

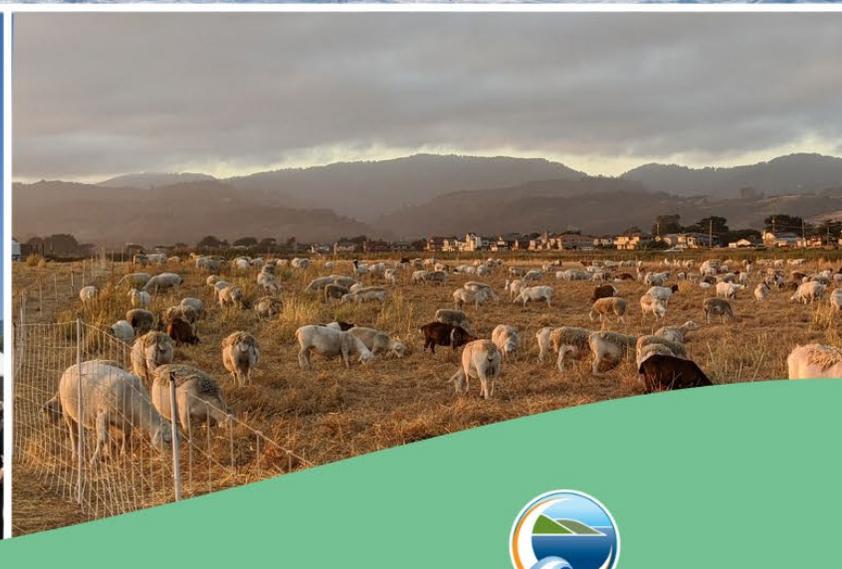
# CLIMATE ADAPTATION PLAN

## City of Half Moon Bay

Climate Action and Adaptation Plan

(Phase 2)

December 2025



# Acknowledgments

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### Updated RICAPS Template and Tools—2020

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## Disclaimer

This Climate Action and Adaption Plan (CAAP) provides an overview of the major changes in ecosystem and climate variables that could affect the Half Moon Bay environment and community. Climate change impacts are complex, and even with the most up-to-date science, the exact timing, extent, and variability of these impacts are not fully certain. In addition, while the vulnerability assessment developed for this Plan includes the most current hazard data and best available science in accordance with current state guidance, several data gaps remain unaddressed, including site-specific models for wind hazards and pluvial/rainfall/stormwater flood hazards.

Concurrent climate hazards can pose compounding stressors to the community and environment and lead to cascading effects that this Plan cannot fully account for. For example, wildfire compounded with extreme heat increases the likelihood of power shutoffs and can lead to environments with poor indoor air quality, where residents may suffer health effects due to smoke and/or high indoor air temperatures. As an exercise, the plan depicts and discusses a range of these cascading impacts in the “Vulnerability Assessment” section; however, a more detailed sector-by-sector analysis would be warranted to understand the broader range of these climate hazard impact interactions of their cascading effects.

While outreach was conducted to reach people both in-person and online with varying levels of involvement and feedback, the Project Team only reached a small portion of the Half Moon Bay population (see Chapter 3 for more details on community engagement). In addition, although City staff met with a member of the Muchia Te’ Indigenous Land Trust, the representation of indigenous voices was limited.

This Plan serves to focus on what the City of Half Moon Bay can do to mitigate the impacts of climate change hazards. This Plan is just one of several documents that have been developed in the region that plan for hazards and future adaptation. For instance, due to the multi-jurisdictional management of freshwater by the Coastside County Water District (CCWD), this Plan does not make direct adaptation strategy recommendations for CCWD, but does include this system for consideration in the vulnerability assessment to give context to the potential impacts on the residents in the city.

Additionally, the city is currently in the process of updating the Safety Element of the General Plan. The primary goal of the Safety Element is to reduce the potential short and long-term risk of death, injuries, property damage, and economic and social dislocation resulting from fires, floods, droughts, earthquakes, landslides, climate change, and other hazards. Climate change is a central focus of the Safety Element update, but not the sole focus. As an element of the general plan, the Safety Element accomplishes this through goals, policies, and implementation programs primarily related to City land uses and development. Progress on implementation programs is reported to the Governor’s Office of Land Use and Climate Innovation in the General Plan Annual Report.

There is substantial overlap between the Safety Element and this Plan. The primary difference is that this Plan is focused on climate change, and the Safety Element has a broader reach, covering multiple hazards that may or may not be exacerbated by climate change. This Plan’s focus allowed a more detailed vulnerability assessment than the Safety Element, which may contribute to the development of policies for the Safety Element update. This Plan is not a policy document. It identifies strategies and actions. The public outreach conducted for this Plan resulted in some innovative strategies and actions that were prioritized by community members. Some of those may very well be incorporated into the Safety Element as policies and implementation programs. Either way, this plan provides a roadmap for the climate change policies and implementation programs in the Safety Element, which may diverge slightly from the focus in this Plan, but will remain substantially consistent with it.

# Acronyms and Abbreviations

ACS	American Community Survey
CAAP	Climate Action and Adaptation Plan
Cal Fire	California Department of Forestry and Fire Protection
CAP	Climate Action Plan
CCC	California Coastal Commission
CCI	California Climate Investments
CCWD	Coastside County Water District
CERT	Coastside Certified Emergency Response Team
CGS	California Geological Survey
City	City of Half Moon Bay
CRISP	Coastside Resilience Infrastructure Strategic Plan
CWSRF	Clean Water State Revolving Fund
FEMA	Federal Emergency Management Agency
GCM	global climate model
IBank	California Infrastructure and Economic Development Bank
IPCC	Intergovernmental Panel on Climate Change
JPFA	Joint Powers Financing Authority
LCIP	Local Coastal Implementation Plan
LCLUP	Local Coastal Land Use Plan
LCP	Local Coastal Program
LHMP	Local Hazard Mitigation Plan
MCDA	multi-criteria decision analysis
NGO	nongovernmental organization
OSHA	Occupational Safety and Health Administration
P3	public-private partnership
PG&E	Pacific Gas and Electric Company
RCP	relative concentration pathway
SAM	Sewer Authority Mid-Coastside
SSP	shared socioeconomic pathway
TOT	transient occupancy tax
USACE	U.S. Army Corps of Engineers

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USBR	U.S. Bureau of Reclamation
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USGS	U.S. Geological Survey
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# Lexicon

**Adaptation.** The process of adjustment to actual or expected climate and its effects, either to minimize harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate (IPCC 2012).

**Adaptation Pathway.** A planning approach that helps manage the uncertainties of climate change and other complex issues by outlining a sequence of actions or strategies that can be implemented over time, adjusting as new information or conditions emerge.

**Adaptive Capacity.** The ability to adjust to the consequences of climate change. Types of adaptive capacity include adjustments in behavior, resources, and technologies (Cal OES 2020).

**Asset.** A resource, structure, facility, or service relied on by a community.

**Cascading Impact.** Climate caused impacts that compromise infrastructure or disrupt critical services (i.e., power supply or water conveyance), broadening the scope of impact past a single system to reliant subsystems and populations (Collins et al. 2019).

**Climate Driver.** A change in the climate which acts as the main source of change for subsequent climate hazards.

**Climate Hazard.** A dangerous or potentially dangerous condition created by the effects of the local climate (Cal OES 2020).

**Compounding Risk.** When two or more events occur simultaneously and increase the scope of impact or severity of the event; an additional risk brought about by increased frequency of events from climate change (Seneviratne et al. 2012).

**Ecosystem.** A community or group of living organisms that live in and interact with each other and abiotic systems in a specific environment.

**Exposure.** The people, infrastructure, housing, and other assets located in hazard-prone areas.

**Greenhouse Gas.** Or GHGs for short, are a category of gases that absorb heat energy emitted from the planet's surface and they remain in Earth's atmosphere for a long time (from decades to centuries) (NOAA, 2025).

**Impact.** Effects on natural and human systems, including effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate hazards and the vulnerabilities of the system or asset affected (IPCC 2012).

**Mitigation.** An act or sustained actions to reduce, eliminate, or avoid negative impacts or effects (Cal OES 2020). From a climate change perspective, mitigation refers to actions taken to reduce the severity of climate change by lowering greenhouse gas emissions and enhancing carbon sinks.

**Resilience.** The capacity of an entity (an individual, a community, an organization, or a natural system) to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience (Cal OES 2020). Also, the ability of a city's systems, businesses, institutions, communities, and individuals to survive, adapt, and grow no matter what kinds of acute shocks and chronic stresses they experience.

**Risk.** The consequence of the interaction between a hazard and the characteristics that make people and places vulnerable and exposed (UNDRR Terminology 2017).

**Sensitivity.** The degree to which a species, population, natural system, community, asset, service, or other associated system would be affected by changing climate conditions (Cal OES 2020).

**Socially Vulnerable Populations.** Those experiencing heightened risk and increased sensitivity to climate change and having less capacity and fewer resources to cope with, adapt to, or recover from climate impacts (Cal OES 2020).

**Vulnerability.** The physical, social, economic and environmental factors or processes that increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards, or the propensity or predisposition to be adversely affected (IPCC 2012).

# Letter from the Mayor



*Half Moon Bay has always been a community defined by its deep connection to the natural environment, and the strong bonds among the people who live and work here. Our residents are innovative, our businesses are resourceful, and our values run deep, rooted in stewardship, resilience, and a shared responsibility to protect what makes this place so special.*

*In 2023, Half Moon Bay adopted its Climate Action Plan, a roadmap for reducing greenhouse gas emissions and transitioning toward a more sustainable future. That was the first step in our wider vision. Now, we are building on that foundation with the second phase of our climate planning efforts: the Climate Adaptation Plan.*

*This plan is focused on preparing our community for climate change impacts that we can no longer avoid, including sea level rise, coastal erosion, flooding, extreme heat, wildfire, high winds, and poor air quality. These hazards pose serious risks to our health, infrastructure, economy, and natural resources. But we are facing these risks head-on and doing the work to strengthen our community's long-term resilience, and safeguard the people and places we care about most.*

*As you will see in this plan, the City is identifying proactive strategies that protect vulnerable populations, preserve critical infrastructure, and integrate resilience into our land use and environmental planning. The Adaptation Plan complements our Climate Action Plan by widening our focus—moving beyond emissions reduction to include preparation for the future impacts we know are coming.*

*This plan brings us to a pivotal moment for Half Moon Bay. Climate change is a global issue, but the most effective solutions will come from local leadership, thoughtful planning, and collective action. The Adaptation Plan invites all of us—residents, businesses, and city leaders—to take part in this effort.*

*Our future depends on the steps we take today. Only by working together can we ensure that Half Moon Bay remains a safe, healthy, and thriving place for generations to come. This plan will help guide our community toward the more sustainable future that we all desire.*

*Robert Broustone*

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# 1. Executive Summary

This Plan encompasses the City of Half Moon Bay's Climate Action and Adaptation Plan, Phase 2 (CAAP Phase 2), and advances the City's longstanding commitment to environmental stewardship and climate resilience. Developed between March 2023 and June 2025 by the City of Half Moon Bay (City) in collaboration with Integral Consulting, BluePoint Planning, and Lester Coastal Policy, this Plan reflects an integrated, science-based, and community-driven approach to understanding and addressing climate risk. It builds upon the 2023 Climate Action Plan Phase 1 (CAP Phase 1), which focused on mitigation and the emission of greenhouse gases and the human influences on climate change. This 2025 Climate Action Plan Phase 2 (CAP Phase 2) focuses on identifying key vulnerabilities facing Half Moon Bay from future climate hazards and prioritizing targeted adaptation strategies that the City can implement, along with identifying collaborations necessary to develop regional resilience.

## Community Outreach and Public Engagement

Community engagement was a cornerstone of this effort. Over 300 touchpoints were recorded through outreach activities, including in-person pop-up events and surveys. Other groups were engaged through classroom curriculum and listening sessions with community-based organizations and service providers. The engagement process intentionally focused on reaching underserved and socially vulnerable groups, including Spanish-speaking residents, seniors, and youth. Residents shared firsthand accounts of the challenges they experienced during recent storms, expressed concern about the worsening wildfire risk, and emphasized the importance of reliable infrastructure and communication systems during hazardous weather and emergencies.

While recent extreme winter storm events and flooding that occurred in 2022/23 and 2023/34, as well as the CZU Lightning Complex wildfire that affected regions just south of the City in 2020 remain prominent in residents' minds, the City must also prepare for less immediate but increasingly likely threats in the future, such as groundwater rise, longer droughts, extreme heatwaves, and other escalating and compounding hazards.

## Key Findings from the Vulnerability Assessment

This CAP Phase 2 Vulnerability Assessment evaluated the community's exposure to climate hazards, sector-specific sensitivities, and the City's current adaptive capacity, including a focus on different populations within the community. The most pressing climate-related risks include:

- **Wildfire**, which threatens community health, safety, and the built environment.
- **Coastal and fluvial flooding**, which contributes to erosion, and has implications for homes, businesses, transportation, and infrastructure.
- **Coastal erosion**, which threatens recreational areas and coastal access and imperils shoreline properties and infrastructure.
- **High winds**, leading to tree falls, power outages, and transportation disruptions.
- **Extreme heat**, which threatens the health and safety of many at risk population groups.

The analysis found that vulnerability in Half Moon Bay is compounded by geographic isolation, aging and undersized infrastructure, and persistent socioeconomic disparities. The highest vulnerability ratings were observed in:

- **The water supply sector**, due to much of its infrastructure being in areas vulnerable to wildfires and landslides, such as the Coastside and Sierra. Projected changes, including reduced rainfall, more frequent droughts, and higher temperatures that increase evaporation, can also affect water availability. In addition, limited backup infrastructure makes the system less resilient to these impacts.
- **Socially vulnerable and lower-income populations**, including seniors, agricultural workers, and housing-insecure residents with limited adaptive capacity.

- **Critical infrastructure and transportation corridors**, such as Highway 92, where failures can have widespread consequences for public services and the economic sector.

### Adaptation Strategy and Prioritization Framework

Adaptation strategies were developed through public outreach workshops and aligned with five community-informed goals. These five overarching goals include:

1. Ensure a Healthy, Resilient, and Self-Sufficient Community
2. Foster a Thriving and Accessible Coastline and Open Space
3. Protect the City through Increased Resilient Infrastructure
4. Build and Sustain the City of Half Moon Bay Government's Capacity to Increase Resilience
5. Support and Increase Economic Sustainability

Specific adaptation actions were developed to address each goal and were prioritized based on the city's ability to influence or implement, cost, protective value, feasibility, long-term co-benefits, and the number of hazards addressed. The highest-priority suite of adaptation actions among all goals include:

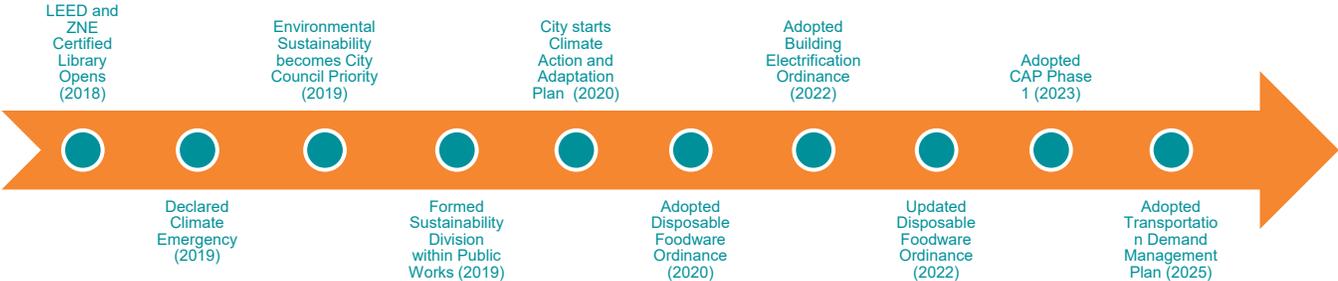
- **Enhancing Emergency Preparedness and Response Capabilities**  
The City can expand and better equip Resilience Hubs, which are public facilities such as a community center, senior center, or school that can serve as locations for emergency shelters, information points, and temporary refuge. These hubs should be bolstered with backup power and resilient communications systems. This Plan also calls for establishing emergency communication protocols for populations with language barriers or limited internet access and ensuring transportation routes remain functional during emergencies.
- **Investing in Resilient Infrastructure and Long-Term Monitoring**  
Actions include developing a monitoring and evaluation program that is integrated into department daily workflows aimed at monitoring long-term climate impacts to infrastructure. Many of Half Moon Bay's drainage and stormwater systems are outdated or undersized and were not designed for the intensity or duration of projected future precipitation events. Adaptation actions include modernizing stormwater conveyance systems and maintenance activities, particularly in vulnerable neighborhoods. Shoreline protection, bluff stabilization, and monitoring of erosion-prone areas like the former County landfill on Poplar Street is also prioritized.
- **Protecting Vulnerable Populations**  
The Plan emphasizes expanded support for those most at risk: seniors, low-income residents, mobile home park residents, and agricultural workers. Proposed strategies include establishing distributed solar plus storage solutions to reduce reliance on vulnerable energy infrastructure; expanding affordable housing in safe locations; partnering with organizations like Senior Coastsiders or ALAS to deliver tailored emergency preparedness and adaptation services to specific communities; and maintaining sustained access to the coast and open space areas to provide refuge during high heat events.
- **Restoring and Leveraging Natural Systems**  
Nature-based solutions are highlighted as both protective, cost-effective, and have significant co-benefits. The Plan identifies wetland and riparian restoration to buffer flood risk, dune restoration and sediment management to reduce coastal and terrestrial erosion, and green infrastructure projects to manage runoff and improve water quality. Additionally, reducing impervious surfaces and enhancing tree canopy coverage, particularly in public parks and open spaces, are identified as tools for both flood and heat mitigation.
- **Strengthening Regional Partnerships and Policy Alignment**  
Recognizing its dependence on regional infrastructure, partners, and services, the Plan identifies strategies to collaborate with Coastside County Water District (CCWD), Pacific Gas & Electric (PG&E), Sewer Authority Mid-Coastside (SAM), San Mateo County, CAL FIRE, Caltrans, and other agencies to implement shared regional climate adaptation solutions. The Plan encourages integrating adaptation

planning into the City's Safety Element (meeting the requirements of SB 379) and aligning capital improvement planning and the Multijurisdictional Hazard Mitigation Plan with vulnerability assessment findings and adaptation priorities to more effectively advocate for funding.

This Plan underscores that adaptation is essential for community and municipal resilience and for equity, safety, and long-term economic stability. This Plan represents a continuing investment in resilience and adaptation and identifies next actions upon which the City and its partners can build. Ongoing community engagement, targeted investment, and cross-sector collaboration will be critical to ensure that Half Moon Bay remains a safe, vibrant, and sustainable community for current and future generations.

# An Update on the City’s Adaptation Work

Updates between the CAP publication and this publication.



Since 2018, the City of Half Moon Bay has taken several significant steps to advance its climate goals and lay the groundwork for long-term sustainability and resilience. Early efforts included the opening of a Leadership in Energy and Environmental Design (LEED) and Zero Net Energy-certified library, the City’s 2019 declaration of a climate emergency<sup>a</sup>, and the establishment of a Sustainability Division within Public Works. That same year, the City Council elevated environmental sustainability to a formal priority.

Over the following years, the City adopted policies to reduce greenhouse gas emissions and waste, including the Disposable Foodware Ordinance (updated in 2022) and the Building Electrification Ordinance, which has since been paused<sup>b</sup>. In 2023, the City adopted Phase 1 of its Climate Action Plan (CAP), outlining key near-term actions to reduce emissions. Most recently, in 2025, the City adopted a Transportation Demand Management Plan to promote cleaner and more efficient mobility options. These milestones demonstrate Half Moon Bay’s continued commitment to meaningful local climate action focused on reducing or mitigating greenhouse gases.

<sup>a</sup> On June 18th, 2019, the Half Moon Bay City Council adopted a climate emergency declaration, calling for a mobilization effort to end citywide greenhouse gas emissions as quickly as possible.

<sup>b</sup> Implementation of the Building Electrification Ordinance was paused following the 2023 federal court decision in the Berkeley case involving the ban of natural gas hookups in new buildings. This ruling set a precedent that could affect other cities such as Half Moon Bay from seeking to implement similar ordinances.



# 2

## Introduction & Purpose

## 2. Introduction and Purpose

The City of Half Moon Bay (City) is committed to sustainability and recognizes its role in addressing the threat of climate change. This Climate Action and Adaptation Plan (CAAP, hereinafter referred to as the Plan) establishes strategies for the City to prepare for and adapt to the effects of climate change, reduce the impacts of future disasters, and recover more quickly when they occur. In support of the City's climate change adaptation goals, Integral Consulting Inc. (Integral), BluePoint Planning, and Lester Coastal Policy, in conjunction with the City's Public Works Department (together referred to as the Project Team), prepared this Plan. It provides an overview of City-specific climate change vulnerabilities informed through analysis of climate change hazard models and data. The Plan also reflects input gathered through community outreach efforts to solicit perspectives and guide a vision on adaptation priorities to meet the upcoming challenge. The overall adaptation approach and community engagement process are described more fully in the next chapter.

This Plan describes a path forward for the City to address these changing conditions and create a resilient community. This Plan aligns with and builds upon Phase 1 of the City's Climate Action Plan (CAP), which provides a comprehensive and strategic approach to sustainability and mitigation of greenhouse gas emissions. Phase 2, the Adaptation Plan (adding another A to the acronym and becoming the CAAP), provides a directed approach to addressing the various vulnerabilities to climate hazards. This is the first CAAP for the City and the first step in a much larger process to evaluate and plan for the impacts of climate change. Latest information, knowledge, and updated science should be reevaluated over time and incorporated into future planning. As such, this Plan will need to be reevaluated and updated on a regular basis.



Figure 1. The Half Moon Bay Art & Pumpkin Festival takes place annually in the fall (Source: City of Half Moon Bay)

This Plan is organized into six chapters as outlined below -

## Document Roadmap



## Study Background and Relationship with Other City Plans

In March 2020, the City embarked on a combined Climate Action and Adaptation Plan (CAAP), however, the City had to pause when it lost funding due to the COVID-19 pandemic. To address this funding challenge, the City conducted planning in two phases: the Climate Action Plan, or CAP, which focused on greenhouse gas mitigation and was adopted in 2023, and this effort, focused on hazard mitigation, resilience, and adaptation, which began in March of 2023. This Plan will be a complementary document to the CAP. Together; these two documents form the overall Climate Action and Adaptation Plan (CAAP).

The City is concurrently undertaking an update to the Safety Element, which includes climate adaptation strategies in accordance with SB 379. That plan is intended to prepare for a wider range of hazards and for the City to respond when a disaster occurs, and may include such actions as providing emergency response, equipment, food, shelter, and medicine. This Plan's focus allowed a more detailed vulnerability assessment with a focus on climate change-related hazards, and a focus on adaptation strategies that are forward-thinking to minimize community disruption, loss of life, and property damage resulting from climate change. This plan is a roadmap for climate change action, not a policy document, and can inform other plans such as the Safety Element.

The Plan lays out the City's strategy for mitigating natural hazards and implementing strategies to adapt to a changing climate, but the success of this Plan rests in our collective global ability to reduce greenhouse gas emissions to limit global warming. Of course, the City of Half Moon Bay and its surrounding coastal neighbors,

plus the larger state and national communities cannot do this alone; Half Moon Bay's efforts are small pieces of the larger global effort. The City's approach to increase efficiency and reduce emissions is laid out in the City's CAP. Together, the CAP and this Plan (CAAP) form the City's collective response to mitigate and adapt to climate change.

## Community Profile



Figure 2. The annual Half Moon Bay Wine & Jazz Festival held in downtown Half Moon Bay (Source: City of Half Moon Bay)

This section provides a brief community profile to provide understanding of the community's characteristics, which provides context for understanding the adaptive capacity of the community, as well as the community-specific sensitivities and unique dynamics that may influence climate change vulnerabilities.

The City of Half Moon Bay is a small coastal community of 11,000 residents. Including the surrounding unincorporated county communities to the north of El Granada, Princeton Harbor, Moss Beach, and Montara, the larger region encompasses approximately 30,000 people. The City is known for its beautiful coastline and small-town feel, a major appeal to many residents and businesses that draws many tourists to the area. The area is known for its scenic qualities and recreational opportunities, with a highlight being the California Coastal Trail. The trail meanders for 5 miles along shoreline bluff tops, providing access to beaches, offering breathtaking views of the Pacific Ocean and whale and bird watching, plus opportunities for biking, walking, and horseback riding. There is also 69 acres of City managed parkland, and thousands of acres of parkland managed by the County, State, and other entities throughout the San Mateo County Coast. The City and the surrounding Coastside communities are also home to a healthy agricultural sector with numerous greenhouses, nurseries, and farms.

The City is located 28 miles south of San Francisco and is a 12- to 15-mile drive over State Highway 92 to the bayside cities in Silicon Valley. Highway 1 is the primary roadway linking Half Moon Bay along the coast to the north and south, and Highway 92 is the primary transportation corridor linking the City in the east–west direction with the San Francisco bayside cities and employment hubs of San Mateo County. On the bayside, the area is linked by Highway 92 to Highways 101 and 280, El Camino Real, and the Caltrain corridor. The median age of City of Half Moon Bay residents has increased by nearly twice the rate as in San Mateo County overall between 1980 and 2010, and stands at 44, up from 32 in 1980 (Dyett and Bhatia, 2014).

A snapshot of demographic highlights includes (City of Half Moon Bay 2024):

- Median Age: 48.3
- Total Households: 4,353
- Average Household Size: 2.7 persons
- Average Household Income: \$209,719
- Education—High School Degree or higher: 92.1%
- Education—Bachelor's Degree or higher: 54.6%
- Median Housing Value: \$1,425,500
- Percent of Foreign-Born Persons: 20.9%

For people 25 years and older, 88.3% have a high school diploma, and 57.4% have a bachelor's degree or higher. This high level of education aligns with the region's location as a vibrant job center and part of the financial, pharmaceutical, and technology centers in San Francisco, Oyster Point, and Silicon Valley. Many of Half Moon Bay's residents commute outside the City to the San Francisco Bay Area throughout this job-rich region. The City has also retained employment sectors traditional to the Coastside, such as small businesses and agricultural operations, while also accommodating new businesses and industries that are otherwise primarily thought to be located "over-the-hill" in bayside communities, such as the tech industry (City of Half Moon Bay 2024).

## Study Area

The area of interest for this Plan is the incorporated jurisdiction of Half Moon Bay, where the City has direct land use authority. However, because the impacts of climate change extend beyond jurisdictional boundaries, a broader study area was developed. This Plan incorporates three overlapping scales for hazard evaluation and adaptation planning: regional, local, and neighborhood (see Figure 3). The vulnerability assessment addresses hazards primarily at the regional (county-level) scale, while adaptation strategies focus on specific actions the City can take at both local and neighborhood levels to address climate vulnerabilities more precisely.

The regional study area, developed in collaboration with the Project Team, encompasses the entire coastal watershed, extending from Devils Slide in the north to El Granada in the south, and inland to the crest of the Coast Range along California State Route 35 (Skyline Boulevard). This area encompasses unincorporated coastal communities north of Half Moon Bay: Montara, Moss Beach, Princeton Harbor, and El Granada, which contain critical infrastructure supporting the City, such as high-voltage power lines, gas pipelines, water supply systems, and major transportation connections.<sup>c</sup> Because land use decisions in these neighboring areas may significantly affect the City's long-term resilience, the regional scale also identifies opportunities for collaboration to strengthen climate adaptation planning.

The local study area consists of the City's jurisdictional boundary and adjacent unincorporated areas closely integrated with City services and infrastructure. This area includes the Moonridge neighborhood, the Caltrans Corporation Yard, the James Johnston House property, and portions of unincorporated land along the Highway 92 corridor. These areas were included to align with Local Coastal Plan (LCP) boundaries and the Coastal Zone as regulated by the California Coastal Commission (CCC).

According to the LCP, Half Moon Bay's land use pattern includes diverse neighborhoods separated by undeveloped open space. While the LCP identifies 22 individual neighborhoods, for this Plan they have been grouped into eight larger neighborhood focus areas, each encompassing multiple smaller neighborhoods and

<sup>c</sup> While this Plan evaluates vulnerabilities to the City within this region, it does not focus on adaptation strategies related to regionally connected utilities and infrastructure; instead it focuses on coordination and collaboration and partnerships to plan for these assets.

adjacent open space. Highway 1 serves as the east–west boundary between neighborhood groups, while features such as Pilarcitos Creek, Frenchmans Creek, and Wavecrest Open Space delineate other neighborhood areas. These focus areas guide targeted climate vulnerability assessments and localized adaptation strategies. The eight neighborhood group focus areas include:

North Coastal	<ul style="list-style-type: none"> <li>• West Miramar, North Coast Panhandle to Pilar Point Harbor</li> </ul>
North Inland	<ul style="list-style-type: none"> <li>• Frenchmans Creek, Upper Roosevelt and Pullman, Watershed Area, Rocket Farms Greenhouses</li> </ul>
North Central Coastal	<ul style="list-style-type: none"> <li>• Kehoe &amp; Casa Del Mar, SAM Waste Water Treatment Plant, Belleville, Strawflower Village Plaza</li> </ul>
North Central Inland	<ul style="list-style-type: none"> <li>• Sea Haven &amp; Spindrift, Grandview, Beachwood Open Space Area, Highland Park &amp; Terrace, Half Moon Bay High School</li> </ul>
South Central Coastal	<ul style="list-style-type: none"> <li>• Pilarcitos Park, Alsace Lorraine, Arleta Park, Former Landfill Site, Oceanview Driving Range</li> </ul>
Downtown and 92 Corridor	<ul style="list-style-type: none"> <li>• Cypress Cove, 92 Corridor, North Downtown, Heritage Downtown, South Downtown &amp; Senior Campus, Arleta Park, Cunha Intermediate School, Main Street Park</li> </ul>
South Coastal	<ul style="list-style-type: none"> <li>• Ocean Colony and Golf Course, Wavecrest, Canada Cove, Smith Field Park</li> </ul>
South Inland	<ul style="list-style-type: none"> <li>• Moonridge, Greenhouses adjacent to Highway 1, Johnston House</li> </ul>

# City of Half Moon Bay Study Area Boundaries

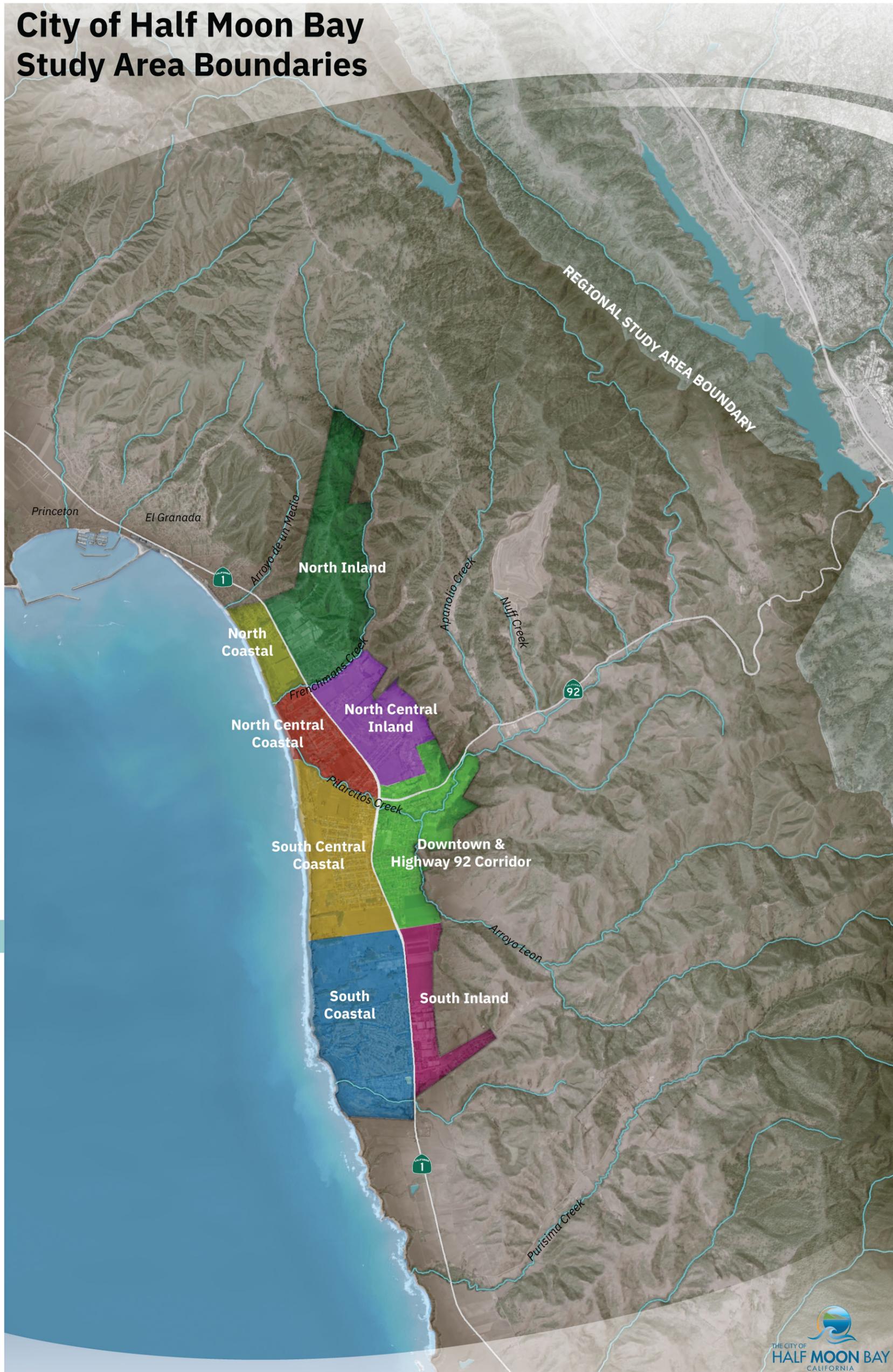


Figure 3. Project study area boundaries. Color-coded areas indicate the local study areas, while the darker shading shows the broader regional study area. The regional area extends from the Tom Lantos Tunnel and Devil's Slide in the north to Highway 84 in the south, and from the Pacific Ocean eastward to major highways and watershed boundaries

## Related Efforts

This section provides a list of related major regional planning efforts that include relevant policy guidance for this Plan and provides context for climate change adaptation strategy recommendations in Chapter 6. Note that this is not a fully comprehensive list, and there are additional smaller programs and internal policies that are not included here (e.g., Sewer Maintenance and Management Plan, engineering standards, design standards). Please refer to the CAP (Phase 1) for a description of global, state, county, and local efforts related to climate change mitigation.

## City Efforts

### General Plan

Under California planning and zoning law, the Land Use Plan and General Plan provide the policy basis for the City's land use vision. The General Plan is a comprehensive long-term policy direction for the physical development, preservation, and conservation in the City. The General Plan includes additional elements addressing housing, safety, noise, parks and recreation, circulation, and land use, and because the City of Half Moon Bay is located entirely within the California Coastal Zone, the Local Coastal Land Use Plan serves as the City's Land Use Element. The City integrates hazard mitigation for all pertinent hazards in the Safety Element (see below). The General Plan was comprehensively updated in 2020.

### Safety Element—*update underway*

A Safety Element is a required section of the General Plan that identifies potential natural and human-caused hazards that could affect residents, businesses, and services in the community. Hazards included in a Safety Element can include wildfire, flooding, earthquakes, landslides, extreme weather, sea level rise, pests and diseases, human health hazards, hazardous materials, and others. It is distinguished from this Plan by incorporating a wider range of non-climate related hazards including earthquakes and tsunamis, and evaluating evacuation and access along Highways 1 and 92. Half Moon Bay's Safety Element was last adopted in 1991 and an update is in progress. Adoption of the updated Safety Element is expected by early 2026.

### Capital Improvement Plans—Updated Annually

The City's Capital Improvement Plan is updated annually. It is a 5-year fiscal planning and budgeting tool for the City to prioritize infrastructure projects.

### Miramontes Point Sea Level Rise Vulnerability and Fiscal Impact Assessment—2023

This study filled a gap in the City's Sea Level Rise Vulnerability Assessment (City of Half Moon Bay 2016) and projected the extent of coastal erosion and vulnerabilities to the Ritz-Carlton resort along a 1-mile stretch of coastline around Miramontes Point at the south end of the City. This upscale resort and golf course provides a substantial source of revenue to the City through transient occupancy taxes (TOTs) and green fees.

### Local Coastal Program and Local Coastal Land Use Plan—Adopted 2021

The primary goal of an LCP is to ensure that the local government's land use plans, zoning ordinances, zoning maps, and implementation actions protect public shoreline access and coastal resources and provide for priority coastal land uses, consistent with the requirements, provisions, and policies of the California Coastal Act. The Local Coastal Land Use Plan (LCLUP) is the land use and resource protection policy component of the LCP. It includes land use designations specifying the types, locations, and intensities of development allowable in the coastal zone. The entire city of Half Moon Bay is in the coastal zone. The LCLUP also identifies land use priorities and how to address land use issues for the City, and it covers foundational policies for guiding coastal

development. The City's LCP has been amended numerous times since 1985 to address changing conditions, laws, and issues. The LCLUP, together with the Local Coastal Implementation Plan (LCIP), which includes zoning ordinances, zoning maps, and standards and requirements, constitutes the entire LCP. The LCLUP was updated by the City in 2020 to address climate change and environmental hazards related to sea level rise and was certified by the CCC in 2021.

### **Sustainability Implementation Plan—2020**

The Sustainability Implementation Plan outlines opportunities to implement sustainable policies, programs, and projects within the City of Half Moon Bay, including cleanup efforts, outreach and education, and the development and implementation of plans such as this one.

### **Climate Action Plan—2023**

As described above, the CAP constituted Phase 1 of the CAAP and focused on climate mitigation actions and greenhouse gas emission reduction strategies. It was adopted in 2023.

### **CAAP Outreach Pilot Project—2019**

This project was part of the initial CAAP project, which was halted due to COVID-19, and focused on targeted outreach to underrepresented communities in Half Moon Bay, specifically the youth, seniors, and Latino population. It relied heavily on partnerships with three local non-government organizations including Youth Leadership Institute, Ayudando Latinos A Soñar (ALAS), and Senior Coastsiders.

### **Green Infrastructure Plan—2019**

This plan focused on identifying potential green infrastructure projects, including drainage improvements, park improvements, complete streets, intersection improvements, and parking and building improvements.

### **Parks Master Plan—2019**

The Parks Master Plan provides a roadmap for the future of parks in Half Moon Bay and helps focus future decisions and parks resources over the next 15 years. This Plan outlines recommendations to enhance City Parks' level of service and improve the quality of life for residents and visitors. It includes significant considerations and recommendations related to sustainable landscape practices, including green infrastructure, native plantings, and water-efficient landscaping. This plan does not explicitly address climate change adaptation.

### **Bicycle and Pedestrian Master Plan—2019**

The City's Bicycle and Pedestrian Master Plan guides the development of programs and facilities to enhance bicycling and walking as practical, efficient, and safe transportation choices for Half Moon Bay residents and workers, plus coastal visitors. It provides recommendations to improve the safety, comfort, and connectivity of the bicycle and pedestrian networks in Half Moon Bay.

### **Storm Drain Master Plan—2016**

The City's 2016 Storm Drain Master Plan established an approach to prioritizing Capital Improvement Program funds to mitigate the impacts of stormwater runoff in the City. This document identified the steps taken to inventory and analyze the existing storm drain system, analyzed capacity restrictions within the storm drain networks, and provided recommendations for a more comprehensive update in fiscal year (25-26).

## **Plan Half Moon Bay, Sea Level Rise Vulnerability Assessment—2016**

This document assesses the City of Half Moon Bay’s vulnerability to sea level rise. It was prepared to ensure that the update to Half Moon Bay’s LCP reflected the conditions, information, and community priorities as of 2016. This study identified sea level rise impacts for most of the City outside of Miramontes Point and was used to update the LCP in 2020 to reflect more current sea level rise projections.

## **County Efforts**

### **San Mateo County Local Hazard Mitigation Plan—2021**

The San Mateo County Local Hazard Mitigation Plan (LHMP) is a large regional and cross-jurisdictional effort to plan for the reduction of risk from natural and man-made disasters. It assesses hazard vulnerabilities and identifies mitigation actions that jurisdictions will pursue in order to reduce the level of injury, property damage, and community disruption that might otherwise result from such events. The LHMP 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 risks and threats. Projects identified in the LHMP are eligible for federal funding to improve resilience to natural hazards.

### **San Mateo County Midcoast LCP**

This County LCP defines policy, zoning ordinances, zoning maps, and standards and requirements for development along the coastline just north of Half Moon Bay, from the Miramar neighborhood up to the Moss Beach neighborhood.

### **Coastside Resilience Infrastructure Strategic Plan—Currently Underway**

The Coastside Resilience Infrastructure Strategic Plan (CRISP) is a critical infrastructure inventory mitigation project, sponsored by Supervisor Ray Mueller and spearheaded by the San Mateo Department of Emergency Management. CRISP promotes a collaborative approach, engaging stakeholders from various agencies and organizations along the coast to prioritize community voices and concerns. Through CRISP, a comprehensive inventory of infrastructures will be conducted to develop a prioritization framework.

