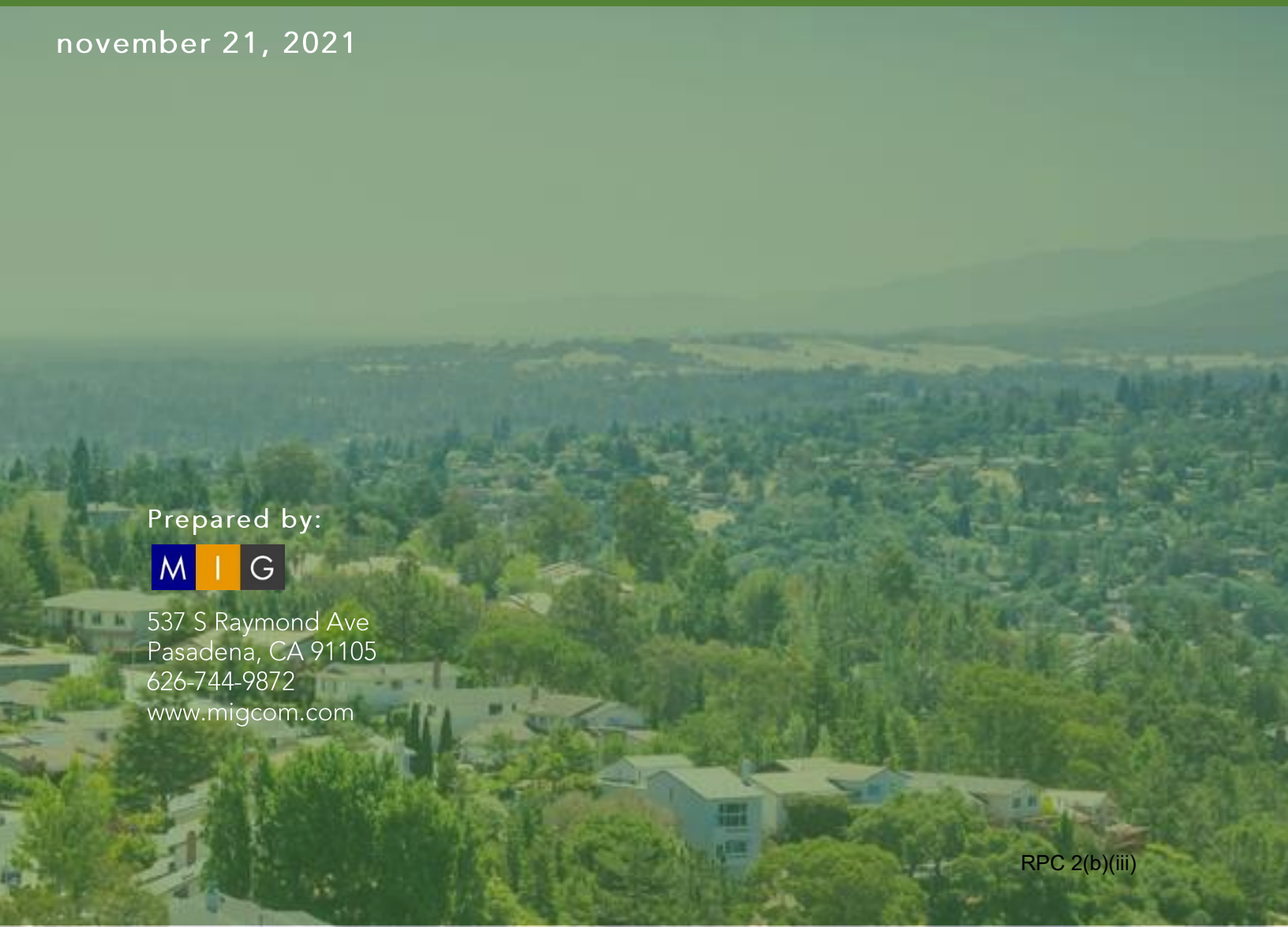
Redwood City | California Founded 1867

focused general plan

vulnerability assessment

existing conditions technical memorandum

november 21, 2021



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RPC 2(b)(iii)

Introduction

California Senate Bill (SB) 379, adopted in 2015, requires that a General Plan's safety element be reviewed and updated, as necessary, to address climate adaptation and resiliency strategies applicable to that city or county. While the City's current Public Safety Element focuses on addressing climate change through the reduction of greenhouse gas emissions, this update identifies ways in which the City can plan for and adapt to changing climatic conditions. This requires preparing a vulnerability assessment identifying the risks that climate change poses to the local geographic areas and populations vulnerable to climate change impacts. The vulnerability assessment follows the process outlined in the California Adaptation Planning Guide 2.0 (released in 2020) and is composed of the following four steps:

1. **Exposure:** Provides an overview of existing hazards within the city and how these hazards will change because of climate change. Climate projection data from the Cal-Adapt[1] tool are used to understand how these changes will occur by mid-and late-century.
2. **Sensitivity and Potential Impacts:** Discusses the potential impacts climate change will have on various populations and critical assets.
3. **Adaptive Capacity:** Assesses the City of Redwood City's and partner agencies' ability to cope with climate impacts. This is determined by a review of existing plans, policies, and programs.
4. **Vulnerability Scoring:** Scores potential impacts and adaptive capacity for reach population and asset at risk for each climate change-related effect identified in Step 2.

The information gathered from the vulnerability assessment is then used to develop a set of goals, policies, and programs related to climate adaptation and resiliency. The Public Safety Element will also incorporate findings from the City's 2030 Climate Action Plan, Multijurisdictional Local Hazard Mitigation Plan, and various other local initiatives that address sea level rise, flooding and wildfire risk.

Exposure

The Vulnerability Assessment Exposure provides an overview of communities' risk to projected climate hazards to understand what the potential impacts might be.

Direct changes to the local climate include increases in average temperature, annual precipitation, and seal level rise, which can be categorized as primary impacts. Secondary impacts are those associated with these direct changes such as heatwaves, intense rainstorms, landslides, droughts, and wildfires. As part of this vulnerability assessment, it is necessary to understand the following:

- Past major natural hazard events
- Differences between current conditions and those projected for the middle and end of the 21st century
- The pace at which these changes are projected to occur
- The scale of the area that these changes are projected to occur

[1] The Cal-Adapt tool is a publicly available tool that provides data and insights on how climate change might affect California at the local level. The tool was developed by UC Berkeley's Geospatial Innovation Facility and utilizes data gathered from California's scientific community. This assessment utilizes data accessed from the Cal-Adapt website in September 2021.

