision of adequate water supply for firefighting, fire retardant construction, and minimum street widths, among other things.

CAL FIRE Wildfire Mapping

CAL FIRE has modeled and mapped wildfire hazard zones using a computer model that designates moderate, high, or very high fire hazard severity zones (FHSZs). FHSZ ratings are derived from a combination of fire frequency (how often an area burns) and expected fire behavior under severe weather conditions. CAL FIRE's model derives fire frequency from 50 years of fire history data. Fire behavior is based fuel loads (such as the level and type of vegetation), weather conditions (temperature, wind, precipitation, humidity, etc.), slope and elevation, fire ignition patterns, and expected rate-of spread. It accounts for flying ember production, which is the principal driver of the wildfire hazard in densely developed areas, as well as the relative density of vegetative fuels that can serve as sites for new spot fires within the urban core and spread to adjacent structures. The model refines the zones to characterize fire exposure mechanisms that cause ignitions to structures.

CAL FIRE periodically reviews and revises the FHSZ boundaries based on updated modeling and scientific information. Individuals should consult the most recent available mapping, available from CAL FIRE's Fire and Resource Assessment Program (FRAP) at https://frap.fire.ca.gov/.

Secondary Hazards

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires cause the contamination of reservoirs, destroy transmission lines, and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes. Major landslides can occur several years after a wildfire. Most wildfires burn hot and for long durations that can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding.

Fire Hazard Areas

CAL FIRE has designated Moderate, High, and Very High FHSZ areas in San Mateo County. These zones of elevated risk include WUI areas, where high-value structures such as homes meet highly flammable native vegetation. Such WUI areas are more vulnerable to fire, and as a result of serious wildland fires throughout the state in recent years, are subject to more stringent fire-prevention regulations on development. Residential development in the WUI has exposed more people to risks from wildfires. The introduction and proliferation of exotic species, accumulated fuel, and climate change–driven droughts and extreme heat events exacerbate the fire problem. Together, these factors result in more people, property, critical infrastructure, and natural resources in harm's way on a more frequent basis. Though large-scale wildfires do not occur every year, wildfire incidents driven by extreme weather conditions have repeatedly been difficult to contain.

A combination of factors, including weather, topography, and vegetation, put large sections of San Mateo County at a high risk from wildfires. Figure 13 shows the wildfire hazard severity zones in and around San Mateo County.

Wildfire Smoke

Increasing local and regional fire frequency can create recurring air quality degradation leading to respiratory health effects. Wildfire smoke consists of a mix of gases and fine particulate matter from burning vegetation and materials. The pollutant of most concern from wildfire smoke is fine particulate matter ($PM_{2.5}$). $PM_{2.5}$ from wildfire smoke is damaging to human health due to its ability to deeply penetrate lung tissue and affect the heart and circulatory system. Although wildfire smoke presents a health risk to everyone, sensitive groups may experience more severe acute and chronic symptoms from exposure to wildfire smoke, such as children, older adults, people with chronic respiratory or cardiovascular disease, or people experiencing low socioeconomic status.

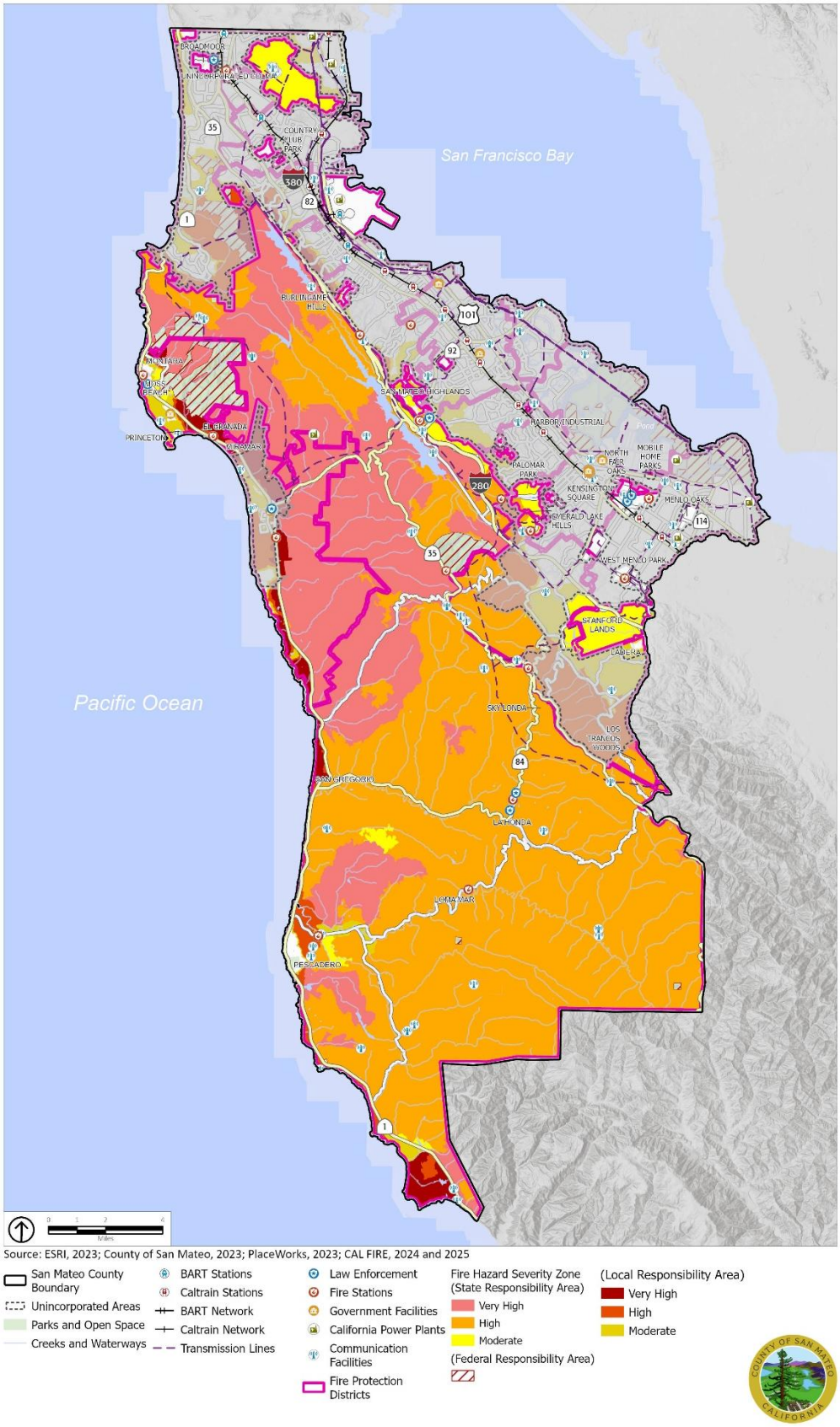
Past Events

While San Mateo County has a prolific fire history, few of its fires have caused sufficient damage to trigger a State or federal disaster declaration. Notable fires of record are the November 1929 fire near Montara that destroyed 25 homes, a church, and cattle, and the August 2020 CZU Lightning Complex in Santa Cruz and San Mateo Counties, caused by a reported 12,000 lightning strikes.

The CZU Lightning Complex fires burned in San Mateo and Santa Cruz Counties starting on August 16, 2020. This fire destroyed 1,490 structures, damaged 140 others, and caused one injury and one fatality. Fires burned in both Butano and Big Basin Redwoods State Parks, where several historic buildings were destroyed, including the visitor's center at Big Basin. The fire burned a total of 86,509 acres. According to CAL FIRE, the CZU Lightning Complex fire was the 12th most-destructive California wildfire. This fire triggered air quality concerns across the Bay Area, including in San Mateo County. The Bay Area Air Quality Management District issued 25 consecutive days of air quality alerts in the Bay Area during the CZU Lightning Complex fire.