### **OneShoreline Plan Princeton Study—Currently Underway**

Plan Princeton is a study by the County of San Mateo to update the development plan for Princeton. The project focuses on the area west of and including Highway 1, between Pillar Point Harbor and Moss Beach. The purpose of this project is to make a comprehensive update to the policies, plans, and standards regulating the Princeton study area.

### **San Mateo County South Coast Sea Level Rise Vulnerability Assessment—2022**

This study evaluated the impacts of coastal hazards on the South Coast from Miramontes Point in the City south to the county line with Santa Cruz County and evaluates 0.8 feet, 1.4 feet, and at 4.9 feet of sea level rise. The vulnerability assessment provided projections of the extent of coastal hazards and of the physical and economic impacts to community assets like buildings, roads, farmland, and coastal access infrastructure.

### **San Mateo County Sea Level Rise Vulnerability Assessment—2018**

This study evaluated the impacts of sea level rise for the bayside of San Mateo County, and in Half Moon Bay at Miramontes Point north to San Francisco. The study evaluated a 1% annual chance storm event with 3.3 feet and 6.6 feet of sea level rise, and the projected extent of coastal erosion with 4.6 feet of sea level rise. The study also included an appendix with a detailed description of local-specific vulnerabilities, which included the Sewer

Authority Mid-Coastside (SAM) Wastewater Treatment Plant, the former Half Moon Bay landfill, areas around Mirada Road (located just north of City’s jurisdictional boundary), and other local assets such as the California Coastal Trail.

## Multi-jurisdictional Efforts

### **Sewer Authority Mid-Coastside Plant Vulnerability Assessment—2024**

This study evaluated potential existing fluvial flood hazards along Pilarcitos Creek and Kehoe Waterway under a range of storm recurrence intervals as well as future compound flooding associated with sea level rise and dune erosion for the SAM Wastewater Treatment Plant in Half Moon Bay. The study provided facility-specific recommendations on adaptations to potential existing flooding and future compound hazards from sea level rise.

### **Urban Water Management Plan (Coastside County Water District Planning)—2021**

The Urban Water Management Plan from the Coastside County Water District provides a framework for long-term water supply planning and documents how urban water suppliers fulfill their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future water demands.

### **Coastal Regional Sediment Management Plan for the Santa Cruz Littoral Cell, Pillar Point to Moss Landing (USACE, MBNMS, and Noble Consultants 2015)**

The Santa Cruz Littoral Cell encompasses the 75-mile coastline from Moss Landing to Pillar Point. The regional Coastal Regional Sediment Management Plan was a scientific summary and guidance document to identify sediment sources to potentially restore and maintain coastal beaches and other critical areas of sediment deficit; reduce the proliferation of protective shoreline structures; sustain recreation and tourism; enhance public safety and access; and restore sandy coastal habitats. The Plan recommends future regional- and site-specific strategies for managing and responding to these erosion issues with sediment to protect coastal resources and infrastructure.

### **San Mateo-Santa Cruz Unit Strategic Fire Plan—2022**

This plan identified and prioritized wildfire mitigation and recovery strategies aimed at reducing risk within the San Mateo–Santa Cruz Unit. The Plan has goals and strategies that address specific planning for vulnerable populations including those in schools and nursing facilities as well as the older adult population.

## Other Efforts

### **California Climate Adaptation Strategy (Central Coast Regional Workshop)—2021**

This workshop was led by the California Natural Resources Agency and the Governor’s Office of Planning and Research, and involved an in-person event that was held on June 28, 2021<sup>d</sup>. Drought, wildfire, and sea level rise were the top three climate hazards of concern among respondents. Strategies focused on the following priorities: protect climate vulnerable communities, advance public health and safety, build a climate resilient economy, accelerate nature-based climate solutions, make decisions based on best available climate science, and leverage resources for climate action through partnerships and collaboration.

<sup>d</sup> An overview of responses from the event can be found at: <https://resources.ca.gov/Initiatives/Building-Climate-Resilience/2021-State-AdaptationStrategy-Update>



# 3

## Project Process & Community Engagement

# 3. Project Process and Community Engagement

## A Community-Driven Plan

This Plan follows the climate adaptation planning process recommended by the California Governor’s Office of Emergency Services, as outlined in the 2020 California Adaptation Planning Guide (CalOES 2020), and incorporates the latest climate science available. In alignment with this guidance, the Plan is community-driven. At each step, the technical team integrated community input and ideas to shape and direct the plan (see Figure 4 for a visual timeline).

During the first phase of the planning process, the Project Team gathered feedback from the community through in-person pop-up events, online surveys, engagement with school groups, and community listening sessions. This feedback focused on the climate impacts of greatest concern, the community’s needs, and the areas they wish to protect.

This information complemented the development of the vulnerability assessment and associated maps (Chapter 5), which assessed the risks of sea level rise, coastal flooding, and erosion; impacts of rising temperatures, including extreme heat, wildfire, drought, and decreased fog; and changes in precipitation, including extreme storms, creek and stormwater flooding, high winds, and secondary impacts such as landslides. As part of the vulnerability assessment process, the Project Team analyzed the intersection of spatially explicit hazards, such as storm flooding, with the locations of community assets. For non-spatially explicit hazards such as high heat, this assessment relied on climate change projections from CalAdapt and community information such as U.S. Census data to inform where potentially sensitive population groups reside. This information was analyzed and then synthesized into vulnerability assessment scores for various populations, different assets, and service sectors of the community (see Chapter 5).

Once community concerns were identified and the vulnerability assessment was complete, the Project Team developed a set of problem statements to address the impacts of climate hazards on different community assets and populations (Appendix A). During the second community engagement phase, these problem statements were vetted with the public through an online platform called “Consider.it,” where participants could rate their agreement with the problem statements. City staff also conducted in-person outreach for problem statement feedback. The top problem statements were identified based on participant feedback, providing high-priority focus areas in the Plan. City staff also conducted pop-ups to gather feedback on the problem statements and shared the vulnerability maps with the public.

In addition, based on top concerns and input into problem statements, the Project Team developed a set of community values and a vision to reflect the issues and desires of the community. The Project Team also developed a suite of Plan goals alongside community values, which were similarly developed through the community engagement process with input from staff. City staff conducted in-person engagement on project vision and values, and these goals formed the basis of the Plan strategies and influenced the organization of the Plan strategies into the five goal areas (see Chapter 0 for a full description of the goals). The vision, goals, and values were shared with the community, and are listed in the subsequent section.



Based on the problem statements, the Project Team prepared a list of adaptation actions by problem statement category. This included identifying work that has already been done to improve resilience and actions to build from existing plans and programs. City department staff reviewed this list, and the Project Team helped to prioritize adaptation policies and actions to incorporate into this Plan. These actions were workshopped and refined to clarify focus and strategy areas while also being organized by community goals. A full list of these adaptation actions can be found in Appendix B.

 **City of Half Moon Bay Climate Adaptation Plan**

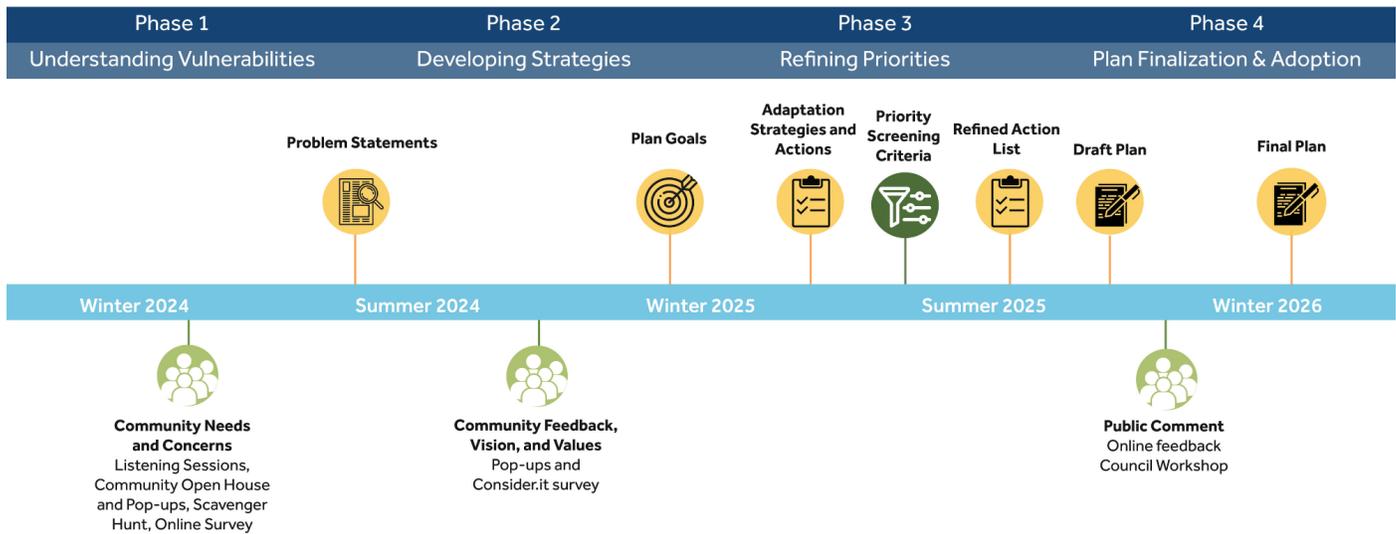


Figure 4. A visual timeline of the project

## Embedding Equity Into the Plan

The City prioritized equity and the Project Team considered it throughout the planning process, from community outreach to vulnerability assessment and adaptation strategy development. Equity was built into outreach through engagement with community-based organizations, including those representing socially vulnerable communities, who took part in listening sessions during the first round of engagement. The vulnerability assessment considered socially vulnerable populations by analyzing where socially vulnerable groups reside and the challenges they may face due to climate change. Finally, in strategy development, the team prioritized actions that promote equity and foster community resilience. This included strategies that protect the City’s most vulnerable populations and prioritize benefits to communities that are disproportionately vulnerable to climate impacts.

## Overview of Stakeholders

Throughout the Plan development process, the Project Team engaged the following stakeholder groups:

City of Half Moon Bay Staff	Grenada Community Service District
General Public	Muchia Te' Indigenous Land Trust
Cabrillo Unified School District	Puente
California State Parks	San Mateo County Parks
Coastside Certified Emergency Response Team (CERT)	San Mateo Resource Conservation District
Coastside County Water District	Sea Hugger
Coastside Land Trust	Senior Coastsiders
Cunha Intermediate School	

## Community Engagement Phase 1: Understanding Vulnerabilities

The first round of engagement took place from December 2023 to February 2024. The engagement process included a mix of in-person pop-ups and an online survey designed to reach community members who would be less likely to participate in traditional engagement opportunities and to reach a broader audience. Approximately 15% of in-person participants in the first round were Spanish speakers.

The next round of community outreach assessed the community needs and vulnerabilities to hazards in Half Moon Bay. This phase included pop-ups throughout the community, an online survey, an educational curriculum for students, and listening sessions with representatives from environmental, recreation, transportation, government, and community organizations. Overall, there were at least 337 separate touchpoints with community members during this phase of engagement. Further information on the separate components of these rounds of engagement is provided below.

### Project Kick-off Pop-ups

The first round of pop-ups took place in January 2023 throughout the community. The Project Team conducted a dot-voting exercise for the public, which showcased climate hazards including sea level rise, winter storms, drought, wildfire, and increased heat, along with their respective secondary impacts. The Project Team asked the community which climate impacts they were most concerned about. The community was also presented with a map of Half Moon Bay and asked to identify the areas of Half Moon Bay they loved, and which areas they wanted to protect.

### Student Engagement

In addition to the community pop-ups, the Project Team created a student curriculum, worksheets, a scavenger hunt, and a similar dot-voting activity for middle school students in Half Moon Bay. This curriculum included a presentation for students to learn about climate hazards and impacts, and



Figure 5. The Project Team at a pop-up event in Half Moon Bay (source: Blue Point Planning)

the expected increases in frequency and severity of climate hazards in the next century. Approximately 40 students participated.

## Community Pop-ups

Community pop-ups were held at Mac Dutra Park, the Ted Adcock Community Center, and the Half Moon Bay Library. The Project Team conducted a dot-voting exercise for the public which showcased climate hazards including sea level rise, winter storms, drought, wildfire, and increased heat and their respective secondary impacts, and asked the community which climate impacts they were most concerned about. The community was also presented with a map of Half Moon Bay and asked what areas of Half Moon Bay that they loved, and which areas they wanted to protect. These pop-ups garnered over 55 individual responses and project staff talked to more than 100 community members.



Figure 5. Engagement Community Pop-up events (source: Blue Point Planning)

## Online Survey

The Project Team also hosted an online survey alongside the community pop-ups that was open until the end of February 2024. The survey asked similar questions to the pop-ups with the aim of identifying the community's concerns about climate hazards. The survey received 178 responses.

## Community Listening Sessions

In addition to understanding community concerns around climate hazards, the Project Team held four listening sessions with representatives from 13 community stakeholder groups, including leaders from CBOs and local agency staff, to understand more about the challenges, needs, and opportunities of each of these organizations. The listening sessions were split up by Environment and Conservation, Recreation and Transportation; Government Agencies; and Community Organizations such as social services organizations. In addition, City staff also did one-on-one outreach with a tribal representative from the Muchia Te' Indigenous Land Trust.

## Overall Findings from Engagement

Listed below are the overall findings from the first round of engagement activities.

- Overall, the Half Moon Bay community is “extremely” or “quite” concerned (the top two most concerned survey options) about the impacts of climate change.
- Overall, 74% of the community is very concerned about **coastal erosion** caused by sea level rise and winter storms, with a further 20% stating they were somewhat concerned.

- Community members indicated they are concerned with **power outages** caused by any hazard, particularly during winter storms and flooding, and **road blockages**.
- The community is concerned about **impacts on water use** due to drought.
- The community is concerned about **poor air quality** in the event of a wildfire.
- The community survey found that residents are most concerned about secondary climate impacts: **impacts to the natural landscape** (65%) and **housing/property values** (44%), with the remaining categories receiving 38–39%.
- The coastline is a major asset, and participants love and want to protect the **beach** and **coastal trail**.
- The community identified impacts on **mental health**, **emergency preparedness**, **tsunamis**, and **wave flooding** as other top concerns during the pop-ups.
- The community has faced **excess flooding**, particularly in creeks and rivers. The community is concerned with dead trees and trash that are causing these pile-ups.
- The community expressed the need for **emergency preparedness** and community reliance and importance of strong **communication channels** for the following reasons:
  - The community recognizes that Half Moon Bay is in a **remote location** with limited routes in and out. In cases of emergency or road closures the City and its neighboring communities, who often rely on key City services, are often **isolated** and unable to get aid or resources into Half Moon Bay or able to evacuate out of Half Moon Bay<sup>e</sup>.
  - The community often faces **power outages** that last multiple days, leaving many without internet access, phone service, or fresh food.
- Additional **support services for seniors** should be provided during emergencies.
- Senior Coastsiders and the High School offer spaces and resources to create Resilience Hubs and act as shelters for the community to go to in times of emergency. Expanding and bolstering these Resilience Hubs can help connect Half Moon Bay with other nearby Coastside communities and provide areas of refuge to these communities.
- The community is interested in affordable renewable energy sources, especially for its most vulnerable residents, like solar energy with increased energy storage.

## Community Engagement Phase 2: Priority Setting

Phase 2 of the engagement took place between August and September 2024 and included in-person outreach at the Half Moon Bay Library, a City Council Meeting, the Senior Coastsiders lunchtime service, and Make It Main Street's back-to-school night. The Project Team also solicited input on problem statements through the online platform Consider.it, which asks users to rate their agreement with each problem statement with the opportunity to provide comments for feedback, similar to the in-person exercise. A total of 13 users participated via the online platform. In-person engagement included four pop-up events, during which City staff interacted with approximately 119 people, resulting in 47 completed surveys (which asked the same set of questions as the online platform). This brought the total survey participation to 60 individuals when combining in-person and online responses. Additionally, 132 individual touchpoints were achieved by adding the 13 online responses to the 119 in-person engagements. Below are the top three hazards from the problem statements that received the highest level of agreement during this round of engagement:

- **High winds** can lead to trees falling and downing power lines, which can block roadways and cause dangerous situations for residents and visitors. These events can also disrupt electrical and communication connections to the broader region.

<sup>e</sup> Many community members expressed concerns about evacuation. Evacuation is a significant issue for the community and is being considered in the Safety Element update.

- **Wildfire** can lead to road closures, damage to roads and transportation infrastructure, and also have indirect impacts such as reduced visibility due to wildfire smoke and an increased likelihood of washouts post-fire. Wildfire risk in the region can also lead to public safety power shut-offs, which shut off electricity in the City and beyond, sometimes including infrastructure such as cell towers, traffic lights, and pump stations.
- **Flooding impacts**, especially to the SAM Wastewater Treatment Plant, are a concern. This facility has flooded in the past and remains at an elevated risk of future flooding in extreme storm events.



Figure 6. Priority setting community engagement event outside of City Hall (source: City of Half Moon Bay)



# 4

## Values & Goals

# 4. Vision, Values, and Goals

## Vision and Values

Based on input gathered from the community engagement described in the previous chapter, the Project Team developed a series of values and goals to guide the Adaptation Plan effort, which in turn contributed to the Plan's vision. **The Plan's vision for the City of Half Moon Bay is to be better prepared for future hazards and climate impacts by reducing the impact of climate change and disasters, and by ensuring equitable recovery from disasters when they do occur.** This vision formed from community values gathered during the first engagement round: working across the City to form community and resilience to climate impacts, developing regional connections to support regional resilience, supporting vulnerable populations, and safeguarding natural systems.

Below is a list of community values that can help achieve this vision.

### Values



#### Community

Half Moon Bay community members, businesses, and government work together to be resilient and adaptable.



#### Connection

Half Moon Bay is part of a vibrant coastal community that values partnerships and collaboration with other government entities, businesses, and organizations.



#### Equity

Half Moon Bay supports and protects the most vulnerable community members.



#### Nature

Half Moon Bay residents cherish the local natural resources, and work to protect these benefits while safeguarding access for all.

Figure 7. Project values including community, connection, equity, and nature

## Goals

The first round of community engagement resulted in the following project goals (see Figure 8). City staff and subsequent engagement activities vetted and confirmed the initial goals. These goals reflect the community's focus for adaptation and serve as the organizing structure for the Plan and strategies. By grounding the Plan in community goals, strategies and actions are more closely aligned to community values and can be more effectively supported and implemented. Each goal serves a distinct community need and has specific City departments associated with action implementation (see Chapter 6). With this approach, each department or community audience can reference this document and use it to help guide future efforts and work priorities.

### Project Goals



#### **Ensure a Healthy, Resilient, and Self-sufficient Community**

Foster community self-sufficiency by building resilience, health, and safety and ensuring consistent access to energy, water, communications and other critical resources.



#### **Foster a Thriving and Accessible Coastline and Open Space**

Ensure that community members can access and enjoy the City's cliffs, beaches, natural resources, parks, and open space today and in the future.



#### **Protect the City through Increased Resilient Infrastructure**

Mitigate hazard exposure to safeguard essential infrastructure from extreme weather events and climate impacts.



#### **Build and Sustain the City's Capacity for Resilience**

Update internal processes, allocate funding, and forge strong partnerships to enable the City to implement climate adaptation efforts.



#### **Support and Increase Economic Sustainability**

Support a robust local business environment that contributes to economic prosperity while adapting to the impacts of climate change.

Figure 8. Project goals developed in conjunction with City staff and the community



# 5

## Vulnerability Assessment

# 5. Vulnerability Assessment

## Overview

The City of Half Moon Bay faces a range of climate-related hazards, including wildfire, coastal and fluvial flooding, landslides, coastal erosion, storm wave flooding, and increased extreme heat events. These hazards can lead to cascading impacts that disrupt infrastructure, businesses, services, and quality of life, potentially causing long-term or even permanent changes.

Climate change hazards interact with the community's preexisting conditions to determine the level of vulnerability for specific assets, services, or population groups. These conditions include sensitivities such as aging stormwater infrastructure, a shortage of affordable housing, and the community's adaptive capacity. Adaptive capacity varies based on factors like civic engagement, legal or political challenges, and staffing or funding limitations.

This chapter assesses exposure to climate hazards in conjunction with sector-specific sensitivities and adaptive capacities, providing a comprehensive overview of the most significant vulnerabilities across the City's social, economic, natural, and built systems.

The most prominent climate change hazards include the following:

- **Wildfire and extreme heat**, which could directly impact homes, businesses, and infrastructure and have indirect impacts on a wide range of systems, including human health.
- **Drought** conditions are projected to rise, impacting ecosystems, water resources, and the local economy.
- **Emergent groundwater** which could be problematic in low-lying areas such as around the mouth of Pilarcitos Creek (Barnard et. al. 2018 and Befus et. al. 2020).
- **Stormwater and fluvial flooding** events could increase, leading to disruptions and damage in low-lying areas.
- **Coastal erosion and sea level rise** could threaten homes, roads, recreation areas, and utilities along the shoreline (Barnard et. al. 2018).
- **High winds and other secondary impacts** such as tree fall could lead to disruptions to power distribution systems and other utilities.
- **Debris flow and landslides** could increase due to more intense precipitation and other cascading impacts. The hazard will be highest on steep slopes and creekbanks.
- **Decreased coastal fog** could have impacts on agriculture and coastal habitat areas, especially redwood forests (Johnstone and Dawson, 2009 and O'Brien et al. 2013)<sup>f</sup>.

Sensitivities and adaptive capacities are characterized by:

- **High cost of living** impacts the potential adaptive capacity of the community, and especially socially vulnerable populations, including seniors, low-income residents, agricultural workers, and unhoused individuals. Socially vulnerable populations who are exposed to multiple hazards might not be supported by social systems and often lack adaptive capacity.
- **Aging and undersized stormwater systems**, particularly in older neighborhoods, and even newer neighborhoods that may have deferred maintenance.
- **Limited redundancy** in utility services that are prone to closure from landslides, flooding, and wind.

<sup>f</sup> The future of coastal fog under climate change remains uncertain and a topic of continued research, however, researches at USGS have found a 33% reduction in terrestrial fog frequency since the early 20<sup>th</sup> century, and researchers at the University of Santa Cruz have projected a 12- 20 percent reduction in coastal fog by 2070.

- **Confined geographies and limited space** affecting where Highways and other systems can be rerouted.

These intersecting hazards and sensitivities result in the highest vulnerabilities in:

- **The water supply sector**, where the collection, storage, and distribution systems have an extremely high degree of exposure to climate change hazards including wildfire, landslides, and changes in precipitation, and the system is particularly sensitive due to limited redundancy and sensitivity to cascading hazards such as reduced snowpack.
- **Socially vulnerable groups**, who face compounding risks from a wide range of climate impacts and face systemic barriers to recovery.
- **Critical infrastructure and transportation corridors**, which include Highway 92, where damage or disruption can cascade through other systems and services and affect emergency response, communications, and economic stability.

Overall, vulnerability in Half Moon Bay is driven not just by exposure to climate hazards, but by the ways in which preexisting conditions—like outdated infrastructure, socioeconomic disparities, and geographic constraints—amplify risk and reduce resilience. In the following vulnerability assessment, a narrative with supporting tables and maps outlines the vulnerabilities to the City. In the subsequent chapter (Chapter 6. Adaptation Strategies), the vulnerabilities detailed here are used to inform a suite of adaptation strategies.

## Vulnerability Assessment Introduction

Half Moon Bay is already experiencing the effects of climate change, and these impacts are expected to intensify in the coming decades. Rising temperatures, prolonged droughts, increased wildfire risk, coastal erosion, flooding, and sea level rise threaten the City's residents, infrastructure, ecosystems, and economy. These hazards do not act in isolation; rather, they interact through cascading and compounding effects that can overwhelm systems and accelerate damage.

Local and regional infrastructure and utilities are critical for community function, and much of these assets and services are highly exposed to climate change and climate hazards, which is compounded by the Coastside's remote and rural nature. As mentioned in the section above, the City's water supply is highly vulnerable to climate change. This sector includes the imported water supply from the Tuolumne Watershed and the regional surface water supply from the local watersheds. Not only will climate change bring greater uncertainty in precipitation on which the water supply depends, but the pumping and conveyance infrastructure, which is located in and traverses rugged terrain, is highly exposed to wildfire, fluvial flood hazards, landslide and earth movement, and a range of cascading impacts including sedimentation and pollution burden. The Coastside County Water District (CCWD) has developed an Urban Water Management Plan (2021) that outlines the goals, strategies, and actions to address these vulnerabilities. CCWD's plan sets a vision for developing adaptive capacity, and the City has an opportunity to find alignment with and partner with this agency to ensure success for this vision.



Figure 9. Pilarcitos Reservoir, located north of Half Moon Bay within the San Francisco Peninsula watershed, a 23,000-acre protected area managed by the San Francisco Public Utilities Commission (Photo: Coastside Buzz)

Certain areas of the City face elevated risks from climate change hazards due to their geographic location and specific vulnerabilities. Many of the greenhouses are situated in areas prone to wildfires and landslides. Due to the nature of their operations, these businesses are particularly sensitive to changes in temperature and water availability, making them highly vulnerable to climate-related impacts. Half Moon Bay High School is also at risk, not only because of its physical location, but also because of the population it serves, which may be more susceptible to disruption caused by climate events. The former Half Moon Bay landfill, now owned and managed by San Mateo County, is another critical site of concern. Located near the coast at the end of Poplar Street, this 14-acre parcel is exposed to coastal wave action, increasing the risk of coastal erosion. Failure at this site could have serious consequences, potentially exposing humans and wildlife to buried waste and allowing contaminants to reach the Pacific Ocean. There is, however, some adaptive capacity at the landfill site. To address erosion risks, a cap has been constructed to help stabilize the bluff. In 2021, Anchor QEA conducted a comprehensive geotechnical assessment of the site. The evaluation included a range of bluff armoring alternatives and concluded with specific recommendations to further reduce erosion risk (Anchor QEA, 2021).



Figure 10. Former landfill and landfill cap, located at Poplar Beach (source: City of Half Moon Bay)

The sections below outline the hazards facing Half Moon Bay, along with the populations, assets, and services that are most sensitive to those hazards. The assessment highlights that while climate change presents risks citywide, certain sectors—such as water supply, stormwater infrastructure, transportation, and socially vulnerable populations—are particularly exposed due to their location, structural condition, or capacity to withstand trauma.

By identifying the areas of greatest vulnerability, this assessment provides the foundation for strategic planning, investment, and community engagement to reduce risk and build resilience. It is intended to inform not only climate adaptation strategies, but also land use decisions and infrastructure investments that will shape the future health and sustainability of Half Moon Bay. The vulnerability assessment and the problem statements helped support the selection of climate adaptation and resilience goals (outlined previously in Chapter 0), as well as the prioritization of adaptation strategies that can help increase community resilience (Chapter 6).

## Methodology

The vulnerability assessment focused on determining the threat of different types of hazards to different systems within the Half Moon Bay community. Vulnerability to climate change hazards is evaluated based on three main criteria: 1) exposure to hazards, 2) population, asset, or service sensitivity to hazards, and 3) the adaptive capacity of the population, asset, or service. The following sections outline the steps taken to perform the vulnerability assessment, including how hazards were characterized, how system-specific sensitivities were identified, and how vulnerability rankings were derived to prioritize areas of greatest concern.

## Climate Change Hazards

This Plan utilizes multiple standard data sources to assess and understand climate hazards for Half Moon Bay. To assess a full range of potential vulnerabilities, this Plan considers two standard scenarios<sup>9</sup>:

- A medium emissions scenario where global greenhouse gases peak in 2045 and then decline (also known as RCP 4.5), and
- A high emissions scenario where global emissions continue to rise through the end of the century unabated (also known as RCP 8.5)<sup>h</sup>

Critical data sets and climate hazard considerations for the Vulnerability Assessment include changes in precipitation, increased temperature, and drought stress.<sup>i</sup> These datasets provide a historic baseline from which to consider future conditions out to 2070 to 2099. Climate change scenarios analyzed in this study used localized (or downscaled) data from California's Fourth Climate Change Assessment to identify the ranges in both the magnitude and timing of climate-change-related impacts. These scenarios are used to develop climate stressors that impact relationships for the cascading impacts, problem statements, and hazard rankings. They are applied using professional judgment based on available data sources and climate planning practices as outlined in the 2020 California Adaptation Planning Guide (CalOES 2020). These processes helped account for uncertainty and support conservative planning assumptions when identifying vulnerabilities.

<sup>9</sup> CAP phase 1 covers emissions scenarios in more depth.

<sup>h</sup> The Intergovernmental Panel on Climate Change (IPCC) uses a range of global climate models (GCMs) to project future climate changes and related hazards. These GCMs are based on a range of relative concentration pathways (RCPs) that relate scenarios of development patterns with emission scenarios, and this study has evaluated both RCPs 4.5 and 8.5 to provide a range of future climate change scenarios. Note that the latest Sixth Assessment IPCC report uses CMIP6, which relies on SSPs (Shared Socioeconomic Pathways) rather than RCPs. SSPs encompass broader socioeconomic factors influencing climate change, providing a more holistic view of future scenarios. However, as most prior reports and most of the model data relies on CMIP5, this study has continued to use RCPs to maintain consistency.

<sup>i</sup> These data were sourced from CalAdapt ([cal-adapt.org](http://cal-adapt.org)), an online tool that presents historical and modeled projections based on 10 different global climate models that have been localized to 3.7-mile by 3.7-mile grids. These projections are forecasted to the end of the century (2070 to 2099) and are compared to a modeled historical baseline (1961 to 1990).

## Cascading Impacts

Climate hazards do not occur in isolation. Each one can set off a chain of secondary effects that ripple across systems and amplify overall risk. These cascading impacts occur when an initial stressor—such as a prolonged drought coupled with high winds—triggers additional hazards such as wildfire, which then leads to disruptions and impacts such as power outages, degraded air or water quality, or disruption to emergency/essential services. Because different sectors depend on interconnected systems, the same initial hazard may lead to different outcomes depending on where and how it occurs.

The vulnerability assessment considered cascading impacts unique to Half Moon Bay, and these relationships are illustrated in the network diagram in Figure 11, which links primary climate change drivers—increased heat, sea level rise, altered precipitation patterns (represented as the largest nodes)—to specific hazards and secondary impacts they can initiate. These hazards, in turn, have impacts on critical systems such as infrastructure, water supply, ecosystems, human health, and emergency services. Feedback loops can intensify these interactions; for example, wildfire is worsened by high heat and wind, which can further dry vegetation and increase local temperatures, reinforcing fire-prone conditions. This network diagram is an example of using a systems-based approach, which helps identify where risks may compound and where targeted resilience strategies can have the greatest effect. The idea of cascading impacts and interconnectedness is core to this document, and the links between climate stressors and potential impacts informed the development adaptation strategies that have impacts across vulnerabilities.

By way of illustration, certain stressors and hazards will have greater and further-reaching effects with more cascading impacts than others. The relative impact can be seen in Figure 11 as the greater number of linkages associated with wildfire than the number of linkages associated with reduced fog. While both hazards have significant impacts, the threat of wildfire is likely to have a greater impact on Half Moon Bay's systems than reduced fog.

How the chain of events may play out depends on community decisions and the community's ability to mitigate and adapt to climate change. As climate-related natural disasters become more frequent and intense, costs for disaster response and relief are anticipated to increase. This may create a financial burden on the community, which may affect some groups more than others, such as underserved communities and socially vulnerable populations. In addition, a loss of homes and businesses in fire- or flood-prone areas may reduce the City of Half Moon Bay's income from property and sales taxes. Climate change is also anticipated to impact public buildings, critical infrastructure, the transportation network, and community services, which may affect ratepayers directly, as well as impact the quality of service that the community expects. The cost of upkeep, mitigation measures, and recovery post-disaster could have significant impacts on the fiscal health of the City, County, and State. The anticipated financial burden reflects how initiative-taking measures and allocating resources and investment in climate change protection strategies now will function as insurance against the costliest impacts that are projected in this assessment.

# City of Half Moon Bay Climate Change Vulnerabilities *Cascading Impacts*

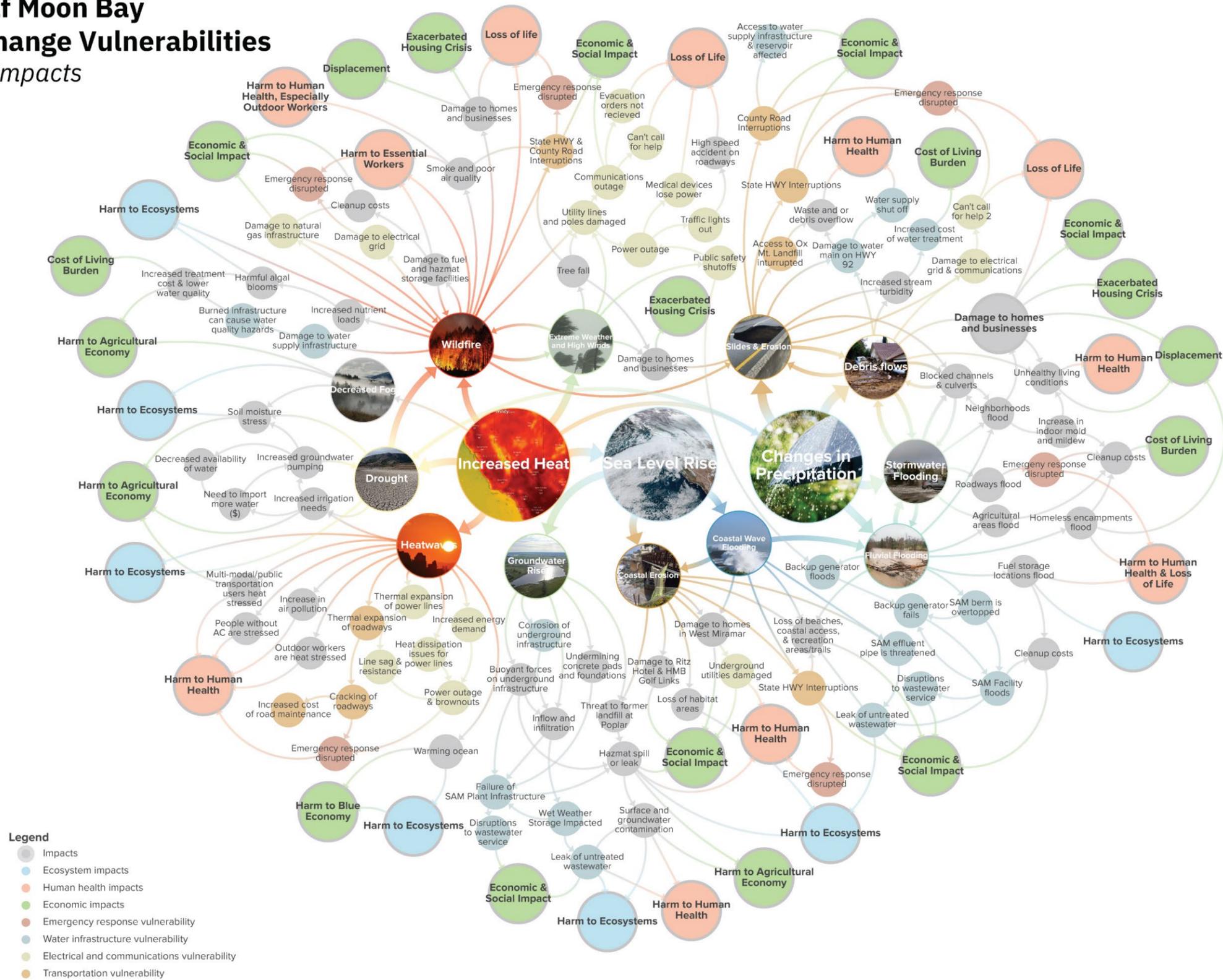


Figure 11. Primary climate change and environmental drivers with their associated cascading impacts that will likely affect social, economic, and life-sustaining systems.

## Hazards Considered

The hazards evaluated in this vulnerability assessment reflect the wide-ranging consequences of shifting environmental stressors and are depicted as secondary nodes in Figure 11 (see the medium-sized circles, e.g. Drought, Stormwater Flooding etc.). As summarized in Table 1, these hazards are grouped into three categories: Rising Temperatures and Changes in Precipitation (e.g., extreme heat, drought, wildfire, fluvial flooding); Sea Level Rise and Coastal Hazards (e.g., coastal wave flooding, cliff and dune erosion); and Escalating Climate Stressors and Secondary Effects (e.g., high-intensity winds, declining ocean health, and other systemic disruptions).

Table 1. Climate Change Hazards and Data Sets Evaluated in the Vulnerability Assessment (Data sets are noted in parentheses).

	<b>Rising Temperatures and Changes in Precipitation</b>	<ul style="list-style-type: none"> <li>• Increased Agricultural and Ecological <b>Drought</b> (<i>CalAdapt</i>)</li> <li>• Increased <b>Extreme Heat</b> (<i>CalAdapt</i>)</li> <li>• Increased <b>Fire Weather</b> and <b>Wildfire</b> Threat (<i>CalAdapt and CAL FIRE</i>)</li> <li>• <b>Stormwater Flooding</b> and <b>Fluvial Flooding</b> (<i>FEMA and Other Studies</i>)</li> <li>• Increase in <b>Landslides, Debris Flow, and Terrestrial Erosion</b> (<i>CGS</i>)</li> </ul>
	<b>Sea Level Rise and Coastal Hazards</b>	<ul style="list-style-type: none"> <li>• Increase in <b>Coastal Wave Flooding</b> (<i>USGS, FEMA</i>)</li> <li>• Increase in <b>Coastal Erosion</b>, both <b>Dune</b> and <b>Cliff</b> (<i>USGS, Pacific Institute, and Integral Consulting's Miramontes Point Study</i>)</li> <li>• <b>Emerging Groundwater</b> and <b>Saltwater Intrusion</b> (<i>USGS</i>)</li> </ul>
	<b>Escalating Climate Stressors and Secondary Effects</b>	<ul style="list-style-type: none"> <li>• <b>Decreased fog</b> (<i>USGS Pacific Coastal Fog Project</i>)</li> <li>• Increase in <b>High Intensity Winds</b> and <b>Extreme Weather</b></li> <li>• Reduced <b>Air Quality</b> and Increase in <b>Smoke</b></li> <li>• Reduced <b>Ocean Health</b> including Warming, Acidity, Changes in Upwelling, and Increased Contamination</li> <li>• Increased <b>Pollution Burden</b> including <b>Contaminants</b> and <b>Silt</b></li> <li>• Changes to <b>Biodiversity, Ecosystems</b> and an <b>Increase in Pests</b></li> </ul>

## Sector Descriptions and Data Sources

Hazards were assessed for Half Moon Bay's social, economic, natural, and built systems, which were organized into community sectors. Community sectors comprised different elements such as key populations, assets, and services. Some of these elements have management structures such as City of Half Moon Bay, the County of San Mateo, the State of California, PG&E, or the CCWD, and when applicable, those entities are noted in the vulnerability assessment tables (Tables 2–8).

In conversation with City staff, the community sectors included sensitive populations; sensitive structures; areas of natural, cultural, economic and social importance; and key infrastructure systems and critical public services. These sectors are detailed below.

**Socially vulnerable populations** include sensitive community groups and rely on data collected by the American Community Survey (ACS). These populations were mapped by neighborhood and indicate areas with a higher percentage of Fixed Income, Low Income, Renters, Linguistically Isolated, Small Business Owners, Service

Industry Workers, Agricultural Workers, Children (under 5), Seniors (65+), Unhoused or Housing Insecure, Climate Refugees, Disabled, Low Resourced People of Color, Visitors, Residents of Mobile Home Parks, Unemployed, and Persons without High School Diplomas.

**Homes and businesses** include most structures in the City, with building footprints sourced from Microsoft Building Footprints in 2024. These were organized by place, with neighborhoods grouped by North Coastal, North Inland, North Central Coastal, North Central Inland, South Central Coastal, Downtown and 92 Corridor, South Coastal, and South Inland.

**Transportation** includes state roads, local roads, and public transportation. Transportation data were sourced from OpenStreetMap and the County of San Mateo. This sector does not include active transportation infrastructure such as the California Coastal Trail; this asset has been included in the 'Parks, beaches, and open space' sector analysis.

**Parks, beaches, and open space** include all natural and managed parks and open space areas, including active recreation trails. Open space data were sourced from the California Protected Areas Database. These include the following:

- **Natural assets:** California state beaches and campgrounds.
- **Active transportation and recreation:** California Coastal Trail, East Side Parallel Trail and Naomi Partridge Trail.
- **City parks and other recreation facilities:** John L. Carter Memorial Park, Kitty Fernandez Park, Frenchmans Creek Park, Ocean View Park, Smith Field, Oak Avenue Park, Mac Dutra Park, Main Street Park Playground, Moonridge Playground, Skate Park, and Kehoe Park.
- **City beaches:** Cañada Verde/Manhattan Beach, Redondo Beach, Poplar Beach, Surfers Beach.