The data used to understand the points listed above are sourced from the State's Cal-Adapt[2] tool and the San Mateo County's Draft 2021 Multijurisdictional Local Hazard Mitigation Plan (LHMP).

Past Major Natural Hazard Events

Historical federal disaster declarations related to intense weather events and wildfires give an indication of the types of natural hazards that could be exacerbated by climate change. Federal disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government, although no specific dollar loss threshold has been established for these declarations. Table 1 summarizes local wildfires and intense weather-related disaster events dating back to the 1950s.

Table 1: Historical Federal Disaster Declarations in San Mateo County and Local Jurisdictions

Event	Disaster Declaration	Date	Damages
Wildfires (CZU Lightning Complex)	DR-4558	August 16 – September 26, 2020	1,490 buildings destroyed.
Severe Winter Storms, Flooding, and Mudslides	DR-4308 and DR-4305	January 18-23, 2017 and February 1 – 23, 2017	Power outages, flooded roads and agricultural lands, dam overflows, bridge collapses
Severe Winter Storms, Flooding, and Mudslides	DR-1646 and DR-1628	December 14, 2005 – January 3, 2006 & March 29 – April 16, 2006	Power outages, damaged roads and highways, flooding of local rivers and streams
Severe Winter Storms and Flooding	DR-1203	February 2 – April 30, 1998	Power outages, damaged roads, flooding of local rivers and streams, property damage
Severe Storms, Flooding, Mud, and Landslides	DR-1155	December 28, 1996 – April 1, 1997	Power outages, damaged roads, flooding of local rivers and streams, property damage, flooding of agricultural land
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1046 and DR-1044	January 3 – February 10, 1995 and February 13, 1995 – April 19, 1995	Power outages, damaged roads, flooding of local rivers and streams, property damage, flooding of agricultural land
Severe Freeze	DR-894	December 19, 1990 – January 3, 1991	Billions of dollars in damages due to destroyed crops
Severe Storms, Flooding	DR-758	February 12 – March 10, 1986	Power outages, damaged roads, flooding of local rivers and streams, property damage, flooding

[2] Cal-Adapt Tool accessed September 2021.

			of agricultural land, loss of life
Coastal Storms, Floods, Slides, Tornadoes	DR-677	January 21 – March 30, 1983	Property damage, coastal erosion
Severe Storms, Flood, Mudslides, High Tide	DR-651	December 19, 1981 – January 8, 1983	Power outages, damaged roads, flooding of local rivers and streams, property damage, flooding of agricultural land, loss of life
Flooding	DR-145	February 25, 1963	Power outages, damaged roads, flooding of local rivers and streams, property damage, loss of life
Severe Storms	DR-138	October 24, 1962	Power outages, damaged roads, flooding of local rivers and streams, property damage, loss of life
Flooding	DR-122	March 6, 1962	Power outages, damaged roads, flooding of local rivers and streams, property damage, loss of life
Flooding	DR-82	April 4, 1958	Power outages, damaged roads, flooding of local rivers and streams, property damage, loss of life
Wildfires	DR-65	December 29, 1956	Damaged structures and loss of life
Flooding	DR-47	December 23, 1955	Power outages, damaged roads, flooding of local rivers and streams, property damage, loss of life
Flooding	DR-15	February 5, 1954	Power outages, damaged roads, flooding of local rivers and streams, property damage, loss of life

Source: San Mateo County Draft Multijurisdictional Local Hazard Mitigation Plan, 2021; Federal Emergency Management Agency, 2021.

Projected Climate Change Effects

Each tool in Cal-Adapt uses two greenhouse gas and climate scenarios in California's 4th Climate Assessment. The two scenarios are called Representative Concentration Pathways (RCPs):

- **RCP 4.5.** A "medium" emissions scenario that models a future where greenhouse gas emissions (GHG) peak around 2040 and then decline to lower than 1990 levels by the end of the century.

This moderate scenario assumes that society will make significant strides in the reduction of greenhouse gas emissions.

- **RCP 8.5.** A "business as usual" scenario where emissions continue to rise strongly through 2050 and plateau around 2100.

This assessment uses data modeled for both the RCP 4.5 and RCP 8.5 scenarios. While the best available data is used in these models, climate change projections involve inherent uncertainty. This uncertainty is largely derived from the fact that climate projections depend on future greenhouse gas emission scenarios and that different climate change models result in differing outcomes or impacts. The different scenarios also indicate the level of risk involved when developing climate adaptation strategies. The medium emissions scenario would require less aggressive strategies due to progress towards emissions reduction and the business-as-usual scenario would require more aggressive strategies due to a continuance in rising emissions.

Changes in Annual Precipitation

Although extended drought conditions are expected to become more frequent, more intense storms will also occur because of climate change. A warming climate also points to more volatile storms with greater amounts of rainfall and increased flood potential. The warming climate affects large-scale circulation patterns, influencing the intensity of storm events around the world.

The historical average (1961-1990) rainfall in Redwood City is 20.2 inches and is expected to increase slightly by 1.1 inches by the end of century in the high emissions scenario. While the City and the rest of the State do not expect to see average annual rainfall changing significantly over the next 50-75 years, rain will likely be delivered in more intense storms within a shorter wet season. This is demonstrated by the 30-year range in rainfall, where the range is expected to increase significantly by the end of the century. Table 2 summarizes the changes in annual precipitation under each of the emissions scenarios.

Table 2: Projected changes in annual precipitation

	Change from baseline	30-year average	30-year Range
Baseline (1961-1990)			
Modeled historical	-	19.6 inches	17.7 – 22.4 inches
Mid-Century (2035-2064)			
Medium Emissions	-0.1 inches	19.5 inches	16.9 - 26.2 inches
High Emissions	+0.3 inches	19.9 inches	15.9 – 15.6 inches
End-Century (2070-2099)			
Medium Emissions	+0.4 inches	20.0 inches	16.3 – 24.9 inches
High Emissions	+1.1 inches	20.7 inches	14.3 – 28.0 inches

Increased Temperatures

The historical annual average maximum temperature in Redwood City is 70.0 °F. The average maximum temperature in Redwood City is expected to increase above this baseline by 8.9 °F by the end of the century under the high emissions scenario. Extreme heat days, which are days when the daily maximum temperature is above the threshold temperature of 99.1°F, have a historical average of four days. This is expected to increase to average of 18 days by the end of the century under the high emissions scenario. Tables 3 and 4 summarize the changes in annual average temperatures and extreme heat days under each of the emissions scenarios.