Although San Mateo County has not experienced many major wildfire events, nearby Alameda County has demonstrated some worst-case scenario fires that could occur in other Bay Area counties. At the time it occurred, the October 1991 Oakland/Berkeley Hills "Tunnel Fire" was the most damaging fire (now the third-most damaging) and the second deadliest (currently the third deadliest) fire in California. This WUI fire resulted in 25 lives lost, including a fire battalion chief and an Oakland police officer, 148 people injured, and 2,900 structures destroyed. The blaze started from a grass fire in the Berkeley Hills and burned 1,600 acres. According to the Insurance Information Institute the estimated private property loss was $1.7 billion.

Figure 13: Regional CAL FIRE Fire Hazard Severity Zones



Existing Programs and Regulations

Wildfire Protection Responsibility Areas

Hundreds of agencies have fire protection responsibility for wildland and WUI fires in California. Local, state, tribal, and federal organizations have primary legal (and financial) responsibility for wildfire protection. In many instances, two fire organizations have dual primary responsibility for the same parcel of land—one for wildfire protection, and the other for structural or improvement fire protection. The California Department of Forestry and Fire Protection (CAL FIRE) designates lands into local, state, and federal responsibility areas based on who is financially responsible for fire protection services. Figure 14 shows these areas.

Local Responsibility Areas

Local Responsibility Areas (LRAs) are areas protected by local agencies, including city and county fire departments, local fire protection districts, and CAL FIRE when under contract to local governments. LRAs may include flammable vegetation and WUI areas where the financial and jurisdictional responsibility for improvement and wildfire protection is that of a local government agency. Several sections of the unincorporated area, especially along the Pacific coast and in more developed areas, are LRAs.

State Responsibility Areas

State Responsibility Areas (SRAs) include unincorporated areas and State lands where the State/CAL FIRE has financial responsibility for fire protection. CAL FIRE can also provide fire protection services by contract to cities and counties. Most of San Mateo County's unincorporated area is an SRA, especially lands outside of developed areas.

Federal Responsibility Areas

Federal Responsibility Areas (FRAs) are fire-prone wildland areas that are owned or managed by a federal agency such as the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, or U.S. Department of Defense. Primary financial and rulemaking jurisdictional authority rests with the federal land agency. In many instances, FRAs are interspersed with private land ownership or leases. Fire protection for developed private property is usually not the responsibility of the federal land management agency, as structural protection responsibility is that of a local government agency. In San Mateo County, the FRAs are the various sections of the Golden Gate National Recreation Area and the Don Edwards San Francisco Bay National Wildlife Refuge.

CAL FIRE Wildfire Mapping

CAL FIRE has modeled and mapped wildfire hazard zones using a computer model that designates moderate, high, or very high FHSZs. FHSZ ratings are derived from a combination of fire frequency (how often an area burns) and expected fire behavior under severe weather conditions. CAL FIRE's model derives fire frequency from 50 years of fire history data. Fire behavior is based on fuel loads (such as the level and type of vegetation), weather conditions (temperature, wind, precipitation, humidity, etc.), slope and elevation, fire ignition patterns, and expected rate of spread. It accounts for flying ember production, which is the principal driver of the wildfire hazard in densely developed areas, as well as the relative density of vegetative fuels that can serve as sites for new spot fires within the urban core and spread to adjacent structures. The model refines the zones to characterize fire exposure mechanisms that cause ignitions to structures.

CAL FIRE periodically reviews and revises the FHSZ boundaries based on updated modeling and scientific information. Individuals should consult the most recent available mapping, available from CAL FIRE's Fire and Resource Assessment Program (FRAP) at https://frap.fire.ca.gov/.

County Fire Management and Response

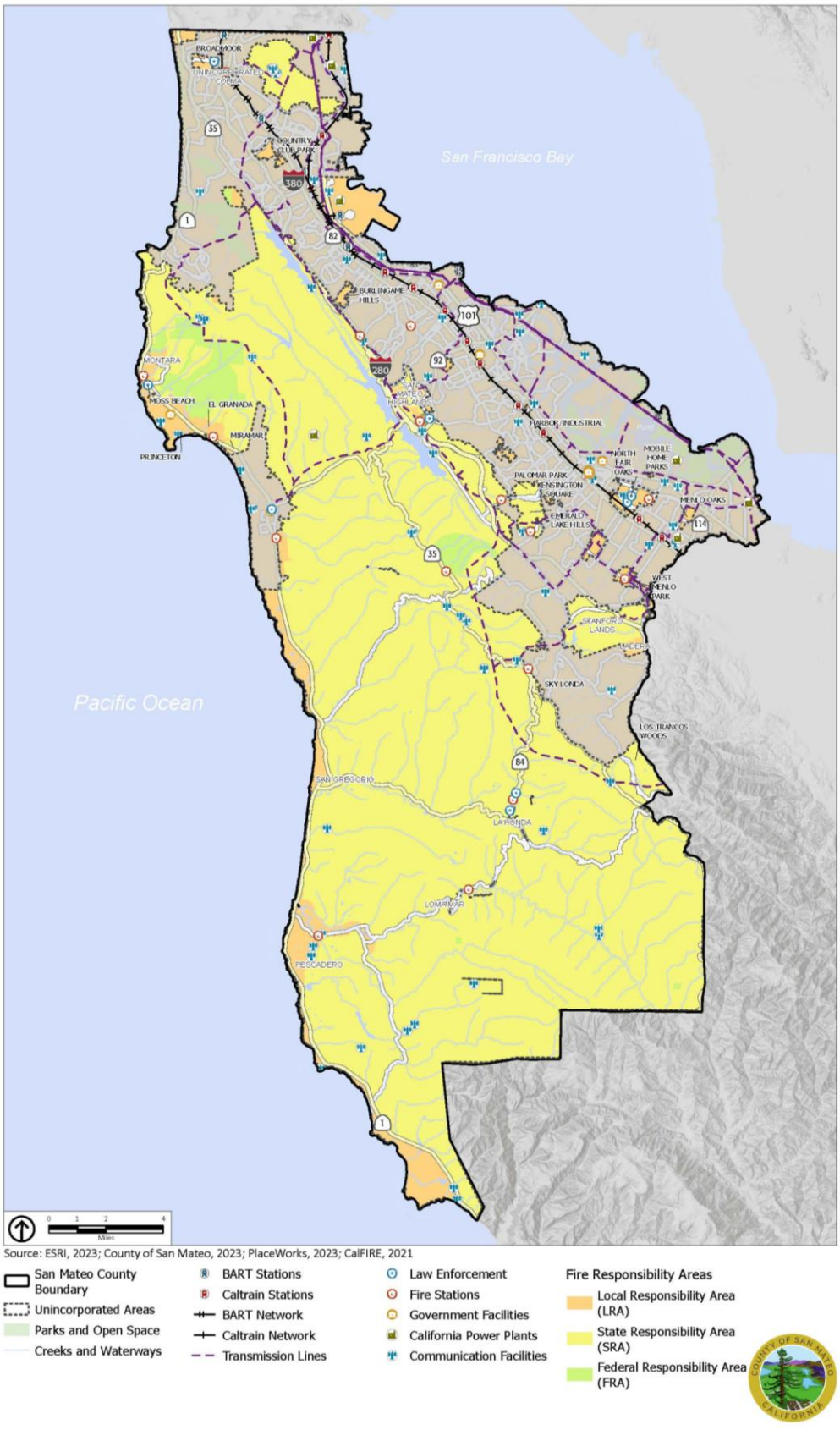
Santa Cruz and San Mateo Counties updated their joint Community Wildfire Protection Plan (CWPP) in 2018. A CWPP is a tool for communities to identify landscape scale hazards and take strategic action to reduce wildfire risk for healthier ecosystems and more resilient communities. The updated CWPP assesses hazards and priorities within the two counties, identifies at-risk communities, and provides fuel reduction recommendations for high-priority areas. The CWPP can also aid communities to apply for State and federal funding for fire prevention projects and programs.