**Economy, business sector, workforce** includes the tourist economy, agricultural economy, blue economy/ocean economy, construction workforce, office and institutional workforce, transportation workforce, and service workforce. Due to the highly distributed nature of the businesses and the workforce, this category was not mapped.

**Utilities and public services** include the critical public services upon which the community depends. These services were further subdivided between regional and local public services. Due to the locational sensitivity of these assets, they were not mapped in the assessment.

**Regional utilities and services** include the following:

- **Energy:** Lines and substation, managed by PG&E.
- **Communications and internet:** Lines, towers, and underground utilities, managed by AT&T, Verizon, and others.
- **Wastewater:** Treatment plant, lines, tanks, pumps stations, outfall, managed by SAM, City of Half Moon Bay, the Granada Community Services District, and Montara Sanitary District.
- **Water supply:** Regional and local water supply, lines, pump stations, storage tanks, managed by the CCWD and SFPUD.
- **Emergency response:** Fire and police services, managed by the San Mateo County Sheriff's Office and the Coastside Fire Protection District.

**Locally Managed Infrastructure and Facilities** include the stormwater drainage system, outfalls, the corporate yard, schools, and other public buildings.

## Assessment Method

Vulnerability to climate change hazards was evaluated using a vulnerability score, which encompasses a hazard ranking as well as the sensitivity and the current adaptive capacity of a population, asset, or service. A figure illustrating this relationship is provided in Figure 12.

### Hazard Ranking

The hazard ranking reflects how much a specific threat—like flooding or heat—might affect different parts of the community. The ranking is based on two main ideas: how likely the hazard is now and, in the future (**timing**), and how widespread or intense the impact could be (**exposure**). Timing came from future climate projections described in CalAdapt and from the Phase 1 CAP, and exposure was informed through evaluation of spatially explicit hazard zones and evaluation of the Cascading Impacts network diagram (Figure 11). Every sector has specific elements with varying hazard timings and exposures, and these were quantified using a simple high, medium, or low scale, where:

- **Low** signifies that community members may not notice much change, or the damage and interruptions may be minor. Generally, this included hazards that are expected to be less severe in the near- to mid-term (out to 2050).
- **Medium** signifies noticeable impacts to the community with corresponding impact to the quality of life. Damage, service interruptions, and other impacts are expected.
- **High** signifies that the well-being of the community declines significantly, and buildings, infrastructure, and services will not function as intended or meet community demand. These hazards are also associated with a severe risk of injury or death to people or of significant or total ecosystem loss. Generally, this includes hazards that are expected to be more severe in the near-to mid-term (out to 2050).

For each hazard category (rising temperatures and changes in precipitation, sea level rise and coastal hazards, escalating climate stressors and secondary effects), individual hazards were cumulated to create a category hazard ranking. These rankings were then weighted and cumulated to create the overall hazard rankings.

### Sensitivity

Sensitivity is the degree to which the sector element would be affected by exposure to a hazard. It is informed by preexisting conditions, which might increase the level of sensitivity. There are many ways sensitivity can be defined for each sector element, depending on whether the sector element is a population, an asset, or a service. In general, a sector element that is highly sensitive may lose its primary function or experience severe disruptions if exposed to any degree of hazard. If a sector element will lose only part of its function, it is considered moderately sensitive, and if a sector element can maintain its primary function(s) during exposure, it is defined as low sensitivity.

### Current Adaptive Capacity

Current adaptive capacity refers to the sector element's ability to function during or recover quickly from any temporary impact (either with no or very little intervention), as well as its ability to adapt to potential impacts or changes resulting from climate hazards. An example of high adaptive capacity would be a facility with backup generators, emergency plans, or an ability to move its primary functions to less hazardous locations. A sector element with a low adaptive capacity would be one that does not have any plans in place, or is unable to maintain or quickly restore operations or functionality following hazard impacts. Barriers that affect adaptive capacity include costs or other resource constraints, lack of available space for relocation, restricted access to technological and other resources, lack of support from decision-makers, and limited access to alternatives that meet the same level of service.

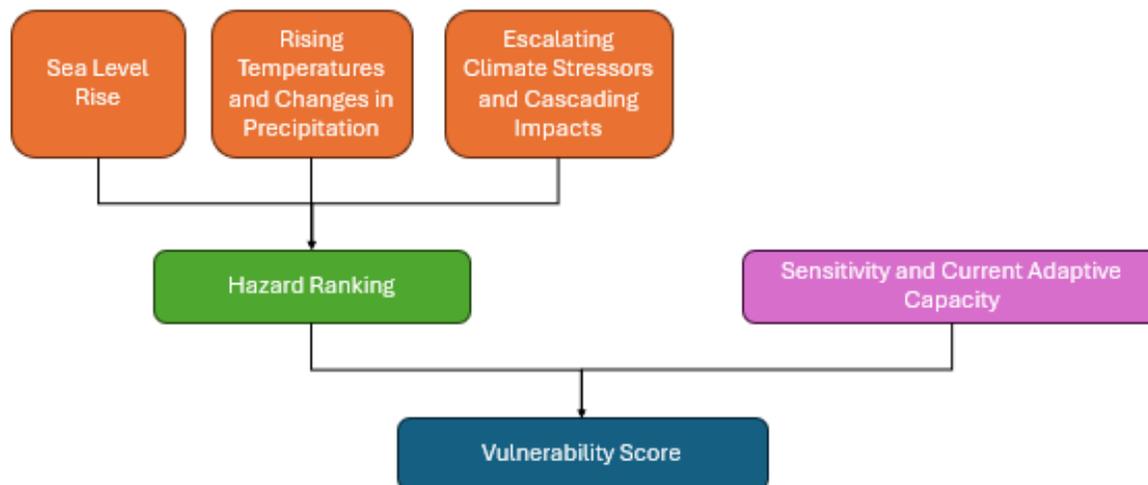


Figure 12. Factors considered in the vulnerability assessment

The vulnerability score is made up of the hazard ranking, sensitivity capacity score, and adaptive capacity score for each sector element. The vulnerability score represents the degree of urgency associated with the level of climate change risk for each element. For example, consider unhoused or housing-insecure individuals (see the first row of Table 2 on pg. 3737), a subgroup within the socially vulnerable populations. This group faces very high exposure to hazards related to rising temperatures and changes in precipitation, and high exposure to escalating climate stressors and cascading impacts. However, because unhoused individuals do not have fixed housing locations, their general exposure to sea level rise hazards is low. These factors together result in a high overall hazard ranking. Due to this population's limited resources, higher rates of chronic health conditions, and other societal barriers, this population also has low adaptive capacity and high sensitivity, leading to a very high sensitivity ranking. When combined, these elements result in a very high overall vulnerability.

## Data Limitations and Disclaimer

There are inherent limitations and uncertainties in the vulnerability assessment analysis that stem from gaps in the data, as well as difficulties in summarizing complex systems. One example of a data gap can be found in the ACS from the U.S. Census Bureau, which often overlooks certain segments of the community (e.g., homeless populations, undocumented immigrants). The spatial aggregation method at the census block group level may hide small population groups or localized differences in populations within the block group.<sup>1</sup> In addition, the hazards data may have gaps or significant uncertainty when projecting changes in future time horizons. For instance, the Federal Emergency Management Agency (FEMA) 100-year flood zone was not available for some portions of Pilarcitos Creek and was supplemented with model data from separate studies. The California Department of Forestry and Fire Protection (CAL FIRE) Fire Hazard Severity Zones also have significant uncertainty, as the zones are based on existing vegetation, land use, fire history, and terrain, but cannot account for the wide range of potential future states, and uncertainties extend to natural system responses that are difficult to project with confidence. For instance, potential shifts in coastal fog patterns, groundwater behavior, and vegetation dynamics may significantly influence local ecosystems and long-term climate impacts but remain only partially understood due to limited localized data and monitoring.

<sup>1</sup> This is partly done because of the ACS sample sizes, i.e. it wouldn't be reliable at lower scales even if it were available.

## Results

The results of the vulnerability assessment are divided into two sections. The first consists of a vulnerability assessment narrative and tables, and the second section consists of maps.

### Sector Narratives and Vulnerability Tables

#### Socially Vulnerable Populations

Socially vulnerable groups in Half Moon Bay include, but are not limited to, seniors, children, mobile home residents, individuals with health sensitivities or mobility limitations, racially marginalized groups, individuals facing language isolation, and low-income community members. These populations are presented first in the sectoral vulnerability assessment to emphasize their importance. Unlike community assets and services, where physical damage and losses from climate hazards can often be quantified and repaired, harm to people is not easily monetized. While structures and utilities support quality of life, they can be rebuilt or restored. For socially vulnerable groups, the consequences of hazard exposure can be lasting, compounding, and far-reaching.

Almost all socially vulnerable groups (except for tourists) received very high vulnerability rankings due to the combination of high exposure and sensitivity. The reason tourists did not have this high vulnerability is due to their very low sensitivity (i.e., they are only visiting Half Moon Bay and can more easily leave or avoid traveling to Half Moon Bay during a climate hazard, and also do not have their homes or businesses located in Half Moon Bay).

#### Hazard Ranking

Among all climate-related hazards, extreme heat, wildfire, and air quality degradation pose the greatest threats to socially vulnerable groups due to their widespread exposure and increasing timing (likelihood and frequency of occurrence). These hazards are already affecting the region and are projected to worsen with climate change. Socially vulnerable groups are often exposed to these hazards at higher rates because of where they live or work. For example, Half Moon Bay has a substantial number of outdoor workers, many in agriculture, who are already being exposed to higher temperatures and poor air quality with limited current adaptive capacity.

During the July 2023 heat wave in California, agricultural workers experienced increased risks of heat-related illnesses and reduced work hours. While this event was less severe along the Coastside, in inland communities, the severity of the heat prompted the issuance of a high-heat hazard alert. In response, the Biden administration called on the Occupational Safety and Health Administration (OSHA) to develop a federal heat safety standard to protect outdoor workers (U.S. Department of Labor 2024).

#### Sensitivity and Current Adaptive Capacity

Socially vulnerable populations are highly **sensitive** to climate hazards because of preexisting social, economic, and health conditions. Sensitivity varies depending on whether the population is defined by age, income, health, housing, or other factors:

- **Age** is one of the most acute drivers of sensitivity. Half Moon Bay's population has aged significantly over the past three decades. Between 1990 and 2017, the proportion of children (ages 0–17) declined from 24.1% to 18.8%, while adults aged 65 and older increased from 9.6% to nearly 21% (City of Half Moon Bay 2021). This aging trend matters because older adults are more vulnerable to health impacts from heat and wildfire smoke, particularly those with preexisting respiratory or cardiovascular conditions.
- **Health conditions** such as asthma or cardiovascular disease increase sensitivity, especially for outdoor workers who are chronically exposed to poor air quality and high heat.
- **Occupational exposure** compounds sensitivity. Agricultural workers, already exposed to extreme outdoor conditions, often live in housing that lacks insulation or structural protection from the elements. The October 2020 heat wave in Half Moon Bay revealed how these vulnerabilities translate into real impact—reduced work hours, greater illness risk, and amplified public concern.

- **Housing insecurity** also amplifies sensitivity. Homeless populations often reside in exposed areas—under bridges, along creeks, or near wildland-urban interfaces—where hazard exposure is highest. For example, during the January 2023 flooding of Pilarcitos Creek, an encampment near Strawflower Plaza was inundated, putting residents at risk and posing secondary threats to water quality, ecosystems, and public health. Debris from the site was washed downstream, a stark visual of how vulnerability and hazard exposure intersect (Figure 13).



Figure 13. Debris from a homeless encampment that has been washed downriver along Pilarcitos Creek (source: Integral Consulting)

- **Mobile home parks** are particularly sensitive due to their structural characteristics. Cañada Cove Mobile Home Park, the largest in the City, is located at the southern end of town and houses a significant number of highly-sensitive residents. Mobile homes may be less resilient to flooding, high winds, and heat due to construction materials, lack of insulation, and limited ability to be retrofitted or reinforced.
- **Limited affordable housing** options, which force people into higher-risk locations or substandard structures.
- **Limited public transportation** and mobility barriers, especially for seniors or those with disabilities.
- **High cost of living** in coastal communities, which limits financial flexibility during emergencies.
- **Language isolation**, which can prevent residents from receiving or acting on emergency communications.
- **Racial inequities** and **historical disenfranchisement**, which affect access to public services, trust in government, and representation in planning decisions.
- **Limited access to health insurance** and **high cost of utilities**, which create financial stress during and after hazard events.
- **Homelessness** is a particularly stark example of low adaptive capacity. When disaster strikes, those without housing have limited ability to find safe shelter or relocate. Discrimination or stigma may further reduce access to public recovery resources. During floods, encampments are not only physically threatened but also excluded from most emergency response systems.

### Geographic Distribution of Vulnerability

While socially vulnerable populations live throughout Half Moon Bay, certain areas are disproportionately affected, as illustrated in Table 2. Spatial analysis using data from the San Francisco Bay Conservation and Development Commission (BCDC), based on the U.S. Census ACS, identifies the area south of Kelly Avenue to Main Street and Highway 1—roughly downtown—as having the highest concentration of underserved residents (Figure 32). These include individuals who are very low-income, disabled, elderly, or living alone. Although this area is relatively close to public services such as the Half Moon Bay Library, the Ted Adcock Community Center, schools, and San Mateo County health offices, proximity does not guarantee access, especially when linguistic, financial, or cultural barriers are present.

Some vulnerable communities are not well-captured in this data. For example, mobile home parks can contain a large share of residents with heightened exposure and limited options for recovery. Because the U.S. Census does not always clearly reflect conditions in manufactured housing communities, targeted outreach and tailored resilience planning are essential for these groups.

Table 2. Vulnerability assessment for **Socially Vulnerable Populations**. Each row is a sector element. The weighted hazard ranking is a combined score of the timing and exposure for hazards in three hazard categories (sea level rise, rising temperatures and changes in precipitation, and escalating climate stressors and cascading impacts). The sensitivity ranking takes into account any preexisting conditions and the current adaptive capacity of each sector element. The vulnerability ranking is a combination of the sensitivity and weighted hazard ranking. Results are given one of five possible rankings: very low, low, moderate, high, or very high.

<b>Socially Vulnerable Populations</b>	<i>Sea Level Rise Ranking</i>	<i>Rising Temperatures and Changes in Precipitation Ranking</i>	<i>Escalating Climate Stressors and Cascading Impacts Ranking</i>	<b>Weighted Hazard Ranking</b>	<b>Sensitivity Ranking</b>	<b>Vulnerability Ranking</b>
Unhoused or Housing Insecure	Low	Very High	High	High	Very High	Very High
Agricultural Workers	Low	High	High	High	Very High	Very High
Disabled	Low	High	Moderate	High	Very High	Very High
Seniors (65+)	Low	Moderate	Moderate	High	Very High	Very High
Children (under 5)	Low	Moderate	Moderate	High	Very High	Very High
Residents of Mobile Home Parks	Low	High	Low	High	High	High
Low Resources People of Color	Low	High	Low	Moderate	High	High
Low Income	Low	Moderate	Low	Moderate	High	High
Fixed Income	Low	Moderate	Low	Moderate	High	High
Linguistically Isolated	Low	Moderate	Low	Moderate	High	High
Unemployed	Low	Moderate	Low	Moderate	High	High
Renters	Low	High	Low	Moderate	High	High
Climate Refugees <sup>k</sup>	Low	Low	Low	Low	High	Moderate
Service Industry Workers	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Persons without HS Degree	Low	Moderate	Low	Moderate	Moderate	Moderate
Small Business Owners	Low	Moderate	Low	Moderate	Low	Moderate
Visitors	Moderate	Moderate	Low	Moderate	Very Low	Low

<sup>k</sup> Climate refugees are defined as people escaping inland areas during the summer months

## Homes, Businesses and Neighborhood Areas

The homes, businesses, and other structures of Half Moon Bay are highly vulnerable to a range of climate-related hazards, including wildfire, riverine and stormwater flooding, landslides, coastal erosion, and extreme wind events. Older structures, rental units, and areas with older and undersized infrastructure were identified as the most imminent sensitivities. Adaptive capacity is related to a variety of factors, including the availability of insurance, ownership status of the structure, permitting, and building code compliance. Assessing these risks and fully understanding existing adaptive capacity is essential for guiding land use decisions, updating building codes, and prioritizing capital improvement planning.

CAL FIRE’s 2025 Fire Hazard Severity Zone (FHSZ) update shows several neighborhoods previously considered lower hazard are now classified in higher hazard categories. Areas of highest hazard, once limited to the Highway 92 Corridor and the north inland area, now extend across more of the eastern half of the city along Highway 1, with the south coastal area newly designated as a moderate fire hazard.

These designations reflect fire hazard, the long-term physical conditions that influence wildfire behavior over a 30 to 50-year period, not risk, which accounts for existing development and mitigation measures (CAL FIRE and OSFM 2025). The Highway 92 Corridor remains particularly vulnerable due to its inland river valley setting, where steep slopes and dense development increase exposure to wildfire as well as landslides, debris flows, and flooding.

### Hazards

Several key hazards pose immediate and growing threats to the built environment in Half Moon Bay:

- **Wildfire** threat is expected to escalate and increase in severity as the climate warms and dry fuels accumulate. Fires can cause direct structural damage, destroy critical infrastructure, and leave communities without power or communication. Exposure is higher in inland neighborhoods east of Highway 1, where nearby vegetation and less defensible space contribute to structural vulnerability. The north, central, and south inland areas, and the downtown and 92 corridor sections of the city are primarily in High and Very High Fire Hazard Severity Zones designated by CAL FIRE (Figure 14).

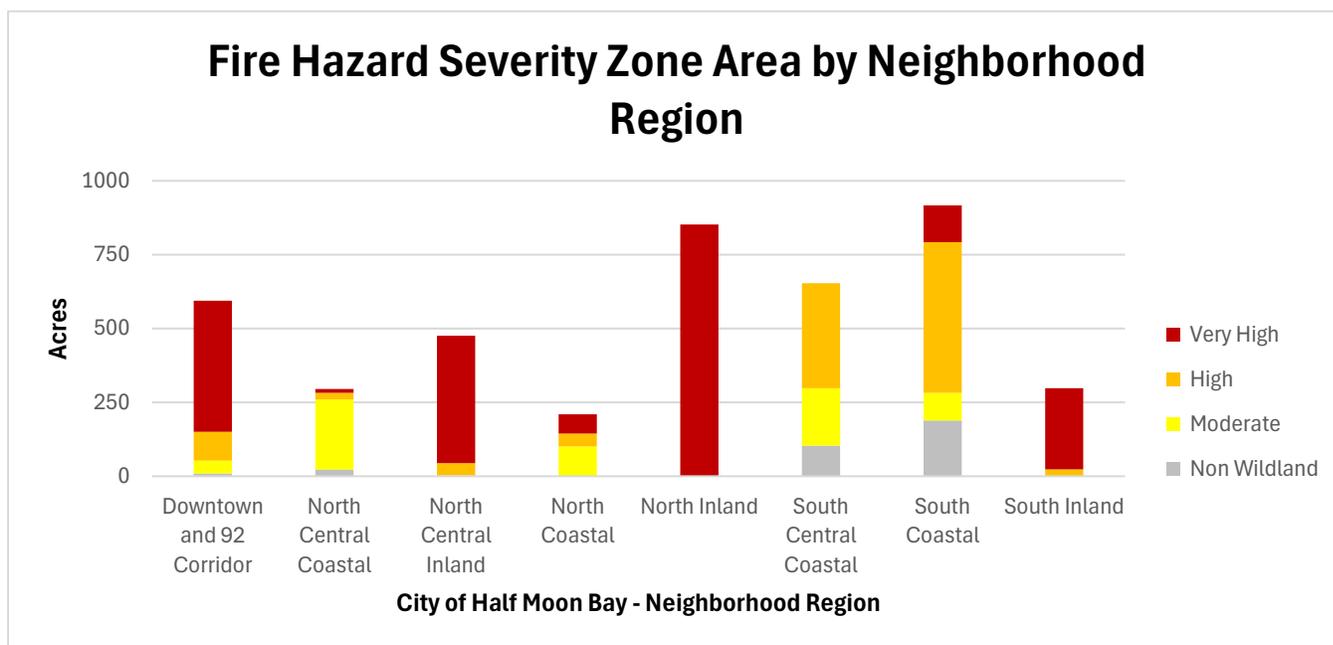


Figure 14. Fire hazard severity zones by neighborhood group, highlight areas of intrinsic, long-term wildfire hazard (not risk) in Half Moon Bay, demonstrating that inland areas east of Highway 1 and the

Downtown/Highway 92 Corridor are categorized as High and Very High Fire Hazard Severity Zones based on underlying vegetation, terrain, and climate patterns.( CAL FIRE and OSFM 2025)

- **Riverine flooding** results from intense rainfall that overwhelms creeks and streams, causing water to overtop banks and flow into developed areas. These floodwaters can carry debris, erode foundations, and cause waterlogging of structural materials, leading to long-term building damage.
- **Stormwater flooding** occurs when local drainage infrastructure is unable to handle high volumes of runoff, especially during back-to-back storms or when culverts and drains are blocked. Flooded streets can limit emergency access, damage homes and vehicles, and shut down businesses. Infrastructure in low-lying areas are especially vulnerable to stormwater flooding, including structures near Pilarcitos Creek, Arroyo Leon, Pullman Waterway, Kehoe Waterway, and Frenchmans Creek. Downtown Half Moon Bay and the commercial corridor near Highway 1, including Strawflower Plaza, which experienced flooding in January 2023, demonstrate existing hazard exposure in these areas. Residential neighborhoods such as Miramar can also experience flooding when drainage ditches are overwhelmed by runoff from the surrounding watershed.
- **Coastal erosion and storm surge** are driven by wave action and sea level rise, undermining shoreline infrastructure including roads and buildings. These events may occur episodically during king tides or major storms, but they are projected to increase in frequency and intensity over time with climate change and sea level rise. The loss of protective coastal features can accelerate inland flooding and infrastructure failure. West Miramar, where homes are located near eroding bluffs, is particularly vulnerable to coastal hazards, with single-family homes and condominiums potentially being exposed by 2100 or earlier.
- **Extreme wind events** often accompany winter storms and pose risks to buildings, utilities, and transportation systems due to falling trees, which can damage roofs, block roads, and knock out power lines. These events are especially severe in fall and winter when trees still have leaves and are weighed down by precipitation. While local projections of future wind intensity remain uncertain, anecdotal and observed storm impacts suggest that such events are a growing concern for the community. Areas along the Highway 92 corridor and areas with older trees, such as El Granada, have a higher vulnerability and have already been impacted, as seen in Figure 15.



Figure 15. Tree down over a house in El Granada (source: CAL FIRE Santa Cruz Unit)

These various hazards have cascading impacts. For instance, wildfire may be followed by landslides which are exacerbated by the charred landscape and lack of vegetation, flooding and erosion can expose hazardous waste, and power outages from wind or fire can disrupt communication and emergency services. Compound events—such as a flood during a high-wind storm can intensify damage, complicate response, and prolong recovery times.

### Sensitivity

The sensitivity of Half Moon Bay's buildings to climate hazards varies across the City and is influenced by location, topography, construction type, and the performance of surrounding infrastructure. Several areas of the City are more exposed due to these factors:

- **Limited drainage capacity** leads to higher stormwater, and flood sensitivity occurs in neighborhoods with limited drainage capacity and other pre-existing conditions. Moonridge, Kehoe, Casa Del Mar, and portions of Kelly Avenue west of downtown often experience surface flooding during heavy rainfall, leading to property damage and access issues, which can be seen in Figure 16 and Figure 17.
- **Older infrastructure** including older roofs, single-pane windows, and insufficient insulation make these structures more vulnerable to wind, heat, and moisture damage. In some cases, electrical systems and power lines are aboveground, increasing exposure to outages and fire risk during storms or wildfires.



Figure 16. Flooding at Oak Avenue Park (source: City of Half Moon Bay)



Figure 17. Flooding off Kelly Avenue (source: City of Half Moon Bay)

Table 3. Vulnerability assessment for **Homes, Businesses and Neighborhood Areas**. Each row is a sector element. The weighted hazard ranking is a combined score of the timing and exposure for hazards in three hazard categories (sea level rise, rising temperatures and changes in precipitation, and escalating climate stressors and cascading impacts). The sensitivity ranking takes into account any preexisting conditions and the current adaptive capacity of each sector element. The vulnerability ranking is a combination of the sensitivity and weighted hazard ranking. Results are given one of five possible rankings: very low, low, moderate, high, or very high.

<b>Home, Business, or Neighborhood Area</b>	<b>Neighborhood Grouping</b>	<i>Sea Level Rise Ranking</i>	<i>Rising Temperatures and Changes in Precipitation Ranking</i>	<i>Escalating Climate Stressors and Cascading Impacts Ranking</i>	<b>Weighted Hazard Ranking</b>	<b>Sensitivity Ranking</b>	<b>Vulnerability Ranking</b>
92 Corridor	<b>Downtown and 92 Corridor</b>	Low	High	Low	Moderate	Very High	Very High
Rocket Farms Greenhouse	<b>North Inland</b>	Low	High	Low	High	Moderate	High
Former Landfill Site at Poplar St	<b>South Central Coastal</b>	Moderate	Low	Low	Low	High	High
Johnston House	<b>South Inland</b>	Low	Low	Low	Low	High	High
Highway 1 and 92 Gas Stations & Businesses	<b>Downtown and 92 Corridor</b>	Low	Low	Low	Low	High	High
Heritage Downtown	<b>Downtown and 92 Corridor</b>	Low	Low	Low	Low	High	High
West Miramar	<b>North Coastal</b>	Very High	Low	Low	Moderate	Moderate	Moderate
Moonridge	<b>South Inland</b>	Low	Moderate	Low	Moderate	Moderate	Moderate
Greenhouses	<b>South Inland</b>	Low	Moderate	Low	Moderate	Moderate	Moderate
Cypress Cove	<b>Downtown and 92 Corridor</b>	Low	Moderate	Low	Moderate	Moderate	Moderate
Strawflower Village Plaza	<b>North Central Coastal</b>	Low	Moderate	Low	Moderate	Moderate	Moderate
Hilltop Mobile Home Park	<b>Downtown and 92 Corridor</b>	Low	Moderate	Low	Moderate	Moderate	Moderate
North Coast Extension to Harbor	<b>North Coastal</b>	Very High	Low	Low	Moderate	Moderate	Moderate
Belleville	<b>North Central Coastal</b>	Low	Low	Low	Low	Moderate	Moderate
Canada Cove (Accent Homes)	<b>South Coastal</b>	Low	Low	Low	Low	Moderate	Moderate
Casa Del Mar	<b>North Central Coastal</b>	Low	Low	Low	Low	Moderate	Moderate
South Downtown and Senior Campus	<b>Downtown and 92 Corridor</b>	Low	Low	Low	Low	Moderate	Moderate
North Downtown	<b>Downtown and 92 Corridor</b>	Low	Low	Low	Low	Moderate	Moderate
Main Street Park	<b>Downtown and 92 Corridor</b>	Low	Low	Low	Low	Moderate	Moderate
Frenchmans Creek Neighborhood	<b>North Inland</b>	Low	Moderate	Low	Moderate	Low	Moderate
Upper Roosevelt and Pullman Watersheds	<b>North Inland</b>	Low	Moderate	Low	Moderate	Low	Moderate
Sea Haven and Spindrifft	<b>North Central Inland</b>	Low	Moderate	Low	Moderate	Low	Moderate
Pilarcitos Park	<b>South Central Coastal</b>	Low	Moderate	Low	Moderate	Low	Moderate
Glencree Open Space Area	<b>North Central Coastal</b>	Low	Moderate	Low	Low	Low	Low
Grandview	<b>North Central Inland</b>	Low	Moderate	Low	Low	Low	Low
Beachwood Open Space Area	<b>North Central Inland</b>	Low	Moderate	Low	Low	Low	Low
Highland Park and Terrace	<b>North Central Inland</b>	Low	Moderate	Low	Low	Low	Low
Half Moon Bay RV Park	<b>South Coastal</b>	Low	Low	Low	Low	Low	Low

<b>Home, Business, or Neighborhood Area</b>	<b>Neighborhood Grouping</b>	<i>Sea Level Rise Ranking</i>	<i>Rising Temperatures and Changes in Precipitation Ranking</i>	<i>Escalating Climate Stressors and Cascading Impacts Ranking</i>	<b>Weighted Hazard Ranking</b>	<b>Sensitivity Ranking</b>	<b>Vulnerability Ranking</b>
Wavecrest Open Space and Smith Field Park	South Coastal	Low	Low	Low	Low	Low	Low
Ritz-Carlton Hotel	South Coastal	Moderate	Low	Low	Low	Low	Low
Alsace Loraine	South Central Coastal	Low	Low	Low	Low	Low	Low
Arleta Park	South Central Coastal	Low	Low	Low	Low	Low	Low
Half Moon Bay Golf Links	South Coastal	Moderate	High	Moderate	Moderate	Very Low	Low
Ocean Colony	South Coastal	Low	Low	Low	Low	Low	Low
Oceanview Driving Range	South Central Coastal	Low	Low	Low	Low	Very Low	Low

## Transportation

This sector includes all roadways within the City and includes transportation-related infrastructure and public services such as the Caltrans Corporation Yard.<sup>1</sup> Roadways are managed by different entities in the City, with local roads managed by the City's Public Works Department, and state roads including Highways 1 and 92 managed by Caltrans, the California Department of Transportation. While these state-managed roads are critical to the City's transportation network, the City does not have direct control over their maintenance or long-term planning. As such, the focus of City actions in this sector will center on City-owned roads. Additionally, the City can play a key role in coordination, communication, and disaster response planning, particularly where state-managed roads are essential to emergency access and evacuation.

The most vulnerable transportation element is Highway 92, which has a high vulnerability ranking due to its highly sensitive nature, being confined to a narrow river valley and rugged mountain pass.

### Hazard Ranking

Among transportation assets, Highway 92 and portions of Highway 1 rank highest in terms of hazard exposure. These regional roads are vulnerable to a combination of coastal and terrestrial hazards, including flooding, cliff erosion, landslides, and high winds. Due to their critical role in regional connectivity, disruptions along these corridors have citywide implications for mobility, public safety, commerce, and access to services.

- **Coastal Flooding:** Highway 1, north of the city near Surfers Beach, is directly exposed to wave overtopping and seasonal flooding during storm events. Overtopping and ponding of seawater can render the road impassable and contribute to long-term deterioration of the roadway.

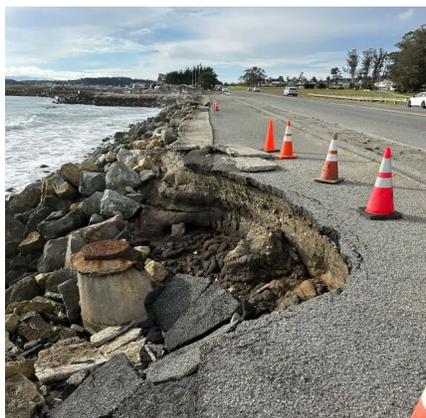


Figure 18. Erosion of the walkway and wave overtopping at Surfers Beach (left), waves crashing and overtopping Surfers Beach (right) (sources: City of Half Moon Bay and jamydonaldson)

- **Cliff Erosion:** Erosion poses an ongoing threat along Highway 1. North of the city, between Montara and the Tom Lantos Tunnel at Devil's Slide, erosion affects long stretches of coastal roadway. South of the city, erosion near Tunitas Creek Beach and Pescadero State Beach has led to emergency mitigation measures, including realignments within the right-of-way and shoreline armoring.

<sup>1</sup> However, the City's Public Works Corps Yard is included in local infrastructure and facilities sector to maintain sector cohesion.



Figure 19. Slumping and erosion on Highway 1 near Pescadero (source: Coastside Buzz)

- **Flooding:** Highway 92 passes through low-lying areas along Pilarcitos Creek, where creekside flooding threatens both the roadway and nearby homes and tourism-oriented businesses.



Figure 20. Flooding of businesses and Highway 92 (source: Coastside Buzz)

- **High winds:** High wind events along Highway 92 often cause tree falls and downed power lines, prompting lane closures and traffic delays during storms.
- **Landslides and ground movement:** In 2023, a sinkhole developed along Highway 92 due to a Caltrans culvert failure, closing the road in both directions and highlighting the corridor's vulnerability to subsurface failures.



Figure 21. Sinkhole along Highway 92 (Source KTVU Fox)

Alternate east–west routes, such as Highway 84, offer limited redundancy, and were themselves closed for extended periods in 2023 due to landslides, tree fall, and fire risk.

### Sensitivity

Sensitivity in the transportation sector is driven by structural and design limitations that make roads more likely to experience damage or prolonged closures when exposed to hazards. Key contributing factors include:

- **Limited structural redundancy**, where few alternate routes exist and detours are long or hazard-prone
- **Aging pavement, drainage systems, and retaining infrastructure**, which is more prone to failure under stress
- **Constrained rights-of-way** that limit realignment and repair options and complicate emergency response
- **Undersized or outdated stormwater systems**, which contribute to roadbed saturation and erosion
- **Critical choke points**, where a single disruption, such as at an intersection, bridge, or tunnel, can block access to or from the wider network

These characteristics increase sensitivity along the following key corridors:

- **Highway 92** regularly experiences closures due to fallen trees, drainage issues, and ground movement/slope instability. Its steep terrain, narrow roadway, and aging infrastructure leave it prone to long-duration outages, as seen in the 2023 sinkhole event, which closed the road in both directions.
- **Highway 1** is sensitive in confined low-lying areas near the coast and along steep cliffsides. This includes segments near Surfers Beach, Devil’s Slide, and Pescadero.
- The **Tom Lantos Tunnel** serves as a critical pinch point. Disruptions here affect the entire regional connectivity north of the city, with few alternative routes available.

These sensitivities amplify the impacts of coastal erosion, flooding, and storm events, often resulting in full closures, and limited access for residents, businesses, and emergency responders.

Table 4. Vulnerability assessment table for **Transportation** thoroughfares and features at risk. Each row is a sector element. The weighted hazard ranking is a combined score of the timing and exposure for hazards in three hazard categories (sea level rise, rising temperatures and changes in precipitation, and escalating climate stressors and cascading impacts). The sensitivity ranking takes into account any preexisting conditions and the current adaptive capacity of each sector element. The vulnerability ranking is a combination of the sensitivity and weighted hazard ranking. Results are given one of five possible rankings: very low, low, moderate, high, or very high.

<b>Assets and Areas at Risk</b>	<b>Management Entity(s)</b>	<i>Sea Level Rise Ranking</i>	<i>Rising Temperatures and Changes in Precipitation Ranking</i>	<i>Escalating Climate Stressors and Cascading Impacts Ranking</i>	<b>Weighted Hazard Ranking</b>	<b>Sensitivity Ranking</b>	<b>Vulnerability Ranking</b>
Highway 92	Caltrans	Low	High	Low	Moderate	Very High	Very High
County Roads	San Mateo County	Moderate	High	Low	High	Moderate	High
Local Roads	City of Half Moon Bay	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Highway 84	Caltrans	Low	High	Low	Moderate	Moderate	Moderate
Highway 1 South	Caltrans	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Highway 1 North	Caltrans	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Highway 1 in City	Caltrans	Moderate	Low	Low	Low	Moderate	Moderate
County Bus Lines	City of Half Moon Bay	Moderate	High	Low	High	Low	Moderate
Half Moon Bay Airport	San Mateo County	Low	Low	Low	Moderate	Low	Moderate
Caltrans Yard	Caltrans	Low	Low	Low	Low	Low	Low

## Parks, Beaches, and Open Space

This sector includes managed parks, open spaces, natural habitat areas, and recreational sites within the City of Half Moon Bay. These areas provide physical and mental health benefits, attract tourism, and support essential ecosystem functions that contribute to the City's overall resilience.

Most parks and open space areas received high hazard rankings for individual hazards; however, due to the higher adaptive capacity of this sector in general, none received very high vulnerability rankings. The locations with high vulnerability rankings were mostly beaches that are threatened by coastal erosion and flooding due to sea level rise and may have limited space to retreat inland due to cliff-backed shorelines.

### Total Hazard Ranking

Parks and open spaces are exposed to multiple hazards that affect both ecological integrity and public access:

- **Extreme heat** and **drought** place stress on native vegetation and wildlife, disrupting plant reproduction, animal migration, and habitat conditions. Prolonged drought and hotter temperatures increase the risk of vegetation die-off, reduce soil moisture, and weaken ecological resilience.
- **Wildfire** threatens vegetative cover and habitat continuity.
- **Debris flows** and **landslides** occur on steep slopes and degraded soils, often after wildfire, and can have significant impacts on soils and vegetative cover.
- **Decreasing coastal fog** will have direct impacts on the resilience of coastal redwood trees as fog keeps the trees nourished, the understory and ground moist, and supports the ecosystems that thrive beneath the redwood canopy.
- Increased **drought** will likely lead to dieback and die off in established trees and increase competition for surface soil moisture which will be detrimental for the establishment of young tree seedlings.
- **Coastal and terrestrial erosion** affects access to public lands and infrastructure within them. Roads, trails, and beach access points are increasingly disrupted by erosion and undermining.
- **Storm damage** and **infrastructure failure**, including culvert collapse or slope instability, have already affected recreational access in multiple areas.

These hazards can trigger cascading ecological impacts, such as changes in species abundance, shifts in ecosystem function, and degradation of public space. For instance, extended extreme heat conditions will potentially lead to heat stress on plants and animals, which may lead to disrupted reproductive cycles, changes in migration, and other large-scale shifts in species abundance and distribution. Plants and animals that are adapted to current conditions may see large-scale migrations to more suitable conditions, and plants may experience increased disturbance regimes, which can put pressure on native species.

### Sensitivity

Sensitivity in this sector is shaped by the condition of natural systems, the reliance of native species on specific environmental conditions, and the vulnerability of park infrastructure:

- **Native ecosystems**, such as **coastal redwood forests**, are sensitive to declining fog, prolonged and repeated summer drought, and heat stress. Redwoods rely on fog to maintain moisture in the understory and canopy. Reductions in fog and soil moisture, projected under both RCP 4.5 and 8.5, threaten their ability to regenerate and may result in dieback of mature trees and poor establishment of seedlings.
- **Hillsides north and south of Highway 92**, including areas near **Frenchmans Creek** and the **Johnston House** in the southern end of the City,<sup>m</sup> are sensitive to landslides and erosion due to slope instability and post-fire exposure.

<sup>m</sup> A site-specific evaluation of underlying soil and geologic conditions would be needed to understand active landslide areas on site-specific level. This study has relied on data from the California Geological Survey, which was conducted at a regional scale of analysis.



- **Access infrastructure**—such as roads and trails within parks—is sensitive to erosion and storm damage. For example, access to Roosevelt State Beach has been closed due to culvert failure (Figure 22), and the California Coastal Trail near Poplar Beach is threatened by ongoing coastal erosion (Figure 23).



Figure 23. Incising erosion at Poplar Bluffs threatening the trail (source: Unsettled Times, YouTube)

- **The complexity and highly interdependent nature of** ecological systems means that climate change can trigger broader disruptions in species distribution, reproduction, and overall ecosystem health.

Together, these sensitivities reduce the resilience of natural and recreational areas, making it more difficult to maintain access, protect biodiversity, and support ecosystem services under escalating climate stress.

Table 5. Vulnerability assessment table for **Parks and Open Areas**. Each row is a sector element. The weighted hazard ranking is a combined score of the timing and exposure for hazards in three hazard categories (sea level rise, rising temperatures and changes in precipitation, and escalating climate stressors and cascading impacts). The sensitivity ranking takes into account any preexisting conditions and the current adaptive capacity of each sector element. The vulnerability ranking is a combination of the sensitivity and weighted hazard ranking. Results are given one of five possible rankings: very low, low, moderate, high, or very high.