These significant increases in temperatures can have dangerous impacts, such as more frequent and prolonged heatwaves, wildfires, and droughts.

Table 3: Projected changes in average maximum temperature

	Change from baseline	30-year average	30-year Range
Baseline (1961-1990)			
Modeled historical	-	70.0 °F	69.7 - 70.3 °F
Mid-Century (2035-2064)			
Medium Emissions	+3.1 °F	81.3 °F	78.9 - 83.8 °F
High Emissions	+5.5 °F	82.2 °F	79.7 - 84.3 °F
End-Century (2070-2099)			
Medium Emissions	+5.7 °F	82.4 °F	80.3 - 85.4 °F
High Emissions	+8.9 °F	85.6 °F	82.7 - 89.3 °F

Table 4: Projected changes in extreme heat days

	Change from baseline	30-year average	30-year Range
Baseline (1961-1990)			
Modeled historical	-	4 days	3 - 5 days
Mid-Century (2035-2064)			
Medium Emissions	+5 days	9 days	13 - 46 days
High Emissions	+7 days	11 days	17 - 51 days
End-Century (2070-2099)			
Medium Emissions	+8 days	12 days	7 - 21 days
High Emissions	+18 days	22 days	12 - 48 days

Sea Level Rise

As sea levels rise, more areas of Redwood City will be vulnerable to 100-year flood events. Scenario modeling results pictured below range from one foot of sea level rise to nine feet of sea level rise (Figure 1). The map indicates possible significant flooding, erosion, and water damage impacts to the built environment along both sides of Highway 101. Under all scenarios, San Carlos Airport and Redwood Shores will be inundated by rising Bay waters. Along the Redwood City shoreline, Bayshore sea levels are projected to rise approximately 24 inches by 2050 and 84 inches by 2100. Eventually, sea level may increase enough to permanently flood low-lying areas in the eastern part of Redwood City along the Bayshore.

Droughts

Drought is characterized as a period of unusually persistent dry weather that continues long enough to cause serious problems such as regional water supply shortages. One dry year does not normally constitute a drought in California but serves as a reminder of the need to plan for droughts. Drought is a gradual phenomenon that occurs slowly over a multi-year period. Research suggests that extended drought occurrences could become more pervasive in future decades. The modeled historical baseline shows that the average maximum length of a dry spell is 124 days in Redwood City. This is expected to increase by 13 days in the high emissions scenario by the end of the century (see Table 5).

Table 5: Projected maximum lengths of dry spell period

	Change from baseline	30-year average	30-year Range
Baseline (1961-1990)			
Modeled Historical	-	124 days	109 - 139 days
Mid-Century (2035-2064)			
Medium Emissions	+6 days	130 days	111 - 150 days
High Emissions	+10 days	134 days	116 - 147 days

End-Century (2070-2099)			
Medium Emissions	+7 days	131 days	106 – 149 days
High Emissions	+13 days	137 days	106 - 168 days

Wildfires

Heatwaves combined with drought and Diablo wind conditions can increase the likelihood and severity of wildfires. Redwood City's foothill neighborhoods are particularly susceptible to wildfire since foothill areas are generally covered with dry and dense vegetation. Where and how wildfire activity will occur is difficult to project due to the uncertainty of influencing factors, such as development patterns and pest infestations. However, the Cal-Adapt tool does provide a high-level assessment of the likeliness of an increase in wildfire activity. The tool uses a statistical model based on historical data of climate, vegetation, population density, and fire history. The table below summarizes these projections.

Table 6: Projected wildfire activity

	Change from baseline	30-year average	30-year Range
Baseline (1961-1990)			
Medium Emissions	-	137.1 acres	132.4 - 142.5 acres
High Emissions	-	145.4 acres	137.0 - 148.9 acres
Mid-Century (2035-2064)			
Medium Emissions	+66.4 acres	203.5 acres	188.5 - 212.8 acres
High Emissions	+60.7 acres	206.1 acres	179.2 - 223.3 acres
End-Century (2070-2099)			
Medium Emissions	+70.8 acres	207.9 acres	194.3 - 230.6 acres
High Emissions	+42.5 acres	187.9 acres	169.9 - 203.5 acres

Sensitivity and Potential Climate Change Impacts

Climate change effects will impact some population groups and assets more severely than others. The sections below identify what key populations and assets are likely to be more sensitive to the impacts of climate change-related effects.

Flooding

The National Oceanic and Atmospheric Association (NOAA) and the Federal Emergency Management Agency (FEMA) provide information on flooding hazards. However, the methods for identifying flood zones differ between the two organizations. FEMA flood zones are based on past patterns of flooding and do not take into consideration future sea level rise, which is expected to create new and bigger flood zones. The NOAA Sea Level Rise Viewer tool visualizes community-level impacts from coastal flooding or sea level rise and uses the best available elevation and water height data. The following

section discusses impacts of future flooding based on the sea level rise projections discussed on above and FEMA flood zones.

Sea Level Inundation

Sea levels are projected to increase significantly along the Redwood City shoreline and along both sides of Highway 101. Increased sea levels can cause bridges and roadways to become impassable, flood control infrastructure to not work effectively, and hazardous material facilities to increase the risk of accidentally releasing harmful substances. Natural systems, such as wetlands and tidal marshes, can be disrupted by higher tide levels.

Rising sea levels can cause the bay shoreline to flood more frequently and severely. Due to ocean levels being higher during normal conditions due to sea level rise, shoreline floods, such as king tides and storm surge, can be exacerbated and reach even further onto land. During strong storms and king tides, shoreline flooding may damage or destroy homes and commercial buildings in low-lying areas in eastern Redwood City. These events can also disrupt transportation routes such as Highway 101, Veteran's Boulevard, Bay Road, Broadway, Main Street, and Woodside Road (State Route 84). Important economic assets, such as Downtown Redwood City, Port of Redwood City, industrial and manufacturing centers, biotechnology companies, and other major employers may be negatively impacted. Essential infrastructure, such as the Caltrain transit station, Kaiser Permanente Medical Center, bridges, electric vehicle charging stations, solid waste facilities, and water and wastewater infrastructure, may be frequently inundated, causing them and the community services they support to be negatively impacted.

FEMA Flood Zones

FEMA identifies multiple areas in Redwood City that are within the 100-year and 500-year floodplains. They are located within Bair Island, the eastside industrial/commercial areas between Highway 101 and El Camino Real, and along the central parts of the city. Both residential, including mobile home parks, and nonresidential uses, are located within the 500-year flood zone.