The San Mateo County Fire Department, Colma Fire Protection District, Coastside Fire Protection District, Woodside Fire Protection District, Belmont Fire Protection District, and Menlo Park Fire Protection District provide fire response services in the unincorporated county.

Future Conditions

Climate change is expected to affect the frequency and severity of future fire hazards in San Mateo County. Please review the San Mateo County Vulnerability Assessment Report for details.

Figure 14: Local Responsibility Areas and State Responsibility Areas in San Mateo County



ISSUE 7: SEVERE WEATHER

General Overview

Severe weather is generally any destructive weather event, but usually occurs in San Mateo County as localized storms that bring heavy rain, hail, thunderstorms, and strong winds. Severe weather is usually caused by intense storm systems, although types of strong winds can occur without a storm. The most common severe weather events that have historically impacted San Mateo County are heavy rains (usually a result of atmospheric rivers), thunderstorms, and windstorms. Utilities may temporarily turn off power to specific areas to reduce the risk of fires caused by electric infrastructure, an action called a public safety power shutoff (PSPS) event.

Atmospheric Rivers

Atmospheric rivers are long, narrow regions in the atmosphere that transport water vapor from the tropics. When the atmospheric rivers make landfall, they release this water vapor in the form of precipitation, often causing heavy rains that can lead to flooding and mudslide events. These events can cause significant injuries, disrupt travel, and damage property. However, they also play a critical role in replenishing California's water supply.

Fog

Fog forms when air close to the ground can no longer hold all the moisture it contains, causing the excess moisture to condense as a low cloud. This occurs either when air is cooled to its dew point or the amount of moisture in the air increases. Heavy fog is particularly hazardous because it can restrict surface visibility. Severe fog incidents can close roads, cause vehicle accidents and airport delays, and impair the effectiveness of emergency response. Cool marine air and fog are common in the Bay Area in the summer.

Public Safety Power Shutoff

Electricity utilities throughout California, including Pacific Gas and Electric Company (PG&E), have begun to occasionally "de-energize," or turn off the electricity for power lines that run through areas where there is an elevated fire risk. This is intended to reduce the risk of power lines sparking or being damaged and starting a wildfire. A PSPS event may occur at any time of the year, usually during high wind events and dry conditions. PSPS events may be limited to specific communities, or they may affect broad swaths of the state. Given the long, connected nature of power supply systems, a shutoff event targeted at a small at-risk area can affect a larger area outside the risk zone. The duration of a shutoff is related to the severe weather that triggers it. However, a shutoff typically ends within 24 hours after the severe weather has passed.

Thunderstorms

A thunderstorm is a rain event that includes thunder and lightning. According to NOAA's National Severe Storms Laboratory, a thunderstorm is classified as "severe" when it contains hail with a diameter of one inch or greater, wind gusts exceeding 57.5 mph, or tornado. Lightning can cause forest and brush fires and deaths and injuries to livestock and other animals. According to the National Lightning Safety Institute, lightning causes more than 26,000 fires in the United States each year. "Lightning sieges" are extreme lightning events in which lightning strikes multiple points at once. In August 2020, an estimated 12,000 lightning strikes caused a set of fires known as the CZU Lightning Complex in San Mateo and Santa Cruz Counties.

Tornadoes

A tornado is a violently rotating column of air extending between a cloud and the surface of the earth, with winds that can reach destructive speeds of more than 300 mph. A tornado's vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long. Tornadoes can occur throughout the year at any time of day but are most frequent in the spring during the late afternoon. However, tornadoes are rare in San Mateo County; only five have been recorded in the county since 1950.

Windstorms

Windstorms are generally short-term events involving winds or gusts of over 50 to 60 mph that are strong enough to cause property damage. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles.

Windstorms can cause significant property damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Falling trees and branches can damage buildings, power lines, and other property and infrastructure. During wet winters, saturated soil causes trees to become less stable and more vulnerable to uprooting from high winds. Utility lines brought down by summer thunderstorms have also been known to cause fires, which start in dry roadside vegetation. Downed trees and power lines, and damaged property also can be major hindrances to emergency response and disaster recovery. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric service and from extended road closures.

Secondary Hazards

Major riverine or urban flooding can result from heavy rain. Rain falling on saturated soils on slopes or on areas recently burned by wildfire may lead to landslides. Lightning during thunderstorms presents a risk of starting a wildfire. Storms can also exacerbate existing areas of vulnerability, such as increasing the frequency of erosion along coastal cliffs.

Poor air quality is a secondary impact of severe weather. One type of cold wave also allows air pollution to accumulate.[19]

Past Events

Table 10 lists past severe weather events in San Mateo County as recorded by NOAA since 1950.

Table 10: Past Severe Weather Events

Date	Type	Description
April 1, 1958	Tornado	A tornado with a 0.2-mile length and 67-yard width impacted San Mateo County.
October 24, 1962	Severe Storms	Federal disaster declaration issued (DR-138)
December 19, 1981 – January 8, 1983	Severe Storms, Flood, Mudslides, High Tide	Federal disaster declaration issued (DR-651)
January 21 – March 30, 1983	Coastal Storms, Floods, Slides, Tornadoes	Federal disaster declaration issued (DR-677)

Date	Type	Description
February 12 – March 10, 1986	Severe Storms, Flooding	Federal disaster declaration issued (DR-758)
March 10, 1986	Tornado	A F0 tornado with a 0.2-mile length and 50-yard width impacted San Mateo County. The small waterspout moved ashore from the Pacific Ocean, flipped a car, and did minor property damage at a seaside restaurant at Moss Beach.
December 19, 1990 – January 3, 1991	Severe Freeze	Federal disaster declaration issued (DR-894)
January 3 – February 10, 1995	Severe Winter Storms, Flooding, Landslides, Mud Flows	Federal disaster declaration issued (DR-1044)
February 13, 1995 – April 19, 1995	Severe Winter Storms, Flooding, Landslides, Mud Flows	Federal disaster declaration issued (DR-1046)
December 28, 1996 – April 1, 1997	Severe Storms, Flooding, Mud, and Landslides	Federal disaster declaration issued (DR-1155)
February 2 – April 30, 1998	Severe Winter Storms and Flooding	Federal disaster declaration issued (DR-1203)
February 7, 1998	Tornado	A F0 tornado with a 0.2-mile length and 50-yard width impacted San Mateo County which ripped up some trees.
February 13, 2000	Heavy Rain	Widespread rain with 24-hour accumulations of more than 5 inches occurred over the area on Feb 13 – 14. Urban and small stream flooding occurred in most counties of the area. Many roads including SR-1 and Highway 116 were closed. Twenty-nine people were evacuated in Pescadero due to high waters. Several houses in Daly City were abandoned and eventually destroyed due to mudslides.
March 20, 2005	Tornado	A F1 tornado with a 3-mile length and 30-yard width impacted San Mateo County. The tornado damaged approximately 60 structures.
December 17, 2005 – January 3, 2006	Severe Storms, Flooding, Mudslides, and Landslides	Federal disaster declaration issued (DR-1628)
March 29 – April 16, 2006	Severe Storms, Flooding, Landslides, and Mudslides	Federal disaster declaration issued (DR-1646)
January 4, 2008	High Wind	A very strong cyclone slammed into the San Francisco and Monterey Bay areas bringing inland and coastal flooding, and