<b>Park Area or Trail at Risk</b>	<b>Management Entity(s)</b>	<i>Sea Level Rise Ranking</i>	<i>Rising Temperatures and Changes in Precipitation Ranking</i>	<i>Escalating Climate Stressors and Cascading Impacts Ranking</i>	<b>Weighted Hazard Ranking</b>	<b>Sensitivity Ranking</b>	<b>Vulnerability Ranking</b>
Cañada Verde/Manhattan Beach	City of Half Moon Bay	Very High	Low	Low	Moderate	Moderate	Moderate
Poplar Beach	City of Half Moon Bay	Very High	Low	Low	Moderate	Moderate	Moderate
Surfers Beach	City of Half Moon Bay	Very High	Low	Low	Moderate	Moderate	Moderate
Roosevelt State Beach	CA State Parks	Very High	Moderate	Moderate	High	Low	Moderate
Francis State Beach	CA State Parks	Very High	Moderate	Moderate	High	Low	Moderate
California Coastal Trail	State Coastal Conservancy, City of Half Moon Bay, CA State Parks	High	Moderate	Moderate	High	Low	Moderate
Venice State Beach	CA State Parks	Very High	Moderate	Moderate	High	Low	Moderate
Dunes State Beach	CA State Parks	Very High	Moderate	Moderate	High	Low	Moderate
Frenchmans Creek Park	City of Half Moon Bay	Low	High	Moderate	High	Low	Moderate
Oak Avenue Park	City of Half Moon Bay	Low	High	Moderate	High	Low	Moderate
Sweetwood Campground	CA State Parks	Moderate	Moderate	Low	High	Low	Moderate
John L. Carter Memorial Park	City of Half Moon Bay	Low	Moderate	Moderate	High	Low	Moderate
Moonridge Playground	MidPen	Low	High	Low	High	Low	Moderate
Naomi Patridge Trail	City of Half Moon Bay	Low	Moderate	Low	Moderate	Low	Moderate
Francis Campground	CA State Parks	Moderate	Moderate	Low	Moderate	Low	Moderate
Smith Field	City of Half Moon Bay	Low	Moderate	Moderate	Moderate	Low	Moderate
East Side Parallel Trail	City of Half Moon Bay	Low	Moderate	Low	Moderate	Low	Moderate
Ocean View Park	City of Half Moon Bay	Low	Low	Low	Low	Low	Low
Main Street Park Playground	MidPen	Low	Low	Low	Low	Low	Low
Kehoe Park	City of Half Moon Bay	Low	Low	Low	Low	Low	Low
Kitty Fernandez Park	City of Half Moon Bay	Low	Low	Low	Low	Low	Low
Mac Dutra Park	City of Half Moon Bay	Low	Low	Low	Low	Very Low	Low
Skate Park	City of Half Moon Bay	Low	Low	Low	Low	Very Low	Low

## Business Sector and Workforce

Many of Half Moon Bay's residents work outside the City, but the City still has traditional employment areas for local residents including small businesses and agriculture. The economy of Half Moon Bay employs 5,730 people, and the largest industries are professional, scientific, and technical services (1,105 people); educational services (706 people); and retail trade (551 people). The most common workforce groups, by number of people living in the City, are management occupations (1,217 people), office and administrative support occupations (518 people), and sales and related occupations (515 people) (Datause.io 2025).

While not directly listed above, another important sector is the agricultural economy, which remains an important driver of economic and tourist activity for the City and is an important part of the City's character. Half Moon Bay has traditionally been home to a range of growers of beans, pumpkins, and artichokes as well as cut flowers. Climate change pressures aside, this industry has faced a range of challenges including competition from foreign markets, shifting consumer trends, as well as rising land and labor costs (Visithalfmoonbay.org 2025). There are agencies and nonprofits with programs that are committed to supporting growers; farms are still an essential part of the landscape, economy, and community, plus are an important driver of tourist visits to the region.

The business sectors with the highest vulnerability rankings were the agricultural economy, blue/ocean economy, and the construction workforce.



Figure 24. Farm fields just north of Half Moon Bay near the airport (source: City of Half Moon Bay)

### Total Hazard Ranking

Climate change poses a range of direct and indirect hazards to Half Moon Bay's economy and workforce. These include:

- **Extreme weather events**—such as flooding, drought, and wildfire—can damage physical business infrastructure, disrupt operations, and break supply chains, especially for businesses that rely on transportation, perishable goods, or seasonal services.
- **Heat waves** pose a risk to **outdoor workers**, particularly in agriculture, landscaping, and construction. Rising temperatures increase the likelihood of **heat-related illnesses and injuries**, reduce work hours, and can degrade productivity.
- **Air quality degradation**, particularly from **wildfire smoke**, can pose health risks to both workers and customers, leading to reduced downtown foot traffic, increased sick days, and service disruptions.

- **Economic uncertainty**, driven by climate disruption, may lead to **lower investment, reduced consumer activity**, and **higher operating costs**, particularly for small businesses with limited flexibility or insurance.

Though many economic effects are outside the scope of this assessment, these hazards represent clear stressors that threaten local commerce and labor conditions.

### Sensitivity

Sensitivity in the economic and workforce sector is shaped by several key factors:

- **Outdoor labor reliance:** A significant portion of the workforce, including agricultural, landscaping, and construction workers, are directly exposed to heat and smoke. These workers are more sensitive because of their physical exertion in unshaded environments, potential lack of employer-provided protections, and in some cases, undocumented status that may limit access to medical care or worker protections.
- **Social vulnerability:** Many workers in farm work and low-wage service industries are also part of socially vulnerable populations. This increases sensitivity to health risks, lost wages, and unstable working conditions.
- **Small business fragility:** Many local businesses operate with thin margins and are sensitive to temporary closures and disruptions due to storms, wildfire, or smoke, which can result in permanent losses for businesses with limited financial resources.
- **Economic sector dependence on tourism and seasonality:** The local economy's sensitivity is heightened by its dependence on tourism, which can be disrupted by weather-related closures, road access issues, or negative air quality conditions during peak visitation times.

Together, these factors make both the workforce and business community in Half Moon Bay more vulnerable to the cascading effects of climate change—particularly when climate shocks intersect with existing economic or social stressors.

Table 6. Vulnerability assessment table for **Businesses and Work Force**. Each row is a sector element. The weighted hazard ranking is a combined score of the timing and exposure for hazards in three hazard categories (sea level rise, rising temperatures and changes in precipitation, and escalating climate stressors and cascading impacts). The sensitivity ranking takes into account any preexisting conditions and the current adaptive capacity of each sector element. The vulnerability ranking is a combination of the sensitivity and weighted hazard ranking. Results are given one of five possible rankings: very low, low, moderate, high, or very high.

<b>Business or Workforce Sector at Risk</b>	<i>Sea Level Rise Ranking</i>	<i>Rising Temperatures and Changes in Precipitation Ranking</i>	<i>Escalating Climate Stressors and Cascading Impacts Ranking</i>	<b>Weighted Hazard Ranking</b>	<b>Sensitivity Ranking</b>	<b>Vulnerability Ranking</b>
Agricultural Economy	Low	Very High	Very High	Very High	High	Very High
Blue Economy / Ocean Economy	High	Moderate	Very High	Very High	High	Very High
Construction Workforce	Low	High	Moderate	High	High	High
Tourist Economy	Moderate	Very High	High	Very High	Low	High
Transportation Workforce	Low	Very High	Moderate	High	Low	Moderate
Service Workforce	Low	Moderate	Low	High	Low	Moderate
Office and Institutional Workforce	Low	Moderate	Low	Moderate	Very Low	Low

## Public Services, Utilities, and Local Infrastructure

Regional utilities and public services include water supply, wastewater, stormwater, communications, gas, and power, as well as the public services such as emergency response (fire, police, and emergency operations). Due to the sensitivity of their locations, these sectors were not mapped, but their vulnerabilities are discussed in this section. The most vulnerable infrastructure are the elements within the stormwater system, mostly due to their highly sensitive nature, as well as elements of the energy system.

Half Moon Bay's infrastructure systems face a range of climate-related hazards, with varying degrees of vulnerability across sectors. Energy and communications are exposed to wildfire, high winds, and landslides, with frequent outages driven by shutoffs, downed lines, and limited grid redundancy. Stormwater infrastructure is challenged by aging systems and undersized drainage networks, making neighborhoods like Downtown and West Miramar prone to localized flooding. Wastewater systems are increasingly at risk from fluvial flooding and groundwater intrusion, particularly around the SAM Wastewater Treatment Plant. Among all systems, the water supply sector faces the highest overall risk due to its high sensitivity and intersecting hazards—including wildfire in watershed areas, landslides along transmission corridors, and vulnerability to erosion, increased evaporation, and groundwater rise. Its reliance on long-distance pipelines heightens the risk of disruption. Ensuring the reliability of this sector is essential to maintaining the City's long-term resilience.

### Energy

PG&E is the owner and operator of the electricity distribution system, including the high-voltage transmission lines as well as the local distribution grid. Two main high voltage lines travel to Half Moon Bay, one just north of Highway 92 over the Coast Ranges, and one that traverses along that same range from Pacifica. These lines arrive at the PG&E substation just north of downtown. Natural gas distribution services are also operated by PG&E. While PG&E is responsible for energy delivery, Peninsula Clean Energy is the primary energy retailer, with 97% of electricity users in the City receiving energy from this service.

The electrical grid will play a central role in the City's ability to address climate change. This sector will need to move toward alignment with the state's electrification strategy, while also conducting upgrades to address extreme heat and wildfire vulnerabilities. Electrical system reliability across the City is a critical element to help build adaptive capacity for vulnerable community members, critical facilities, buildings, services, and infrastructure. Currently, outages are common, mostly due to downed trees and/or public safety power shutoffs.

### Total Hazard Ranking

Half Moon Bay's energy systems face increasing threats from climate-related hazards:

- **Wildfire and high winds** can damage or ignite overhead transmission lines. These hazards also trigger **public safety power shutoffs**, disrupting energy delivery citywide. PG&E's Enhanced Powerline Safety Settings (EPSS) have improved powerline safety and shutoff response, but have also led to more frequent outages in high-risk areas over the past two years.



- **Heat waves** increase sag and reduce the carrying capacity of transmission lines as well as substation transformers. These events also increase peak electrical demands for cooling, heightening the risk of overload and failure.
- **Landslides and flooding**, particularly along the Highway 92 corridor, threaten natural gas pipelines and overhead transmission lines.
- **Sea level rise and coastal erosion** could affect underground utility infrastructure, particularly in low-lying or shoreline-adjacent neighborhoods.

## Sensitivity

The energy system's sensitivity is influenced by aging infrastructure, limited grid redundancy, and the increasing complexity of managing fire-safe operations:

- The **PG&E substation** near downtown plays a critical role in local energy distribution and is sensitive to load stress during high temperatures.
- Overhead **high-voltage transmission lines**, which connect Half Moon Bay to the larger grid via two main corridors over the Coast Range, are vulnerable to tree fall, wildfire damage, earth movements, and weather-triggered shutoffs. These lines lack redundancy and are a single point of failure for much of the City's power.
- **Natural gas infrastructure**, while underground, is sensitive to earth movement from landslides, flooding, and wildfire along key corridors like Highway 92.
- Many **cell towers and internet systems** are co-located with electric infrastructure and can experience cascading outages during power loss.
- The lack of **microgrid infrastructure**, which consists of localized energy systems capable of operating independently from the main power grid, means there are limited backup power options for critical facilities and vulnerable populations during shutoffs.

## Communications and the Internet

This sector includes underground and aboveground communications infrastructure, including cell towers. Broadband internet and phone service are provided by a range of private companies including Comcast and AT&T.

### Total Hazard Ranking

The City's communications infrastructure is exposed to multiple hazards:

- **High winds and wildfire** threaten overhead communication lines and cell towers, many of which are located on ridgelines and are in fire-prone areas.
- **Coastal flooding and sea level rise** threaten underground lines and at least one cell tower in Princeton Harbor.
- **Power outages** resulting from extreme weather events.
- **Extreme weather** events along Highway 84, the primary communications corridor, have led to weeks-long outages in the past and disrupted cell and broadband services, as most systems rely on the electrical grid.

## Sensitivity

Communications infrastructure is sensitive because of its reliance on exposed systems and lack of redundancy:

- **Cell towers** require continuous power and are often located in highly exposed hazard-prone areas, making maintenance and recovery challenging.
- **Overhead transmission line infrastructure** is aging and vulnerable to tree fall and fire, particularly along Highway 84.
- **Underground lines** are vulnerable to groundwater rise, coastal erosion, and saltwater intrusion, particularly in West Miramar.
- A lack of **redundant infrastructure** means outages are more common and often affect large areas.

## Stormwater

The City's stormwater system captures and conveys stormwater from areas within the City to creeks and/or drainage ditches that ultimately lead to the Pacific Ocean. The City Public Works Department conducts various maintenance activities including street sweeping, cleaning catch basins and storm lines, and removing material from drainage channels. Much of this drainage system consists of a network of man-made ditches or swales originally constructed prior to 1948 or by the mid-1950s as roadside or agricultural drainage features. Between the 1960s and 1980, large portions of agricultural lands in the City were developed as low-density residential development.

### Total Hazard Ranking

The City's stormwater system faces mounting hazards:

- **Intensifying rainfall** will likely exceed existing system capacity, leading to frequent localized flooding.
- **Debris flows** and landslides triggered by intense rainfall, especially post-wildfire, pose threats to stormwater infrastructure and adjacent utilities.
- **Coastal and creek erosion**, intensified by **stormwater runoff** and **sea level rise**, increases slope instability and can lead to infrastructure loss.

### Sensitivity

The stormwater system sensitivity is high due to outdated and undersized infrastructure:



- Much of the system dates back to pre-1950s agricultural drainage networks, and is not designed for urban runoff volumes (City of Half Moon Bay, 2014).
- Capacity deficiencies are present in areas including Casa del Mar (Kehoe Waterway), Roosevelt and Pullman Watercourses (West Miramar), Grandview, Newport Terrace, Magnolia St. in Arleta Park, Kelly Ave, and Mill St. Downtown (City of Half Moon Bay, 2014).
- Blocked culverts and limited maintenance capacity reduce drainage effectiveness, increasing flood risk even during moderate rain events.
- Older outfalls and steeper slopes contribute to localized landslides and streambank failures, especially in areas adjacent to creeks and coastal bluffs.

Figure 26. Localized erosion along the Kehoe Waterway (source: Sewer Authority Mid-Coastside)

## Wastewater

The City of Half Moon Bay provides wastewater collection service to areas south of Frenchmans Creek to Cañada Verde Creek. Wastewater from residences, businesses, schools, restaurants, and other buildings is conveyed through sewer mains owned by the City of Half Moon Bay to the SAM Wastewater Treatment Plant. The SAM Wastewater Treatment Plan provides wastewater treatment services to City of Half Moon Bay residents under a Joint Powers Agreement signed in 1976. The Granada Community Services District provides sewer collection service for residents of the City of Half Moon Bay north of Frenchmans Creek.

### Total Hazard Ranking

Wastewater infrastructure is exposed to several compounding hazards:

- **Fluvial flooding**, especially from Pilarcitos Creek, threatens the SAM Wastewater Treatment Plant and adjacent sewer infrastructure.
- **Sea level rise raises groundwater levels**, compounding inundation risk and increasing pressure on SAM's treated effluent outfall systems. Rising waters will also impact the SAM Wastewater Treatment Plant's underground infrastructure.
- **Coastal erosion** may eventually compromise the effluent outfall pipe at the SAM Wastewater Treatment Plant, with long-term consequences for wastewater discharge.



- **Increasing groundwater rise** would raise buoyant pressures on wastewater pipes in low-lying areas and increase the potential for failure. The largest risk for groundwater rise is around the Pilarcitos Creek west of Highway 1 and near the SAM Wastewater Treatment Plant.
- **Higher intensity rainfall events** can lead to greater inflow and infiltration of stormwater into wastewater lines and manholes, increasing pressure on wastewater treatment infrastructure.

### Sensitivity

Wastewater systems are sensitive because of their proximity to hazard-prone zones and vulnerability to groundwater pressure:

- **Wastewater lines** in Francis Beach Campground and West Miramar are sensitive to erosion and groundwater rise.
- **Inflow and infiltration** during heavy rains place additional strain on treatment capacity, increasing the risk of overflows or service disruption.

### Water Supply

Water supply for the City is provided by Coastside County Water District. CCWD has two surface and two subsurface water supply sources. Surface water is sourced from Pilarcitos Lake and the Upper Crystal Springs Reservoir, and groundwater is sourced from the Pilarcitos Well Field and the Denniston Well Field. The first two water sources are owned and operated by the San Francisco Water Department; the latter two are owned and operated by CCWD. The system consists of two water treatment plants, 17 miles of transmission pipeline, 83 miles of distribution pipeline, and several water storage tanks. The water supply for the City is a hotly contested local issue. The 3% annual population growth in Half Moon Bay between 1980 and 2000 put pressure on the City's water supply system (LCLUP 2020).



### Total Hazard Ranking

Climate change will impact both local and regional water supply systems:

- **Wildfire** and **vegetation loss** in local watersheds (e.g., around Pilarcitos Lake) can degrade water quality and increase treatment costs.
- **Snowpack declines** in the Sierra Nevada would put increased pressure on the water supply that is conveyed to Crystal Springs Reservoir, part of the regional system managed by the San Francisco Water Department.
- **Increased evaporation** due to an increased number of hot days will strain the local water budget.
- **Landslides** and **wildfires** along the Highway 92 corridor threaten transmission infrastructure connecting sources to the Nunes Treatment Plant.



### Sensitivity

The water supply system is sensitive because of its physical vulnerability and long distribution distances:

- Pipelines in steep slopes and fire zones make them sensitive to disruption from landslides and wildfire.
- Local groundwater and surface water sources, such as the Pilarcitos and Denniston Well Fields, may be affected by changing recharge rates or contamination.
- Water infrastructure in low-lying or erosion-prone areas, such as Francis Beach and West Miramar, is exposed to groundwater rise and coastal erosion.
- Increased pressure on water systems during droughts may result in greater reliance on imported water, which is costlier and more energy-intensive.

Table 7. Vulnerability assessment table for **Regional Public Services and Infrastructure**. Each row is a sector element. The weighted hazard ranking is a combined score of the timing and exposure for hazards in three hazard categories (sea level rise, rising temperatures and changes in precipitation, and escalating climate stressors and cascading impacts). The sensitivity ranking takes into account any preexisting conditions and the current adaptive capacity of each sector element. The vulnerability ranking is a combination of the sensitivity and weighted hazard ranking. Results are given one of five possible rankings: very low, low, moderate, high, or very high.

<b>Asset at Risk</b>	<b>Sector</b>	<b>Management Entity(s)</b>	<i>Sea Level Rise Ranking</i>	<i>Rising Temperatures and Changes in Precipitation Ranking</i>	<i>Escalating Climate Stressors and Cascading Impacts Ranking</i>	<b>Weighted Hazard Ranking</b>	<b>Sensitivity Ranking</b>	<b>Vulnerability Ranking</b>
Imported Water Supply (Tuolumne Watershed)	<b>Water Supply</b>	San Francisco Public Utilities Commission	Low	Very High	Moderate	Very High	Very High	Very High
Regional Reservoir Water Supply	<b>Water Supply</b>	Coastside County Water District	Low	Very High	Moderate	Very High	Very High	Very High
Transmission Lines	<b>Energy</b>	PG&E	Low	Moderate	Low	Moderate	Very High	High
Groundwater Water Supply	<b>Water Supply</b>	Coastside County Water District	Low	High	Low	Moderate	Very High	High
Treatment Plant (SAM)	<b>Wastewater</b>	Sewer Authority Mid-Coastside	Very High	Moderate	Low	Moderate	Very High	High
Cell & Radio Towers	<b>Communications and Internet</b>	T-Mobile, Verizon, etc.	Moderate	Moderate	Low	Moderate	High	High
Communications Lines	<b>Communications and Internet</b>	Comcast, AT&T, etc.	Low	Moderate	Low	Moderate	High	High
Substation	<b>Energy</b>	PG&E	Low	Low	Low	Low	High	Moderate
Wastewater Storage Tanks	<b>Wastewater</b>	Sewer Authority Mid-Coastside	High	Moderate	Low	Moderate	Moderate	Moderate
Water Supply Major Lines	<b>Water Supply</b>	Coastside County Water District	Low	Moderate	Low	Moderate	Moderate	Moderate
Water Supply Pump Stations	<b>Water Supply</b>	Coastside County Water District	Low	Moderate	Low	Moderate	Moderate	Moderate
Wastewater Pump Stations	<b>Wastewater</b>	Sewer Authority Mid-Coastside	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Tanks	<b>Water Supply</b>	Coastside County Water District	Low	Moderate	Low	Moderate	Moderate	Moderate
Major Lines	<b>Wastewater</b>	Sewer Authority Mid-Coastside	Low	Moderate	Low	Moderate	Moderate	Moderate
Outfall Line	<b>Wastewater</b>	Sewer Authority Mid-Coastside	Moderate	Low	Low	Low	Moderate	Moderate
Fire Building and Personnel	<b>Emergency Response</b>	Coastside Fire District	Low	Moderate	Low	Moderate	Low	Moderate
Police Building and Personnel	<b>Emergency Response</b>	County of San Mateo, City of Half Moon Bay	Low	Moderate	Low	Moderate	Low	Moderate
Underground Utilities (Gas, Fiber, Cable)	<b>Communications and Internet</b>	Comcast, AT&T, PG&E	Low	Low	Low	Low	Moderate	Moderate
Emergency Operations Center	<b>Emergency Response</b>	City of Half Moon Bay	Low	Low	Low	Low	Low	Low

Table 8. Vulnerability assessment table for **Local Public Services and Infrastructure**. Each row is a sector element. The weighted hazard ranking is a combined score of the timing and exposure for hazards in three hazard categories (sea level rise, rising temperatures and changes in precipitation, and escalating climate stressors and cascading impacts). The sensitivity ranking takes into account any pre-existing conditions and the current adaptive capacity of each sector element. The vulnerability ranking is a combination of the sensitivity and weighted hazard ranking. Results are given a total of five possible rankings from very low, low, moderate, high and very high.

<b>Assets and Areas at Risk</b>	<b>Management Entity(s)</b>	<i>Sea Level Rise Ranking</i>	<i>Rising Temperatures and Changes in Precipitation Ranking</i>	<i>Escalating Climate Stressors and Cascading Impacts Ranking</i>	<b>Weighted Hazard Ranking</b>	<b>Sensitivity Ranking</b>	<b>Vulnerability Ranking</b>
Half Moon Bay High School	School District	Low	Moderate	Low	High	High	High
Sea Crest School	Private	Low	Moderate	Low	High	High	High
Alvin S. Hatch Elementary School, Manuel F. Cunha Intermediate School	School District	Low	Moderate	Low	Moderate	High	High
Public Works Corp Yard	City of Half Moon Bay	Low	Low	Low	Low	Moderate	Moderate
Historic Train Depot	City of Half Moon Bay	Low	Low	Low	Low	Moderate	Moderate
Medical and Care Facilities	Private/ County	Low	Low	Low	Low	Moderate	Moderate
Stormwater Drainage Features (basins)	City of Half Moon Bay	Very High	Moderate	Low	High	Low	Moderate
Waste Management Facilities	Private	Low	High	Low	Moderate	Low	Moderate
Ted Adcock Community Center	City of Half Moon Bay	Low	Low	Low	Low	Moderate	Moderate
Boys and Girls Club	Non-Profit	Low	Low	Low	Low	Moderate	Moderate
Half Moon Bay Library	City of Half Moon Bay	Low	Low	Low	Low	Moderate	Moderate
Stormwater Outfalls	City of Half Moon Bay	High	Low	Low	Moderate	Low	Moderate
Stormwater Channels (above ground)	City of Half Moon Bay	Low	Moderate	Low	Moderate	Low	Moderate
Stormwater Lines (underground)	City of Half Moon Bay	Low	Moderate	Low	Low	Low	Low
Stormwater Culverts	City of Half Moon Bay	Low	Moderate	Low	Low	Low	Low
Seawalls and Revetments	City of Half Moon Bay	High	Low	Low	Low	Low	Low
City Hall	City of Half Moon Bay	Low	Low	Low	Low	Low	Low

## Vulnerability Assessment Maps

Each map in this section has a description of how climate change-related hazards may impact the community. For each map, callouts representing acute location-specific climate hazards are noted. Maps use color and shape to organize potential impacts to hazards, where:

- **Diamonds** represent terrestrial and extreme weather hazards and are associated with warmer and wetter winters.
- **Squares** represent ocean-related hazards, both chronic events such as rising tides and emergent groundwater, and extreme events such as coastal wave flooding and are associated with rising sea levels and ocean warming.
- **Circles** represent heat-related weather events and changes in climate and are associated with a hotter and drier summer and fall.

And the colors:

- **Light blue** represents flooding and high-wind hazards associated with winter storm events.
- **Yellow** represents coastal and terrestrial erosion.
- **Orange** represents high heat events.
- **Red** represents the wildfire hazard, which is influenced by a variety of factors including changes in temperature, precipitation, and vegetative and anthropogenic responses. Note, the wildfire hazard icon is only used to represent hazards for general population or asset sector categories, rather than for specific locations.

### Depiction of the Study Area

The study area boundary on the maps are represented as a shaded black line, and areas outside the study area boundary have a white opaque tint. See the “Study Areas” section in Chapter 2 for a detailed description of the local study area.

### Map Legend

The legend below serves as a reference for each map.

# MAP LEGEND

## EXTREME WEATHER



**Creek & Storm-water Flooding**



Sources: FEMA, Integral Consulting, and City of Half Moon Bay. Representing areas within a 100-year flood.



**Debris Flow & Landslides**



Sources: California Geological Survey's seismic hazard zones. Representing areas where liquefaction and landslides may occur during a strong earthquake. Based on areas with steep slopes and failure-prone soil types.



**High Winds (not mapped)**

No hazard zones available. Analysis based on documented high wind hazard locations.

## SEA LEVEL RISE



**Coastal Wave Flooding**

Sources: USGS CoSMoS. Representing 4.9 ft of sea level rise and most probable flooding from a 100-year storm wave event.



**Coastal Erosion**



Sources: Pacific Institute. Representing cliff and dune erosion under high erosion conditions to 2100 (SLR of 4.6 feet).



**Emergent Groundwater (not mapped)**

Sources: USGS CoSMoS. Assuming a more permeable water table and influence from 4.9 ft of sea level rise, approximating 2100 projections.

## RISING TEMPERATURES



**Wildfire**



Sources: CAL FIRE Fire Hazard Severity Zones (FHSZ), released February 24, 2025. Areas are distinguished by three fire hazard severities.

-  Very High Severity Zone
-  High Severity Zone
-  Moderate Severity Zone

Only the outer edge of the hazard area is represented on map. The actual area within the hazard area encompasses the area within the delineated areas.



**Heatwaves (not mapped)**

Sources: Cal-Adapt. Based on California's Fifth Climate Change Assessment projections to 2100.



**Drought (not mapped)**

Sources: Cal-Adapt. Based on California's Fifth Climate Change Assessment projections to 2100.



**Decreased Coastal Fog (not mapped)**

Sources: USGS's Pacific Coastal Fog Project projections to 2100.

### Impacts on the City of Half Moon Bay

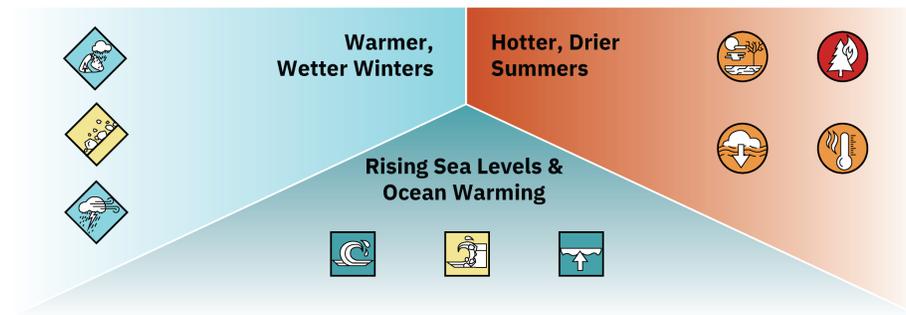
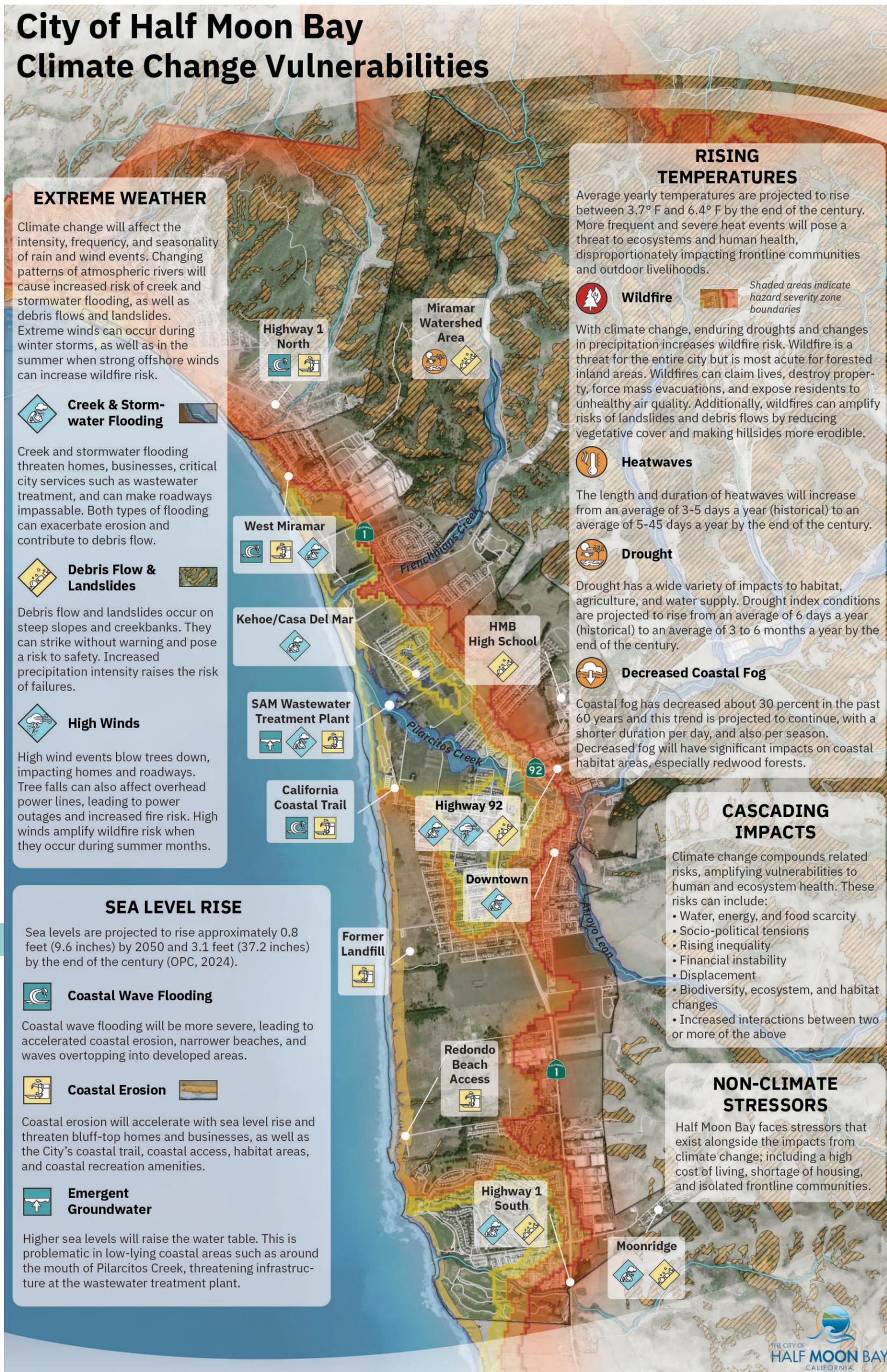


Figure 30. Vulnerability assessment maps legend

# City of Half Moon Bay Climate Change Vulnerabilities



## EXTREME WEATHER

Climate change will affect the intensity, frequency, and seasonality of rain and wind events. Changing patterns of atmospheric rivers will cause increased risk of creek and stormwater flooding, as well as debris flows and landslides. Extreme winds can occur during winter storms, as well as in the summer when strong offshore winds can increase wildfire risk.

**Creek & Stormwater Flooding**

Creek and stormwater flooding threaten homes, businesses, critical city services such as wastewater treatment, and can make roadways impassable. Both types of flooding can exacerbate erosion and contribute to debris flow.

**Debris Flow & Landslides**

Debris flow and landslides occur on steep slopes and creekbanks. They can strike without warning and pose a risk to safety. Increased precipitation intensity raises the risk of failures.

**High Winds**

High wind events blow trees down, impacting homes and roadways. Tree falls can also affect overhead power lines, leading to power outages and increased fire risk. High winds amplify wildfire risk when they occur during summer months.

## SEA LEVEL RISE

Sea levels are projected to rise approximately 0.8 feet (9.6 inches) by 2050 and 3.1 feet (37.2 inches) by the end of the century (OPC, 2024).

**Coastal Wave Flooding**

Coastal wave flooding will be more severe, leading to accelerated coastal erosion, narrower beaches, and waves overtopping into developed areas.

**Coastal Erosion**

Coastal erosion will accelerate with sea level rise and threaten bluff-top homes and businesses, as well as the City's coastal trail, coastal access, habitat areas, and coastal recreation amenities.

**Emergent Groundwater**

Higher sea levels will raise the water table. This is problematic in low-lying coastal areas such as around the mouth of Pilarcitos Creek, threatening infrastructure at the wastewater treatment plant.

## RISING TEMPERATURES

Average yearly temperatures are projected to rise between 3.7° F and 6.4° F by the end of the century. More frequent and severe heat events will pose a threat to ecosystems and human health, disproportionately impacting frontline communities and outdoor livelihoods.

**Wildfire**

With climate change, enduring droughts and changes in precipitation increases wildfire risk. Wildfire is a threat for the entire city but is most acute for forested inland areas. Wildfires can claim lives, destroy property, force mass evacuations, and expose residents to unhealthy air quality. Additionally, wildfires can amplify risks of landslides and debris flows by reducing vegetative cover and making hillsides more erodible.

**Heatwaves**

The length and duration of heatwaves will increase from an average of 3-5 days a year (historical) to an average of 5-45 days a year by the end of the century.

**Drought**

Drought has a wide variety of impacts to habitat, agriculture, and water supply. Drought index conditions are projected to rise from an average of 6 days a year (historical) to an average of 3 to 6 months a year by the end of the century.

**Decreased Coastal Fog**

Coastal fog has decreased about 30 percent in the past 60 years and this trend is projected to continue, with a shorter duration per day, and also per season. Decreased fog will have significant impacts on coastal habitat areas, especially redwood forests.

## CASCADING IMPACTS

Climate change compounds related risks, amplifying vulnerabilities to human and ecosystem health. These risks can include:

- Water, energy, and food scarcity
- Socio-political tensions
- Rising inequality
- Financial instability
- Displacement
- Biodiversity, ecosystem, and habitat changes
- Increased interactions between two or more of the above

## NON-CLIMATE STRESSORS

Half Moon Bay faces stressors that exist alongside the impacts from climate change; including a high cost of living, shortage of housing, and isolated frontline communities.



Figure 31. Overview of climate change hazards with a description of potential impacts, and some notable locations of highly sensitive areas to climate change hazards and the hazards of greatest concern for these areas

# City of Half Moon Bay Climate Change Vulnerabilities

## Socially Vulnerable Populations

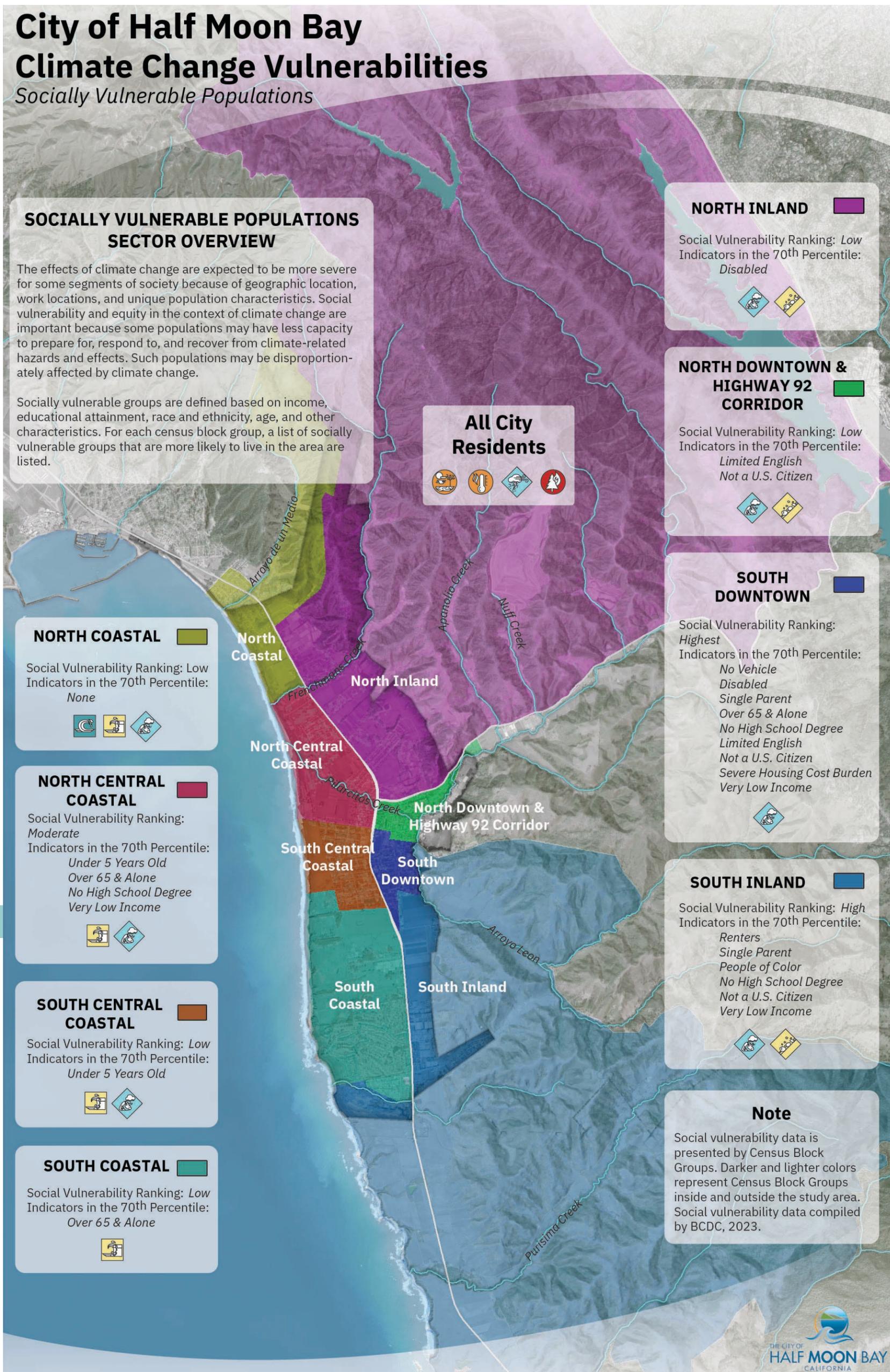


Figure 32. Vulnerabilities to socially vulnerable populations and a list of social vulnerability indicators by neighborhood along with the hazards of greatest concern for these areas.

# City of Half Moon Bay Climate Change Vulnerabilities Homes and Businesses

## HOMES & BUSINESSES SECTOR OVERVIEW

This sector includes all homes, businesses, and neighborhood areas within the City. This sector focuses on vulnerabilities to lands and structures, while other sectors focus on vulnerable populations and economic activities.

All Homes and Businesses



All City Greenhouses



West Miramar



## HOMES AND BUSINESSES SECTOR HAZARDS

### Wildfire

Climate change will increase the entire city's wildfire risk. This risk is most acute for inland areas that abut the eastern city limits. 92% of the City area is in a moderate to very high high fire hazard severity zone.

### Fluvial & Stormwater Flood

Flooding threatens creekside homes and businesses, as well as park facilities. Localized stormwater flooding can also occur along Magnolia St. in Arleta Park, Miramontes Point Rd. in Moonridge, West Miramar, and Downtown.

### Coastal Erosion

The West Miramar neighborhood faces the largest threat from coastal erosion with more than 20 single family homes and condos potentially exposed by 2100. In the south of the City, the Ritz-Carlton Hotel, and part of the Half Moon Bay Golf Links are exposed to coastal erosion hazards.

### Landslides & Debris Flow

Earth movement threatens several commercial greenhouses including those east of Highway 1 and those along the Highway 92 corridor. The lands just east of Half Moon Bay High School and the Moonridge neighborhood are also exposed to landslides that threaten nearby structures. Homes and businesses located along creekbanks such as Arroyo De Un Medio, Frenchmans Creek, Pilarcitos Creek, Arroyo Leon, Cañada Verde Creek, and others are also exposed.

### Extreme Weather and High Winds

High winds can lead to trees falling, which can damage structures, block roadways, and lead to disruption in power. This could escalate with climate change, particularly in heavily wooded areas such as the Highway 92 corridor.

Ocean Colony



Moonridge



Downtown



Kehoe/Casa Del Mar



Figure 33. Vulnerabilities to homes and businesses, and some notable locations of highly sensitive areas to climate change hazards and the hazards of greatest concern for these areas

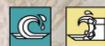
# City of Half Moon Bay Climate Change Vulnerabilities

## Transportation & Roadways

### TRANSPORTATION & ROADWAYS SECTOR OVERVIEW

This sector includes all roadways in the region and within the city. Most local roads within the city are under city authority, and Highway 1 and 92 are state highways.

**Highway 1 North at Surfers Beach**



**Local Roads West Miramar**



**Highway 92**



### TRANSPORTATION & ROADWAYS SECTOR HAZARDS

#### Wildfire

Low visibility from smoke and ash can result in road closures. The need to evacuate communities, while also providing access for firefighters, can lead first responders to limit traffic.