Buildings and facilities east of Highway 101, such as hospitals, regional commercial uses, and residential areas, are highly vulnerable to flood events. Several major eastside employers including industrial or manufacturing uses, and other commercial office centers may be negatively impacted by flood events. As illustrated by Figures 2 and 3, at-risk infrastructure includes transmission lines that run parallel to US-101 and across Bair Island, multiple microwave towers and electrical substation facilities, and a few solid waste facilities near the Port of Redwood City. Transportation infrastructure, such as the Caltrain transit station, major roads and highways, and other services, can also be inundated, blocked, and damaged by floodwaters.

Certain populations face particularly high risks from flooding events. Persons experiencing homelessness, households in poverty, and linguistically isolated persons are severely vulnerable to flooding, as they may live in or near flood hazard areas, lack financial resources to protect their homes, or have difficulty receiving adequate evacuation notices due to language barriers. Persons with limited mobility and those without access to lifelines (persons without access to a car, transit, or

communication systems) may have difficulty evacuating prior to a flooding event, and therefore are also highly vulnerable.

Public Safety Element Considerations

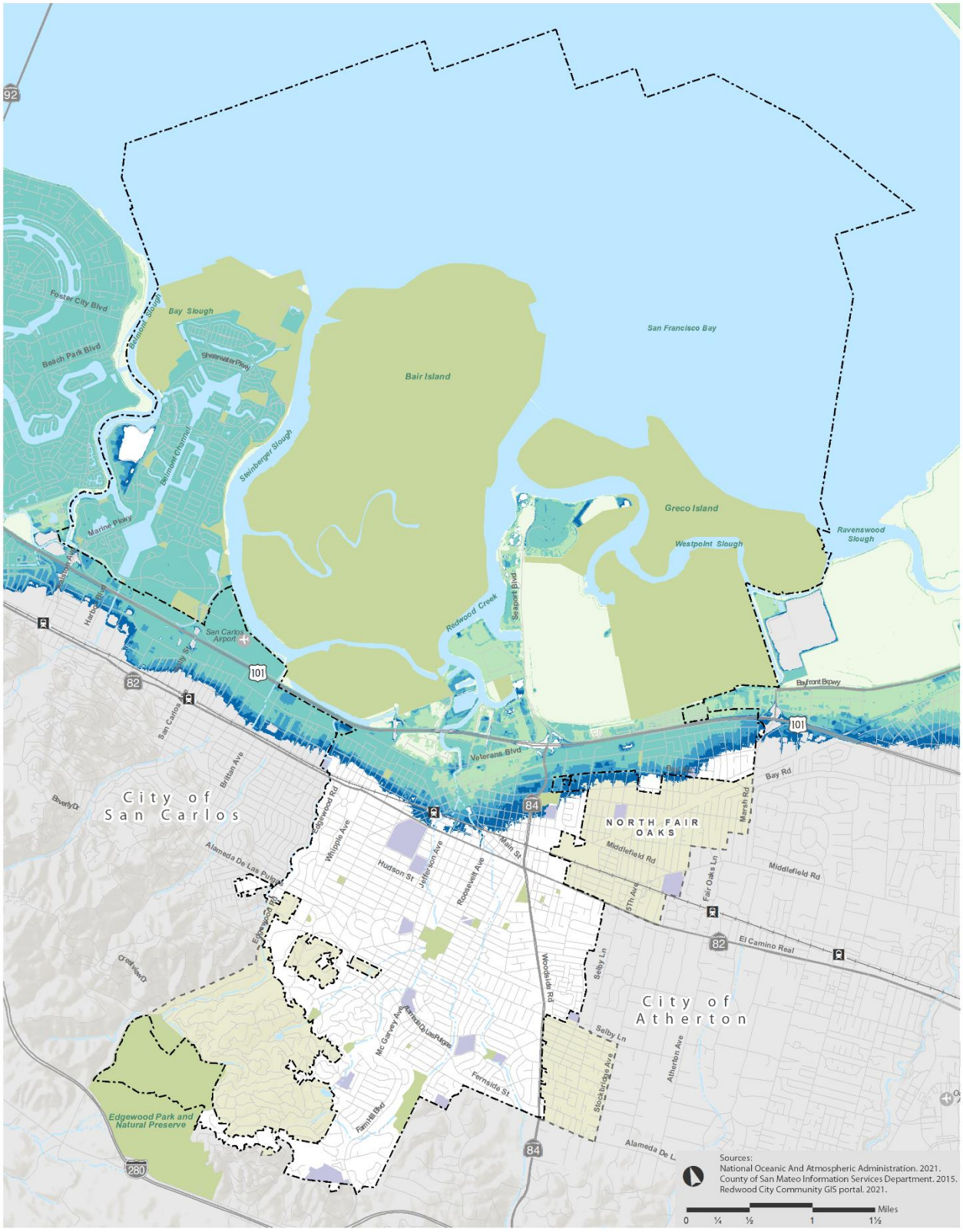
Floodproofing development and critical infrastructure. The City should adopt policies that require development and infrastructure within flood zones to implement floodproofing measures, such as elevating structures and equipment above expected flood levels. Additionally, the siting of new residential development must also consider the impacts of flooding and sea level rise.

Continuously evaluate the adequacy of flood control infrastructure. As climate change is expected to create new and more intense flood zones and events, the City should continuously evaluate whether existing flood control infrastructure has the capacity to withstand future extreme events. The City should upgrade existing and construct new infrastructure where necessary and also integrate climate-related risk into capital improvement plans.

Study response of nearby wetlands to storm surge events. Coastal wetlands act as buffers to storm surge. Protecting and understanding the ability of existing wetlands to provide protection for coastal infrastructure in the future is important considering projected sea-level rise and possible changes in storm severity.

Develop coastal restoration plans. Coastal restoration plans may protect water utility infrastructure from damaging storm surge by increasing protective habitat of coastal ecosystems such as wetlands. Restoration plans should consider the impacts of sea-level rise and development on future ecosystem distribution. Successful strategies may also consider rolling easements and other measures identified by Environmental Protection Agency's Climate Ready Estuaries program.

Coordination with regional agencies responding to sea level rise and flooding. Continue to collaborate with the San Mateo County Flood and Sea Level Rise Resiliency as a way to support integrated regional planning and investment.