Date	Type	Description
		winds as high as 81 mph. Thousands of residences and businesses were without power, some of which were without power for several days due to high winds toppling power lines. Millions of dollars of property damage was reported.
February 15, 2009	High Wind	An eastern Pacific storm produced strong wind and heavy rain as it moved through the San Francisco Bay Area. Over 61,000 Bay Area customers lost power. High wind knocked down numerous trees in the Santa Cruz Mountains causing Highway 9 and Highway 236 to close.
April 14, 2009	High Wind	High winds along the San Francisco Bay Area shoreline caused numerous power outages and downed trees. A big rig blew over in the westbound lane of the San Mateo Bridge closing the entire bridge for more than an hour. Shortly afterwards a 70-foot fishing vessel was blown into the bridge after losing power. The Redwood City Mesonet observation site reported a gust of 57.5 mph.
May 2, 2009	Dense Fog	Dense fog along with a slippery road surface caused eight traffic collisions along SR-17 in the Santa Cruz County mountains.
October 13, 2009	High Wind	Heavy rain combined with very strong wind through Northern and Central California to cause numerous trees, tree limbs, and power and telephone poles to fall. Pacific Gas and Electric reported over 277,000 customers had lost power in the San Francisco and Monterey Bay areas with $13 million dollars in damage. Record-breaking heavy rain led to flooding and debris flows. In San Mateo County, at least 47 trees and 31 sets of power lines were knocked over. Wind also caused power outages across San Mateo County. Approximately 58,000 community members lost power during the storm.
October 13, 2009	Heavy Rain	This powerful rainstorm overwhelmed pipes and utility holes in San Mateo, San Carlos, and Millbrae causing over 127,000 gallons of untreated sewage to flow into streets and creeks. Over 55,000 gallons of raw sewage spilled into San Francisco Bay.
January 18, 2010	Thunderstorm Wind	Squall line thunderstorms moved across the San Francisco International Airport producing wind gusts to 59 mph. Numerous power lines and trees were knocked down when strong wind combined with saturated soil.
January 18, 2010	High Wind	High wind knocked over power poles along San Mateo County's coast, causing 12,000 customers to lose power. The Half Moon Airport Mesonet site reported a wind gust of 69 mph. At least 12,000 customers lost power in San Mateo County.
January 20, 2010	Thunderstorm Wind	The third in a series of significant storms brought strong winds and heavy rain to the San Francisco and Monterey Bay areas. Around 159,000 customers lost power across the San Francisco Bay area with nearly 22,000 customers without power in the Monterey Bay area. Numerous power lines and trees were knocked down when strong wind combined with saturated soil.

Date	Type	Description
February 15, 2011	High Wind	Strong and gusty wind developed ahead of a long wave trough. A mesonet automated weather reporting system measured a wind gust of 60 mph at midnight. Other automated observation systems around the area above 1,000 feet in elevation reported gusts up to 83 mph. Overall, more than 6,500 customers lost power in the San Francisco Bay Area.
December 21, 2012	Heavy Rain	A series of storm systems, part of a large Atmospheric River type of pattern, impacted the area during late December 2012. From December 21 through 26, heavy rain, gusty winds, flooding, and mudslides occurred across the Bay Area in these consecutive events. Downed trees, powerlines, and flooded roadways impacted community members.
February 9, 2015	Heavy Rain	The storm brought heavy rain, gusty winds, and damage to trees and power lines along with some minor flooding of urban areas. A 72-hour rainfall total of 5.43 inches was measured from Emerald Lake Hills at an elevation of 472 feet.
January 18 – 23, 2017	Severe Winter Storms, Flooding, and Mudslides	Federal disaster declaration issued (DR-4305)
February 1 – 23, 2017	Severe Winter Storms, Flooding, and Mudslides	Federal disaster declaration issued (DR-4308)
October 2018	PSPS	PG&E induced outage due to extreme weather conditions.
September to November 2019	PSPS	PG&E induced outage due to extreme weather conditions
December 31, 2021	Heavy Rain	An atmospheric river impacted the Bay Area on December 31st, resulting in significant rainfall across the San Francisco Bay Area. During the morning a surface low developed west of San Francisco and the river stalled over the Bay Area. This resulted in significant rainfall totals for many Bay Area communities. Most notably, downtown San Francisco received 5.46 inches of rain which is the second wettest day on record. The Oakland Museum received its wettest day since records began in 1970, with 4.75 inches of rain.

Sources: National Centers for Environmental Information, 2021.

County staff have also looked at earlier extreme weather events as model of potential future flooding. One such scenario is known as ARkstorm 2.0, which simulates flooding across California due to two intense storms: one that would be comparable to the “Great Flood” of 1862 that killed an estimated 4,000 people destroyed an estimated quarter of all property in the state, and another even more extreme future scenario that would result in 30-45 inches of rain along the coast during a month-long period.

ARkStorm highlights the risks posed by prolonged, high-intensity precipitation events. Extensive flooding in the Central Valley, coastal communities, and urban centers could overwhelm flood-protection systems designed for lower thresholds. Winds reaching hurricane force, hundreds of landslides, and widespread infrastructure damage—including disruptions to power, water, and transportation systems—are key

concerns. Experts estimate total direct property losses of nearly $400 billion across California, with an additional $325 billion in business interruptions. Modeling of the historic 1862 scenario suggests that San Mateo County would experience about $11.5 billion in damages under these conditions, the 9th-highest in California.

The ARkStorm scenario underscores critical policy implications, such as the need for improved disaster planning, innovative financing strategies, and enhanced mitigation efforts. The findings provide a foundation for government agencies, emergency planners, and infrastructure operators to develop more resilient strategies against future extreme weather events exacerbated by climate change.

Existing Programs and Regulations

PG&E offers generator and battery rebates, which helps to address power outages from severe weather. Additionally, PG&E offers a Low Income Home Energy Assistance Program that can help low-income households with in-home weatherization services that improve energy efficiency and health and safety of their home.

Future Conditions

Climate change is expected to affect the frequency and severity of future severe weather in San Mateo County. Please review the San Mateo County Vulnerability Assessment Report for details.

ISSUE 8: DROUGHT

General Overview

Drought is a significant decrease in water supply relative to what is needed to meet typical demand, leading to a water shortage for some activity, group, or environmental sector. While drought is a normal occurrence for Mediterranean climates such as that of San Mateo County, long and severe droughts have the potential to impact ecosystems and economic activity across the entire community. Most droughts are defined based on declines in normal precipitation levels, declines in agricultural production, declines in streamflow and groundwater levels, or socioeconomic impacts from water shortages.

The severity of any given drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. While drought does not typically directly result in loss of life or damage to structures, drought can have widespread impacts on the environment and the economy. Potential drought impacts include loss of crops, costs incurred by having to drill new wells, increased costs for water straining household finances and reducing commercial profits, reduced habitat and food supply for plants and animals, and increased risk of wildfire.

The demand that society places on water systems and supplies—such as expanding populations, irrigation, and environmental needs—contributes to drought impacts. Drought can lead to difficult decisions regarding the allocation of water, as well as stringent water use restrictions, water quality problems, and inadequate water supplies for fire suppression.