#### Fluvial & Stormwater Flood

The Highway 1 bridge spans across Frenchman's Creek and Pilarcitos Creek are potentially vulnerable areas. Localized stormwater flooding can also occur along Magnolia St. in Arleta Park, Miramontes Point Rd. in Moonridge, West Miramar, and Downtown.

#### Coastal Erosion

Highway 1 at Surfers beach is vulnerable to coastal erosion, as is Mirada Rd in West Miramar.

#### Landslides

Many areas along Highway 92 and Highway 1 southbound.

#### Debris Flow

Miramontes Point Rd in the Moonridge neighborhood.

#### Extreme Heat

Because Half Moon Bay is one of the more temperate parts of California, during regional heatwaves it is common for people to visit from across the state to escape the heat, resulting in increased traffic and congestion.

#### Extreme Weather and High Winds

High winds can lead to trees falling, which can block roadways. This could escalate with climate change, particularly in heavily wooded areas such as the Highway 92 corridor.

**Local Roads in Arleta Park**



**Local Roads Downtown**



**Miramontes Point Rd**



**Highway 1 South**



### Legend

Major Roads



Figure 34. Vulnerabilities to the transportation and road network, and some notable locations of highly sensitive areas to climate change hazards and the hazards of greatest concern for these areas

# City of Half Moon Bay Climate Change Vulnerabilities Parks, Beaches & Open Space

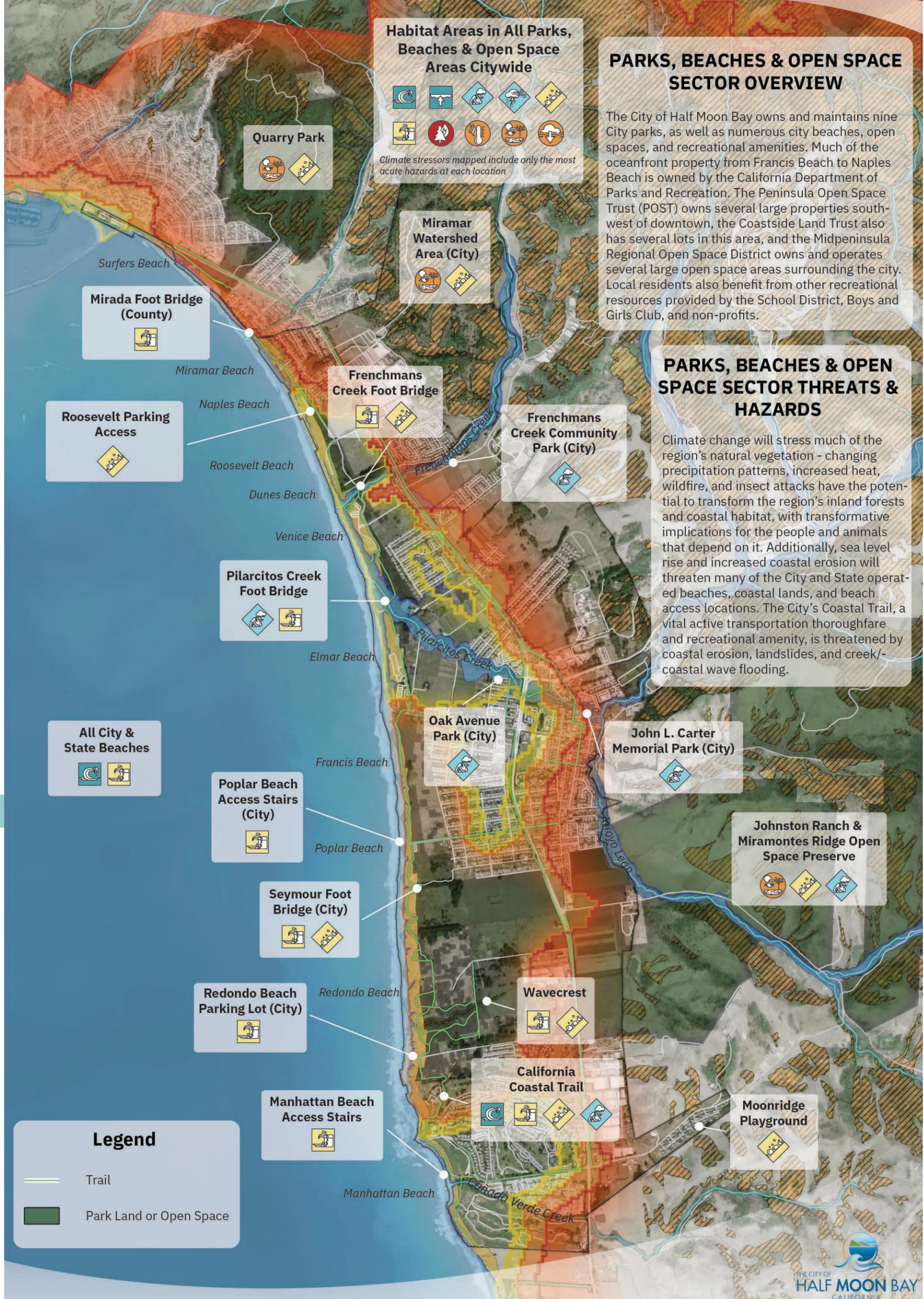


Figure 35. Vulnerabilities to parks and open space, and some notable locations of highly sensitive areas to climate change hazards and the hazards of greatest concern for these areas



# 6

## Adaptation Strategies

# 6. Adaptation Strategies

## Overview

Adaptation strategies aim to reduce the negative effects of climate change or take advantage of opportunities to build resilience that will mitigate the effects of global warming. The goal of this chapter is to present adaptation strategies that reduce risk (limit exposure or minimize consequence) and/or enhance resilience (increase adaptive capacity) to the vulnerabilities discussed in the previous chapter. The adaptation strategies presented in this chapter are organized by goal areas, which were informed through the initial vulnerability assessment and outreach and engagement activities of this project. The goals are listed in this chapter, and the adaptive policies and actions that seek to increase resilience can be found in Appendix B.

*It's important to plan for climate change because it helps us prepare for things like floods, storms, and hotter temperatures. By getting ready now, we can preserve our homes, jobs, and health when changing weather patterns threaten these fundamental rights. This way, everyone, including those most at risk as well as future generations, can adapt and thrive amidst this global uncertainty.*

An important element of this Plan is to ensure that the City of Half Moon Bay can effectively and efficiently implement the following strategies and make measurable progress in becoming more resilient to climate change. To do that, the strategies in this chapter focus on areas where the City either has jurisdiction or direct influence. This means that some vulnerabilities, such as flooding of Highway 92 or wildfire risks in unincorporated San Mateo County, may not be addressed directly, instead, those vulnerabilities are addressed through partnerships and ongoing coordination that the City must manage.

## Goals

The goals listed in this chapter include statements that encapsulate community desires and were refined in conjunction with conversations among the public, City staff, and consultant team during the community outreach events. These goals serve as a guide for the development of adaptation actions and policies, which can be found in the “Adaptation Policies and Actions” section in Appendix B. Each goal is broadly organized around the roles of certain departments within the City, and each goal also encapsulates multiple sub-goals that broadly target a range of climate hazards and the sensitivities of vulnerable populations, assets, or services.

### Organizing Goals

1. Ensure a Healthy, Resilient, and Self-Sufficient Community
2. Foster a Thriving and Accessible Coastline and Open Space
3. Protect the City through Increased Resilient Infrastructure
4. Build and Sustain the City of Half Moon Bay Government's Capacity to Increase Resilience
5. Support and Increase Economic Sustainability

## Tables 9–13. Organizing Goals and Strategies: High-Level Summary Table

### Goal 1: Ensure a Healthy, Resilient, and Self-Sufficient Community

**Goal 1** focuses on creating a healthy, safe, and resilient community in the face of climate change. The policies and actions under this goal offer targeted support for vulnerable populations, service industry workers, and local businesses. They aim to address underserved communities by offering tailored services and protections that ensure these populations are not left behind in adaptation efforts. This includes providing housing assistance during climate-related events or access to a climate hub and cooling centers during extreme heat waves or wildfire events. In addition, educating the public about climate-health connections will empower residents to take preventive actions such as using air purifiers during wildfire smoke events, and working with business owners and workers about safety during heat waves.

Policies and actions for this goal are mostly administered by the City’s **Administrative Services, Community Development, and Public Works Departments**. In addition, coordination with **local NGOs** will be essential for effective outreach and service delivery, but should be managed by the City to ensure alignment and impact.

Table 9. Goal 1

Goal	Strategy	Hazards Addressed	Neighborhood, Population, or Sector
<b>Goal 1. Ensure a Healthy, Resilient, and Self-Sufficient Community</b>			
1.1	<b>Residential Resilience:</b> Increase residential home hardening and resilience to climate hazards.	Extreme Heat, Wildfire, Fluvial Flood Events; Coastal Wave Flooding and Erosion	All Populations in all Neighborhoods
1.2	<b>Community Capacity:</b> Support community organizations and increase community understanding and adaptive capacity to better respond and adapt to climate hazards.	All	All Populations in All Neighborhoods
1.3	<b>Vulnerable Populations:</b> Protect highly vulnerable populations from climate-related impacts, especially due to extreme weather.	Rising Temperatures and Changes in Precipitation	Socially Vulnerable Populations in All Neighborhoods
1.4	<b>Community Storm Preparedness:</b> Increase the community's active participation in building resilience for extreme storm events.	Increased High-Intensity Winds, Coastal Wave and Fluvial Flooding, Landslides	Homes and Businesses, Utilities, Transportation, Coastal and Inland Regions
1.5	<b>Communications:</b> Create a robust and reliable citywide communications system and protocols for climate hazards.	All	All Populations (especially Socially Vulnerable Populations), Economy, All Regions
1.6	<b>Community Education and Outreach Planning:</b> Prepare and communicate using educational materials and outreach addressing climate change adaptation.	All	All Populations (especially Socially Vulnerable Populations), All Regions

## Goal 2: Foster a Thriving and Accessible Coastline and Open Space

**Goal 2** focuses on ensuring a thriving and resilient natural environment. The City’s beaches, open space, and parks are all at risk from climate change stressors and hazards. The policies and actions under this goal focus on scientific research to better understand the specific vulnerabilities of local ecosystems, as well as building partnerships with environmental organizations, research institutions, and other stakeholders. These collaborations will facilitate the sharing of knowledge, resources, and innovative solutions that can help mitigate the impacts of climate hazards on the natural environment.

Structural measures, such as the restoration of wetlands and dune systems, will play a crucial role in safeguarding the City’s ecosystems. These efforts can provide natural protection against flooding and erosion while also enhancing biodiversity and help achieve CAP goals of carbon sequestration. In addition, preserving or expanding native plant species, improving wildlife corridors, and restoring degraded habitats will all contribute to a more resilient ecosystem.

Policies and actions for this goal are mostly administered by the City’s **Public Works and Community Development Department**.

Table 10. Goal 2

Goal	Strategy	Hazards Addressed	Neighborhood, Population, or Sector
<b>Goal 2. Foster a Thriving and Accessible Coastline and Open Space</b>			
2.1	<b>Creekside Flooding Monitoring:</b> Enhance monitoring and maintenance of creeks and drainage areas to reduce flooding impacts.	Fluvial Flooding	Utilities, Transportation, Homes and Businesses, Downtown and 92 Corridor, North and South Inland, North and North-Central Coastal
2.2	<b>Vegetation Management:</b> Plan, implement, and maintain fuel reduction efforts on City-owned coastline and open space.	Wildfire	All Buildings and Utilities that Abut a Managed Open Space
2.3	<b>Climate-Smart Coastal Development:</b> Set standards for safe development along the coastline.	Coastal Erosion, Coastal Wave Flooding	Homes and Businesses, Economy, Transportation, Coastal Regions
2.4	<b>Nature-Based Solutions for the Coast:</b> Reduce coastal flooding and erosion by working with nature. This may include protection, restoration, and management of coastal areas.	Coastal Wave Flooding, Coastal Erosion	Parks, Beaches and Open Spaces, Homes and Businesses, Transportation, Coastal Regions
2.5	<b>Recreation Improvements:</b> Implement recreation improvements to reduce erosion and impacts on protected areas. This may include controlling access, signage, and education, or in some cases, improvements in recreational facilities to accommodate higher usage.	Changes to Biodiversity and Ecosystems and Increases in Pests; Coastal Erosion, Coastal Wave Flooding	Parks, Beaches and Open Spaces, Coastal Regions
2.6	<b>Firefighting Resources:</b> Identify additional firefighting equipment, training, and infrastructure to increase firefighting capacity and responsiveness.	Wildfire	Homes and Businesses, Economy, Transportation, Utilities, Socially Vulnerable Populations, Moonridge, Half Moon Bay High School, All City Greenhouses

## Goal 3: Protect the City through Increased Resilient Infrastructure

**Goal 3** of the City's adaptation strategy is to create a resilient built environment. This goal focuses on policies that promote infrastructure redundancy and integrate climate change considerations into planning. The actions under these policies are organized by subgroups aimed at improving infrastructure resilience to climate change. For example, green infrastructure actions may address storm drain repairs to handle more intense precipitation events, while landslide management focuses on managing infrastructure and monitoring techniques to detect slides as well as hiring a geotechnical expert for specific landslide and erosion-prone areas.

Policies and actions for this goal are mostly administered by the City's **Public Works Department**.

Table 11. Goal 3

Goal	Strategy	Hazards Addressed	Neighborhood, Population, or Sector
<b>Goal 3. Protect the City through Increased Resilient Infrastructure</b>			
3.1	<b>Green Infrastructure:</b> Improve citywide stormwater management and reduce extreme heat by adopting low-impact development guidelines and green infrastructure approaches.	Fluvial Flooding, Extreme Heat, Incr. Pollution Burden; Incr. Precipitation Intensity, Decreased Biodiversity	Homes and Businesses, Transportation, Parks and Open Space
3.2	<b>Wind Infrastructure:</b> Invest in wind protection infrastructure that is both natural and manmade to increase resilience to high wind events.	High Intensity Winds, Changes to Biodiversity	Homes and Businesses, Utilities
3.3	<b>Climate Change Considerations:</b> Incorporate climate change considerations into municipal planning, design and construction documents.	All	Municipal Businesses, Transportation, Parks and Open Spaces, Utilities and Public Services
3.4	<b>Increase Water Supply:</b> Increase water conservation and water supply efforts to increase long-term water sustainability and reliability.	Emerging Groundwater, Saltwater Intrusion, Drought, Extreme Heat	All Neighborhoods, All Populations, All Sectors
3.5	<b>Landslide Management:</b> Install and manage infrastructure to prevent landslides and manage debris.	Increased Landslides	Homes, Transportation, Socially Vulnerable Populations, Inland, 92 Corridor
3.6	<b>Energy Resilience:</b> Support electrification strategies and implementation. This may include increasing opportunities for localized power, battery backups, and infrastructure upgrades for overall resilience to power outages due to climate hazards.	Extreme Heat, Wildfire, Increased Precipitation Intensity, Fluvial Flooding, Landslides	Economy, Utilities and Public Services, Socially Vulnerable Populations

## Goal 4: Build and Sustain the City of Half Moon Bay Government's Capacity to Increase Resilience

**Goal 4** focuses on improving internal processes, allocating dedicated funding, and building strong partnerships. These steps will strengthen the City's ability to plan, coordinate, and implement effective resilience strategies. This includes integrating climate considerations into planning, development, and operational practices across departments. This also aims to prioritize budget allocations for climate resilience projects and to seek out additional funding through grants, state and federal programs, or partnerships to increase city staff bandwidth to help manage and implement these strategies effectively. In addition, forging strong partnerships with local organizations, state agencies, and regional/multi-jurisdictional authorities is essential for the success of climate adaptation efforts. These partnerships can provide valuable expertise, resources, and collaborative opportunities to tackle complex local issues and climate change hazards.

Policies and actions for this goal are administered by the **Public Works** and/or **Community Development Departments** with assistance from all City departments.

Table 12. Goal 4

Goal	Strategy	Hazards Addressed	Neighborhood, Population, or Sector
<b>Goal 4. Build and Sustain the City of Half Moon Bay Government's Capacity to Increase Resilience</b>			
4.1	<b>Policies and Procedures:</b> Operationalize climate considerations into City policies and procedures.	All	All Neighborhoods, All Populations, All Sectors
4.2	<b>Build Capacity:</b> Increase staffing for climate projects and train staff in climate implementation.	All	All Neighborhoods, All Populations, All Sectors
4.3	<b>Build and Maintain Partnerships:</b> Maintain and expand regional and State partnerships to increase resilience.	All	All Neighborhoods, All Populations, All Sectors
4.4	<b>Build and Sustain Funding:</b> Secure, sustain, and increase City funding for climate resilience efforts.	All	All Neighborhoods, All Populations, All Sectors

## Goal 5: Support and Increase Economic Sustainability

**Goal 5** focuses on promoting policies and initiatives that help local businesses thrive. The City has tools that it can implement to promote economic stability while also encouraging resilience. This includes providing resources and incentives for businesses to adopt sustainable practices, reduce their environmental footprint, and invest in climate adaptation measures. Local businesses play a vital role in the community’s economic sustainability, and their success can be enhanced by facilitating access to green technologies, climate-conscious supply chains, and workforce training in sustainability practices. In addition, supporting business innovation in climate resilience can position the local economy to capitalize on emerging green industries, such as renewable energy, eco-tourism, and sustainable agriculture.

It is also important to ensure that local businesses are prepared to withstand the specific climate change impacts that may affect them by providing businesses with the tools, knowledge, and financial support to strengthen their resilience to climate hazards. Mitigating disruptions to local business operations will safeguard the local business environment while ensuring that businesses are contributing positively to both local prosperity and climate adaptation.

Policies and actions for this goal are administered by the **City Manager’s Office** with assistance from a range of City departments.

Table 13. Goal 5

Goal	Strategy	Hazards Addressed	Neighborhood, Population, or Sector
<b>Goal 5. Support and Increase Economic Sustainability</b>			
5.1	<b>Resilience Incentives:</b> Improve the resilience of homes to climate hazards through economic programs.	Coastal Wave Flooding, Decreased Air Quality, High Intensity Winds, Extreme Heat	Homeowners and all Residents
5.2	<b>Strong Local Businesses:</b> Work collaboratively with local businesses to build their resilience and adaptive capacity.	Coastal Wave Flooding, Coastal Erosion, Wildfire, Decreased Air Quality, High Intensity Winds, Extreme Heat, Drought, Increased Precipitation, Reduced Ocean Health	Local Business

## Adaptation Strategies and Actions

To achieve the five adaptation goals outlined in the section above, a set of adaptation strategies was developed. The strategies that were identified fall into **10** general categories:

- 1) **Programs**—involves a wide range of strategies that may expand or create new programs, activities, and initiatives, including those that incentivize or disincentivize action
- 2) **Funding and Capacity Building**—aims to enhance local capabilities
- 3) **Partnerships**—includes developing coordination and collaboration with stakeholders
- 4) **Monitoring**—involves evaluation and developing the means to judge success
- 5) **Study**—includes a range of activities that can improve feedback, data, and analysis and lead to better understanding of impacts and increase preparedness
- 6) **Plans, policies, regulations**—involves a wide range of strategies to develop or revise existing plans, policies, regulations, and guidelines; for example, this may include actions that influence the way land and buildings are developed to reduce hazards
- 7) **Capital Improvements**—typically follow from planning and policy and involve a wide range of actions designed to address physical and functional deficiencies and needs in the built and natural environment; this may include the construction of structures to reduce the impact of a hazard or the restoration of natural systems.
- 8) **Ongoing Efforts**—strategies that build on existing city efforts
- 9) **Communications**—improved communication and coordination within the community, and may involve early warning systems and communications plans post-disaster
- 10) **Internal Procedures**—involves building stronger internal processes, trainings, and internal communications

Strategies were developed by the Project Team and informed through public outreach events. Specific strategy actions and details are listed in Appendix B. Strategies were developed to target specific problem statements that emerged from the vulnerability assessment and focus on the most vulnerable populations, assets, and services in Half Moon Bay. To ensure the creation of effective strategies, the Project Team developed a short list of selection criteria to prioritize strategies. These criteria include the impact/protective value of the approach, the number of hazards addressed and alignment with the problem statements, the cost/level of effort of the approach, the level of feasibility and capacity to implement the approach, co-benefit considerations such as equity, and alignment with existing plans and policies.

## Prioritization Process

A prioritization process was used to provide a relative ranking of adaptation actions that are “Low,” “Medium,” and “High” priorities for the City. While all strategies are worthwhile, some strategy’s effect on climate change mitigation and hazard reduction may be less impactful than others. Clear prioritization helps to focus resources and staff time on the most impactful areas, or on strategies that need to be done earlier to enable other strategies.

The prioritization process included the development of performance criteria, which included the scoring and weighing of each action. The result was an aggregated score (or performance rating) and a ranking as a high, medium or low priority action. Note that overall prioritization across goals is not undertaken, as

the types of actions aligned with each goal are affected in different ways by the criteria weighting process. In addition, there are other factors that are not easily quantified, but should be considered as the City selects actions for implementation (see the section below on additional factors for consideration).

## Performance Criteria and Ratings

For each criterion, actions were assigned a performance rating, and the criteria and rating levels used to assign these scores are listed below.

The **impact and protective** value were scored from very high to low, where higher priority was given to strategies that will create a measurable increase in resilience and or reduction in harm. The strategies were judged according to how effective the strategy is at addressing a problem(s) and what future losses might be avoided. The measure included:

- **Very High**—Action will provide an immediate and ongoing reduction of risk exposure for life and property to a highly vulnerable or large area/population.
- **High**—Action can be implemented in the mid-term to provide a reduction of risk exposure for life and property to a highly vulnerable or large area/population, or action will provide an immediate reduction in the risk exposure for property to a moderately sized area/population.
- **Medium**—Action can be implemented in the long term to provide a reduction of risk exposure for life and property, or action will provide an immediate reduction in the risk exposure for property to a smaller area/population.
- **Low**—Long-term benefits of the action are difficult to quantify or minimal in nature, or benefits cannot be determined with adequate certainty.

### Alignment with the Problem Statements

The number of problem statements addressed by an action was also included as a factor.<sup>14</sup>

**Cost/level of effort** was given a relative score from highest to lowest to prioritize lower cost/more fundable strategies where:

- **\$\$\$\$**—Cost is very high, and existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (e.g., outside funding sources, bonds, grants, levies, or fee increases).
- **\$\$\$**—Cost is high, and existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (e.g., outside funding sources, bonds, grants, and fee increases).
- **\$\$**—The action could be implemented with existing funding but would require a reapportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years (including those with significant ongoing costs).
- **\$**—The action could be funded under the existing budget.
- **Enabling**—No direct cost to the City, but enables or supports an existing program from a local or regional partner.
- **Within Current**—The action is part of an existing program funded by the City.

The level of **feasibility and capacity** accounts for responsibility for implementing the action and the City or partner's level of organizational capacity:

<sup>14</sup> Across all actions, the scores for this factor ranged from 1 to 6.

- **High**—Preference for City administered programs that align with existing plans and programs or is aligned with the LCIP
- **Medium**—Preference for outside entity-administered programs that align with existing plans and programs or is aligned with the LCIP
- **Low**—Organizational capacity to implement the strategy is low or unknown

**Additional Benefits considerations** are strategies to minimize maladaptation (which refers to an action that is intended to be beneficial, but worsens the situation or increases vulnerability), and promotes co-benefits to the community (such as improved recreational opportunities) and ecological systems, and leads to more sustainable practices such as a reduction in greenhouse gas emissions. Scores were given to strategies with more co-benefits. Some examples of the co-benefits considered include:

- **Equity:** The strategy involves meaningful and active engagement with the most impacted communities, fosters community resilience, and protects the City’s most vulnerable populations. This involves explicitly prioritizing communities that are disproportionately vulnerable to climate impacts, while ensuring that the costs of the action do not fall disproportionately on those sectors of the community.
- **Environmental performance:** What are the potential environmental impacts or considerations of implementing the strategy?

## Normalization of Performance Ratings

For each of the criteria, the performance score was assigned, normalized<sup>15</sup>, and then multiplied by a relative importance factor for each criterion. These weightings prioritize actions that have low costs, address multiple hazards and problem statements, provide additional co-benefits, and are actions that the City has the capacity to implement. Criteria weightings used in the calculation of the final ranking are outlined below:

- Cost—20%
- Impact and protective value—30%
- Number of problem statements addressed by an action—10%
- Feasibility and operational capacity to implement—25%
- Additional Benefits—15%.

While overall scores were calculated in the same way for actions across all goals, the prioritization ratings of each action were determined within each goal. This prioritization rating is based on a rule of thirds, with actions scored in the top third of the range of scores for each goal assigned a rating of High, actions with scores in the bottom third assigned a Low priority, and the balance being assigned a priority rating of Medium.

## Priority Actions

This section provides a summary of the top adaptation actions that received the highest priority scores under each goal. Many actions that received lower priority rankings may be worthwhile strategies to pursue for the community; however, their effect on climate change mitigation and hazard reduction is considered less impactful than the other strategies. This list does not necessarily indicate the first actions

<sup>15</sup> Numeric scores were converted to a score between zero and one, by dividing the score by the number of potential scores (the range). For example, if there were six potential scores (0 to 5), then a score of 5 would be assigned the maximum value of 1, and a score of 4 would be assigned a value of 0.8 (4 divided by 5). A constant linear relationship between the scores was assumed.

to be undertaken by the City, or that the ordering has a sequence of implementation. Full results of the prioritization process are available in Appendix B.

## Goal 1: Ensure a Healthy, Resilient, and Self-Sufficient Community

Actions rated most highly under this goal represent actions that enable greater agency and capacity for members of the community via local planning activities and provision of information and economic incentives. The five actions rated most highly under this goal are:

- Action 1.4.9. Develop neighborhood-specific climate adaptation plans with local stakeholders
- Action 1.4.2. Establish financial incentives, including stormwater fee discounts (requires imposition of stormwater fees), tax credits/rebates/reimbursements, permit rebates (e.g., freeboard incentives), awards/recognitions, etc., to homeowners who mitigate flood risk on at-risk properties.
- Action 1.2.1. Host annual educational events for residents and businesses on weatherproofing and fireproofing their homes and businesses. Continue to coordinate with the CERT program to help distribute information to increase resident and homeowner awareness and knowledge of how to prepare for emergencies.
- Action 1.2.3. Bolster and further promote the neighborhood-level CERT program. Work with existing CERT leads to identify neighborhood-level gaps in membership, and develop emergency preparedness by organizing the City by blocks and sections, plus recruiting new Block Captains as needed
- Action 1.5.4. Build on existing email newsletters, websites, and social media for community outreach, and communication for storm and disaster readiness. Coastside Buzz, Half Moon Bay Review - Coastside News, etc.

## Goal 2: Foster a Thriving and Accessible Coastline and Open Space

Actions rated as high priorities under this goal focus on management of public open space adjacent to hazard source areas, plus planning and operational measures to improve knowledge of and reduce risk of private and commercial structures to coastal hazards. The top five equally rated actions under this goal are:

- Action 2.1.2. Identify public land near creeks that will benefit from sustainable landscaping and other stormwater management to slow water infiltration along steep stream channels.
- Action 2.2.2. Develop staff guidance and education materials for selection of plants and landscaping alternatives that increase drought resilience and comply with FireWise requirements.
- Action 2.4.2. Track current state efforts around artificial reefs and sediment management. If alignment exists, study the viability of artificial reefs, reef augmentation, and opportunistic sediment placement in key areas prone to coastal flooding and erosion (e.g., three rocks off Miramontes Point<sup>16</sup>, West Miramar, etc.)<sup>17</sup>.
- Action 2.1.3. Increase the frequency of creekside debris (trash) removal.
- Action 2.1.4. Partner with the San Mateo Resource Conservation District (RCD) to restore wetlands in high-impact areas vulnerable to flooding.
- Action 2.3.1. Identify adaptation pathways with specific actions and triggers for neighborhoods especially vulnerable to shoreline hazards. Identify hazard-prone critical facilities and

<sup>16</sup> Miramontes Point Sea Level Rise Vulnerability and Fiscal Impact Assessment—2023

<sup>17</sup> The California Department of Fish and Wildlife is developing a framework with guidance and currently studying the viability of artificial reefs under the California Artificial Reef Program (CARP).

infrastructure and plan for relocation, and structural and nonstructural retrofitting measures as necessary.

### **Goal 3: Protect the City through Increased Resilient Infrastructure**

Actions with the highest priority ratings under this goal are focused on improving knowledge about the asset-specific climate vulnerabilities of key assets and Public Works properties, and actions to increase the availability of generators and backup power in the case of an emergency. The top five rated actions under this goal are:

- Action 3.6.2. Develop a community resilience hub(s) by adding solar energy, water supply, communications, and battery storage at a publicly available site, such as the library or an established resilience hub.
- Action 3.3.1. Climate change facilities master plan for the City Corporation yard and City-owned downtown buildings.
- Action 3.4.2. Upgrade municipal watering systems to be more water efficient.
- Action 3.3.2. Update the Storm Drain Master Plan. Consider the projected future intensity and duration of precipitation events to recalculate flood hydrographs and inform the design of infrastructure upgrades and retrofits. Aligns with 4.1.2.
- Action 3.6.3. Ensure that all critical facilities have backup solar/generator systems so that they are operational during multiday power outages. Installation and replacement of emergency generators at critical facilities (cell towers, library, city hall, community center, police/fire). Continue to monitor, maintain, and perform condition assessments for the existing emergency generators (serviced monthly by Public Works).

### **Goal 4: Build and Sustain the City of Half Moon Bay Government's Capacity to Increase Resilience**

Actions under this goal that were rated as high priorities include actions focused on improving the financial and technical capacity of staff through training and grant applications, plus strengthening regional partnerships. The actions with the five highest priority ratings are:

- Action 4.2.2. Hire a full-time grant writer, or contract these services on an as-needed basis, to increase funding and resources for Half Moon Bay's climate and resilience projects.
- Action 4.3.2. Continue with and expand the working relationship with PG&E to improve coordination. Work with PG&E to better understand the grid map and power grid with historical outages and causes, and study where the grid could become more resilient. Develop partnerships on vegetation management; identify key locations for undergrounding electric lines; conduct a feasibility study to determine potential locations for microgrids; ensure dedicated backup power systems for key infrastructure (resilience hubs, key City facilities such as the SAM Wastewater Treatment Plant, traffic signals, and telecommunications infrastructure).
- Action 4.3.15. Coordinate with Coastside Fire Protection District to enhance fuel break and fuel reduction efforts and increase participation in CERT program.
- Action 4.3.8. Work with regional partners to maximize the number of residents that have health insurance, especially for vulnerable populations.
- Action 4.3.16. Work with Cabrillo Unified School District to distribute emergency response kits to students.

## Goal 5: Support and Increase Economic Sustainability

Actions under this goal that were rated as higher priorities focused on education, facilitating support for businesses via recovery and resilience actions, and improving the urban canopy. The five actions rated most highly for this goal are:

- Action 5.2.1. Work with the City's businesses and business organizations to support their efforts to become more resilient, including providing resources related to energy resilience, increased defensible space, backup power, water, and communications continuity. Conduct outreach campaigns to engage business leaders to understand risks and identify opportunities.
- Action 5.2.4. Foster business partnerships and mentoring to support business continuity planning and enterprise risk management. Coordinate with regional businesses to ensure they understand the ramifications of, and are planning for, wildland fires including power shutoffs, data backup, chain of command in leadership, evacuation, defensible space, and building hardening.
- Action 5.1.1. Evaluate the provision of incentives to encourage homeowners and business owners to improve home/building hardening practices and implement accordingly.
- Action 5.1.4. Where permitted by FireWise regulations, using existing contractors, incrementally improve and maintain the urban canopy in downtown and throughout the City to provide shade and beautification.
- Action 5.2.5. Establish a local business pre-disaster recovery planning and coordination group and/or committee to update or initiate business continuity planning programs. Include considerations of physical assets and workforce.

### Additional Factors for Consideration

**Alignment** with other plans is noted if a strategy has already been identified in or builds on a policy or plan that has already been developed. The parties responsible are listed to note the City department that could take ownership of the strategy. Ideally, these strategies would build upon existing institutional structures within the City, and the identification of a champion to see the action through should be identified.

If a strategy is of interest, the following additional considerations should be evaluated once the specific nature of implementation is identified.

- **Funding:** What resources are available to pay for implementation (both to implement and over the life of the project)?
- **Legality and Regulatory Environment:** Is the strategy consistent with applicable laws and/or compatible with the existing regulatory environment?
- **Adaptability:** Does the strategy respond to continual changes in climate, ecology, and the economy using adaptive management that incorporates regular monitoring?
- **Flexibility:** Does the strategy employ adaptive and flexible governance approaches? For example, maximizing collaborative partnerships, or among numerous knowledge holders and stakeholders, accelerate effective problem solving.
- **Accountability:** Can the responsible party ensure success of the strategy, and are they capable of transparency on decisions, actions, and outcomes, and taking corrective measures when needed.
- **Equity:** Does the strategy directly impact or support vulnerable communities and help to increase resilience, adaptive capacity or otherwise improve the ability of identified socially vulnerable populations to withstand climate hazards.

## Considerations of Socially Vulnerable Populations

Vulnerability has underlying historical roots that should be considered when developing strategies, and historically, socially vulnerable and underserved communities have faced barriers to disaster preparedness and recovery due to factors such as limited financial and technical resources, reliance on others for basic needs and transportation, and potential discrimination or stigma that could impact recovery efforts. Recognizing these challenges, the City has an opportunity to lead by example. Proactive planning can help the City identify potential impacts and community needs, engage with vulnerable communities, and work to reverse past injustices that have placed undue strain on these populations.

It is important that the City aims to reduce the health risks associated with climate change for disadvantaged communities by prioritizing programs and improvements to address public health and other social needs. The City may have difficulty addressing the needs of disadvantaged groups and aiding socially vulnerable groups because of limited funding, political and community will, competing interests, and differing priorities on the allocation of public safety dollars. The City should identify and work with local groups with connections to socially vulnerable groups, such as nonprofits, faith groups, the various affordable housing programs in the City, mobile home and RV park management, and other community groups. Venues for outreach and the building of trust include the public library, the community center, and local events.

## Implementation

Once the adaptation strategies are prioritized, chosen strategies must be implemented. Developing an adaptation implementation plan for each prioritized strategy helps City departments agree on how and when a strategy should be implemented. To ensure that implementation of each strategy is effective, a designated party will need to monitor, evaluate, and modify strategies as needed based on their observed effectiveness, local changes, and in response to new science. The implementation plan also lays out the roles and responsibilities for implementation, as well as providing some description of the existing resources to enact it, those that are still needed, and potential barriers to implementation.

Aligning strategies and actions with existing City programs is an effective way to leverage the implementation of the CAAP. Many of the steps and recommendations developed in this plan align with policies that the City developed in its recent update of the LCP. Appendix C notes the primary alignments between this plan and the policies of the LCP. The Project Team also identified other existing programs, plans, and policies that are best suited to drive strategy implementation. In some cases, the best approach to implementation was unknown, and in these cases, the City will need to identify the planning document(s) or other mechanisms best suited to drive strategy implementation.

## Roles and Responsibilities

Adaptation strategies, irrespective of the specific plan or program in which they are embedded, must be effectively implemented to realize their objectives. This necessitates the allocation of the approach to a leader within the City, as well as the identification of personnel and supporting departments or other agencies. This section provides a list of City departments and their responsibilities.

### City Government Departments

Figure 36 provides an overview of the City of Half Moon Bay's organizational structure. The departments include the City Manager's Office, the Communication/City Clerk's Office, Administrative Services, Public Works, and Community Development.

The City contracts with the San Mateo County Sheriff's Office for police services and is served by the Coastside Fire Protection District, which has a cooperative fire protection contract with CAL FIRE. The City is also served by CCWD for water service and participates in the SAM Joint Powers Authority.

### City of Half Moon Bay Organizational Chart

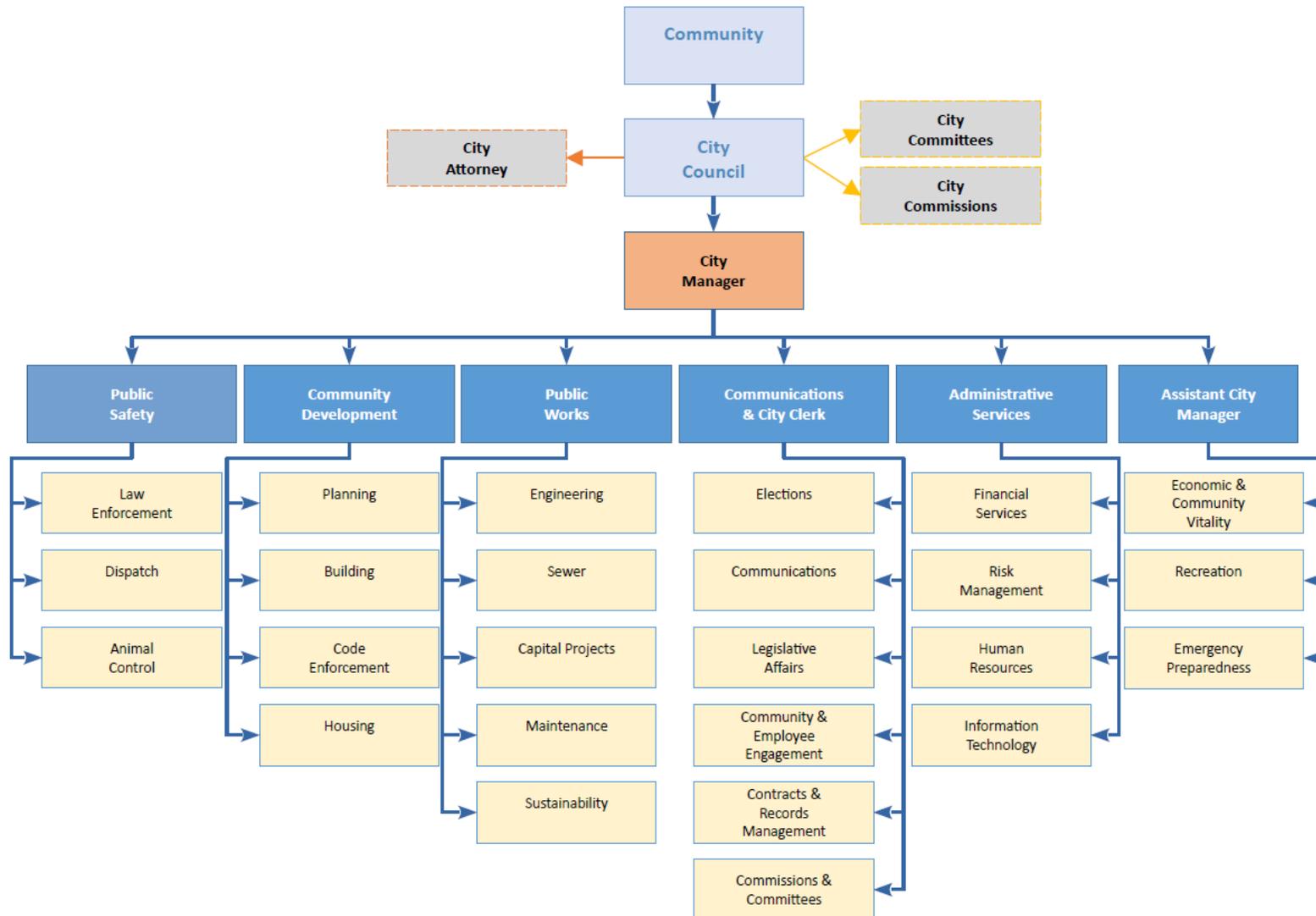


Figure 36. City of Half Moon Bay organization chart

## City Departments

The Departments of Community Development and Public Works have key roles in all climate adaptation actions. The role of Community Development guides development in a manner that protects public health and safety, and ensures economic vitality by developing long range plans, setting policy and regulating projects through building and planning permits. This is mostly closely aligned with strategies and actions outlined in Goal 1. Ensure a Healthy, Resilient, and Self-Sufficient Community, and Goal 4. Build and Sustain the City of Half Moon Bay Government's Capacity to Increase Resilience.

The role of Public Works is targeted towards physical interventions to reduce climate risk exposure and vulnerabilities, and the maintenance of existing infrastructure and facilities. With a key role in implementation, Public Works will be heavily involved in Goal 2. Foster a Thriving and Accessible Coastline and Goal 3. Protect the City through Increased Economic Sustainability.

The Department of Administrative Services is critical to actions that involve partnerships with regional, state and federal entities, and would be involved in Goal 4. Build and Sustain the City of Half Moon Bay Government's Capacity to Increase Resilience.

The City Manager's Office has responsibilities over economic and community vitality and would be involved in Goal 5. Support and Increase Economic Sustainability.

## Partners

Provided below is a short list of the partners referenced in the adaptation strategies in Appendix B. The CAP provides a much more comprehensive list of public sector and nonprofit partner organizations, and Bay Area Climate Action Mapping Project<sup>†</sup> provides an up-to-date list of organizations actively working on climate action.