Sea Level Rise Scenarios

- 1 foot (Low-End Scenario)
- 3 feet
- 5 feet (Mid-Level Scenario)
- 7 feet
- 9 feet (High-End Scenario)

Base Map Features

- Redwood City Boundary
- Sphere of Influence Boundary
- Railway and Stations
- San Mateo County Streets
- US Highway 101
- Channel, Rivers, and Streams
- Bay, Harbor, and Sloughs
- Open Space and Parks
- Schools

Figure 1: Sea Level Rise

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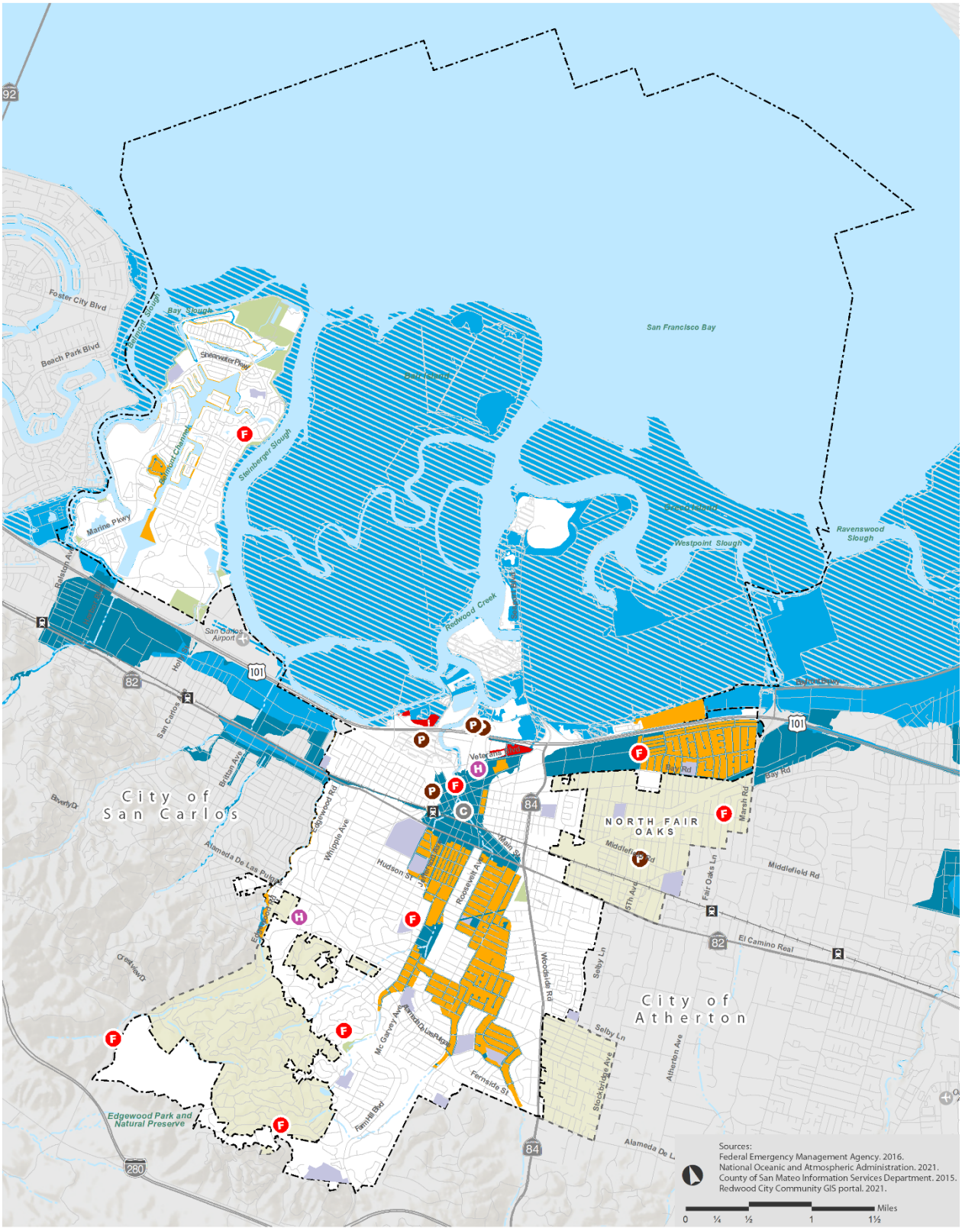

Flooding Hazards

- 1% Annual Chance (100-year flood)
- 0.2% Annual Chance (500-year flood)
- 24" Sea Level Rise +5-year Storm

Buildings and Facilities

- City Hall
- Hospitals
- Local Law Enforcement Locations
- Fire Stations
- Regional Commercial Uses
- Residential Uses
- Schools

Base Map Features

- Redwood City Boundary
- Sphere of Influence Boundary
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Figure 2: Flood Hazards

At Risk Buildings and Facilities

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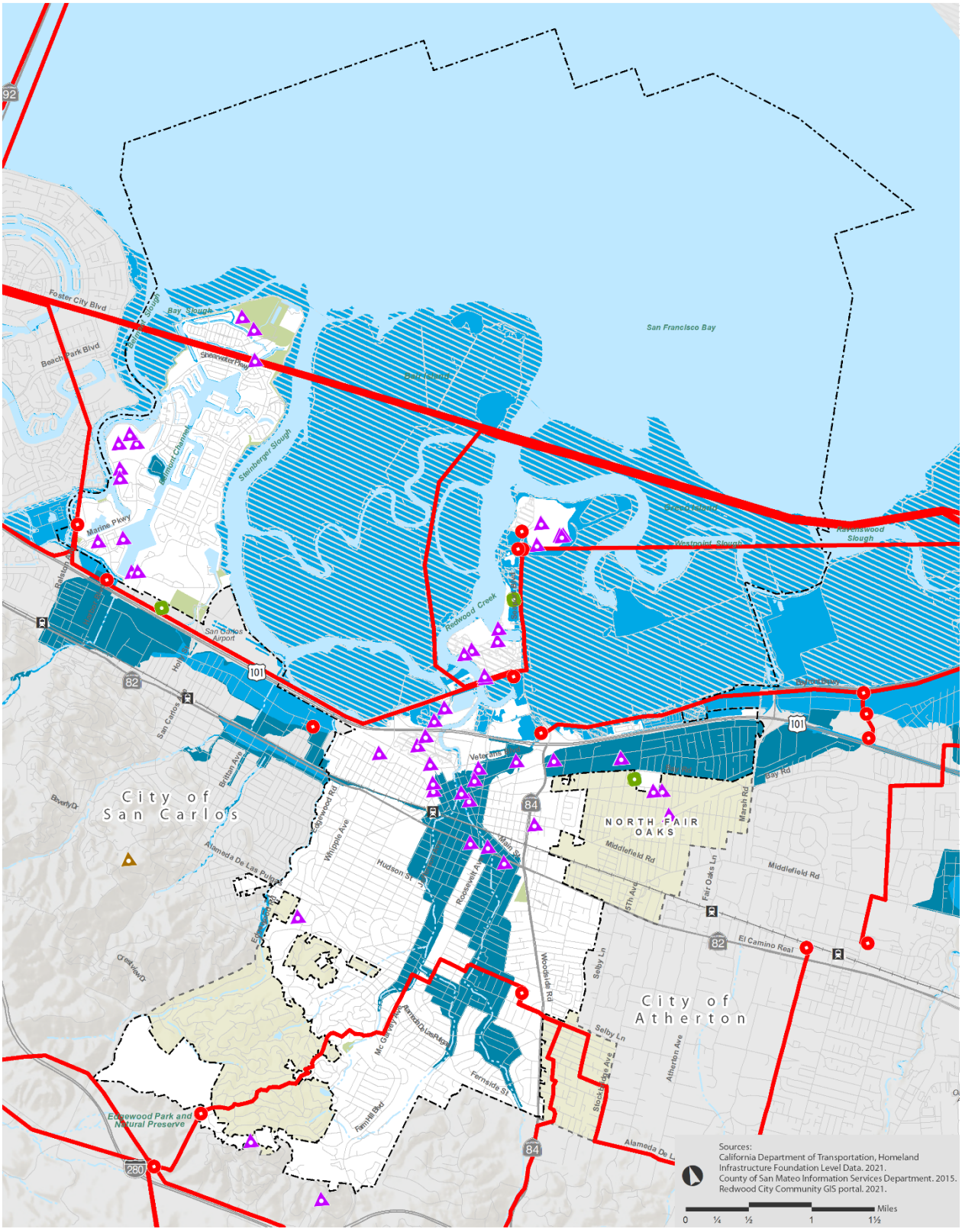