Droughts can affect groundwater storage as reserves are drawn down in anticipation of or in response to drought impacts, or as reduced precipitation causes groundwater supplies to be replenished at a slower rate. Drought affects groundwater sources more slowly than it affects surface water supplies, but

groundwater supplies generally take longer to recover. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. It can take groundwater supplies years to recover from heightened use during droughts. This reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation. Reduced groundwater levels mean that even less water will enter streams during periods of low precipitation.

Drought can also increase community susceptibility to wildfire. A prolonged lack of precipitation dries out vegetation and makes plants more vulnerable to pests, both of which can increase susceptibility to wildfires.

Many of the cities, water districts, and private utilities in San Mateo County rely on the Hetch Hetchy Regional Water System for water supplies. The regional water system provides water to San Mateo County, as well as San Francisco, Santa Clara, and Alameda Counties. Approximately 85 percent of the water comes from Sierra Nevada snowmelt stored in the Hetch Hetchy reservoir on the Tuolumne River in Yosemite National Park. Hetch Hetchy water travels 160 miles via gravity from Yosemite to the San Francisco Bay Area. The remaining 15 percent of water comes from runoff in the Alameda and Peninsula watersheds. This local water is captured in reservoirs in San Mateo and Alameda Counties. Delivering approximately 260 million gallons of water per day, the regional system consists of over 280 miles of pipelines, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants. The County also relies on groundwater wells, including private wells for water supplies.

Past Events

San Mateo County has a history of severe droughts. DWR hydrologic data from the early 1900s shows multi-year droughts from 1912 to 1913, 1918 to 1920, 1922 to 1924, and 1928 to 1934. The 1929 to 1934 drought established the criteria for designing storage capacity and yield for large Northern California reservoirs. The following sections describe the most recent prolonged droughts that have impacted the planning area.

1976 to 1977 Drought

California had a severe drought due to lack of rainfall during the winters of 1976 and 1977. 1977 was the driest period on record in California at that time, with the previous winter recorded as the fourth driest in California's hydrological history at that time. The cumulative impact led to widespread water shortages and severe water conservation measures statewide. Over $2.6 billion in crop damage was recorded in 31 counties. FEMA declared a drought emergency (Declaration 3023-EM) on January 20, 1977, for all California counties.

1987 to 1992 Drought

California received precipitation well below average levels for four consecutive years. While the Central Coast was most affected, the Sierra Nevada range in Northern California and the Central Valley counties were also affected. During this drought, only 56 percent of average runoff for the Sacramento Valley was received. In 1991, the State Water Project sharply decreased deliveries to water suppliers. By February 1991, all 58 counties in California were experiencing drought. Urban areas as well as agricultural areas were impacted.

2007 to 2009 Drought

The state proclaimed a statewide drought emergency on June 4, 2008, after spring 2008 was the driest spring on record. On February 27, 2009, the state proclaimed a state of emergency for the entire state as severe drought continued. State courts imposed what was, at the time, the largest court-ordered water restriction in state history.

2012 to 2017 Drought

This drought set several records for the state. The period from 2012 to 2014 ranked as the driest three consecutive years for statewide precipitation. Calendar year 2014 set new records for statewide average temperatures and for low water allocations from the State Water Project. Calendar year 2013 set minimum annual precipitation records for many communities. Detailed executive orders and regulations addressed water conservation and management. The statewide drought emergency was lifted in April 2017.

2020 to 2023 Drought

The U.S. Department of Agriculture declared a drought disaster that included San Mateo County on April 21, 2020. By May of 2021, precipitation levels for the year to date were the third-lowest in the past 127 years.[20] Between April and December 2021, San Mateo County was at the D3—Extreme Drought level, putting the county at risk for wildfire on a year-round basis.[21] Excessive rainfall and flooding in late December 2022 and early January 2023 alleviated some of the drought conditions. Governor Newsom officially eased drought restrictions in March 2023. As of October 2023, San Mateo County was not considered to be in a state of drought.

Existing Programs and Regulations

Bay Area Water Supply and Conservation Agency BAWSCA allows many of San Mateo County's cities, water districts, and private utilities to coordinate to ensure the continual water supply necessary to maintain health, safety, and economic wellbeing of the community. BAWSCA agencies manage two-thirds of water consumption from the Hetch Hetchy Water System. BAWSCA applies a long-term water supply strategy for its customers throughout the Bay Area. This strategy recognizes that drought year shortfalls can be significant, resulting in system-wide cutbacks of up to 20 percent. BAWSCA focuses on identifying options for filling all or portions of the drought year supply shortfall.

In 2009, BAWSCA developed a Water Conservation Implementation Plan, which aims to help BAWSCA member agencies evaluate potential water savings the cost-effectiveness of various water conservation measures and to develop a regional plan for water conservation measures to serve as a guideline for member agencies. BAWSCA's core water conservation programs include the Water Efficient Landscape Education Program, Water-Wise Gardening in the Bay Area landscape education tool, native garden tours and symposiums, regional Water Conservation Database, Qualified Water Efficient Landscaper Training program, regional water demand and conservation savings projections, and development of the "Making Conservation a Way of Life" Strategic Plan.

In August 2017, BAWSCA released a drought report outlining state and local demand management actions to reduce water use, water supply actions, and regulatory and policy support.

BAWSCA released the first phase of its Strategic Plan in 2018. The purpose of the Strategic Plan is to lead member agencies in a multi-year effort to develop and implement a strategy to meet the state's water conservation objectives. The first phase of the plan evaluates the feasibility of implementing the urban water use objectives proposed by the state and associated cost impacts to BAWSCA agencies and identifies

actions to support BAWSCA agencies in preparing for and implementing these urban water use objectives. Phase II of the Strategic Plan includes a study of residential water use and a pilot audit program for commercial, industrial, and institutional water use.

Drought response is determined case by case, and response priorities are typically based on imminence of potential water shortages. The U.S. Drought Monitor recognizes a five-point scale for drought events: D0 (abnormally dry), D1 (moderate drought), D2 (severe drought), D3 (extreme drought), and D4 (exceptional drought). During severe drought conditions, water shortages are common and water restrictions may be imposed to meet essential community needs. BAWSCA has developed Drought Implementation Plans for both the SFPUC and BAWSCA. However, these plans do not specify trigger levels.

San Francisco Public Utilities Commission

The SFPUC issued its most recent Urban Water Management Plan (UWMP) in 2021. The UWMP provides an overview of water deliveries and uses, water supply sources, and water conservation programs. It also includes discussions on supply and demand projections out to 2045, available water supplies to meet existing and future demands under a range of water supply conditions, and measures to reduce long-term water demand, including the Water Shortage Contingency Plan. The SFPUC engages in a number of other water conservation activities, including groundwater monitoring and development of water recycling projects, which help support system-wide water conservation.

Mid-Peninsula Water District

The Mid-Peninsula Water District (MPWD) issued its most recent UWMP in 2021. The UWMP provides an overview of water deliveries and uses, water supply sources, and water conservation programs. It also includes discussions on supply and demand projections out to 2045, available water supplies to meet existing and future demands under a range of water supply conditions, and measures to reduce long-term water demand, including the Water Shortage Contingency Plan. The MPWD engages in a number of other water conservation activities, including water waste prevention ordinances, metering, conservation pricing, public education and outreach, and water conservation program promotion, which help support system-wide water conservation. MPWD also serves the community of Harbor Industrial Area.

Coastside County Water District

The Coastside County Water District provides water supplies to the City of Half Moon Bay and to the communities of Princeton, Miramar, and El Granada.