- **Coastside Fire Protection District (CAL FIRE)**—A special district government agency responsible for fire protection on the Coast of San Mateo County. CAL FIRE is the operational service provider for the district and is included with the City above as they are a key partner.
- **Coastside County Water District (CCWD)**—A public utility that provides treated potable water to the City of Half Moon Bay and the unincorporated coastal communities of El Granada, Miramar, and Princeton-by-the-Sea in San Mateo County. Serving an area of approximately 14 square miles, the district serves nearly 20,000 residents across more than 7,600 accounts.
- **Sewer Authority Mid-Coastside (SAM)**—A Joint Powers Authority that provides wastewater treatment and collection services to the communities of Half Moon Bay, El Granada, Miramar, Montara, Moss Beach, and Princeton-by-the-Sea in San Mateo County. SAM's member agencies include the City of Half Moon Bay, the Granada Community Services District, and the Montara Water and Sanitary District.
- **Land Trusts**—There are numerous land trust organizations that are active landholders and managers in the Half Moon Bay region. Within the City, one of the largest is the **Coastside Land Trust**, a nonprofit organization that has significant holding in the Wavecrest area.
- **California State Parks**—These are public lands preserved and managed by the California Department of Parks and Recreation (California State Parks). Half Moon Bay State Beach is in the City, and includes Francis Beach, Venice Beach, Dunes Beach, and Roosevelt Beach, as well as two campgrounds.
- **Pacific Gas and Electric Company (PG&E)**— is a major utility provider in the City and broader region.
- **Peninsula Clean Energy (PCE)**— The main electricity provider for 97% of Half Moon Bay Residents.
- **California Department of Transportation (Caltrans)**—The state agency responsible for planning, maintaining, and improving California's transportation infrastructure, including State Routes 1 and 92.

<sup>†</sup> More information can be found here: <https://www.bayareaclimateactionmap.org>

- **County of San Mateo**—Operates under a five-member Board of Supervisors system. The Board oversees county operations, including health services, public works, and law enforcement. The Sheriff is an independently elected official responsible for law enforcement duties.
- **California Coastal Commission (CCC)**— Is a state agency that protects and regulates California's coastal resources ensuring public access and sustainable development within the coastal zone

## Monitoring and Evaluation

The science and certainty around climate impacts is constantly evolving, however, projections of climate change impacts are fraught with uncertainty. Adapting to climate change should be approached as an ongoing, flexible, and adaptive process. The City needs to prepare for inevitable changes, while also managing and overseeing its day-to-day responsibilities.

Monitoring and evaluation will play a crucial role in documenting changes caused by climate change and identifying points in time where it is important to adjust adaptation strategies to avoid emergencies and the worst possible consequences of climate change. For example, if all ice on Earth melted, sea levels would rise ~200 feet, causing significant global changes including localized flooding and erosion impacts along the entire City shoreline. However, if that were to occur, it will take time, and adapting to climate change should not be an evacuation. Monitoring sea level rise and erosion over time will indicate when it is time to move away from the current shoreline and avoid emergency damage to infrastructure and property.

Each department in the city should evaluate day-to-day actions and identify opportunities to start collecting long-term monitoring data as part of daily routine actions. This will require subtle changes in each department to begin tracking various monitoring information. For example, Public Works should document how many times the department needs to close a road due to flooding, measure the distance between a road surface and a cliff edge after an erosion event, or how much is spent annually to repair infrastructure due to elevated groundwater, flooding, high heat, or fire. These monitoring elements could be integrated into daily work orders and completion procedures.

The Community Development Department could add items to a permit checklist to account for more fireproof or floodproof construction considerations. Integrating these changes into daily practices could include upgrading checklists, tablet templates, end-of-day reporting, completion of project accounting, and this information can then establish a long-term monitoring data set. This long-term data set will play a crucial role in tracking climate impacts and help identify when to adjust adaptation efforts and when and where changes may be necessary.

The City should create a strong monitoring and evaluation plan that covers all actions that are implemented either in part or in full, by department, and reported annually or interannually. Developing a streamlined central database that is automated in these daily workflow adjustments will help with reporting and is key to avoiding wasted staff time and resources. Such a plan should clearly define desired outcomes, specify what will be monitored and how, establish thresholds that indicate if goals aren't being met, and outline alternative actions to take if those thresholds are crossed. Monitoring and evaluation processes should also track the uptake and effectiveness of actions that are implemented both by the community at large and by regional partners.

A monitoring and evaluation plan should be revisited on a routine basis to maintain relevance and address changing needs, limitations of the plan, or changes in the political landscape (such as funding). Reporting progress of CAAP actions as well as any needed adjustments to goals should be presented to City Council every 1-2 years. This will provide updates on the implementation of individual actions, as well as an opportunity for feedback on priority reevaluation as needed.

## Funding and Financing Mechanisms

Effective implementation of a climate adaptation plan requires capital investment, funding, and staff time. However, climate adaptation, while costly, is significantly more economical than the escalating damages resulting

from inaction. These expenses can be reduced through the utilization of grants, leveraging public and private partnerships, low-interest financing, fees, and effective use of current funds, lessening the financial burden on the City and community.

#### *Requirements of Climate Adaptation Project Funding*

As an overarching concept, due to the unique nature of climate projects (specifically their uncertainty in costs, benefits, timing, longevity, and interconnectedness to other natural and human/cultural processes), funding sources should have the following characteristics:

- They should be matched to the demands or costs, both in terms of scope and timing.
- They should have a broad base with a low unit cost, meaning that the burden is spread across as large a number of sources or payees as possible.
- They should have sufficient longevity or, through investment, allow for streams of ongoing funding, such that capital repayments and operational and maintenance costs can be covered over the entire life of the project.
- They should align the beneficiaries of a given project with the means of raising revenue, noting that there may be multiple beneficiaries of the same project.
  - For example, rain gardens or permeable pavement reduce flooding, improve water quality, and enhance neighborhood aesthetics, benefiting both public agencies and private stakeholders. Shared funding can come from stormwater fees, developer contributions, and environmental grants.
- They should be equitable.<sup>s</sup>

## How To Decide between Viable Funding Sources

An important aspect of funding and financing is the practical question: Once the City has found viable funding sources, how should it choose between them and ensure that the source, scale, and duration of funding is aligned with the implementation of that action? To support the strategic and rigorous evaluation of financing options, Keenan (2019) suggests a multi-criteria decision analysis framework. This framework can be used to consistently weigh choices against one another in as transparent a manner as possible, based on the relative importance placed on particular aspects or outcomes of a funding source, such as cost, flexibility, and sustainability of a funding source. Further explanation and process development for these tools is included in Appendix D.

#### *Other Resources*

Several thorough reports have already been developed to explore the possibilities for funding and financing climate adaptation in California, including:

- Proposed Funding Pathways for Adaptation to Climate Change in California (Robert et al. 2021)
- Paying for Climate Adaptation in California: A Primer for Practitioners (AECOM 2018)
 

This report contains a comprehensive list of funding and financing tools (p.14), highlighting the benefits and drawbacks of each. This list is an excellent summary of the variety of funding categories available for climate adaptation in the state. It can be used as a starting point to assess and weigh options as funding opportunities are considered.
- Climate Adaptation Finance and Investment in California (Keenan 2019)

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<sup>s</sup> Even with *ad valorem* taxes that are equitable in principle, the increases in property values in coastal regions of California over the past decades have created a class of long-term residents who are asset-rich, but do not have ample free capital resources for additional fees and charges. This must be considered when selecting adaptation actions reliant on property taxes.

Each of these supplementary resources should be reviewed as a complement to this report for a thorough review of funding and financing general principles and overarching guidelines. This section focuses on avenues relevant to Half Moon Bay.

The following subsections explore several avenues for climate adaptation funding: existing city and county funds, state sources, non-governmental organizations, federal sources, and others. Each category and specific option has its own opportunities and challenges that are explored in detail and summarized at the end of this section.

## Existing City Programs and Funds

Although the City of Half Moon Bay is a small, low-density community with a smaller residential property tax base, it hosts several established funding mechanisms that could be directed toward climate resilience initiatives. While monies for these funds have already been allocated, there is a process in place to reallocate funds. Each revenue stream has a set of initiation documents that lay out the types of projects that funding stream considered. These initiation documents could be reviewed and the types of projects expanded or weightings changed to prioritize longer-term benefits to the City. The City should consider doing so for necessary infrastructure upgrades and resilience measures that benefit City infrastructure, open space, and the Half Moon Bay community as a whole.

According to the fiscal year 2024–2025 budget, there is an expected shortfall in the next 3 years that, without intervention, would deplete the City’s reserve balance by fiscal year 2026–2027 (Rossi et al. 2024). Because climate resiliency measures often suffer from complacency due to climate change’s uniquely sporadic, insidious nature, they are typically some of the first initiatives to be cut during financial stress. However, due to the expected increased future costs to the City if climate resiliency programs are delayed, it is important that the City continues to prioritize climate resiliency as it would any other pressing, risk-reduction measure, such as reinforcing a degraded bridge or clearing away dry, natural debris from electrical infrastructure. The return on investment of climate resilience activities is substantial<sup>1</sup>.

As such, it may be helpful to create a special fund for climate resilience projects that can house dedicated funds (rather than tracking multiple projects from funding streams of many sources independently) to keep it insulated from spending cuts.

The following options present opportunities to finance adaptation programs with minimal structural changes to existing funding frameworks; a priority action should be to investigate whether these funds can be used to support resilience projects directly either as is or with modifications to the governing documents of the funds, or potentially be funneled into a resiliency Special Fund, if one were to be created:

### Streets and Roads Special Revenue Fund

This fund consolidates multiple revenue streams, including gas tax funds, transportation-related taxes, and targeted grants, for street and road maintenance and improvement projects (excluding capital projects). With streets and roads being particularly vulnerable to climate impacts (flooding, extreme heat affecting road surfaces, etc.), a portion of these funds could be allocated to climate-resilient transportation infrastructure projects (assuming it is possible to amend the allowed expenses, or to amend the prioritization process within those approved spending categories). Although they cannot be used for new projects, they could be used for climate-related repairs until a threshold is met, requiring additional investment for new infrastructure. The number of repairs should be documented as part of routine maintenance to support longer-term climate monitoring and evaluation.

<sup>1</sup> ROI typically ranges from \$6-\$13 in return per dollar spent, but the returns (savings) and costs are not aligned. i.e. costs may be incurred by the City, with many of the savings accruing to higher levels of government or to the residents. <https://www.uschamber.com/security/the-preparedness-payoff-the-economic-benefits-of-investing-in-climate-resilience>

## Capital Projects Fund (Fund 151)

This fund supports capital improvement projects outlined in the City of Half Moon Bay Capital Improvements Plan. This plan was developed to “ensure major infrastructure - such as streets, parks, trails, public facilities, sewers, and drainage - are well-maintained for maximum safety, public use, and enjoyment” (City Council Strategic Plan 2025). As of June 20, 2024, this fund contained \$1.7 million (Rossi et al., 2024). The purpose of these funds is to support projects that address the City’s identified priorities, one of which being Community and Climate Resilience and Sustainability (City Council Strategic Plan 2025). This fund could further support climate adaptation strategies through capital projects, such as infrastructure improvements.

## Lot Acquisition/Retirement Fund

This fund, which collects in lieu fees for development rights, allocates funds to retirement of lots from development. An example of this type of transaction is the transfer of 21 parcels in the Wavecrest area to the Coastside Land Trust in 2025. These parcels were acquired in 2024, with funding coming in part from lot retirement payments associated with the Ailanto Pacific Ridge development, allowing the City to facilitate conservation and extension of the California Coastal Trail with reduced financial impacts to City finances.

The process of selecting parcels for acquisition and retirement could be reoriented toward managed retreat or removal of properties in high-risk areas. As of June 2024, this fund housed \$1.4 million. This fund could be expanded to prioritize acquisition of properties in flood zones, coastal erosion areas, or wildfire-prone locations, facilitating orderly withdrawal from areas where adaptation may be impractical.

## Parks Development Funds

This fund is used to support the acquisition, development, and capital improvements of the City’s parks and trails. This fund consists of funding acquired by development impact fees, state grants, and federal grants, comprising a total of \$894,000 as of June 2024. This fund is particularly relevant for supporting nature-based climate solutions, some of which may correspond with programs in the City’s Green Infrastructure Plan<sup>u</sup>, which should be reviewed periodically in cases where land has either been reclaimed from development of some kind or could be protected from development. For example, if a few lots were acquired with acquisition funding, they could be returned to the public trust as parks and trails whose design is specifically attuned to climate adaptation needs such as erosion control, defensible space, and storm setback buffering. These funds could potentially support development of green infrastructure projects in the City’s Green Infrastructure Plan as they relate to improvements in parks and open space.

## Usage Fees

The City of Half Moon Bay already has a few usage fees (or franchise fees) in place already. The Storm Drainage Fee and Solid Waste Franchise Fee are examples, garnering \$7,900 and \$613,923 in fiscal year 2023–2024, respectively. This report suggests that the City consider reallocating those revenues (in whole or in part) to resilience projects (understanding that a portion of the franchise fee goes toward this already) and introducing more usage fees that are thematically linked to climate adaptation. These might include an Electrical Utilities Franchise Fee, Parking Fees (other than at Poplar Beach), Hazardous Waste Removal Fee, and Water Usage Fees (above the water price).

## Existing County Programs and Funds

In addition to the City of Half Moon Bay, the greater San Mateo County also hosts several established funding mechanisms that could support climate resilience initiatives.

<sup>u</sup> <https://www.half-moon-bay.ca.us/617/Green-Infrastructure>

## San Mateo County Resiliency Grants

The Community Resilience Grants Program supports projects that assess sea level rise impacts and implement innovative adaptation strategies. The County has awarded \$310,000 in grants to cities and nonprofit organizations for developing adaptation plans and building community coalitions focused on climate resilience<sup>v</sup>.

## San Mateo County Joint Powers Financing Authority

Formed as a partnership between San Mateo County and its Community Development Commission, the Joint Powers Financing Authority (JPFA) is a specialized entity that finances county capital projects by issuing and facilitating the repayment of lease revenue bonds (County of San Mateo 2025). This means that San Mateo County is the holder of the bond revenue, and that if Half Moon Bay wanted an adaptation-focused capital improvement project, the City would need to appeal to the County. Lease revenue bonds are restrictive in that they only finance capital projects that generate rental income, which may be a difficult category of adaptation project to find. In the case where an adaptation project is aligned with this mechanism, this could be a good option if the debt servicing of an alternative financier would be larger than a monthly lease payment to the County. If the alternate is a private bank, this would likely be the case since the County would be able to lend at a lower rate than private competitors due to its financial standing.

This JPFA is classified as a major governmental fund, with a fund balance of \$79.6 million as of fiscal year 2023–2024 (Rossi et al., 2024). In addition, this San Mateo County JPFA was assigned an AA+ rating by Standard & Poor, indicating to investors a high capacity to meet financial obligations, and low risk of default thus allowing for low interest rates (lease payment obligations for Half Moon Bay)<sup>w</sup>.

## Capital Projects Fund

Similar to the City's Capital Projects Fund, this County fund supports infrastructure and development projects within the County, with an overall fund balance of \$173.6 million for fiscal year 2023–2024 (Rossi et al., 2024).

## State

State programs include both grants and loans. There are several sources of such funding opportunities in California set aside for various purposes. Like philanthropic organizations, competitiveness is high because the funds are available to so many entities (state-wide). State opportunities involve application processes, monitoring and reporting, and spending limitations that can be administratively burdensome; however, as long as there is substantial overlap between the intent of the funding program and the project to be funded, this can be a comparatively more streamlined, less costly, and secure source of funding than other options.

## Proposition 4

In November 2024, California Proposition 4 was passed, which allowed the State to issue \$10 billion in general obligation bonds to fund climate and water projects. Proposition 4 funding will be well aligned with City goals as it includes funding for coastal resilience and sea level rise, flood planning, and nature-based solutions (Figure 37).

<sup>v</sup> See more information here: <https://resilientca.org/projects/2e2d0006-0ec0-463c-917f-56542df5e97f/>

<sup>w</sup> See more information here in the County's annual comprehensive financial report: <https://www.smcgov.org/controller/annual-comprehensive-financial-report-acfr>

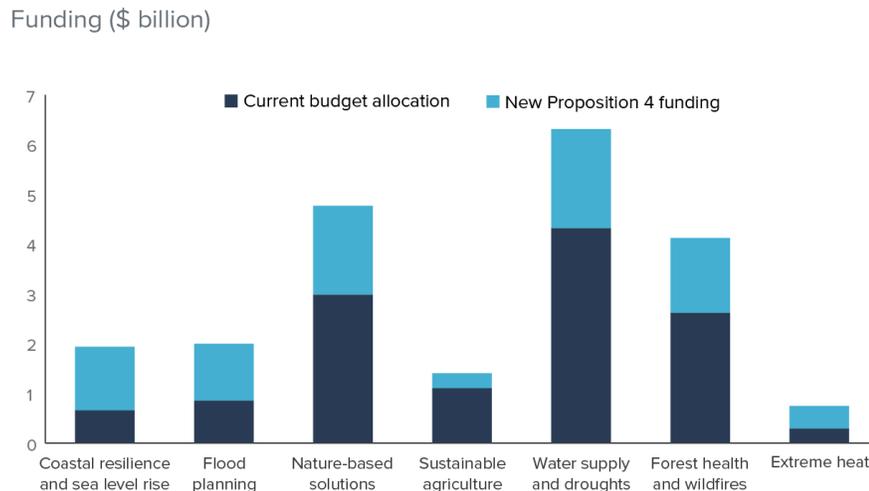


Figure 37. Proposition 4 funding categories for the State of California. Source: Public Policy Institute of California.

### California Infrastructure and Economic Development Bank

The California Infrastructure and Economic Development Bank (IBank) aims to support “the transition to net-zero GHG emissions while strengthening resilience to climate impacts, including municipal lending for climate-smart wastewater management infrastructure.” Ultimately, IBank’s goal is to act as California’s green bank, “facilitating investments of more than \$35 billion in California’s clean energy economy and the safeguarding of its environment” through various financial instruments (California Infrastructure and Economic Development 2025).

Like traditional bank instruments, there are financing costs (although much lower than with a traditional bank), which makes this option less desirable than a grant or even some public-private partnership (P3) arrangements; however, the potential for large (multimillion dollar), lump-sum investments and flexibility to partner with aligned companies makes IBank a compelling option to pursue. More detailed information on IBank’s offerings are attached in Appendix E.

### California Climate Investments

California Climate Investments (CCI) is an entity that facilitates the funding of greenhouse gas-reducing projects via various state agencies. CCI allocates revenues from California’s cap-and-trade program. The CCI endorses the use of loans, grants, and rebates as incentive mechanisms; which financial product Half Moon Bay might encounter depends on which state agency and program it pursues. Agencies that currently offer CCI-funded programs include California Air Resources Board, California Coastal Commission, California Conservation Corps, California Department of Community Services and Development, California Department of Fish and Wildlife, and several others. A full list of current programs and participating agencies can be found here. Although the mission of CCI focuses on greenhouse gas-reducing projects, there are many other goals that align with adaptation planning and execution. Some examples of currently offered projects are below.

- **California Ocean Protection Council**—Senate Bill 1, Sea Level Rise Adaptation Planning Grant Program: “The overall goal of the SB 1 Grant Program is to provide funding to develop sea level rise adaptation plans and projects to build resilience to sea level rise along the entire coast of California and San Francisco Bay.”
- **California Natural Resource Agency**—Urban Greening Program: “Establishment, enhancement, and expansion of community spaces and parks, tree planting, green infrastructure in streets and alleys, and the construction of active transportation infrastructure.”

## Clean Water State Revolving Fund

*California State Water Resources Control Board*

The Clean Water State Revolving Fund (CWSRF) program is a state-funded grant program for water infrastructure improvements. The CWSRF provides low-interest loans for projects ranging from under \$1 million to over \$100 million in scale.

Applicants consist of municipal governments, tribal governments, and nonprofit organizations. While wastewater treatment plants and sewer system upgrades constitute the majority of funded projects, the CWSRF also supports a variety of water quality initiatives including nonpoint source pollution control and estuary protection efforts. This grant program offers a funding opportunity for water infrastructure improvements that improve community climate resiliency (State Water Resources Control Board 2025).

## Sustainable Transportation Planning Grant

*California Department of Transportation*

The **Sustainable Transportation Planning Grant Program** offers three different programs that focus specifically on local and regional transportation infrastructure that aligns with State climate goals of Caltrans:

- 1) **Sustainable Communities Grants** (\$29.5 million purse) provide both competitive (\$17 million) and formula-based (\$12.5 million purse) funding to support local projects and planning that are aligned with state greenhouse gas emissions goals. These grants support Regional Transportation Plan Sustainable Communities Strategies while achieving California's greenhouse gas reduction targets of 40% below 1990 levels by 2030 and 80% by 2050.
- 2) **Climate Adaptation Planning Grants** (\$3.7 million purse) identify transportation-related climate vulnerabilities through the development of comprehensive adaptation plans. This funding also supports project-level adaptation strategies for transportation infrastructure facing climate risks. This is the only grant type of the three that would fund physical infrastructure changes such as road relocation.
- 3) **Strategic Partnerships Grants** (\$4.5 million purse) support “statewide, interregional, and regional transportation improvements on the State highway system in collaboration with Caltrans. A specialized subcategory within this grant focuses on transit planning projects that address multimodal transportation” needs across jurisdictions.

## Fire Prevention Grants Program

*California Department of Forestry and Fire Protection*

The Fire Prevention Grant Program prioritizes projects that promote community wildfire resilience, including: “hazardous fuels removal, wildfire prevention planning, wildfire prevention education, and wildfire prevention research with an emphasis on improving public health and safety.” Through a competitive selection process, eligible entities—including local governments, tribal authorities, certified conservation corps, qualified nonprofits, and Fire Safe Councils with 501(c)(3) status—can access funds to implement proactive wildfire management strategies. Joint Powers Authorities are acceptable applicants if they consist of the above-listed entities.

## Federal

Although federal funding may appear uncertain at the time of this report, there are still several federal resources available. The main benefits of the following programs are that they are all grants, meaning there are no capital costs, and they can be for large, lump-sum amounts. However, the (potentially short-term) unpredictability of these funds suggests that the City considers complementing these sources with other financial tools to diversify their portfolio against risk. In addition, federal programs often involve application processes, monitoring and

reporting, and spending limitations that can be administratively burdensome. However, when there is substantial overlap between project and funding program goals, this can be a comparatively more streamlined and less costly source of funding than other options.

### **Federal Emergency Management Agency**

Although FEMA is more typically associated with rapid-pace devastating events such as hurricanes, tornados, and floods, there are funding levers that should be explored within the context of climate change's slower-paced, sometimes less-obvious devastation.

The Pre-Disaster Mitigation and Building Resilient Infrastructure and Communities (BRIC) grant programs are two funding sources that could be creatively applied to the unique needs of climate adaptation projects. The Pre-Disaster Mitigation program was turned into the BRIC program in 2023, yet they remain separate entities on the FEMA website. The Trump Administration discontinued the BRIC program in spring 2025. There has been no change in the Pre-Disaster Mitigation program resources online. The City will need to contact FEMA directly to get the most recent funding options available.

The general outline of both programs is the same: funds any project that aims to insulate a community from losses due to a future disaster through a federal-state/local cost-share; all non-federal, government entities and tribes may apply; applicants tend to sign as sub-applicants on a state application; example projects could be retrofitting a community center to accommodate a double-use as a tsunami emergency gathering place or nature-based erosion control and flood management solutions.

Although the above grant program(s) rest(s) under the Hazard Mitigation Assistance Grants umbrella, the eponymous Hazard Mitigation Grant Program is not well suited to adaptation goals. It only becomes available after a presidentially declared disaster (i.e., a disaster needs to occur and the president must declare it a disaster). The goal of the funding is to rehabilitate a community after a disaster in a manner that will insulate the community from future disaster. The City should be aware of this funding source, but it should not be relied upon as a primary source of adaptation funding as it is reactive rather than proactive.

### **U.S. Bureau of Reclamation WaterSMART Water and Energy Efficiency Grants**

The U.S. Bureau of Reclamation (USBR) provides 50/50 cost-share funding for projects that improve water conservation and efficiency, water reuse, and water supply reliability, and reduce risk of future water shortages. Any entity with water or power delivery authority may apply. Projects with 2- to 3-year time frames are preferred. In 2024, projects ranged in size from approximately \$250,000 to \$5,000,000 and included activities such as ditch reclamation, underground pipeline construction, and advanced metering installations.

### **U.S. Army Corps of Engineers Continuing Authorities Program**

The U.S. Army Corps of Engineers (USACE) Continuing Authorities Program provides funding for feasibility studies and implementation of water and environmental projects related to flood control, aquatic ecosystem restoration, erosion control and prevention, and storm damage reduction, among others. Each feasibility study is federally funded up to \$100,000, and any additional costs are shared 50/50 with the project's nonfederal-agency sponsor.

### **U.S. Department of Agriculture Disaster Assistance Programs**

The U.S. Department of Agriculture (USDA) disaster assistance programs help farmers protect and recover from drought, wildfire, and winter storms. The USDA offers several programs that provide coverage for agricultural producers to help them manage risk and protect their operations from climate hazards and disasters that fall into the following categories: livestock, farm loans, farmland damage, and crop losses.

## Philanthropic and Nonprofit Organizations

Grants from private foundations can be well-suited for projects that build upon public funds to add further value to existing funding streams or initiatives. Local governments may consider applying for grants from adaptation-focused foundation programs, such as those at The Kresge Foundation, Doris Duke Charitable Foundation, the MacArthur Foundation, the California Endowment, or The William and Flora Hewlett Foundation.

The City of Goleta took advantage of these philanthropic opportunities to form and adopt its Creek and Watershed Management Plan in November 2020. It received funding from Union Bank, University of California Santa Barbara Coastal Fund, and Clif Bar Family Foundation to fund a Watershed Protection and Education Program (Trautwein et al. 2020). Although this project was a success, this project's funding makeup represents the typical struggles of sourcing from philanthropies; they typically, but not always, fund smaller projects, and thus a patchwork of various sources may need to be collected in order to fully support a single project. In the case of the Goleta project for example, University of California Santa Barbara provided \$8,912.32 in funding, which was specifically awarded for the hiring of a single intern (Coastal Fund UC Santa Barbara Associated Students). The Kresge Foundation, however, consistently funds projects ranging from \$50,000 to \$800,000. The City of Half Moon Bay will need to be particularly strategic in weighing competitiveness, size, administrative burden, and goal overlap when considering philanthropies and NGOs.

## Creative Strategies

### Municipal (Green) Bonds

Municipal bonds are another fiscal instrument that the City of Half Moon Bay can use to fund climate resilience projects; municipal bonds give projects access to the funding capacity of capital markets while distributing those costs over time in a predictable and relatively low-cost manner.

A relatively new instrument in sustainable financing, Municipal Green Bonds can be issued by governments as a means to raise funds for specified climate-resilience programs (Flammer 2020). Although Half Moon Bay has yet to issue any of its own green bonds, nearby San Francisco Public Utilities Commission issued green bonds to fund critical repairs of the Mountain Tunnel, an essential component of the regional water system that supplies drinking water to 2.7 million Bay Area residents (World Economic Forum 2023).

Although they require similar legislative processes, bonds are attractive as compared to taxation methods because they are a dedicated and protected source of funding for a specific type of spending. The capital costs are distributed through time (i.e., the current constituents of Half Moon Bay will not be the only ones paying for a project that benefits those 30 years from now), large sums can be generated immediately without placing the immediate cost on the current residents, and the total annual borrowing and financing cost to the local residents is typically lower than the amount that would be required in annual tax increases to pay for the project directly. In addition, as compared to taxation that is confined by the geographic jurisdiction of the City, the City can allow participation from any entity, regardless of whether it is within City jurisdiction.

The major drawback is that there is no guarantee of bond purchase, unlike in a taxation scheme where there is a guarantee that funds will be raised by some amount.

### Public-Private Partnerships

A P3 would involve collaboration between a private company and the City of Half Moon Bay to provide a marketable public asset or service (AECOM 2018). These partnerships, invited by a competitive bidding process, can improve service quality and efficiency. California's Infrastructure Finance Act authorizes local governments to use P3s for this purpose. P3s are often used to execute infrastructure projects. However, one drawback of P3s is that they cannot be executed in cases where private and municipal interests do not align. In other words, P3s are only attractive to private partners when there is revenue to be made from their involvement. Although this strategy would be beneficial for an adaptation measure, such as the revitalization of a local beach park where

revenues can be garnered from parking meters, other projects, such as urban tree planting for the mitigation of urban heat island effects, would need to be financed differently given the lack of a clear revenue stream.

One example of a P3 was the partnership between the City of Long Beach and the private company Plenary Properties to build the new Long Beach Civic Center in 2016–2019. The project included “the creation of a new City Hall, a new Main Library, a revitalized Lincoln Park, parking facilities, and a new Port of Long Beach headquarters, as well as a complementary private development in downtown Long Beach” (Plenary, n.d.). The project cost approximately \$900 million and Plenary was given a 40-year concessionary period during which it would manage operations and maintenance to collect revenue from its investment.

By using a P3, the City of Long Beach was able to redevelop the Civic Center at a lower cost than it had been paying to maintain its existing facilities, without assuming any new debt or levying any new tax measures. The private solution also offered lower financing costs than tax-exempt lease revenue bonds and better risk allocation for the City of Long Beach.

The key benefits of a P3 are that they:

- Include access to private capital
- Avoid public debt and associated debt-raising requirements
- Share risk between the public and private sector and assign the risk to the partner best equipped to manage or avert it
- Use private sector knowledge
- Manage risk as well as support maintenance and operations activities for projects with long lifespans.

## PG&E

### Self-Generation Incentive Program

The PG&E Self-Generation Incentive program offers rebates to customers installing battery storage systems. Although this program is targeted at PG&E residential and business customers, this could be a great opportunity for the City to facilitate/encourage customers to enhance the City’s energy resiliency. In addition, this program is a prime candidate for IBank’s Climate Incentive Bridge Loans and the Infrastructure State Revolving Fund loans.

## Summary of Funding and Financing Mechanisms

The City of Half Moon Bay’s small tax base and predicted, upcoming budget shortfalls indicate that although there are several preexisting funding and financing tools available to the municipality, they may not be sufficient to fund medium- and large-scale projects. Preexisting city funds can be creatively applied to sponsor adaptation projects with minimal procedural and administrative burden, save new taxation schemes, which may outweigh its relatively small contribution as compared to other similarly sized options such as NGOs and philanthropies. The benefit of NGOs and philanthropies as funding sources, although administratively burdensome and offering similarly sized awards, are that they are not subject to City budget cuts, which insulates them against local policy changes and budget shortfalls. Aligning capital improvement plans and the multi-jurisdictional hazard mitigation plans with adaptation priorities will help position the city for state and federal funding.

County programs are similarly insulated from local policy changes and budget shortfalls with the added benefit of preexisting programs with no voter approval required. However, compared to other funding categories explored in this section, the county offers few programs that, although do address aspects of adaptation like sea level rise, are not expansive enough in scope to fund multiple aspects of adaptation.

Federal funding has the capacity to sponsor large-scale projects at no or low cost to the municipality and its constituents. There is a moderate number of agencies and programs the City could pursue to achieve various facets of an adaptation strategy. However, recent Federal changes indicate that grants and programs that were

previously available may not be accessible in the future. For example, FEMA’s Building Resilient Infrastructure and Communities (BRIC) program has been terminated, and it is unclear if other programs such as the United State Bureau of Reclamation (USBR) water program will be impacted. At the time of writing, other than the BRIC program, all federal programs listed in this section are still available. It is possible that programs that are terminated or reduced will be funded in the future and should be kept in mind as future options.

The City has the unique advantage of being part of the most aggressive, state-wide, climate policy initiative in the United States. As such, there are many state-wide opportunities to choose from, varying in both targeted recipient (private or public), size (\$1K–\$100M) and financial product (subsidy, grant, loan, bond). There is strong overlap between the intent of the financial products offered and the goals of a climate adaptation plan. Although the administrative burden and competition for funds are high, the size, thematic overlap in goals, and stability make state-sponsored programs a promising avenue to pursue.

Other options such as P3s and municipal bonds require the City to initiate and administer the entire program. P3s can be streamlined and attract large investment as long as the project outcome is marketable while bonds are attractive for purely public-good and long-term benefits outcomes.

In evaluating these options, the Project Team recommends deploying an MCDA to narrow down and compare options before undergoing a full cost–benefit analysis for a single option. The more concrete the MCDA inputs and assumptions, the more helpful it is and the less work a cost–benefit analysis will be. In this manner the city will be able to rigorously and consistently apply the needs of a project to the myriad of characteristics of a funding mechanism. The following table is a summary of the “Funding and Financing” section and can be used as a precursor to an MCDA.

Table 14. Overview of funding mechanisms, opportunities, and challenges by categories of funding

Mechanism Category	Opportunities	Challenges
City Programs and Funds	<ul style="list-style-type: none"> <li>○ Pre-existing, proven concepts</li> <li>○ No application or vote needed to approve (aside from taxes/fees)</li> <li>○ Clear alignment between activity and adaptation goals (e.g., electric utilities franchise fee)</li> </ul>	<ul style="list-style-type: none"> <li>○ Unlikely to finance large projects</li> <li>○ Near-term, budget shortfalls may stagnate reallocation to resiliency projects</li> </ul>
County Programs and Funds	<ul style="list-style-type: none"> <li>○ Relatively stable source of funding</li> <li>○ No vote or approvals required</li> </ul>	<ul style="list-style-type: none"> <li>○ Fewer options to choose from</li> <li>○ More competition from other cities in the county</li> <li>○ Potentially high administrative burden</li> </ul>
State Programs and Funds	<ul style="list-style-type: none"> <li>○ Stable</li> <li>○ Can finance large projects</li> <li>○ Offers a mix of financial tools</li> <li>○ No vote or approvals required</li> <li>○ Offers a mix of both private-entity and public-entity focused financial products</li> </ul>	<ul style="list-style-type: none"> <li>○ Highly competitive</li> <li>○ Often focus on GHG-reduction only, but cases can be made for resiliency-focused projects</li> <li>○ Higher administrative burden</li> </ul>

Mechanism Category	Opportunities	Challenges
Federal Programs	<ul style="list-style-type: none"> <li>○ Can finance large projects</li> </ul>	<ul style="list-style-type: none"> <li>○ Unstable but not unavailable</li> <li>○ Higher administrative burden</li> <li>○ Relatively few options with limited scope</li> <li>○ Highly competitive</li> </ul>
Philanthropies and NGOs	<ul style="list-style-type: none"> <li>○ Clear overlap between funder goals and City goals</li> <li>○ No vote or approvals required               <ul style="list-style-type: none"> <li>- Typically grants</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>○ May not be able to fund a project from a single source</li> <li>○ High administrative burden</li> <li>○ Potentially highly competitive</li> </ul>
Creative Strategies	<ul style="list-style-type: none"> <li>○ Flexible—can be molded to meet each project’s specific needs</li> <li>○ Established/proven concepts</li> <li>○ Minimal administrative burden</li> </ul>	<ul style="list-style-type: none"> <li>○ Requires conceptualization and initiation from the City</li> <li>○ May require voter approval (green bonds)</li> </ul>



# 7

## Conclusions & Next Steps

## 7. Conclusions and Next Steps

The City of Half Moon Bay benefits from a spectacular setting on the coast of California, with a unique small town character nestled into the hills. This beauty is also a challenge as climate change intensifies droughts, wildfires, winter storms, and flooding. This Plan, in concert with the City's CAP, offers a strategic and clear set of strategies to make the Half Moon Bay community more resilient and able to navigate future hazards.

This community-driven plan identifies the vulnerabilities associated with various climate hazards within the City and the Half Moon Bay region more broadly. Goals and actions for future adaptation have been identified based on community preferences and objectives that will guide adaptation responses to those risks both in the present day, and as they worsen and expand over time with climate change.

Climate hazards, and the way in which the City responds, will impact different sectors of the community and the local economy in different ways. This Plan outlines the community vision and prioritizes actions that the City should take to respond to these threats reflecting the priorities expressed and recorded through community outreach activities.

The process and results of the vulnerability assessment should serve as a reference for ongoing adaptation planning efforts in response to the climate hazards such as rising temperatures, prolonged droughts, increased wildfire risk, coastal erosion, flooding, and sea level rise. As the City faces increasing risks associated with climate change, the assessment serves as a guidance tool to prepare for these risks and prioritize adaptation and resilience planning across multiple sectors and jurisdictions. By identifying the vulnerabilities facing the built assets, open space and community members, the City can more effectively advocate for funding and improve the eligibility of the City to qualify for grant funding to study, monitor, and implement adaptation projects and develop resilience programs.

Having established vulnerabilities and community priorities, this Plan outlines adaptation strategies, policies, and actions that address those vulnerabilities and move Half Moon Bay towards the desired future vision. Across all City departments, the City must identify routine activities that can be tracked as part of a long term monitoring and evaluation plan to document climate impacts and help the community prepare for the uncertainties of a changing climate. The Plan recognizes the need to prioritize actions that align with community priorities but also reflect a realistic assessment of existing feasibility and operational capacity. Some actions require strengthening partnerships with other organizations, while others can be quickly implemented by the City under existing programs and policies.

For high-priority adaptation actions with strong alignment with existing plans and policies, the City can move forward in integrating these actions into City documents, such as the Capital Improvement Program, MJHMP, and LCP. These foundational documents guide land use, and infrastructure investments, making them key levers for advancing long-term community resilience. Integrating climate adaptation and resilience into the update of City plans and policy will allow Half Moon Bay to proactively manage climate-related risks, protect public safety, and ensure sustainable development. As a next step, the City should look to further the adaptation actions identified in this Plan, either through direct action directed by council, an Adaptation Work Plan or similar document, and drawing upon the initial prioritization presented in Section 6.

For adaptation actions that are high priorities but are not yet reflected in the existing plans and policies, the City should look to identify additional studies to inform implementation of those actions. This may include the development of neighborhood-level plans and adaptation pathways, with community workshopping of adaptation priorities.

The City acknowledges that this Plan is just one part of its activities directed toward a more sustainable future. Coupled with other efforts focused on emissions reductions, green infrastructure, park improvements, and resilience-building, the City can lead by example and promote community leadership and development to address

oncoming climate challenges. Through this approach, the City can build a more adaptive, equitable, and future-ready community that safeguards its people and its resources and activities for generations to come.



# 8

## Appendix

# 8. Appendix

## A. Problem Statements

Problem statements target citywide climate vulnerabilities that are broadly applicable to Half Moon Bay community members as well as specific geographic areas and frontline populations that necessitate a similarly targeted or project-level adaptation strategy. Problem statements were developed based on the findings of the City Vulnerability Assessment along with community engagement efforts, including community pop-ups, a survey, and stakeholder listening sessions, which assessed the community's needs, concerns, and vulnerabilities relating to climate change and the environment.

Problem statements combine sectors and the major climate hazards that stress that sector, for example, homes and businesses + wildfire, along with any specific locations that are experiencing the impacts of the hazards. Problem statements consider pre-existing conditions that may exacerbate the problem. Each statement also identifies potential leaders and partners to understand the responsibility of the problem and the City's level of agency. The timeframe considered for each problem statement sector is out to approximately 2100. Adaptation planning efforts will focus on short-, medium-, and long-term strategies.

### 1. Homes and Businesses

#### *Description*

This sector includes impacts to homes and businesses in Half Moon Bay. This sector includes planned future community land use. Homes and businesses are threatened by wildfire, fluvial and stormwater flooding, coastal erosion, landslides and debris flow, and extreme weather and high winds. The conditions that may affect the City's ability to adapt to the challenges facing this sector include staff capacity, the potential for litigation, community pushback on revised building codes, changes to zoning, and potential future development. Additionally, this sector is affected by pre-existing conditions including a lack of affordable housing, isolated community location, undersized and aging infrastructure, and limited water supply.

#### 1.1 Wildfire – Problem Statement

While the entire city is threatened by wildfire, and increasingly so with climate change, the highest threat area for wildfire is the wildland-urban interface just outside the city limits of Half Moon Bay. The regional risk of wildfire can impact the ability of homes to be insured, can affect home values and rents, and can lead to increased development pressures within the City. Post-fire consequences may include direct losses, higher insurance rates and inability to be insured, spiking rents, and the potential exodus of residents and businesses, which could have an impact on the tax base, further exacerbating staffing and funding challenges. The City has some ability to directly plan for and adapt to this hazard. Partners include the County of San Mateo, neighboring land owners, land trust organizations, California State Parks, PG&E, CAL FIRE, and the CA Department of Insurance.

#### 1.2 Urban Stormwater and Creekside Flooding – Problem Statement

Winter storm events increase the frequency and intensity of creek-side flooding, which can lead to direct flooding of creek-side homes and businesses, as well as indirect impacts to roadway access and transportation (see problem statements for Transportation in 2.1). Localized flooding during storm events also occurs in low-lying areas where runoff accumulates and where stormwater infrastructure may be undersized or impeded. The City has significant ability to affect this hazard as it has jurisdiction for local roads, stormwater, and the urban forest

within many rights of way. Potential partners include CA State Parks, FEMA, Caltrans, San Mateo RCD, local property owners, and One Shoreline.