Flooding Hazards

- 24" Sea Level Rise +5-year Storm
- 1% Annual Chance (100-year flood)
- 0.2% Annual Chance (500-year flood)

Infrastructure

- FM Tower
- Microwave Tower
- Solid Waste Facility
- Electrical Substation
- Transmission Lines

Base Map Features

- Redwood City Boundary
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- Open Space and Parks

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Figure 3: Flood Hazards

At Risk Infrastructure

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Drought

As the climate continues to warm, water supplies will be squeezed tighter. Rising surface temperatures also imply greater moisture loss in vegetation and on the ground surface. These conditions can put stress on existing water supply and water storage facilities.

Drought can also cause respiratory illnesses since there is no rainwater available to flush out airborne pollutants. This could have severe effects on those with respiratory illnesses or other disabilities. Additionally, low-income populations and communities of color are potentially more likely to experience water shortages during periods of drought as they may already lack access to potable drinking water or are unlikely to afford any price surges caused by increased demand for water. In Redwood City, this could pose additional stressors on the environmental justice communities located in the Downtown neighborhoods east to the North Fair Oaks neighborhood since it has existing exposure to groundwater contaminants.

Public Safety Element Considerations

Water conservation. The Safety Element should address issues related to water conservation to ensure that supplies are not exhausted during periods of drought.

Heatwaves

Heatwaves are defined as five consecutive days when temperatures exceed 100 °F. While projections show that the average maximum temperate in the City will be below 85.6 °F, recent heatwaves in 2020 and 2021 show that local temperatures can reach up to 90 °F. Prolonged heatwaves can affect sensitive populations such as elderly residents, lower-income populations who cannot afford air conditioning systems or potential price surges for water and electricity, and homeless individuals without access to cooling centers. These weather events can cause severe symptoms, such as heat exhaustion, heat stroke, and severe dehydration, and sometimes even death. People with chronic diseases are at greater risk of complications and death during a heatwave. Those with disabilities could also face difficulty accessing resources to stay cool and hydrated. According to the California Department of Public Health, heat-related emergencies cause an average of 56 deaths in California each year and prompt 3,800 people to seek treatment at hospital emergency rooms. In the summer of 2000, a heat wave contributed to the deaths of several San Mateo County residents. Children, the elderly, and adults with disabilities may be more at risk for heat stroke and heat exhaustion.

Extreme heat events can put a strain on the electrical supply, transmission, and distribution systems, which in turn increase the risk of very costly and disruptive blackouts. Extreme heat can also adversely impact transportation infrastructure, such as causing the softening and expansion of asphalt surfaces, resulting in buckling, potholed and rutted roads. Impacts on roadways and rail lines can lead to closures and travel delays in the short term and accelerate the breaking down of infrastructure in the long term. Sustained temperatures above 100°F may cause train tracks to expand, resulting in the buckling of rail lines and the derailing of trains.

Public Safety Element Considerations

Access to cooling centers and devices. Redwood City has various community centers that function as cooling centers during heatwaves. The City should continue to make these available to residents and

periodically review cooling centers to ensure they maintain adequate capacity to keep up with demand. The City could also consider working with property owners to implement weatherization measures to ensure property stay cool during extreme heat events.

Heat alerts. The City should continue to release heat alerts and information about City facilities used as cooling centers.

Adverse impacts to utilities and transportation systems. The City should ensure there are policies in place to be able to effectively manage electrical supply to mitigate any potential blackouts and impacts to critical infrastructure, such as energy conservation and management policies. The City should also coordinate with relevant transportation agencies to fortify local transportation infrastructure against extreme heat events.

Wildfires

Redwood City foothill neighborhoods located west of Alameda de las Pulgas are designated "Very High Fire Hazard Severity" (VHFS) Zones by San Mateo County as shown on Figure 4. As a result of climate change, higher temperatures, and drier environments, wildfire events and associated risks could be more prominent. Wildfires can place stress on critical assets within the city. Roadways are at risk of physical damage and/or closure, which could impact the effectiveness of evacuation routes and emergency service access. Water supply is a vulnerable asset as there is likely to be an increase in demand for water for wildfire fire suppression and resident needs.

Wildfire smoke is another hazard associated with wildfires. Smoke releases high concentrations of particulate matter and carbon monoxide. Other air pollutants, such as acrolein, benzene, and formaldehyde, are present in smoke, but in much lower concentrations than particulate matter and carbon monoxide. The effects of smoke range from eye and respiratory tract irritation to more serious disorders, including reduced lung function, bronchitis, exacerbation of asthma, and premature death. These effects can be more severe for sensitive populations, such as those with respiratory illnesses and other chronic diseases, the elderly, and children.