North Coast County Water District

The North Coast County Water District provides water supplies to the City of Pacifica, San Pedro Valley Park, and the Crystal Springs Apartments complex in San Bruno.

Montara Water and Sanitary District

The Montara Water and Sanitary District provides water supplies to the communities of Montara and Moss Beach.

County of San Mateo Public Works Department

The County of San Mateo has two water service areas that provide residents and businesses of the communities that they serve with adequate and reliable supplies of high-quality water. These water service areas include La Honda and Pescadero. Public Works operates County Service Area No. 7 (CSA 7)

to provide potable water to approximately 70 customers in the La Honda community. County Service Area No. 11 (CSA 11) was established in 1988 to finance the development of this new water source and serve as the water provider for Pescadero. The water system consists of two wells, one 135,000-gallon distribution tank, and a distribution system.

Municipal Code

Chapter 4.36, Water Conservation, of the San Mateo County Municipal Code provides a framework for the orderly and timely implementation of reasonable water conservation measures by the different elements of the county's economy. This ordinance implements certain provisions of the Water Code of the State of California. This ordinance further implements the provisions of the Conservation Element of the Comprehensive Water Resources Management Plan for San Mateo County, as adopted on June 20, 1978.

Future Conditions

Climate change is expected to affect the frequency and severity of future drought in [jurisdiction]. Please review the San Mateo County Vulnerability Assessment Report for details

ISSUE 9: EXTREME HEAT

General Overview

Nationwide, extreme heat is one of the deadliest climate related hazards and one that already affects San Mateo County. While there is no universal definition of extreme heat, California guidance documents define extreme heat as temperatures that are hotter than 98 percent of the historical high temperatures for the area, as measured between April and October of 1961 to 1990. Days that reach this level are called extreme heat days. In San Mateo County, extreme heat on average is a daytime temperature above 85.7 degrees Fahrenheit (°F), and a warm night is nighttime low of above 56.1°F. An event with five extreme heat days in a row is called a heat wave. Extreme heat affects community members' safety and increases community costs and energy generation as it continues. These events can also exacerbate wildfires and impact water supplies. High demand for power for air conditioning during extreme heat can stress and overwhelm the electrical grid, leading to brownouts or power loss. Extreme heat events may degrade the quality of roadways and railways, resulting in closures and travel delays.

Health impacts are the primary concern with these hazards, though economic and service impacts are also an issue. The Center for Disease Control and Prevention (CDC) recognizes extreme heat as a substantial public health concern. Historically, NOAA data indicates that extreme heat kills about 175 Americans annually, although this number has increased in recent years. From 2004 to 2018, studies by the U.S. Department of Health and Human Services indicate that there is an average of 702 deaths annually that are directly or indirectly linked to extreme heat. According to the California Climate Adaptation Strategy, heat waves have claimed more lives in California than all other declared disaster events combined.

High heat days and heat waves are experienced more frequently in recent years, including extraordinary heat in the Summer of 2020 and Fall of 2022, in addition to years of drought conditions. This may be even more impactful because San Mateo County has one of the lowest percentages of homes with air conditioning units in California, according to the Home for All and Climate Ready SMC joint. Extreme heat events are dangerous because people exposed to extreme heat can suffer a number of heat-related illnesses, including heat cramps, heat exhaustion, and (most severely) heat stroke. Areas with lower

extreme heat thresholds are not necessarily at lower risk, as persons and community assets used to cooler temperatures may be less prepared for extreme heat events.

Extreme temperatures can harm plants and animals that are not well adapted to these events, including natural ecosystems. Extreme heat can increase the temperature of water in lakes, streams, creeks, and other water bodies, especially during drought conditions when water levels are lower. In some cases, water temperatures may exceed comfortable levels for several plants and animals, causing ecological harm. Outdoor workers in construction or landscaping are also much more exposed to the elements than most people, so they are more susceptible to extreme heat conditions and the potential illnesses associated with extreme temperatures. Extreme heat has disproportionate impacts on populations including older adults, children, people who do not live or work in climate-controlled conditions, who do not have personal vehicles, or who have pre-existing medical conditions.

Indirectly, extreme heat puts more stress on power lines, causing them to run less efficiently. The heat also causes more demand for electricity (usually to run air conditioning units), and in combination with the stress on the power lines, may lead to brownouts and blackouts. Extreme heat also adversely impacts transportation infrastructure. Sustained heat can cause the expansion of asphalt surfaces, resulting in potholed and rutted roads. Sustained temperatures high temperatures may cause train tracks to expand, resulting in the buckling of rail lines and the derailing of trains. Impacts to roadways and rail lines can lead to closures and travel delays in the short term and accelerate the breaking down of infrastructure in the long term. Bay Area Rapid Transit and Caltrain cannot operate at full speed during high-heat events due to these risks. Caltrain will slow train speeds from 80 miles per hour during sustained 90 to 100°F temperatures to prevent tracks from buckling, resulting in increased wait times and extended heat exposure for commuters.

Secondary Hazards

During heat waves, the air becomes stagnant and traps emitted pollutants, often resulting in increases in surface ozone. Heat waves and drought also dry out vegetation and provide more fuel for wildfires whose smoke is a serious medical hazard.

Past Events

In 2022, a combination of heat advisories and an excessive heat warning was issued for parts of Monterey Bay and its near coastal valleys, the San Francisco Bay Shoreline, and Marin Coastal Mountains from September 4 through 8, along with a heat advisory for the Central Coast, San Francisco, and coastal North Bay on September 6. Several daily record-high temperature records were shattered, along with a handful of monthly and all-time records. Reports of power outages, heat related illnesses, and deaths were received. Counties opened/operated one or more cooling centers to provide relief from the heat.

Table 11 lists some past extreme heat events in San Mateo County as recorded by NOAA in recent years.

Table 11: Selected Recent Extreme Heat Events

Date	Description
July 22, 2006	High temperatures reached as high as 103°F with low temperatures at night only falling into the lower 70s.
May 17, 2009	High pressure aloft centered over Reno, Nevada, along with weak offshore flow at the surface caused temperatures to rise to near 100°F in the inland valleys of north-

Date	Description
	central California. Temperatures rose into the upper 80s to mid-90s across the peninsula of the San Francisco Bay Area. High temperatures resulted in heat exhausted individuals, blown electric transformers, and power outages.
September 1, 2017	A strong upper-level ridge brought widespread hot temperatures to the Bay Area. Numerous daily and monthly records were broken as well as a few record max temperatures. Three San Mateo County community members died over the weekend because of the heat.
June 10, 2019	The combination of high pressure and strong offshore flow resulted in an early season heat wave across the Bay Area from June 9th to the 11th. Multiple daily records were broken across the region and multiple power outages were reported due to the heat. The heat wave across the region triggered power outages knocking out service to 57,000 people across nine counties over a two-day period.
August 19, 2020	A prolonged and oppressive heat wave swept the Central Coast and Bay Area for almost a week from August 14th to August 19th with widespread record-breaking temperatures observed across the region. Multiple days of triple-digit temperatures afternoon highs were recorded inland with some coastal locations even reaching the mid-90s.
July 21, 2022	A strong ridge of high pressure developed over the area, allowing temperatures to soar into the 90s to low 100s for all areas, except parts of the immediate coastline. A heat advisory was issued for all but coastal zones from late morning through the evening of June 21st.
September 6, 2022	A strong ridge of high pressure encompassed the western United States from September 1 through 8, leading to anomalously hot temperatures along the California coast. A combination of heat advisories and an excessive heat warning was issued for parts of Monterey Bay and its near coastal valleys, the San Francisco Bay Shoreline, and Marin Coastal Mountains from September 4 through 8, along with a heat advisory for the Central Coast, San Francisco, and coastal North Bay on September 6. The heat wave shattered several daily record high temperature records, along with a handful of monthly and all-time records. There were also reports of power outages, heat-related illnesses, and deaths due to the high temperatures.