### 1.3 Landslides and Debris Flows – Problem Statement

Increased intensity of rainfall during winter storms increases the likelihood of landslides and debris flows, particularly after long periods of rain or in scarred landscapes where vegetation has been impacted by fires, drought, construction, or other events. Landslides and debris flows can cause significant damage to homes and buildings. After effects of a landslide can create significant challenges in moving and managing debris, including truck availability, emissions increases, and appropriate places to move, sort, and clean debris.

The City has some ability to adapt to this hazard, however, some of the most at risk areas include areas of steep slopes adjacent to the city boundary and areas upstream of the City, and the City may need to work with property owners to reduce the potential for hazards. Potential partners include CA State Parks, San Mateo RCD, the County of San Mateo, and land trust organizations.

### 1.4 High Winds – Problem Statement

High wind events can cause downed trees, which can damage property, cut power and other utilities, and injure pedestrians. The City has a significant ability to affect this hazard within the City's right of way and partners include PG&E, Caltrans, and local property owners.

### 1.5 Blufftop Coastal Erosion – Problem Statement

The threat of coastal erosion is localized to a narrow strip of land along the coast however the permanent loss of land has high consequences to the City and residents. Several homes, businesses and their associated utilities, as well as coastal access locations are at risk of coastal erosion. Private development assets at risk include homes in the West Miramar Neighborhood and the Ritz Carlton Hotel at Miramontes Point. Partners for regional-scale adaptation planning include CA State Parks, One Shoreline and County of San Mateo.

## 2. Transportation

### *Description*

Transportation and roadways move people and goods throughout the City. This sector includes the network of roads in Half Moon Bay as well as the 1, 92, and 84 corridors that connect the City to the Bay Area. Emergency response, evacuation routes, and the ability of the Half Moon Bay community to move throughout the region is compromised when transportation routes and roadways are blocked by climate impacts such as wildfire, flooding, landslides, or high wind. The isolated coastal location of the City makes it critical for the City to become more self-sufficient in critical public services that are conveyed through these corridors to the Bay Area.

### 2.1. Wildfire – Problem Statement

Wildfires can lead to road closures, damage roads and transportation infrastructure, and can also lead to indirect impacts such as reduced visibility due to wildfire smoke, and increase the likelihood of washouts post-fire. The threat of wildfire on transportation affects evacuation routes and planning, which are being evaluated in the County's Safety Element.

### 2.2 Stormwater Flooding – Problem Statement

Localized stormwater flooding occurs regularly along Magnolia St. in Arleta Park, Miramontes Point Rd. in Moonridge, the West Miramar Neighborhood, and Kelly Ave. Downtown. With increased storm intensity combined

with potential stressors to vegetation communities (plants that grow together in a specific location and a similar environment) from drought and wildfire, stormwater management issues may escalate, and it may become more difficult to retain and slow site runoff. Impermeable surfaces including roads and sidewalks contribute to runoff, burdening the City's stormwater infrastructure.

Undersized stormwater infrastructure is an existing condition that exacerbates the issue. Limited data exists for the City staff to understand where obstructions may occur in the stormwater system, and where the system is undersized or underperforming. The city has a significant ability to affect this hazard, and potential partners include stormwater management consultants, land trusts, MidPen Housing, Mercy Housing, San Mateo County Resource Conservation District, One Shoreline, and local property owners.

### 2.3 Landslides and Debris Flows– Problem Statement

Increased intensity of rainfall during winter storms increases the likelihood of landslides and debris flows, particularly after long periods of rain, and in situations where vegetation has been impacted by fires, drought, or other events. Landslides can block roadways, cutting off access to emergency response and preventing the ability of the Half Moon Bay community to move throughout the City and the region. Debris in waterways can also damage transportation infrastructure such as bridges and lead to clogging of culverts. After effects of a landslide can create significant challenges in moving and managing debris, which can affect the use of beaches. The City has a significant ability to adapt to this hazard on local roads. Potential partners include the County of San Mateo and Caltrans.

### 2.4 High Winds– Problem Statement

High winds can lead to trees falling, and downing power lines, which can block roadways and cause dangerous situations for residents and visitors. The City has a significant ability to adapt to this hazard within the City's right of way. Potential partners include PG&E and San Mateo County.

## 3. Parks, Beaches, and Open Space

### *Description*

Cliff-backed areas of coastline in Half Moon Bay host public assets including roads, trails, parks, and campgrounds. The California Coastal Trail, largely managed by the State, is a vital active transportation thoroughfare and recreational amenity. It is located just inland of the cliff edge in many locations and is an important thoroughfare both for recreation and transportation.

In addition, the City owns and maintains 12 parks, beaches, and a number of open spaces. Preexisting conditions that affect the ability of parks to maintain their ecological and recreational function include the availability of recreation land, sensitive species and habitat protection, summer droughts and reduced water supply, threats from pests and disease, and City staff funding. Parks and open space areas also provide many opportunities and alignment with green infrastructure and sustainability goals. These areas may provide opportunities for stewardship and engagement, and certain open space areas may provide opportunities for local food production and economic activity.

### 3.1 Beach Narrowing, Dune, and Cliff Erosion– Problem Statement

Winter storms, sea level rise, and increased coastal erosion are already threatening Poplar and Redondo Beaches, State-operated beaches, and beach access locations that are central to the communities' livability and tourism economy, leading to inland migration of beaches. The City's beaches, which are mostly backed by cliffs, will have limited room to migrate inland with sea level rise, which eventually will limit recreational uses. The

California Coastal Trail is already threatened by coastal erosion, landslides, and creek/coastal wave flooding, and these threats will escalate. The parking lot at Redondo Beach is threatened by cliff erosion. The City does not control the state-managed lands but will need to continue to coordinate and align planning along a connected coastline and work with partners to identify potential sources of sediment. Key partners include CA State Parks, USACE, FEMA, NOAA, One Shoreline, and local property owners.

### 3.2 Debris Management – Problem Statement

The mobilization of debris during winter storm events and landslides, as well as the pile-up of debris along creeks and along the coast, directly impacts the ability of Half Moon Bay’s residents and visitors to utilize the coastline and beaches. Debris is largely comprised of natural material such as trees and vegetation, but also includes pieces of farm equipment such as fencing, and parts of homes and infrastructure that have been washed away or damaged in storm events. Debris from agricultural and residential lands can have ecological impacts to waterways and other natural areas. Debris can also damage California Coastal Trail bridge infrastructure and clog culverts under the trail. The city has limited ability to manage sources or locations of debris on non-city land. Key partners include CA State Parks, San Mateo RCD, and the San Mateo Countywide Water Pollution Prevention Program.

### 3.3 Extreme Heat– Problem Statement

High temperatures and extreme heat can pose a threat to recreational uses, especially in parks and areas with less vegetation and shade, such as the skate park. City-run beaches are already experiencing significantly higher visitor demand during periods of high heat. The City may also be forced to close certain parks to sports groups or others during times of extreme heat. Extreme heat will exacerbate ecological drought conditions and cause ecosystem shifts in the City’s parks and open spaces, particularly in coastal scrub landscapes. City parks provide an important opportunity in reducing the urban heat island effect and provide localized cooling. However, the City may be constrained on opportunities for park expansion or intervention in parkland spaces due to highly sensitive species and habitat, high cost of land, and permitting constraints.

### 3.4 Flooding – Problem Statement

Flooding can occur during heavy rainfall events and can impact City parks and amenities and the ability of the community to utilize these spaces for recreation. John L Carter Memorial Park, adjacent to Pilarcitos Creek, is prone to flooding as is Frenchmans Creek Park and the area adjacent to the Old Train Depot near Arroyo Leon. A current park update may help to address some of the flood issues. Key partners include CA State Parks, FEMA, land trusts, One Shoreline, and San Mateo RCD.

### 3.5 Wildfire – Problem Statement

Drought and increased heat will lead to higher wildfire risk in the City. While the highest wildfire risk is in the wildland-urban interface outside of city limits, wildfire spreading from the wildland-urban interface into the City’s inland parks and open spaces (located closer to these areas) could have a multi-year negative impact on tourism and residents in Half Moon Bay. The City may be forced to close parks and open space areas during periods of poor air quality. Cascading impacts post-fire may include increased risk of debris flow, and a large influx of ash and debris in the City’s waterways and shoreline following rain events. This can have impacts on water quality, habitat, ocean health, and debris management (see problem statement 3.2).

## 4. Public Services, Utilities, and Local Infrastructure

### *Description*

This includes a wide range of public services including water supply, wastewater, stormwater, power, natural gas, internet, and communications.

## **Water and Sewer**

### *Description*

Water and sewer services are critical to the City; however, the City has limited direct control over these utilities. The majority of the City's water, depending on the season, comes from the Hetch Hetchy Reservoir in the Sierra Nevada. A reduction in snowpack in the mountains and decreased or changing intensity of rainfall could threaten the City's water supply. Water supply for the City is provided by the Coastside County Water District (CCWD). Wastewater collection service is provided by Sewer Authority Mid-Coastside (SAM) where the City has appointed board members, but limited control of the management and operation of the Treatment Plant. The Bay Area Water Supply and Conservation Agency (BAWSCA) provides regional water supply planning, resource development, and conservation services to the City.

#### 4.1 Drought – Problem Statement

Statewide drought could impact the water supply to the City and increase the costs for residents and businesses. The City does not have control over the supply; however, it can adopt water conservation efforts for municipal buildings, parks and lands, and support residential savings programs to reduce demand and mitigate future rate increases. Potential partners include CCWD, BAWSCA, and the Bay Area Integrated Regional Water Management Program.

#### 4.2 Flooding – Problem Statement

SAM operates the Wastewater Treatment Plant in the City through a joint powers authority. The SAM Plant has flooded in the past and is at high risk of future flooding in extreme storm events. Flooding of the SAM Plant would temporarily shut down the facility, preventing wastewater collection and processing in the City, and potentially causing dire public health consequences. The City does not have direct control over the plant but does have some indirect influence through its appointed board members. Partners include regional board member agencies, including Granada Community Services District, Montara Water & Sanitary District, SAM, San Mateo RCD, and One Shoreline.

CCWD operates wells, a water treatment plant, and a pump station in a low-lying area near Denison Creek, and a pump station near Frenchmans Creek. These facilities are in a potential flood hazard area and flooding could impact these facilities directly and impact water supply systems.

#### 4.3 Wildfire, Debris Flow, and Landslides – Problem Statement

CCWD operates numerous facilities and pipelines in unincorporated San Mateo County that are located in areas of high wildfire risk, and many of these facilities and pipelines are located near steep slopes that are at risk of failure, and this could impact both facility access and the facilities themselves. The majority of the City's water travels by pipe from Crystal Springs Reservoir and Pilarcitos Lake to the Nunes Water Treatment Plant along Highway 92. This corridor is highly vulnerable to wildfire and landslides. Impacts to the reservoirs, pipelines, water tanks, and the water treatment plant in these areas could have lasting and severe impacts on the city's water supply. Additionally, wildfires and landslides can compromise water quality both during events and for months and years after. The City has limited direct control over this utility. Potential partners include CCWD, CAL FIRE, and the County of San Mateo.

#### 4.4 Emergent Groundwater– Problem Statement

SAM operates the wastewater treatment plant that is located in a low-lying area near the convergence of Pilarcitos Creek and the Kehoe Waterway. Many pieces of key infrastructure for the plant are located underground and seepage of groundwater is a persistent nuisance for the facility. The projected rise in sea level will lead coastal groundwater to rise, which will further exacerbate this issue. The City has appointed board members to SAM and should ensure that the wastewater treatment plant is monitoring environmental conditions within and around the facility, and is engaged in future planning and decision-making.

### **Power and Communications**

#### *Description*

Power outages caused by high winds or wildfire can cause significant disruptions to daily life, including the interruption or access to certain medical devices that require power, negatively impacting residents with significant health issues in the City. Power outages can also cause communication outages, which can make it impossible to call for 911 assistance, making the City less safe for residents. It also affects streetlights and traffic lights, making moving around the City much riskier, and potentially increasing the probability of accidents. Both power and communication outages also negatively impact Half Moon Bay's small businesses. Pacific Gas and Electric (PG&E) is the owner and operator of the electricity distribution system, including the high-voltage transmission lines as well as the local distribution grid.

The pre-existing conditions that affect public services include outdated and aging infrastructure and the isolated coastal location of the City. This makes it more critical for the City to become self-sufficient in the case of power outages.

#### **4.5 High Winds – Problem Statement**

High wind events, especially during winter storms, can cause downed power lines and disrupt the electricity and communication delivery to the energy system. A loss of power can create a significant public safety concern by potentially knocking out streetlights and stoplights, and creating difficulties for those that rely on medical devices. Power and communication outages have long been a challenge for the City and if high wind events intensify into the future, these issues will be exacerbated. The City has a significant ability to adapt to this for trees within the City's ROW. Potential partners include PG&E and San Mateo County.

#### **4.6 Wildfire – Problem Statement**

Wildfire risk in the region can lead to direct damage to infrastructure, and Public Safety Power Shut offs, shutting off electricity in the City and beyond, sometimes including telecommunications infrastructure like cell towers. These shutoffs can coincide with hot days and an inability to run air conditioners, fans and other cooling devices impacting vulnerable populations (see 6.1 for impacts of extreme heat). Cell towers, often located along ridgelines, are at an increased threat by wildfire. Potential partners include PG&E and CAL FIRE.

## **5. Socially Vulnerable Populations**

#### *Description*

Socially vulnerable population groups are more likely than the general population to experience impacts from climate hazards and may have less adaptive capacity in the face of cascading issues. Socially vulnerable groups include, but are not limited to, seniors, mobile home residents, individuals with health sensitivities and mobility limitations, language isolation, racially marginalized groups, and low-income community members. Racially

marginalized groups and low-income community members are more likely to live in higher risk locations and be exposed to hazards, and may be less able to recover from climate impacts. As a whole, vulnerable groups may face issues accessing the basic needs and services they need to recover from climate change impacts.

The pre-existing conditions that may affect these groups include lack of affordable housing, limited public transportation, high cost of living, racial inequity, isolated communities, linguistic isolation, housing quality, agency in housing decisions, high cost of public services including utilities, health insurance coverage, and potential lack of trust in City Government workers due to a history of disenfranchisement and lack of representation.

It is important that the City aim to reduce the health risks associated with climate change for disadvantaged communities by prioritizing programs and improvements to address needs. The City may have difficulty addressing the needs of disadvantaged groups and providing assistance to socially vulnerable groups due to limited funding, political and community will, competing interests, and differing priorities on the allocation of public safety dollars. The City should identify and work with local groups with connections to socially vulnerable groups such as non-profits, faith groups, MidPen housing, mobile home and RV park management, and other community groups. Venues for outreach and the building of trust include the Public Library, the Community Center, and local events.

## 5.1 Extreme Heat, Air Quality and Wildfire Smoke – Problem Statement

### A. Outdoor Workers

Individuals who rely on outdoor jobs, such as agriculture, landscaping, and construction where they are required to be outdoors, are significantly more exposed to the extreme heat, wildfire smoke, and poor air quality, than the general population.

### B. Mobile Home Residents

Residents in mobile home parks have significantly less shade/tree cover, creating urban heat islands. The homes are also less likely to have improvements including A/C, ventilation/filtration systems, quality insulation, etc.

### C. Seniors

Seniors, particularly those living alone, have less adaptive capacity for the impacts related to extreme heat, wildfire smoke and poor air quality. This can lead to health issues such as heat exhaustion and heat stroke for these populations, and exacerbate underlying health conditions such as heart disease.

## 5.2 Severe Winter Storms – Problem Statement

### A. Outdoor Workers

Individuals who rely on outdoor jobs, such as agriculture, landscaping, and construction where they are required to be outdoors are more likely to be directly impacted by severe winter weather conditions and bear a heavier burden in post-storm cleanup activities.

### B. Seniors

Seniors, particularly those living alone, are especially vulnerable to power outages resulting from severe winter storms and may experience difficulty preparing for these hazards and cleaning following these events.

### C. Renters

Severe storms may lead to an increased chance of flood damage to impact homes directly. These issues can result in mold problems and direct damage to property. Renters may be less able to prepare for these hazards and recover after these events.

## B. Adaptation Strategies and Actions

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# Goal 1. Ensure a Healthy, Resilient, and Self-Sufficient Community

Strategy	Action	Type of Intervention	Responsible Party	Support	Alignment with Local Coastal Land Use Plan	Cost	Impact/Protective Value	No. Problem Statements Addressed	Feasibility/Capacity	Additional Benefits	Final Score	Prioritization
1.1 Residential Resilience: Increase residential home hardening and resilience to climate hazards.	1.1.1 Evaluate and update existing City residential and commercial permitting and codes to determine appropriate enhancements for climate resilience, including wildfire, flooding and drought protections for buildings and landscapes.	Policy/Regulation	Community Development	Public Works	7-7: Building Codes and Standards, 7-1: Hazard Avoidance, 7-5: Long-Term Adaptation, 7-8: Shoreline Hazards and New Development	Within Current	High	5	Medium	No	0.605	Medium
1.1 Residential Resilience: Increase residential home hardening and resilience to climate hazards.	1.1.2 Assure compliance with LUP fire safety policies through condition compliance review and enforcement.	Policy/Regulation	Community Development	Coastside Fire Protection		Within Current	High	5	Medium	No	0.605	Medium
1.1 Residential Resilience: Increase residential home hardening and resilience to climate hazards.	1.1.3 Utilize the CAL FIRE ArcGIS Collector App to inventory structures that do not comply with firesafe practices and codes.	Monitoring	Public Works	Coastside Fire Protection		\$	High	5	Medium	No	0.525	Medium
1.1 Residential Resilience: Increase residential home hardening and resilience to climate hazards.	1.1.4 Establish a Firewise Community Certification Program.	Partnership, Program	Administrative Services	Coastside Fire Protection		\$	Medium	5	Medium	Yes	0.575	Medium
1.1 Residential Resilience: Increase residential home hardening and resilience to climate hazards.	1.1.5 Develop a partnership mechanism between private property owners (and Homeowners Associations) and agency landowners (i.e. City/County/State/Fed) to enhance wildfire protection, preparedness, and recovery efforts.	Partnership	Economic Vitality/City Managers Office	Public Works		Within Current	Medium	5	High	No	0.63	High
1.1 Residential Resilience: Increase residential home hardening and resilience to climate hazards.	1.1.6 Create a voluntary vegetation management program for property owners, including education materials, "how to" support, and services such as free chipping, for residential properties to increase their defensible space.	Program, Communications	Public Works	Community Development		Within Current	Low	5	Medium	No	0.405	Low

1.1 Residential Resilience: Increase residential home hardening and resilience to climate hazards.	1.1.7	Ensure that new subdivisions are established with adequate emergency vehicle access, evacuation standards for residential development, and can be maintained without requiring fuel modification within ESHAs and their buffer areas. Prohibit the creation of new developable lots within high fire hazard zones.	Policy/Regulation	Public Works	Community Development	7-2: Subdivisions, 7-68: Fire Hazard Avoidance for New Subdivisions	\$\$	Medium	5	Medium	No	0.385	<u>Low</u>
1.1 Residential Resilience: Increase residential home hardening and resilience to climate hazards.	1.1.8	Identify and implement projects and programs to enhance road and circulation capacity, ensuring adequate evacuation capability.	Program, Capital Improvement	Public Works	Community Development		\$	Medium	5	Medium	Yes	0.575	<u>Medium</u>
1.2 Community Capacity: Increase community understanding, cohesion, and adaptive capacity to better respond and adapt to climate hazards.	1.2.1	Host annual educational events for residents and businesses on weather-proofing and fire-proofing their homes and businesses. Continue to coordinate with the CERT program to help distribute information to increase resident and homeowner awareness and knowledge of how to prepare for emergencies.	Program, Communications, Partnership	Emergency Preparedness	Coastside Fire Protection		Within Current	High	3	High	No	0.69	<u>High</u>
1.2 Community Capacity: Increase community understanding, cohesion, and adaptive capacity to better respond and adapt to climate hazards.	1.2.2	Establish incentives and direct support for individual and household emergency preparedness.	Program	Emergency Preparedness	CERT		\$	Medium	3	Low	No	0.26	<u>Low</u>
1.2 Community Capacity: Increase community understanding, cohesion, and adaptive capacity to better respond and adapt to climate hazards.	1.2.3	Bolster and further promote the neighborhood-level Coastside Certified Emergency Response Team (CERT) program. Work with exiting CERT leads to identify neighborhood-level gaps in membership, and develop emergency preparedness by organizing City by blocks and recruiting new Block Captains as needed.	Communications, Program	Emergency Preparedness	Public Works, CERT		Within Current	High	3	High	No	0.69	<u>High</u>
1.2 Community Capacity: Increase community understanding, cohesion, and adaptive capacity to better respond and adapt to climate hazards.	1.2.4	Work with local schools to ensure every family has a disaster preparedness kit. Consider securing local sponsorship to host a "make-a-kit" events.	Partnership	Emergency Preparedness	Coastside Fire Protection		\$	High	3	Medium	Yes	0.635	<u>High</u>

1.2 Community Capacity: Increase community understanding, cohesion, and adaptive capacity to better respond and adapt to climate hazards.	1.2.5	Identify and develop a resilience hub as a cooling center and shelter during climate disasters and extreme weather. Consider existing city-owned facilities such as the Library, Ted Adcock Community Center, Schools. Add solar energy, water supply, communications, and battery storage at a publicly available site, such as the library.	Capital Improvement	Emergency Preparedness	Public Works		\$\$\$	High	3	High	No	0.53	Medium
1.2 Community Capacity: Increase community understanding, cohesion, and adaptive capacity to better respond and adapt to climate hazards.	1.2.6	Work with local CBOs and farmers to establish and maintain a local small Farm Resilience Network.	Partnership	Community Development	Resource Conservation District		\$	Low	3	High	No	0.41	Low
1.2 Community Capacity: Increase community understanding, cohesion, and adaptive capacity to better respond and adapt to climate hazards.	1.2.7	Seek public/private partnerships that facilitate the distribution of cheap and effective air filtration units for communities of concern.	Partnership	Sustainability	Resource Conservation District?		\$\$	High	3	High	No	0.57	Medium
1.3 Vulnerable Populations: Protect highly vulnerable populations from climate-related impacts, especially due to extreme weather.	1.3.1	Expand services and shelter for unhoused populations in creekside homeless encampments.	Ongoing Effort	City Manager's Office	Public Works		\$\$	High	3	High	No	0.57	Medium
1.3 Vulnerable Populations: Protect highly vulnerable populations from climate-related impacts, especially due to extreme weather.	1.3.2	Establish defined extreme heat response policies and partner with community organizations to monitor these requirements, including for schools and for outdoor workers, which would require minimum safety measures in place for extreme heat days and/or prevent work from occurring during that period.	Policy/Regulation	Emergency Preparedness/C MO	Public Works		Within Current	High	3	Low	No	0.44	Medium

1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.1	Consider participation in incentive-based programs such as the Community Rating System, Arbor Day Foundations' Tree City, and StormReady to leverage resources to improve city resilience.	Program	Public Works			Within Current	Medium	4	Medium	No	0.485	Medium
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.2	Establish financial incentives, including stormwater fee discounts (requires imposition of stormwater fees), tax credits/rebates/reimbursements, permit rebates (e.g., freeboard incentives), awards/recognition, etc., to homeowners who mitigate flood risk on at-risk properties.	Program	Public Works	CDD		Within Current	High	4	High	No	0.71	High
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.3	Create a neighborhood-based Adopt-a-Storm Drain program to fund storm drain maintenance.	Program	Public Works	CMO		\$	Low	4	Medium	No	0.305	Low
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.4	Support drought management and rainwater storage by developing a rainwater barrel giveaway program and associated education.	Program	Community Development	Public Works		\$	Low	4	Medium	No	0.305	Low
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.5	Create incentive program for regenerative landscaping practices to support native plants and soil management to increase drought tolerance.	Program	Community Development	Public Works		\$	Medium	4	Medium	Yes	0.555	Medium
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.6	Create an education and incentive program for landowners— especially upstream landowners— to improve stormwater retention on their property.	Program	Community Development	Public Works/San Mateo County/One Shoreline		\$	Medium	4	High	No	0.53	Medium

1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.7	Create Building Department, Code and Permitting Resources that support Passive House practices for New and Major Renovations for passive cooling.	Communications	Community Development			Within Current	Medium	4	Medium	Yes	0.635	High
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.8	Create and promote set of incentives for building improvements that increase air tightness and overall resilience to wildfire and wildfire smoke. Work with regional partners such as PGE and PCE to promote.	Program	Community Development	Public Works		Within Current	Medium	4	Medium	No	0.485	Medium
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.9	Develop neighborhood-specific climate adaptation plans with local stakeholders.	Policy/Regulation	Emergency Preparedness	Community Development/Public Works		\$	High	4	High	Yes	0.78	High
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.10	Consider opportunities to support community-level agriculture as well as agriculture-compatible and ancillary uses in urban and open space reserve and PD areas. Partnering with Andreotti property on Kelly Avenue west of Highway 1.	Partnership	Public Works	Resource Conservation District		\$	Medium	4	Medium	No	0.405	Low
1.4 Community Storm Resilience: Increase community's active participation in building resilience for extreme storm events.	1.4.11	Perform habitat restoration, assisted migration studies, and education on tribal land use practice including food self-sufficiently, fire ecology and impacts and proper use of grazing on open spaces. Sites could include: Peninsula Open Space Land Trust (POST), the Coastside Land Trust, and Beachwood, Glen Cree and Andreotti properties.	Partnership	Community Development	Public Works/Resource Conservation District		Enabling	High	4	High	No	0.67	High

1.5 Communications: Create a robust and reliable citywide communications system and protocols for climate hazards.	1.5.1	Develop an annual resident safety and education campaign for climate hazards (home hardening, flooding, etc.).	Program	Administrative Services	Community Development		\$	Low	3	High	No	0.41	<u>Low</u>
1.5 Communications: Create a robust and reliable citywide communications system and protocols for climate hazards.	1.5.2	Partner with SMC Alerts to develop a robust digital communication and warning systems for hazards (coastal flooding, post-fire landslides, extreme heat) through text messages, phone alerts, and on-site updates.	Partnership	Administrative Services	Public Works, Law Enforcement, Coastside Fire Protection	7-3: Emergency Warning System	Within Current	High	3	Low	No	0.44	<u>Medium</u>
1.5 Communications: Create a robust and reliable citywide communications system and protocols for climate hazards.	1.5.3	Increase participation and awareness of Genasys (formerly known as ZoneHaven) and SMC notification systems through an outreach campaign.	Communications	Communications	Community Development		\$	High	3	High	No	0.61	<u>High</u>
1.5 Communications: Create a robust and reliable citywide communications system and protocols for climate hazards.	1.5.4	Building on existing email newsletters, websites, and social media for community outreach, and communication for storm and disaster readiness. Coastside Buzz, Half Moon Bay Review - Coastside News, etc.	Communications	Communications			Within Current	High	3	High	No	0.69	<u>High</u>
1.5 Communications: Create a robust and reliable citywide communications system and protocols for climate hazards.	1.5.5	Collaborate with local non-profits, HOAs, Mobile Home Parks, and other community-based organizations to develop an inventory of locations with isolated elderly residents and people with disabilities and develop a plan for a social support network to increase resilience to climate change.	Partnership	Administrative Services	Community Development		\$	Medium	3	High	Yes	0.66	<u>High</u>

<p>1.5 Communications: Create a robust and reliable citywide communications system and protocols for climate hazards.</p>	<p>1.5.6</p>	<p>Support residential compliance with permitting requirements through increased education materials and awareness of resilience benefits. City can go beyond code, enhancing educational materials that define climate resilient materials and building standards and reduce barriers to implementation. Develop a project checklist for building and site adaptation measures.</p>	<p>Communications</p>	<p>Community Development</p>	<p>Public Works</p>		<p>\$</p>	<p>High</p>	<p>3</p>	<p>High</p>	<p>No</p>	<p>0.61</p>	<p><u>High</u></p>
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## Goal 2. Foster a Thriving and Accessible Coastline and Open Space

Strategy	Action	Type of Intervention	Responsible Party	Support	Alignment with Local Coastal Land Use Plan	Cost	Impact/Protective Value	No. Problem Statements Addressed	Feasibility / Capacity	Additional Benefits	Final Score	Prioritization
2.1 Creekside Flooding: Enhance monitoring and maintenance of creeks and drainage areas to reduce flooding impacts.	2.1.1 Automate responses from USGS creek gauge system.	Capital Improvement	Public Works			\$	Low	3	Low	No	0.16	Low
2.1 Creekside Flooding: Enhance monitoring and maintenance of creeks and drainage areas to reduce flooding impacts.	2.1.2 Identify public land near creeks that will benefit from sustainable landscaping and other stormwater management to slow water infiltration along steep stream channels. Could be integrated as part of the CIP for Park Improvements	Capital Improvement	Public Works	Community Development	7-56: Flood Hazard Abatement	\$\$	High	3	High	Yes	0.72	High
2.1 Creekside Flooding: Enhance monitoring and maintenance of creeks and drainage areas to reduce flooding impacts.	2.1.3 Increase the frequency of creekside debris (trash) removal.	Ongoing Effort, Enforcement	Public Works	CMO		\$	Low	3	High	Yes	0.56	High
2.1 Creekside Flooding: Enhance monitoring and maintenance of creeks and drainage areas to reduce flooding impacts.	2.1.4 Partner with SM RCD to restore wetlands in high-impact areas vulnerable to flooding.	Partnership	Public Works	One Shoreline	7-56: Flood Hazard Abatement.	\$\$\$	High	3	Medium	Yes	0.555	High
2.2 Vegetation Management: Plan, implement, and maintain fuel reduction efforts on City-owned coastline and open space.	2.2.1 Create Sustainable Open Space Vegetation Management Plan to reduce risk of wildfire, landslide and debris flows, and coastal erosion. Include considerations for natural vegetation management (i.e. goats), native plants, regenerative landscape practices, natural grass recovery, dune restoration, drought tolerant landscapes, and prescribed burning. Include considerations for future changes to climate.	Capital Improvement	Public Works	Community Development	7-67. Unavoidable Fuel Modification in ESHA, 7-17: Beachfront or Blufftop Vegetation, 7-32: Soft Protection Devices	\$	Medium	4	Medium	Yes	0.555	High
2.2 Vegetation Management: Plan, implement, and maintain fuel reduction efforts on City-owned coastline and open space.	2.2.2 Develop staff guidance and education materials for selection of plants and landscaping alternatives that increase drought resilience and comply with FireWise requirements.	Capital Improvement	Public Works	Community Development	7-17: Beachfront or Blufftop Vegetation, 7-63: Siting and Design for Fire Hazard Avoidance	\$	Medium	4	High	Yes	0.68	High

2.2 Vegetation Management: Plan, implement, and maintain fuel reduction efforts on City-owned coastline and open space.	2.2.3	Where permitted by FireWise regulations, identify and plant drought and fire-resistant tree species (fire-smart or fire-wise trees) in City owned parks, open space, and streets.	Capital Improvement	Public Works	Community Development	7-17: Beachfront or Blufftop Vegetation, 7-63: Siting and Design for Fire Hazard Avoidance	\$	Medium	4	Medium	Yes	0.555	High
2.2 Vegetation Management: Plan, implement, and maintain fuel reduction efforts on City-owned coastline and open space.	2.2.4	Promote fire-resistant landscaping through educational materials, particularly on properties adjoining high risk fire zones.	Communications	Communications	Public Works		\$	Medium	4	High	No	0.53	Medium
2.2 Vegetation Management: Plan, implement, and maintain fuel reduction efforts on City-owned coastline and open space.	2.2.5	Create fire breaks in City-owned open space in high risk fire zones.	Capital Improvement	Public Works		7-61: Minimize Fire Hazards	\$\$	High	4	Medium	No	0.465	Medium
2.3 Climate-Smart Coastal development: Limit further development along coast. (or more positive framing- create safe development along coast)	2.3.1	Update Local Coastal Program with triggers to account for updated sea level rise forecasting and new State guidance. Updated LCP policies include rolling setbacks, tagging (warning system), property acquisition, and planned retreat for the handful of properties in West Miramar that are exposed to future erosion. Identify hazard-prone critical facilities and infrastructure and plan for relocation, and structural and nonstructural retrofitting measures as necessary.	Policy/Regulation	Community Development	Public Works	7-29: Protection for Critical Facilities, 7-41: Incremental Removal, 7-48: New Critical, High-Occupancy, and Public Facilities in Geologic Hazard Areas	\$\$	High	1	Medium	Yes	0.555	High
2.3 Climate-Smart Coastal development: Limit further development along coast. (or more positive framing- create safe development along coast)	2.3.2	Establish risk disclosure requirements for properties along high-risk coastal areas.	Policy/ Regulation	Community Development	Public Works	7-4: Disclosure of Hazard Presence	Within Current	Very High	1	Low	No	0.5	Medium
2.4 Nature Based Solutions for the Coast: Reduce coastal flooding and erosion through nature-based solutions.	2.4.1	Establish a winter beach maintenance program to protect against coastal erosion and flooding, including considerations for beach scraping or a winter storm berm	Capital Improvement, Program	Public Works	Community Development		\$\$\$	High	2	Medium	Yes	0.535	High
2.4 Nature Based Solutions for the Coast: Reduce coastal flooding and erosion through nature-based solutions.	2.4.2	Track current state efforts around artificial reefs and sediment management. If alignment exists, study the viability of artificial reefs, reef augmentation, and opportunistic sediment placement in key areas prone to coastal flooding and erosion (ex. three rocks off Miramontes Point, West Miramar, etc.)	Study	Public Works	Community Development		\$	Medium	2	High	Yes	0.64	High

2.4 Nature Based Solutions for the Coast: Reduce coastal flooding and erosion through nature-based solutions.	2.4.3	Create a beach and bluff monitoring program to identify flooding and erosion. Continue to monitor bluff and coastal drainage system erosion and continue to assess appropriate mitigation opportunities (such as clean closure) for the closed Half Moon Bay landfill located on the coastal bluffs near Poplar Beach. Monitor erosion at coastal access stairs. Communicate with Ritz and their consultants on coastal bluff erosion at Miramontes Point.	Monitoring	Public Works	San Mateo County/One Shoreline		\$	Medium	2	Medium	No	0.365	<u>Medium</u>
2.5 Recreation Improvements: Implement recreation improvements to reduce erosion.	2.5.1	Improve and increase fencing and off-trail regulation signage along coastal open spaces to reduce erosion.	Capital Improvement	Public Works			\$\$	Low	2	Medium	Yes	0.375	<u>Medium</u>
2.5 Recreation Improvements: Implement recreation improvements to reduce erosion.	2.5.2	Conduct beach access improvements to allow greater recreation access and protect bluffs and dunes. This will also increase safety along the coast.	Capital Improvement	Public Works	Community Development		\$\$\$	Medium	2	Medium	No	0.285	<u>Low</u>
2.6 Firefighting Resources: Identify additional firefighting equipment, training, and infrastructure to increase firefighting capacity and responsiveness.	2.6.1	Expand Citywide firefighting infrastructure by establishing and maintaining a priority list for upgrading fire flow capabilities in neighborhoods that may have inadequate fire flows.	Capital Improvement	Coastside County Water District	Coastside Fire Protection	7-73: Fire Flow Upgrades	\$\$\$\$	Very High	2	Medium	No	0.445	<u>Medium</u>
2.6 Firefighting Resources: Identify additional firefighting equipment, training, and infrastructure to increase firefighting capacity and responsiveness.	2.6.2	Ensure that all roads, streets, and major public buildings are identified in a manner that is clearly visible to fire protection and other emergency vehicles.	Capital Improvement	Public Works	Coastside Fire Protection, Law Enforcement	7-71: Street Identification and Visibility	\$\$	Medium	2	Medium	Yes	0.475	<u>Medium</u>

### Goal 3. Protect the City through Increased Resilient Infrastructure

Strategy	Action	Type of Intervention	Responsible Party	Support	Alignment with Local Coastal Land Use Plan	Cost	Impact/Protective Value	No. Problem Statements Addressed	Feasibility/Capacity	Additional Benefits	Final Score	Prioritization
3.1 Green Infrastructure: Improve citywide stormwater management and reduce extreme heat by adopting low impact development (LID) guidelines and green infrastructure approaches.	3.1.1 Increase flood monitoring capabilities along roadways and intersections where flooding is frequent.	Monitoring	Public Works		7-33. Mitigation and Monitoring for Shoreline Protection Impacts	\$	Low	5	Medium	No	0.325	Low
3.1 Green Infrastructure: Improve citywide stormwater management and reduce extreme heat by adopting low impact development (LID) guidelines and green infrastructure approaches.	3.1.2 Continue and expand inspections and cleanouts of storm drains, culverts, and ditches. Utilize CCTV and improve geodata.	Ongoing Effort	Public Works			\$\$	Medium	5	High	No	0.51	Medium
3.1 Green Infrastructure: Improve citywide stormwater management and reduce extreme heat by adopting low impact development (LID) guidelines and green infrastructure approaches.	3.1.3 Where permitted by FireWise regulations, identify suitable locations and plant species to provide shade in community spaces.	Capital Improvement	Public Works	Community Development		\$\$	Medium	5	Medium	Yes	0.535	High
3.1 Green Infrastructure: Improve citywide stormwater management and reduce extreme heat by adopting low impact development (LID) guidelines and green infrastructure approaches.	3.1.4 Establish policy promoting permeable paving on new City-owned paved driveways, walk and bikeways, and parking lots.	Policy/ Regulation	Community Development	Public Works		Within Current	Low	5	Medium	No	0.405	Medium
3.2 Wind Infrastructure: Invest in wind protection infrastructure that is both natural and manmade to increase resilience to high wind events.	3.2.1 Implement natural and manmade wind breaks in open space areas prone to high winds.	Capital Improvement	Public Works			\$	Low	4	Medium	No	0.305	Low

3.3 Climate Change Considerations: Incorporate climate change considerations into municipal planning, design and construction documents.	3.3.1	Publish a Climate Change Facilities Master Plan for Corporation Yard and Downtown buildings.	Program	Public Works	Community Development		\$	Medium	6	High	No	0.57	High
3.3 Climate Change Considerations: Incorporate climate change considerations into municipal planning, design and construction documents.	3.3.2	Update the Storm Drain Master Plan. Consider the projected future intensity and duration of precipitation events to recalculate flood hydrographs and inform the design of infrastructure upgrades and retrofits. Aligns with 4.1.2.	Policy/ Regulation	Public Works, Community Development			Within Current	Medium	1	High	No	0.55	High
3.4 Increase Water Supply: Increase water conservation and water supply efforts to increase long-term water sustainability and reliability.	3.4.1	Monitor groundwater salinity within the Pilarcitos Drainage basin.	Monitoring	One Shoreline	Public Works		\$	Medium	1	Medium	No	0.345	Low
3.4 Increase Water Supply: Increase water conservation and water supply efforts to increase long-term water sustainability and reliability.	3.4.2	Upgrade municipal watering systems to be more water efficient.	Advocacy	Coastside County Water	Public Works/Community Development		\$\$	High	1	Medium	Yes	0.555	High
3.4 Increase Water Supply: Increase water conservation and water supply efforts to increase long-term water sustainability and reliability.	3.4.3	Explore recycled water or graywater use in City operations (i.e. park and open space watering).	Capital Improvement	Public Works	Community Development		\$	Low	1	Medium	Yes	0.395	Medium
3.4 Increase Water Supply: Increase water conservation and water supply efforts to increase long-term water sustainability and reliability.	3.4.4	Partner with CCWD to install a network of piezometers to monitor groundwater supply. If feasible, plan, design and build emergency water supply wells to increase local water supply. Aligns with 4.3.10.	Monitoring	Coastside County Water	Public Works/San Mateo County Health		\$\$\$	High	1	Low	No	0.24	Low
3.5 Landslide Management: Install and manage infrastructure to prevent landslides and deal with debris.	3.5.1	Create Debris Management Plan that develops protocol for removing debris on City-owned land after landslides.	Policy/ Regulation	Public Works	Community Development		\$	Medium	3	High	No	0.51	Medium
3.6 Energy Resilience: Increase opportunities for localized power, battery supply and overall resilience to power outages due to climate hazards.	3.6.1	Conduct power supply feasibility studies to assess need and options for back-up power.	Study	Public Works			\$	High	4	Medium	No	0.505	Medium
3.6 Energy Resilience: Increase opportunities for localized power, battery supply and overall resilience to power outages due to climate hazards.	3.6.2	Develop a community resilience hub(s) by adding solar energy, water supply, communications, and battery storage at a publicly available site, such as the library or an established resilience hub.	Capital Improvement	Public Works			\$\$\$	Very High	4	Medium	Yes	0.675	High

<p>3.6 Energy Resilience: Increase opportunities for localized power, battery supply and overall resilience to power outages due to climate hazards.</p>	<p>3.6.3</p>	<p>Ensure that all critical facilities have backup solar/generator systems so that they are operational during multiday power outages. Installation and replacement of emergency generators at critical facilities (cell towers, library, city hall, community center, police/fire). Continue to monitor, maintain, and perform condition assessments for the existing emergency generators (serviced monthly by Public Works).</p>	<p>Capital Improvement</p>	<p>Public Works</p>			<p>\$\$\$</p>	<p>Very High</p>	<p>4</p>	<p>Low</p>	<p>Yes</p>	<p>0.55</p>	<p><u>High</u></p>
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## Goal 4. Build and Sustain the City's Capacity to Increase Resilience