Other populations at risk of experiencing the impacts of wildfire, specifically wildfire smoke, include low-income communities and/or communities of color who have historically lived or worked in areas with greater exposure to pollution burdens. Redwood City's environmental justice communities already experiences high rates diesel particulate matter and air pollution caused by heavy traffic from nearby major roads and highways. Toxins released from wildfire smoke could exacerbate existing pollution burdens in these communities.

Public Safety Element Considerations

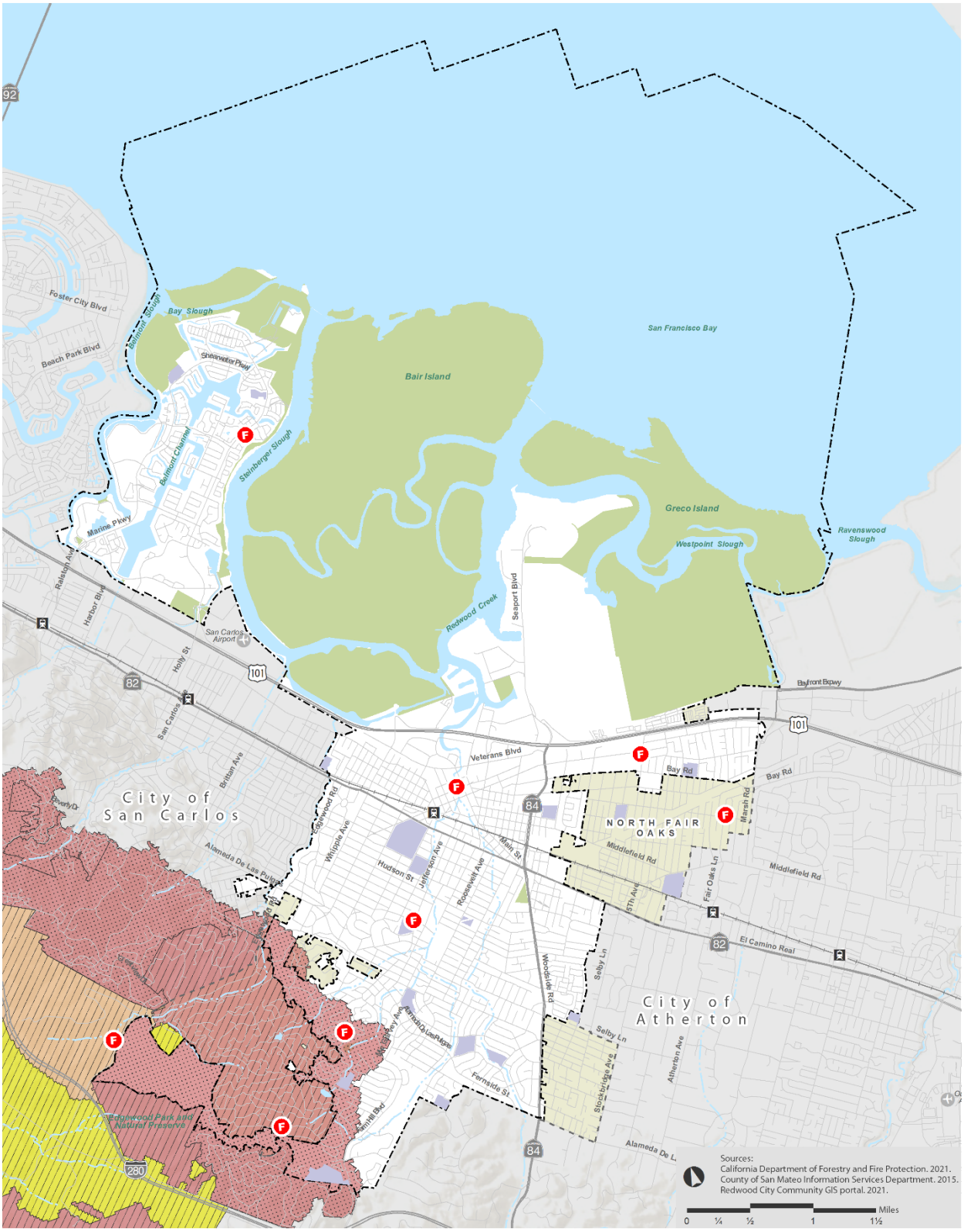
Evacuation routes. Ensure that evacuation routes are consistently updated and exist for all areas of the City and a map of evacuation routes should be included in the Public Safety Element. Evacuation routes should be reviewed to determine if they are of sufficient width to facilitate rapid evacuation. If they are not, General Plan policy should put forth operational programs to address necessary right-of-way. Such programs may include no parking zones during "Red Flag" alerts or during voluntary and mandatory evacuation orders.

Development extending into the Wild Land Urban Interface. One of the factors that affect wildfire activity and severity is development patterns that extend into brush growth. The Public Safety Element should consider additional methods for fire protection and prevention associated with new land uses and new development at the edges of current development.

Coordination between all fire protection services and resources. Several agencies provide additional support to the Redwood City Fire Department for fire services. It is critical to continue to ensure there is efficient and consistent messaging and coordination between all responsible agencies.

Ensure emergency services and facilities can meet future demand. As the frequency and intensity of wildfires are projected to increase, it is crucial to ensure that emergency services and facilities (medical facilities, emergency shelters, etc.) have the capacity to meet future demand. The Public Safety Element should consider coordinating with appropriate agencies on any potential expansions needed to accommodate increased hazard events associated with changing climatic conditions.

Protective measures against wildfire smoke impacts. Wildfire smoke contains high concentrations of harmful toxins. The Public Safety Element should consider protective measures that minimize the impacts of wildfire, such as promoting better building filtration systems, air quality alerts and forecasts, and outreach efforts to educate residents about the wildfire smoke impacts. Special consideration should also be given to vulnerable populations such as the elderly, those with existing lung conditions, and low-income communities.



Wildfire Hazards

- Very High
- High
- Moderate
- Local Responsibility Area
- State Responsibility Area
- Fire Stations

Base Map Features

- Redwood City Boundary
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Figure 4: Wildfire Hazards

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Adaptive Capacity

The City and regional agencies have developed policies, plans, and programs to moderate the potential damages caused by climate change and/or natural hazards. The following sections summarize documents that outline existing efforts to manage climate impacts.