Existing Programs and Regulations

The County Sustainability Department collaborates with jurisdictions, stakeholders, and community-based organizations to explore solutions that reduce harm from climate impacts in vulnerable communities. The County Sustainability Department has funded resilience pilot projects in partnership with community-based organizations in San Mateo County to explore solutions that reduce harm from climate impacts in vulnerable communities, especially from extreme heat and bad air quality.

Cooling centers are located throughout San Mateo at County and local libraries. Additionally, the County has access to programs and rebates to address concerns relating to extreme heat.

San Mateo County Energy Watch (SMCEW) is a local government partnership between PG&E and the City/County Association of Governments of San Mateo County and is administered by the County of San Mateo Sustainability Department. SMCEW assists local governments, schools, nonprofits, and small businesses in accessing energy-efficiency programs, trade professionals, and financing opportunities.

SMCEW provides coordination, outreach, referrals, and educational resources to help community members pursue energy-efficiency projects. Additionally, SMCEW offers a free home energy and water savings toolkit that can be borrowed from any public library in the county. The Rising Sun Center for Opportunity distributes free energy-efficiency kits to residents.

Other programs and rebates are offered through PG&E, Peninsula Clean Energy (PCE), and the Bay Area Regional Energy Network (BayREN). PG&E's programs and rebates include Energy Payment Assistance and Billing Plans, and Residential Rebates for Smart Thermostat or Water Heater. Additionally, PG&E offers a Low Income Home Energy Assistance Program, which can help low-income households with in-home weatherization services that improve energy-efficiency and health and safety of their home. PCE's programs and rebates include a heat pump water heater rebate, heat pump water HVAC rebate, and solar and battery backup rebate. BayREN's programs and rebates include a heat pump water heater, heat pump water HVAC rebate, and heat pump clothes dryer rebate.

Future Conditions

Climate change is expected to affect the frequency and severity of future extreme heat in San Mateo County. Please review the San Mateo County Vulnerability Assessment Report for details.

ISSUE 10: HUMAN HEALTH HAZARDS

General Overview

Human health hazards are bacteria, viruses, parasites, and other organisms that can cause diseases and illness in people. Some of these diseases may cause only mild inconvenience, but others are potentially life threatening. These diseases can be and often are carried by animals such as mice and rats, ticks, and mosquitos. Warmer temperatures and high levels of precipitation can lead to increased populations of disease-carrying animals, creating a greater risk of disease and increased rates of infection. Diseases regularly spread by animals include West Nile virus, Zika virus, and Lyme disease.

Human health hazards and diseases can be local, regional, or even global events. The severity of disease outbreaks varies. Respiratory diseases show strong seasonal patterns varying substantially from summer to winter. Transmission rates depend on local weather and environment, and fatality rates depend on local conditions such as care system quality and capacity, and the general health and immunity of the local population.

Populations most vulnerable to human health hazards are those who spend a disproportionate amount of time outdoors (such as outdoor workers or persons experiencing homelessness), those with fragile immune systems or existing illnesses (which may include persons with chronic illnesses and seniors), and those who may live in sub-standard housing or not have access to health insurance and medical care (households in poverty, low-resourced people of color, immigrant/linguistically isolated communities, and cost-burdened/low-income/overcrowded households). These persons may be living in conditions that increase their chances of catching vector-borne illnesses, lack the ability to fight off infections that may occur, or lack the financial resources to seek timely medical care.

Past Events

San Mateo County, like the rest of the United States, was included in the March 2020 FEMA major disaster declaration for the COVID-19 coronavirus pandemic. As of winter 2023, approximately 62 cases of COVID-

19 were reported in the county each day and the county has reported a total of 184,001 COVID-19 cases and 912 deaths since monitoring began in January 2020.

San Mateo County also dealt with effects from the 1918 to 1920 flu pandemic. Camp Fremont, a military base in Menlo Park, reported the first death in September 1918. By December of that year, 131 community members had died of the flu.

San Mateo County Health received confirmation on April 1, 2016, from the California Department of Public Health (CDPH) that the first San Mateo County resident had tested positive for Zika virus. The individual was infected with Zika virus while traveling abroad fully recovered. In 2017, 13 cases of Zika were reported in the county. No detections of West Nile virus occurred in San Mateo County in 2022. According to testing conducted by the San Mateo County Mosquito and Vector Control District, approximately 1 percent of San Mateo ticks carry the agent for Lyme disease.

Existing Programs and Regulations

San Mateo County Health provides health services, including vaccination clinics, disease testing, and emergency response support, to residents of San Mateo County. The San Mateo County Mosquito and Vector Control District is San Mateo County's community-based mosquito control program. This program uses several methods to help control the risk of disease in San Mateo County, including surveillance, prevention, and control of mosquito populations. The Health Alert Center for San Mateo County allows community members to view all alerts and emergencies put out by the County Health Department.

A disease with a high mortality rate may require a suppressive strategy (such as quarantine or shelter-at-home orders). However, if mortality rates are relatively low, a mitigation strategy is likely to be more effective at reducing total deaths and will likely result in substantially less economic damage.

Contact tracing is a public health practice that health departments use to identify and notify people who have been exposed to someone with an infectious disease. Public health departments have used contact tracing for decades to fight the spread of infectious diseases like measles, tuberculosis, syphilis, and HIV.

There is not much warning time for health or pandemic events. The most commonly relied upon warning signal is the appearance of early cases of a disease within a population. The Health Alert Network is the CDC's primary method of sharing cleared information about urgent public health incidents with public information officers; federal, state, territorial, tribal, and local public health practitioners; clinicians; and public health laboratories. The Health Alert Network collaborates with federal, state, territorial, tribal, and city/county partners to develop protocols and stakeholder relationships to ensure a robust interoperable platform for the rapid distribution of public health information.

Future Conditions

Climate change is expected to affect the frequency and severity of future human health hazards in San Mateo County. Please review the San Mateo County Vulnerability Assessment Report for details.

ISSUE 11: HAZARDOUS MATERIALS

General Overview

Hazardous materials are materials that pose a significant risk to public safety or human or environmental health. These include toxic chemicals, flammable or corrosive materials, petroleum products, and unstable or dangerously reactive materials. They can be released through human error, malfunctioning or broken

equipment, or as an indirect consequence of other emergencies. Facilities that hold hazardous materials include hazardous waste storage and treatment facilities, laboratories, hospitals, water and wastewater treatment plants, waste management facilities, fueling stations, and automotive shops. The release of hazardous materials can occur as a result of natural hazard events, such as earthquakes and other geologic hazards, floods, or severe weather. Hazardous materials can also be released accidentally during transportation, as a consequence of vehicle accidents.

A release or spill of hazardous materials could result in fire, explosion, toxic cloud, or direct contamination of water, people, and property. The effects may involve a local site or many square miles. The large-scale release of hazardous materials in combination with events such as flooding or severe weather can spread contaminants across a wide area and amplify the potential long-term impacts on human and ecological health. Health problems may be immediate, such as corrosive effects on skin and lungs, or gradual, such as the development of cancer from a carcinogen. Damage to property could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material.