Strategy	Action	Type of Intervention	Responsible Party	Support	Alignment with Local Coastal Land Use Plan	Cost	Impact/Protective Value	No. Problem Statements Addressed	Feasibility/Capacity	Additional Benefits	Final Score	Prioritization
4.1 Operationalize climate considerations into City policies and procedures.	4.1.1 Provide an annual Climate Hazards Report for Council and the Community to track impacts and identify potential vulnerabilities.	Internal Procedures	Public Works	Community Development		Within Current	High	6	High	No	0.75	High
4.1 Operationalize climate considerations into City policies and procedures.	4.1.2 Develop/ update a Stormwater Management Plan that increases green infrastructure across the City with limited, key improvements to gray infrastructure. Include considerations for the following green infrastructure improvements: retention basins, bioswales, pollutant traps for storm drains, green infrastructure along streets. Consider the following gray infrastructure improvements: storm drain resizing, culvert resizing, stormwater pumps. Prioritization of efforts should include considerations for areas that impact fire/ police/ rescue response time. Aligns with 3.3.2.	Capital Improvement, Policy/ Regulation	Public Works	Community Development	7-56: Flood Hazard Abatement	\$	High	6	Medium	Yes	0.695	High
4.1 Operationalize climate considerations into City policies and procedures.	4.1.3 Create a municipal guide for ditch/ retaining wall maintenance. Create and maintain geodata for this effort.	Internal Procedures	Public Works	Community Development		Within Current	Medium	6	Medium	No	0.525	Medium
4.1 Operationalize climate considerations into City policies and procedures.	4.1.4 Include most recent climate change considerations in the development and phasing of the Public Works Capital Improvement Plan.	Policy/ Regulation	Public Works			Within Current	High	6	High	No	0.75	High

4.1 Operationalize climate considerations into City policies and procedures.	4.1.5	As part of the State-required update to the General Plan Open Space Element, develop policies for routine implementation of climate change actions (drought, stormwater retention, fluvial flooding, native plants, efficient irrigation) in parks and open space management and maintenance identified in parks planning and Parks and Recreation Master Plan guidelines. Implement active transportation routes into parks.	Policy/ Regulation	Community Development			Within Current	High	6	High	No	0.75	High
4.1 Operationalize climate considerations into City policies and procedures.	4.1.6	Create a post-storm monitoring checklist. Where feasible, note high water marks following storms on creeks (vegetation markers) and on the coasts (driftwood etc.) following storms. Record in a geodatabase. This is valuable data for future modeling efforts.	Policy/ Regulation	Public Works			Within Current	High	6	Medium	No	0.625	Medium
4.2 Increase staffing for climate projects and train staff on climate implementation.	4.2.1	Federal Training: Floodplain management staff training: FEMA Training, Association of State Floodplain Managers Training.	Internal Procedures	Public Works	Community Development		Within Current	High	6	High	No	0.75	High
4.2 Increase staffing for climate projects and train staff on climate implementation.	4.2.2	Hire a full-time grant writer, or contract these services on an as-needed basis, to increase funding and resources for Half Moon Bay's climate and resilience projects.	Funding	City Manager's Office	Public Works		Within Current	Very High	6	High	No	0.85	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.1	Cooperate with RCD, State parks, and local trusts to prioritize vegetation management and thinning efforts on their lands, in a way that reduces the risk transferred to City and private properties.	Partnership	Public Works	Coastside Fire Protection	7-61: Minimize Fire Hazards	Enabling	Medium	6	High	No	0.61	Medium

4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.2	Continue and expand working relationship with PG&E to better understand the grid map and power grid with historical outages and causes, and study where the grid could become more resilient. Develop partnerships on vegetation management; identify key locations for undergrounding electric lines; conduct feasibility study to determine potential locations for microgrids; ensure dedicated backup power systems for key infrastructure (resilience hubs, key City facilities such as the SAM plant, traffic signals, and telecommunications infrastructure).	Partnership	Public works	Coastside Fire Protection	7-61: Minimize Fire Hazards	Within Current	Very High	6	High	No	0.85	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.3	Work with PCE to ensure dedicated backup power systems and sources for key infrastructure, including for resilience hubs, key City facilities such as the SAM plant, traffic signals, and telecommunications infrastructure during power outages. Conduct feasibility study to determine potential locations for microgrids.	Partnership	Public Works	PCE		\$\$	Very High	6	High	No	0.73	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.4	Partner with CAL FIRE to enhance fuel break and fuel reduction efforts. Continue to partner with existing Wildfire Early Detection and Warning Systems (UCSD ALERTCalifornia) and implement additional cameras to cover any gaps that may be identified for the region.	Partnership	Public Works and Community Development	Coastside Fire Protection	7-61: Minimize Fire Hazards	\$\$	Very High	6	High	No	0.73	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.5	Work with AT&T and Verizon to streamline permitting for underground telecommunications.	Partnership	Public works and Community Development		7-61: Minimize Fire Hazards	\$\$\$\$	High	6	Low	No	0.3	Low
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.6	Partner with San Mateo County Health Department to enhance extreme heat warning systems for residents; establish, manage, and monitor extreme heat day protocols and to support cooling centers.	Partnership	Communications		7-3: Emergency Warning System	Within Current	High	6	Medium	No	0.625	Medium

4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.7	Coordinate with regional healthcare providers to enhance outreach and education about smoke, wildfire, and extreme heat impacts.	Partnership	City Manager's Office			Within Current	High	6	High	No	0.75	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.8	Work with regional partners to maximize the number of residents that have health insurance, especially for vulnerable populations.	Partnership	City Manager's Office			Enabling	Very High	6	Medium	Yes	0.835	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.9	Continue working with Coastside Water District to create incentives for water conservation efforts for residents, prioritizing low-income groups. Internally, review city infrastructure opportunities for implementing additional water conservation measures	Partnership	Community Development and Public Works			Enabling	High	6	Medium	Yes	0.735	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.10	Partner with the CCWD or the County to monitor groundwater levels and model groundwater availability into the future using scenario-based models. Aligns with 3.4.4.	Partnership	Public Works	CCWD, County		Enabling	Medium	6	High	No	0.61	Medium
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.11	Coordinate with Caltrans on the following efforts: On-road tree removal; annual pre-winter inspections of 92 and HWY 1 North for landslides; State Highway Operation and Protection Program (SHOPP); Minor Program funding pipeline.	Partnership	Public Works	Coastside Fire Protection, Caltrans		Within Current	High	6	Medium	No	0.625	Medium
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.12	Work with CA State Parks and the Coastal Conservancy to explore dredging the harbor and using harbor sediment for beach nourishment along the City's Panhandle. Work with the State to conduct a phased realignment of the Coastal Trail to account for impacts of coastal erosion.	Partnership	Community Development	Public Works		Enabling	High	6	Medium	No	0.585	Medium
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.13	Partner with One Shoreline to assist with managed retreat solutions in West Miramar.	Partnership	Community Development	One Shoreline		Within Current	High	6	High	No	0.75	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.14	Continue to partner with the Ritz-Carlton and Ocean Colony HOAs to coordinate and monitor coastal and ecological health of the shoreline.	Partnership	Community Development	Ritz-Carlton and Ocean Colony HOAs to coordinate		Within Current	Medium	6	High	No	0.65	Medium

4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.15	Coordinate with Coastside Fire Protection to: enhance fuel break and fuel reduction efforts; increase participation in CERT program.	Partnership	Public Works	Coastside Fire Protection		Within Current	Very High	6	High	No	0.85	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.16	Work with School District to distribute emergency response kits to students.	Partnership	Emergency Preparedness	School District		\$	High	6	High	Yes	0.82	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.17	Collaborate with SAM on future upgrades and resilience efforts with direct links to city infrastructure (ex. sewer lines, I&I, manholes, outfall pipe, Caltrans wetland and Kehoe). Maintain staff/council personnel as liaisons to SAM.	Partnership	Public Works	SAM		Enabling	Very High	6	Medium	No	0.685	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.18	Work with stakeholders (SFPUC, County, others) to address inundation concerns along Pilarcitos Creek.	Partnership	Public Works	SFPUC, County		Within Current	High	6	High	No	0.75	High
4.3 Maintain and expand regional and State partnerships increase resilience.	4.3.19	Partner with institutions to study and install coastal monitoring cameras. At high-impact locations, promote citizen-science and education using CoastSnap.	Partnership	Public Works	CoastSnap, Various Institutions		Enabling	Medium	6	Low	Yes	0.51	Medium
4.4 Increase City funding for climate resilience efforts.	4.4.1	Establish a citywide Climate Resilient Tax District to fund stormwater upgrades, wildfire vegetation management, and other climate specific infrastructure improvements. Align with the CAP to co-fund and support multiple needs.	Funding	Public Works	City Manager's Office		Enabling	High	6	Low	No	0.46	Low
4.4 Increase City funding for climate resilience efforts.	4.4.2	Create Improvement District for high-risk coastal areas.	Funding	Public Works	Finance		Enabling	Very High	6	Low	No	0.56	Medium
4.4 Increase City funding for climate resilience efforts.	4.4.3	Evaluate and implement a Business District Assessment to help manage and pay for green infrastructure improvements, and other similar resilience enhancements and services.	Funding	City Manager's Office	Finance		Enabling	High	6	Low	Yes	0.61	Medium

## Goal 5. Support and Increase Economic Sustainability

Strategy	Action	Type of Intervention	Responsible Party	Support	Alignment with Local Coastal Land Use Plan	Cost	Impact/Protective Value	No. Problem Statements Addressed	Feasibility / Capacity	Additional Benefits	Final Score	Prioritization
5.1 Resilience Incentives: Improve the resilience of homes to climate hazards through economic programs.	5.1.1 Evaluate the provision of incentives to encourage homeowners and business owners to improve home/building hardening practices and implement accordingly.	Program	Public Works and Community Development			Within Current	High	3	High	No	0.69	Medium
5.1 Resilience Incentives: Improve the resilience of homes to climate hazards through economic programs.	5.1.2 Incentivize both passive and active cooling strategies for buildings. Identify the most energy and cost-effective strategies including light-colored roofing for homes and businesses, or initiate a heat pump retrofit program, and strategies to improve indoor air quality. This can go beyond state minimum requirements (reach codes). Prioritize at-risk populations for retrofit incentives. This could align with strategy 5.1.3.	Program	Public Works	Community Development		\$\$	High	3	Medium	Yes	0.595	Medium
5.1 Resilience Incentives: Improve the resilience of homes to climate hazards through economic programs.	5.1.3 Where permitted by FireWise regulations, coordinate and partner with HMB Beautification Committee on landscaping downtown to reduce heat. Connect to Green Infrastructure Development planning, and look for funding from sources such as the Arbor Day Foundation Tree City program. This could align with strategy 5.1.2.	Capital Improvement		Public Works, HMB Beautification Committee		\$	Medium	3	Medium	Yes	0.535	Low
5.1 Resilience Incentives: Improve the resilience of homes to climate hazards through economic programs.	5.1.4 Where permitted by FireWise regulations, using existing contractors, incrementally improve and maintain the urban canopy in downtown and throughout the City to provide shade and beautification.	Capital Improvement	Public Works			\$	Medium	3	High	Yes	0.66	Medium

5.2 Work collaboratively with local businesses to build their resilience and adaptive capacity.	5.2.1	Work with the City's businesses and business organizations to support their efforts to become more resilient, including providing resources related to energy resilience, increased defensible space, backup power, water and communications continuity.	Communications , Program	Economic Vitality/City Manager's Office			Within Current	Very High	3	High	Yes	0.94	High
5.2 Work collaboratively with local businesses to build their resilience and adaptive capacity.	5.2.2	Incentivize vegetation management with free chipping services, work days, and other similar programs that encourage engagement and ongoing best practices.	Program	Public Works			\$	High	3	Medium	No	0.485	Low
5.2 Work collaboratively with local businesses to build their resilience and adaptive capacity.	5.2.3	Design and implement water conservation programs and incentives for homes and businesses in Half Moon Bay. See the 'One Water' approach.	Program	Community Development	Coastside County Water		\$	High	3	Medium	Yes	0.635	Medium
5.2 Work collaboratively with local businesses to build their resilience and adaptive capacity.	5.2.4	Foster business partnerships and mentoring to support business continuity planning and enterprise risk management. Coordinate with regional businesses to ensure they understand the ramifications of, and are planning for, wildland fires (power shutoffs, data back-up, chain of command in leadership, evacuation, defensible space, and building hardening).	Partnership	City Manager's Office	Public Works		Within Current	High	3	High	Yes	0.84	High
5.2 Work collaboratively with local businesses to build their resilience and adaptive capacity.	5.2.5	Establish a local business pre-disaster recovery planning and coordination group and/or committee to update or initiate business continuity planning programs. Include considerations of physical assets and workforce.	Internal Procedure	City Manager's Office	Public Works/CERT		Within Current	Low	3	High	Yes	0.64	Medium
5.2 Work collaboratively with local businesses to build their resilience and adaptive capacity.	5.2.6	Implement innovative soil management practices and regenerative land management for agricultural businesses through ordinances, incentives, emerging technologies, and other innovative practices.	Policy/ Regulation, Program	Resource Conservation District	Public Works		\$	Low	3	High	No	0.41	Low

5.2 Work collaboratively with local businesses to build their resilience and adaptive capacity.	5.2.7	Develop and support a tourism strategy that is proactive in preparing for and adapting to anticipated climate changes. Incentivize tourism sector diversification.	Policy/ Regulation	City Manager's Office/Economic Vitality	Public Works		Within Current	Low	3	High	No	0.49	<u>Low</u>
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## C. Coastal Land Use Plan Policies Supporting Climate Action Plan Goals

Goal and Strategy	Specific Actions	LUP Policies	Supporting Policy Direction
<b>1. Ensure a Healthy, Resilient, and Self-Sufficient Community - Residential Resilience</b>			
1.1	Ensure subdivisions support emergency access and fire avoidance; prohibit lots in high fire hazard zones.	7-68	<i>Ensure that new subdivisions provide emergency vehicle access, meet evacuation standards, avoid fuel modification within ESHA, and prohibit creation of new lots in high fire hazard zones.</i>
1.1	Prohibit new subdivisions in fire, flood, and geologic hazard zones unless risks are mitigated.	7-2	<i>Prohibit subdivisions in areas of high fire, flood, and seismic risk unless all applicable risks are mitigated to meet LCP development standards.</i>
1.1	Update building codes for resilience to fire, flood, and climate hazards.	7-7	<i>Establish minimum requirements for fire, flood, and geologic hazard resilience through building codes, and require hazard disclosures for all developments.</i>
1.3	Prioritize resilience investments and engagement for historically excluded, marginalized, or under-resourced populations.	1-5	<i>Ensure equitable access to environmental benefits, prioritize Coastal Act and Local Priority Uses, and support affordable and workforce housing and culturally inclusive uses.</i>
1.4	Develop climate-resilient building and siting standards for hazard-prone areas.	7-1	<i>Require geologic and geotechnical analysis for hazard avoidance, limit development in hazardous areas, and implement siting/design strategies to reduce risk from environmental hazards.</i>
1.4	Integrate long-term sea level rise and climate change projections into hazard mitigation and planning for private development and public infrastructure.	7-5	<i>Integrate long-term sea level rise and extreme weather projections into planning and development standards.</i>
1.5	Update and maintain hazard warning systems; partner with alert services to disseminate emergency info to residents	7-3	<i>Require citywide hazard warning systems and coordination with San Mateo County's emergency alert system to ensure early warnings and evacuation notices.</i>

Goal and Strategy	Specific Actions	LUP Policies	Supporting Policy Direction
<b>2. Foster a Thriving and Accessible Coastline and Open Space - Climate-Smart Coastal Development</b>			
2.3	Require 100-year site stability analysis for new development; establish adaptive setbacks and prohibit protective devices	2-47	Require site assessment for PD areas that accounts for ESHA, hazards (e.g., flooding, landslides, erosion), and ensures development avoids bluff erosion over its economic life.
2.3	Site development to avoid future shoreline protection devices; anticipate sea level rise impacts	7-8	Site development to avoid future need for shoreline armoring, consider erosion and SLR in siting standards, and require alternatives to hard protection.
2.3	Implement rolling easements, relocation triggers, and shoreline management plans to allow landward migration of beaches and wetlands	7-40 to 7-43	Policies require relocation plans for structures in shoreline hazard areas, use of rolling easements, and shoreline management planning to enable beach migration.
2.5	Enhance and protect public coastal access; site trails and recreation infrastructure to adapt to erosion and sea level rise	5-1 to 5-12	Policies protect and expand public access to beaches and the Coastal Trail, require sea level rise adaptation for trails and access points, and integrate public access with natural resource protection.
2.5	Collaborate with tribes on cultural resource protection, use interpretive elements in coastal spaces	8-1 to 8-6	Policies require coordination with tribes for cultural resources, ensure monitoring and mitigation, and require development to avoid disturbance of archaeological and tribal cultural sites.
<b>3. Protect the City through Increased Resilient Infrastructure - Green Infrastructure</b>			
3.1	Promote LID and BMPs to treat stormwater; use ESHA-adjacent green infrastructure for natural erosion and sediment transport balance	6-76	Require use of green infrastructure to treat stormwater; avoid hard engineering solutions and protect ESHA-adjacent sediment dynamics.
3.1	Implement habitat restoration (e.g., wetlands and riparian zones) that support stormwater retention and improve ecosystem resilience	6-77	Support hydrology restoration and natural floodplain functionality to improve stormwater infiltration and ecosystem services.

Goal and Strategy	Specific Actions	LUP Policies	Supporting Policy Direction
3.1	Prioritize green infrastructure over traditional stormwater outfalls	6-94	Prioritize green infrastructure over new stormwater outfalls; otherwise, design outfalls to minimize impacts from sea level rise and coastal resource degradation.
3.1	Continue implementing NPDES and Countywide stormwater pollution prevention	6-95	Continue implementation of NPDES and Countywide programs to reduce stormwater pollutants through design controls and construction standards.
3.4	Support reclaimed water development; reserve water supply for priority uses; monitor capacity to ensure supply for future needs	3-13 to 3-17	Policies ensure monitoring of water system capacity, promote new water connections for priority uses, support recycled water systems, and phase water infrastructure to avoid growth-inducing impacts.
3.5	Elevate habitable floors, retrofit buildings in flood-prone zones, and prohibit habitable use below flood risk elevation	7-55	Require elevation of habitable areas in flood-prone zones, prohibit use below the risk elevation, and encourage flood risk retrofits.
<b>4. Build and Sustain HMB's Capacity to Increase Resilience - Operationalize climate considerations into City policies and procedures</b>			
4.1	Establishes a governance framework to integrate climate and hazard concerns into General Plan and LUP updates	2-10	Establish procedures for initiating amendments to its General Plan, including the LUP. The procedures shall set forth a process for amendments proposed by the City Council, Planning Commission, and private applicants. The City will not process private General Plan amendment applications, or associated development applications (except as required by State law), unless the City Council has approved initiating the General Plan amendment. Authorization to proceed with a General Plan amendment application shall in no way presume approval of the amendment or project.
4.1	Require utilities in new development to be undergrounded unless infeasible; encourage visual impact minimization and infrastructure resilience through early planning and in-lieu fees	9-37 to 9-39	Policy 9-37: "Locate utilities including traffic control boxes, transformers, meters, backflow prevention devices, and others in underground vaults where feasible; or if above finished grade, in discrete locations outside of any pedestrian path or sidewalk." Policy 9-38: "Require applications for new development to include preliminary utilities plans to ensure that undergrounding and minimizing

Goal and Strategy	Specific Actions	LUP Policies	Supporting Policy Direction
			the negative visual impacts of utilities are considered during the earliest phases of project design. For all new development and new subdivisions, utilities shall be underground unless infeasible..." Policy 9-39: "Require all telecommunications facilities to place support facilities underground where feasible. New communication transmission lines shall be sited and designed to be located underground, except where doing so would result in a hazardous condition..."
4.3	Encourages coordination and integration of regional planning efforts (e.g., watershed restoration, stormwater resilience)	3-43	Update and implement the Green Infrastructure Plan and Storm Drain Master Plan consistent with Land Use Plan policies to improve stormwater system function and management; support regional resilience objectives and coordinated infrastructure planning.
4.3	Supports interagency coordination (SAM, Caltrans) to protect critical infrastructure and integrate climate resilience into capital planning	3-28	Coastal development permit review for new development or redevelopment of wastewater treatment systems shall require that such improvements will operate so as to: minimize or eliminate marine resource pollution; incorporate facilities for reclamation of wastewater for reuse; and minimize noise, vibration, odor, and visual impacts on surrounding areas
<b>5 Support and Increase Economic Sustainability - Strong Local Businesses/Coastline Development</b>			
5.3/5.4	Support coastal workforce housing and economic stability for coastal workers; align land use with Coastal Act priorities	2-70	Designate Workforce Housing Overlay areas for affordable housing close to jobs and transit, integrate into PD areas, and ensure compatibility with LCP goals.

## D. Multi-criteria Decision Making and Cost-Benefit Analysis

Evaluating a variety of financing opportunities against funding requirements can be a complicated process. To support the strategic and rigorous evaluation of financing options, Keenan (2019) suggests a multi-criteria decision analysis (MCDA) framework. This framework can be used to consistently weigh choices against one another in as transparent a manner as possible, based on the relative importance placed on particular aspects or outcomes of a funding source. This avoids potentially overlooking specific benefits of a funding source, ambiguity in how the decision to pursue a source was made, and inconsistency in evaluating sources due to double-counting or over-/underweighting aspects such as risk aversion, administrative burden, opportunity cost, and impatience.

This process involves first, developing a list of criteria and second, evaluating the strength of each option against the criteria to assign a performance score for each option. Weightings can then be applied to each criteria, to calculate an overall score for the option. The more concrete the scores and categories, the more reliable the ultimate comparison, and there is less need for multiple cost-benefit analyses. Keenan (2019) developed an example scoring table; an adapted version is shown in Table 15. The categories are not exhaustive; for example, risk evaluation such as likelihood of default or missed payment is not included below.

Table 15. Example of performance scoring of funding strategies for climate adaptation based on pre-determined criteria, truncated from Keenan (2019). Each attribute could be weighted depending on how important that attribute/criteria was to the planner.

Funding strategy	Source of funds	Revenue generating potential	Cost of funds	Long-term sustainability	Flexibility of funds	Timing	Trade-offs for other city needs	State/federal political feasibility	Local/regional political feasibility	Administrative complexity	Equity/Cost burden
Local property tax increment from Infrastructure financing districts	4	4	4	5	4	4	5	4	4	5	4
Community facilities district	4	4	4	4	4	3	5	4	3	3	4
USACE CAP 103 Program	4	4	5	3	3	4	4	5	4	3	4
State property tax increment from Infrastructure financing districts	4	4	3	4	4	3	5	3	4	3	4
General obligation bonds	4	4	4	4	3	3	2	4	3	4	5

In the category of Cost of Funds, for example, the planner could use their professional judgment to arrive at a score, or be as detailed as calculating the specific financing costs using interest rates and an estimated payment schedule. Choosing the form of a specific scoring schedule for Cost of Funds, or whether to use one at all, is also an important decision (e.g., \$0–\$100K = 5, \$100K–\$500K = 4, \$500K–\$1,000K = 3 and so on, would be just one conceivable scoring schedule.) The more specific and concrete the scores are, the more reliable the final scores and the more likely the comparison of scores is to reflect their true comparative advantages.

Although much of the work of a cost-benefit analysis will have already been done in creating a robust table, a full cost-benefit analysis is recommended for the chosen strategy, or strategies, depending on how close the scores are to one another and how rigorous the MCDA, to finalize the decision (“Closeness” would also need to be defined by the planner).

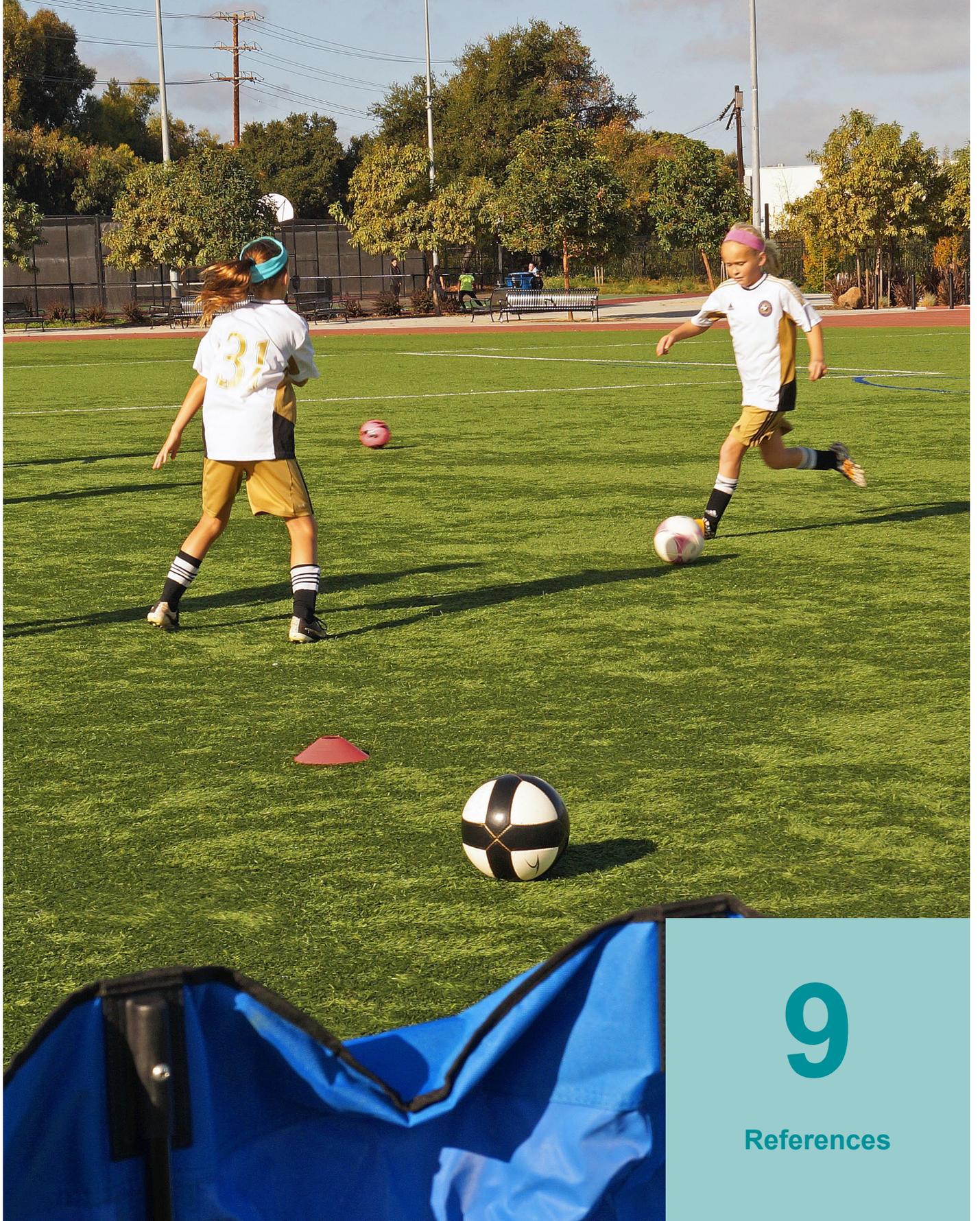
## E. IBank Funding and Financing Options

IBank offers three categories of financial products to businesses, non-governmental organizations, and governments whose projects relate to climate initiatives:

- **Green bonds:** In this case, IBank would be a “conduit issuer” that would issue bonds on behalf of the City of Half Moon Bay (or partner organizations, depending), and then loan the raised funds to the City (or partner entity) on agreed-upon terms. The four types of bonds IBank issues that are available for “green designation” are:
  - **Industrial Development Bonds**—tax exempt; designed for private-company applicants up to \$10 million that strictly focuses on manufacturing and processing tangible goods, which makes this option less aligned with the City’s climate adaptation goals; could be an opportunity for a P3 arrangement
  - **501(c)(3) Bonds**—tax-exempt; designed for nonprofit applicants; focuses on capital improvements but might be applicable to beach restoration and recreation improvements, for example; no listed funding limit; could be an opportunity for the City to facilitate adaptation initiatives of aligned organizations without putting forth its own financing
  - **Public Agency Revenue Bonds**—tax-exempt; designed for government applicants with a project outcome that includes enhancing “the economic, social or cultural quality of life for residents in the community;” no listed funding limit; does not require outside-agency collaboration to access and there is substantial overlap with climate adaptation goals
  - **Exempt Facility Bonds**—tax-exempt, designed for government applicants targeted at infrastructure improvements, can be for private projects on leased government land, no listed funding limit
- **Direct lending:** Like a private bank, IBank would agree to loan terms with the City; these loans are more flexible and lower cost than private-bank alternatives. There are two kinds of loans available:
  - **Infrastructure State Revolving Loan Fund Loans**—“directly provides low-cost public financing to local governments, as well as nonprofits sponsored by public agencies, for a wide variety of infrastructure and economic expansion projects that improve and sustain communities, including projects with energy efficiency, distributed clean energy generation and storage, and climate-smart design elements;” financing from the “ISRF program is available in amounts ranging from \$1 million to \$65 million with loan terms for the useful life of the project up to a maximum of 30 years;” current examples of ISRF financed projects include water and wastewater treatment plant upgrades or construction, venue or airport construction or street repair and upgrades”
  - **Climate Incentives Bridge Loans**—“provide bridge financing for public, private, and nonprofit sector borrowers that anticipate receiving incentives to finance project costs, such as utility and state agency rebates, federal clean-energy tax credits, and reimbursable grant funds. The Incentive Bridge [L]oan is typically structured as a term loan with no prepayment penalty and includes an expectation that incentive payments will be used to retire outstanding debt”
- **Loan guarantees:** IBank may guarantee a portion of a loan for the loan issuer in cases where repayment by the borrower is less certain. Loan guarantees effectively reduce the risk that a lender faces when financing particularly new/untested technologies, products, or programs. In this case, Half Moon Bay would partner with an institution (nongovernmental organization [NGO], private business, or government agency) that seeks financing from a private bank. IBank would then guarantee any loan that the private bank issues to the company. These guarantees are large, accommodating multimillion-dollar investments,

and thus large-scale and/or expensive projects. IBank offers two kinds of loan guarantees for climate-related initiatives:

- **Climate Tech Finance Loan Guarantee**—80% guarantee with maximum guarantee of \$5 million, maximum loan of \$20 million, up to 7-year term; applicant criteria are broad; great opportunity for a P3; example projects could include wave energy startups, energy storage companies, climate modeling software development, or carbon capture
- **Climate Loan Guarantee**—70% to 80% guarantee with maximum guarantee of \$100 million, (target \$30 million), guaranteed for life of loan, 0.5% to 1% of outstanding guarantee servicing fee; must reduce greenhouse gas or other air pollutant emissions; stricter criteria on state of technology to be deployed
- **Loan Participations:** IBank effectively participates in a loan matching system where it will lend up to 50% of the amount of an initial loan; target size is \$10 million to \$40 million; terms of the loan are negotiable based on merit criteria.



# 9

## References

## 9. References

- AECOM. (2018). Paying for Climate Adaptation in California: A Primer for Practitioners.
- Alta Planning and Design and City of Half Moon Bay. (2019). City of Half Moon Bay Bicycle and Pedestrian Master Plan, Approved September 2019.
- Anchor QEA. (2021). Geotechnical Engineering Assessment and Erosion Study Report.
- Barnard, P. L., Erikson, L. H., Foxgrover, A. C., Limber, P. W., O'Neill, A. C., & Vitousek, S. (2018). Coastal Storm Modeling System (CoSMoS) for Central Coast. U.S. Geological Survey data release <https://www.sciencebase.gov/catalog/item/5b280118e4b0592076260491>
- Befus, K.M., Barnard, P.L., Hoover, D.J. *et al.* 2020. Increasing threat of coastal groundwater hazards from sea-level rise in California. *Nat. Clim. Chang.* **10**, 946–952 2020. <https://doi.org/10.1038/s41558-020-0874-1>
- Blue Point Planning and City of Half Moon Bay. (2019, January). City of Half Moon Bay Parks Master Plan.
- Cal-Adapt. (2024). Retrieved November 2024, from <https://cmip5.cal-adapt.org/>
- CAL FIRE and OSFM. (2025). Fire Hazard Severity Zone [(FHSZSRA23\_3, FHSZLRA\_25\_1]. Available at: <https://www.coastsidefire.org/fire-hazard-severity-zones>
- CAL FIRE and OSFM. (n.d.). Fire hazard severity zones. [https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones?itid=lk\\_inline\\_enhanced-template](https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones?itid=lk_inline_enhanced-template)
- CAL FIRE and OSFM. (n.d.). 2024 fire hazard severity zone FAQs. [https://34c031f8-c9fd-4018-8c5a-4159cdf6b0d-cdn-endpoint.azureedge.net/-/media/osfm-website/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones/2024-fhsz-faqs\\_english.pdf?rev=538374a27bb44bbab4c2786ff2eafb39&hash=AD4DB7857E3EF6F0BEC0B56429A1C262](https://34c031f8-c9fd-4018-8c5a-4159cdf6b0d-cdn-endpoint.azureedge.net/-/media/osfm-website/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones/2024-fhsz-faqs_english.pdf?rev=538374a27bb44bbab4c2786ff2eafb39&hash=AD4DB7857E3EF6F0BEC0B56429A1C262)
- CAL FIRE and OSFM. (2022). Short fire hazard severity zone methods. [https://34c031f8-c9fd-4018-8c5a-4159cdf6b0d-cdn-endpoint.azureedge.net/-/media/osfm-website/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones/short\\_fhsz\\_methods\\_072022.pdf?rev=c47bf8be14c942baa48da94ee51902c0&hash=D0DFA909F68BA455658B55212B949CC8](https://34c031f8-c9fd-4018-8c5a-4159cdf6b0d-cdn-endpoint.azureedge.net/-/media/osfm-website/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones/short_fhsz_methods_072022.pdf?rev=c47bf8be14c942baa48da94ee51902c0&hash=D0DFA909F68BA455658B55212B949CC8)
- CAL FIRE and RCD. (2022). San Mateo-Santa Cruz Unit Strategic Fire Plan.
- CalOES. (2020). California Governor's Office of Emergency Services California Adaptation Planning Guide.
- California Energy Commission. (2019). California climate change adaptation planning: San Francisco Bay Area report. [https://www.energy.ca.gov/sites/default/files/2019-11/Reg\\_Report-SUM-CCCA4-2018-005\\_SanFranciscoBayArea\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-005_SanFranciscoBayArea_ADA.pdf)
- California Infrastructure and Economic Development. (2025). *Our Impact*. <https://ibank.ca.gov/climate-financing/our-impact/>.
- California Natural Resources Agency. (2021, June 28). California Climate Adaptation Strategy Workshop Summary.
- City of Half Moon Bay. (2014). Plan Half Moon Bay, Existing Conditions, Trends, and Opportunities Assessment. Revised July 2014.
- City of Half Moon Bay. (2019). CAAP Outreach Pilot Project Final Report.
- City of Half Moon Bay. (2020). Sustainability Implementation Plan. Approved September, 2020.

- City of Half Moon Bay, Dyett and Bhatia, Lester Coastal Policy, et. al. (2021). City of Half Moon Bay Local Coastal Land Use Plan. Certified April, 2021.
- City of Half Moon Bay. (2024). Capital Improvement Plan FY 2023-24 to FY 2027-28.
- City of Half Moon Bay. (2025). City Council Strategic Plan. <https://www.half-moon-bay.ca.us/241/City-Council-Strategic-Plan>.
- County of San Mateo. (2025). *Joint Powers Financing Authority*. <https://www.smcgov.org/ceo/joint-powers-financing-authority>.
- CSG Consultants. (2019). City of Half Moon Bay Green Infrastructure Plan. September 2019.
- Datause.io. (2025). *Half Moon Bay*. Data USA. Retrieved February 2025, from <https://datausa.io/profile/geo/half-moon-bay-ca>.
- DNV and Rincon Consultants. (2023). City of Half Moon Bay Climate Action Plan (CAP Phase 1). August 2023.
- Dyett & Bhatia. (2014). Plan Half Moon Bay: Existing Conditions, Trends, and Opportunities Assessment. July 2014.
- Federal Emergency Management Agency (FEMA). (2025). Available at: <https://msc.fema.gov/portal/home>
- Flammer, C. (2020). Green bonds: Effectiveness and implications for public policy. *Environmental and Energy Policy and the Economy*. 1:95–128. <https://www.journals.uchicago.edu/doi/epdf/10.1086/706794>.
- Integral Consulting and RCD. (2022). San Mateo County South Coast Sea Level Rise Vulnerability Assessment.
- Integral Consulting. (2023). Miramontes Point Sea Level Rise Vulnerability and Fiscal Impact Assessment.
- Integral Consulting. (2024). Sewer Authority Mid-Coastside Plant Vulnerability Assessment.
- Johnstone, J.A. & T.E. Dawson. (2010). Climatic context and ecological implications of summer fog decline in the coast redwood region, *Proc. Natl. Acad. Sci. U.S.A.* 107 (10) 4533-4538, <https://doi.org/10.1073/pnas.0915062107>.
- Keenan, J.M. (2019). *Climate Adaptation Finance and Investment in California*. Routledge. [www.routledge.com/](http://www.routledge.com/).
- Noble Consultants and Dyett and Bhatia. (2016). City of Half Moon Bay Sea Level Rise Vulnerability Assessment. April 2016.
- O'Brien, Travis. (2011). *The Recent Past and Possible Future Decline of California Coastal Fog*. Doctoral dissertation, University of California Santa Cruz.
- Pacific Institute. (2009). *The Impacts of Sea-Level Rise on the California Coast*. Available at: <https://databasin.org/datasets/91a7562429474e92b5f9fe7d79407a8e/>
- Pena, L. (2025, January 23). First homes for HMB farmworkers arrive 2 years after mass shootings exposed poor conditions. *ABC 7 News*. <https://abc7news.com/post/first-homes-half-moon-bay-farmworkers-arrive-2-years-mass-shootings-exposed-poor-conditions/16174067/>.
- Plenary. (n.d.). Long Beach Civic Center Redevelopment. Retrieved March 2025, from <https://plenary.com/project/long-beach-civic-center-redevelopment>.
- Rossi, L., et al. (2024). Adopted Operating Budget. *The City of Half Moon Bay Annual Budget*. The City of Half Moon Bay. Retrieved May 16, 2025, from <https://www.half-moon-bay.ca.us/DocumentCenter/View/6738/FY-2024-25-City-of-Half-Moon-Bay-Annual-Budget---Adopted>.
- Roberts, A., et al. (2021). Proposed Funding Pathways for Adaptation for Climate Change in California. Resource Legacy Fund. <https://resourceslegacyfund.org/wp-content/uploads/2021/05/Proposed-Funding-Pathways-for-Adaptation-to-Climate-Change-in-California.pdf>.

- San Mateo County OneShoreline and AECOM. (2018). San Mateo County Sea Level Rise Vulnerability Assessment.
- State Water Resources Control Board (2025). *Clean Water State Revolving Fund*. CA.gov. Retrieved March 2025, from [https://www.waterboards.ca.gov/water\\_issues/programs/grants\\_loans/srf/](https://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/).
- Trautwein, B., et al. (2020, June 10). Goleta's Creeks and Watersheds: Opportunities for Enhancement and Restoration.
- UC Santa Barbara. (n.d.). Coastal Fund UC Santa Barbara Associated Students. *Spring 2020 Funded Projects*. Retrieved January 2025, from <https://coastalfund.as.ucsb.edu/spring-2020-funded-projects/>.
- U.S. Department of Labor. (n.d.) Department of Labor Takes Critical Step in Heat Safety Rulemaking, Continues Heightened Enforcement Efforts, Focuses on Dangers to Agricultural Workers. Retrieved May 2025, from <https://www.dol.gov/newsroom/releases/osha/osha20240508-0>.
- U.S. Geological Survey. (2017). Pacific Coastal Fog Project. U.S. Department of the Interior. <https://www.usgs.gov/centers/western-geographic-science-center/science/pacific-coastal-fog-project>
- USACE, MBNMS, and Noble Consultants. (2015, September). Coastal Regional Sediment Management Plan for the Santa Cruz Littoral Cell, Pillar Point to Moss Landing.
- Visit Half Moon Bay. (2025). [visithalfmoonbay.org](http://visithalfmoonbay.org).
- West Yost and CCWD. (2021, June). Coastside County Water District Planning 2020 Urban Water Management Plan.
- World Economic Forum. (2023). What are municipal green bonds and how are global cities using them to finance green projects? World Economic Forum. November 20. <https://www.weforum.org/stories/2023/11/heres-how-3-cities-are-using-municipal-green-bonds-to-finance-climate-infrastructure/>.