Existing Plans and Reports

Redwood City General Plan

The City's General Plan provides a long-term vision and policy guidance for future development of the community. Actions taken, laws enacted, and agreements made by the City must be consistent with the policies of the General Plan. State law requires the General Plan to be comprised of eight chapters: land use, circulation, housing, noise, safety, open space, conservation, and environmental justice. Currently, the Public Safety Element of the General Plan contains climate change strategies that focus on reducing greenhouse gas emissions. The Public Safety also calls for developing adaptation plans and a Sea Level Rise Response Strategy that addresses hazards related to changing climatic conditions.

Multijurisdictional Local Hazard Mitigation Plan

San Mateo County's Multijurisdictional Local Hazard Mitigation Plan (LHMP), which was last updated in 2016 and is currently in the process of being updated, assesses hazard vulnerabilities, and identifies mitigation actions that local jurisdictions will pursue to reduce the level of injury, property damage, and community disruption that might otherwise result from such event. 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 hazards.

Redwood City Urban Water Management Plan

An Urban Water Management Plan is required by State law for every urban water supplier to provide long-term resource planning to ensure adequate water supplies are available for meeting existing and future demand. Redwood City is classified as an urban water supplier because it serves more than 3,000 customers through individual metered accounts and supplies more than 3,000 acre-feet of water annually to its customers for municipal purposes. The plan is required to be updated at least every five years and was last updated by the City in 2020.

Climate Action Plan

In 2020, Redwood City updated their Climate Action Plan CAP, which is a detailed and strategic framework for measuring, planning, and reducing greenhouse gas (GHG) emissions and related climatic impact. The CAP does the following:

- Incorporates new global, state, and local policies and climate targets, including carbon neutrality.
- Documents climate change impacts here in San Mateo County and previews action needed.
- Documents our community partners and how we plan to work together to achieve our goals.
- Addresses emissions from what we buy and consume in addition to emissions we generate here.
- Provides more ways individuals, community groups, and businesses can get involved.

- Focuses on equity, or how to make sure everyone benefits, especially the most vulnerable members of our community**.**

California's Fourth Climate Change Assessment San Francisco Bay Area Summary Report

The San Francisco Bay Area Regional Summary Report, prepared in 2018, is one of a series of 12 climate vulnerability assessments in California that provide an overview of climate science, climate adaption strategies, and key research gaps needed to safeguard the region from climate change. The Summary Report breaks down regional vulnerability by land use, infrastructure and services, and communities.

Responsible Agencies

Redwood City is reliant on several critical services and agencies for hazard mitigation and public safety. This section of the assessment assists in determining the adaptive capacity to adapt to climate impacts based on existing policies, plans, and/or programs.

- **Fire Services.** The City of Redwood City Fire Department provides fire services to Redwood City and the City of San Carlos. It provides fire protection, hazardous materials response, disaster preparedness, and emergency medical response.
- **Law Enforcement.** Law enforcement services are provided by the Redwood City Police Department.
- **Other Agencies.** Other agencies that provide emergency preparedness and response services to the greater San Mateo County community in collaboration with fire and sheriff departments, are the San Mateo County Health Services Agency and San Mateo County Office of Emergency Services.

Vulnerability Scoring

This section identifies priority climate vulnerabilities based on a scoring system. The vulnerability scores are based on the combination of potential impact and adaptive capacity. Potential impact measures the likeliness and significance of a potential climate change impact. Adaptive capacity measures the City's ability to be able to address a potential climate change impact. The scoring process is qualitative and uses the California Adaption Planning Guide (APG) guidance. Table 7 summarizes the scoring rubric used to prioritize vulnerabilities.

Table 7: Potential Impact and Adaptive Capacity Scoring Rubric

Score	Potential Impact	Adaptive Capacity
Low	Impact is unlikely based on projected exposure; would result in minor consequences to public health, safety, and/or other metrics of concern.	The population or asset lacks capacity to manage climate impact; major changes would be required.
Medium	Impact is somewhat likely based on projected exposure; would result in some consequences to public health, safety, and/or other metrics of concern.	The population or asset has some capacity to manage climate impact; some changes would be required.

High	Impact is highly likely based on projected exposure; consequences to public health, safety, and/or other metrics of concern	The population or asset has high capacity to manage climate impact; minimal to no changes are required.

Table 8 is used to determine the overall vulnerability scores based on the potential impact and adaptive capacity score. Table 8 essentially quantifies the low, medium, and high scores listed in the scoring rubric from Table 7.

Table 8: Vulnerability Score Matrix

Potential Impacts				
	High	3	4	5
	Medium	2	3	4
	Low	1	2	3
		High	**Medium**	**Low**
		Adaptive Capacity		

Table 9 provides a description of each vulnerability for various populations and assets at risk of experiencing climate change-related impacts within the City. The scores presented in Table 10 help identify the most pressing issues requiring adaptation action. The scores can range from one to five, with one being a low priority and 5 being a high priority. Generally, a high priority risk is one where the potential climate change impact is high and the City's current capacity to address the impact requires enhanced interventions to meet projected climatic conditions. Overall, the City's priorities revolve around primary and secondary impacts from increases in the frequency and intensity of sea level rise including flooding hazards.

Table 9: Vulnerability Scoring

Vulnerability Description	Potential Impact	Adaptive Capacity	Vulnerability Scoring
Increased human health risk (heat-related illnesses, poor air quality, worsening of existing health conditions, etc.)	Medium	Medium	3
Reduced water supply availability due to extended drought periods	Medium	Medium	3
Increased exposure of people to flooding/sea level rise	High	Medium	4
Increased exposure of people to wildfires	Medium	Medium	3
Limited ability to prepare for climate events and to respond and evacuate	Medium	High	2
Increased risk of residence damage due to flooding/sea level rise	High	Medium	4
Increased risk of residence damage due to wildfires	Medium	Medium	3
Increased risk of damage to transportation infrastructure due to flooding/sea level rise	High	Medium	4
Increased risk of damage to transportation infrastructure due to wildfire	Medium	Medium	3
Increased risk of damage to public safety assets due to wildfires	High	Medium	4
Increased risk of damage to public safety assets due to wildfires	Medium	Medium	3
Increased energy system stress during droughts and extreme heat events	High	High	3
Risk of physical damage to energy system from wildfires	High	Medium	4
Risk of physical damage to energy systems from flooding/sea level rise	High	Medium	4
Increase in water demand	Medium	Medium	3
Reduction in available water supply	Medium	Medium	3
Increased demand for emergency response services	High	High	3
Increased demand for emergency facilities (e.g. hospitals, cooling centers, telecommunication systems, and evacuation centers)	Medium	High	2

Note: See Table 8 for Vulnerability Scoring