Hazardous materials and waste within San Mateo County are managed by the Certified Unified Program Agency (CUPA), a local administrative agency within the San Mateo County Environmental Health Services Division. The CUPA consolidates, coordinates, and makes consistent the regulatory activities of several hazardous materials and hazardous waste programs, including Hazardous Materials Management, California Accidental Release Prevention, Hazardous Waste Management, Underground Storage Tanks, Aboveground Storage Tanks, and Emergency Response.

Several State agencies monitor hazardous materials/waste facilities. Potential and known contamination sites are monitored and documented by the Regional Water Quality Control Board (RWQCB) and the California Department of Toxic Substances Control (DTSC). A review of the leaking underground storage tank (LUST) list produced by the RWQCB's and the DTSC's EnviroStor database indicates hazardous waste sites throughout the county.

If a hazardous material spill poses an imminent public health threat, the San Mateo County Fire Department will contact appropriate agencies, such as the County Department of Environmental Health, DTSC, and CalOES, and cooperate with them to address the situation. The transport of hazardous materials/wastes and explosives through the county is regulated by the California Department of Transportation. Highway 101, I-280, I-380, SR-1, SR-35, SR-82, SR-84, SR-92, SR-109, and SR-114 are open to vehicles carrying hazardous materials/wastes. The San Mateo County Fire Department, San Mateo County DEM, and San Mateo County Environmental Health Services Division are responsible for hazardous materials accidents at all locations in the county. Depending on location, San Mateo County fire projection districts will also respond to hazardous materials accidents.

Past Events

On September 9, 2010, a 30-inch-diameter natural gas transmission pipeline in San Bruno ruptured and released vast quantities of natural gas. The escaping gas ignited and initiated structure fires in the community surrounding the pipeline. Eight people lost their lives, 51 people required in-patient hospitalization, and 38 homes were destroyed. PG&E estimated the property damage from the rupture to be over $220 million. On July 13, 2023, there was a hazardous materials spill along Highway 92 which prompted a shelter-in-place advisory. The hazardous materials incident involved the spill of a liquid chemical from a tote on a flatbed truck. While roadways were shut down, investigators were not overly concerned about the exposure since the liquid chemical was not severely toxic.

Since 1970, there has been 348 reported roadway hazardous materials incidents in San Mateo County. There were no fatalities or evacuations associated with these incidents. However, one incident resulted in a personal injury.

Existing Programs and Regulations

In 1993, the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program was established to protect public health and safety, restore and enhance environmental quality, and sustain economic vitality. A Certified Unified Program Agency (CUPA) manages hazardous materials and waste at a local level. The CUPA consolidates, coordinates, and makes consistent the regulatory activities of several hazardous materials and hazardous waste programs, including Hazardous Materials Management, California Accidental Release Prevention, Hazardous Waste Management, Underground Storage Tanks, Aboveground Storage Tanks, and Emergency Response. In 1996, San Mateo County Environmental Health Services was designated by the State Secretary for Environmental Protection as the CUPA for San Mateo County.

A complete list of active and inactive hazardous waste regulated facilities is currently available on the County's Open Data site. This website is maintained by the California Environmental Protection Agency and includes activities related to hazardous materials and waste, State and federal cleanups, impacted ground and surface waters, and toxic materials.

Future Conditions

The frequency and severity of future hazardous materials in San Mateo County will depend on the scale of future activities. Increases in the frequency and severity of other natural hazards, such as floods or landslides, can affect the frequency and severity of future hazardous materials releases.

ISSUE 12: AIRPORT HAZARDS

General Overview

Safety risks associated with airport operations comprise a distinct hazards category. Lands surrounding or near an airport have an increased risk of experiencing accidents involving aircraft. The Half Moon Bay Airport is a public airport located in unincorporated Princeton, approximately six miles northwest of Half Moon Bay and 20 miles south of San Francisco. The airport is home to approximately 80 aircraft. The airport is owned and operated by San Mateo County. The San Carlos Airport is a public airfield located two miles northeast of San Carlos and approximately 20 miles south of downtown San Francisco near the San Francisco Bay. The airport is home to approximately 500 aircraft. San Francisco International Airport (SFO) is in an unincorporated area of San Mateo County. It is approximately 13 miles south of San Francisco and is the largest airport in the San Francisco Bay Area. SFO is on 5,171 acres of property, of which 2,383 acres have been developed for airport use. The remaining 2,788 acres are undeveloped tidelands and wetlands. While SFO is within the boundaries of unincorporated San Mateo County, the City and County of San Francisco owns and operates SFO. San Mateo County has some, but not complete, authority over SFO. However, the San Francsico Police Department has jurisdiction over law enforcement at SFO with San Mateo County Sheriff's Office as a partner. Additionally, the City and County of San Francisco retains full authority over the day-to-day operations of SFO, including airline contracts, security, and maintenance.

The airport is bordered by the cities of Millbrae, Burlingame, and San Bruno. Other nearby cities include Brisbane, South San Francisco, Daly City, Pacifica, San Mateo, Hillsborough, as well as a portion of

unincorporated San Mateo County. Residents and business of these jurisdictions have ready access to SFO, one of the busiest airports on the western seaboard.

Common airport hazards include exposure to hazardous materials, unpleasant odors, and risk of airplane crashes and associated damage to structures and infrastructure and loss of life. Residing near the end of airport runways and behind (downwind of) departing aircraft, neighborhoods close to the airport are exposed to noise that is very different to that from overflights. During ground operations, low-frequency noise may become a disturbance. These operations include engine maintenance run-ups, reverse thrust on landing to slow the aircraft to a safe stop, back-blast in areas behind aircraft taxiing and taking off.

Past Events

On July 6, 2013, Asiana Airlines Flight 214 from Incheon International Airport in South Korea, a Boeing 777-200ER, crashed on final approach into SFO. Of the 307 people on board, 3 died and 187 were injured, 49 of them seriously. Among the seriously injured were four flight attendants who were thrown onto the runway while still strapped in their seats when the tail section broke off after striking the seawall short of the runway. On January 14, 2024, a pilot and three passengers were aboard the small plane that crashed into the ocean shortly after takeoff near Half Moon Bay. The San Mateo County Sheriff's Office confirmed that all individuals on the plane died as a result of the crash.

Regulatory Framework

SFO is responsible for the noise impacts within the immediate vicinity of the airport. The primary mechanism for controlling airport hazards in adjacent communities is the Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport (ALUC). This document regulates aircraft noise, as well as building height, safety policies, and compatibility criteria for areas within the plan's jurisdictional boundary. Applicable City land use and development plans and ordinances are reviewed by the City/County Association of Governments Board of Directors, acting as San Mateo County's Airport Land Use Commission, to ensure consistency.

The SFO Roundtable was formed to address community noise impacts from aircraft operations at SFO by monitoring a performance-based noise mitigation program, interpreting community concerns, and attempting to achieve noise mitigation through the collaborative efforts of the Federal Aviation Administration (FAA), SFO management, and local government. The Roundtable includes representatives from local cities, County Board of Supervisors, and U.S. Congressman's Kevin Mullin's Office.

Future Conditions

The frequency and severity of future airport hazards in San Mateo County will depend on the scale of future activities.

CONCLUSION

This background report provides details on the issues that are discussed at a higher level in San Mateo County's Safety Element, serving as a foundation for associated goals, policies, and implementation actions. It is a technical appendix to the main Safety Element document. It is not necessary to be familiar with this background report to understand or use the Safety Element, but some readers may find this supplemental information helpful. This background report also contains information that is required by the California Government Code as part of the Safety Element, but which does not need to be included in the main Safety Element document.

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