ROLLING HILLS GENERAL PLAN

SAFETY ELEMENT

prepared by

City of Rolling Hills

Planning and Community Services
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Rolling Hills, California 90274

prepared with the assistance of

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*The Local Hazard Mitigation Plan (LHMP or HMP) is a separate document adopted into the Safety Element of the General Plan by Resolution No. 1314 in compliance with AB 2140. It is available electronically at https://www.rolling-hills.org/government/planning_and_community_services/index.php.

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Introduction

The Safety Element provides the City of Rolling Hills' (City's) goals, policies, and actions to minimize the hazards to safety in and around Rolling Hills. The Element evaluates natural and human-caused safety hazards that affect existing and future development and provides guidelines for protecting the community from harm. The Element describes existing and potential future conditions and sets policies for improved public safety. The goal of the Safety Element is to reduce the risk of injury, death, property loss, and other hardships to acceptable levels.

City Setting

Rolling Hills covers an area of approximately three square-miles on the Palos Verdes peninsula, approximately 18 miles south of downtown Los Angeles. The topography of the city and peninsula area is unique in that it rises above the Los Angeles Basin with rolling hills, steep slopes, and canyons. The city itself is in the San Pedro Hills. Due to its location near the coast, the area is generally cooler and has fewer air quality concerns compared to the nearby Los Angeles Basin. Table 1 summarizes the climatology of the area.

Rolling Hills City Hall

Rolling Hills is a residential community that consists of large parcels and ranch-style homes and has a sizable older adult[1] population of about 513 (28% of the city's total population). Important community demographic data for Rolling Hills is included in Table 2. The city is also an equestrian community, as many of residents are horse owners or have horses on their property.

Regulatory Setting

Section 65302(g) of the California Government Code requires that the General Plans include a Safety Element for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami,

Table 1 Rolling Hills Climate Summary

Climate Character	Estimate
Annual Average Observed Maximum Temperature from 1961 - 1990 (Fahrenheit)	71
Annual Average Observed Minimum Temperature from 1961 – 1990 (Fahrenheit)	50
Annual Average Observed Precipitation from 1961 – 1990 (inches)	19

Source: Cal-Adapt 2021

[1] An older adult is any adult over the age of 65 years old.

Table 2 Rolling Hills Demographic Characteristics

Demographic Characteristics	Estimate
General	
Total Population	1,739
Population under 10 years	7 percent
Population over 65 years	28 percent[1]
Race	77 percent White, 18 percent Asian, 5 percent Hispanic/Latino
Disability (hearing, vision, cognitive, ambulatory)	12 percent
Housing	
Total Households	645[1]
Average Household Size	2.76
Owner-occupied Households	96 percent
Population over 65 years living alone	15 percent of those over 65 years
Employment	
Unemployment Rate	6 percent
Poverty Rate	2 percent
Median Income	$ 239,000
Insurance Coverage	97 percent

Source: U.S. Census 2018

seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence and other geologic hazards; flooding, and wildland and urban fire. In addition, Safety Elements are required to address non-hazard specific issues such as peak load water supply, evacuation routes, and military installations.

Senate Bill 379, adopted on October 8, 2015, requires cities to include climate change adaptation and resilience into the general plan process. To comply with SB 379, this Safety Element includes a vulnerability assessment; adaptation and resilience goals, polices, and objectives; and feasible implementation measures.

Senate Bill 99, adopted August 30, 2020, requires the cities to "identify residential developments in any hazard area identified in the safety element that does not have at least two emergency evacuation routes." SB 99 does not define neighborhood and cities are expected to define neighborhoods based on their community.

Relationship to Other Documents

The Rolling Hills Safety Element is one of several plans that address safety in the City. The Safety Element must be consistent with these other plans to ensure the City has a unified strategy to address safety issues. The Safety Element includes information and policies from the following documents to ensure consistency.

Other General Plan Elements

The Safety Element is one section of the Rolling Hills General Plan. Other elements include Land Use, Transportation, Housing,

Conservation, Open Space and Recreation and Noise. Policies in these other elements may be related to safety issues. Information and policies in the Safety Element should not conflict with those in other elements.

Hazard Mitigation Plan *

The City's Hazard Mitigation Plan includes resources and information to assist the City of Rolling Hills, its residents, and public and private sector organizations in planning for hazard events. The Plan provides a list of activities that may assist the City in reducing risk and preventing loss from future hazard events. The action items address multi-hazard issues, as well as activities specifically for reducing risk and preventing losses relating to earthquake, land movement, wildfire, and drought.

Community Wildfire Protection Plan

The City's Community Wildfire Protection Plan (CWPP), adopted in July 2020, seeks to reduce wildfire risk in Rolling Hills. The Plan was developed collaboratively among stakeholders including the community, the City of Rolling Hills, the Rolling Hills Community Association, and the Los Angeles County Fire Department, and the Los Angeles Sheriff's Department. The Plan includes fire mitigation and evacuation strategies for the community.

Critical Facilities and Infrastructure

Critical facilities are places that provide emergency services or serve people who would be impacted by an emergency. Examples include hospitals, fire stations, police stations, emergency services facilities, utility facilities, and communication facilities. Critical facilities can also include the transportation system and schools. Due to the size and composition of Rolling Hills, many of the critical facilities that serve the city are located outside of city limits. No areas in Rolling Hills have been identified as lacking emergency service. Critical facilities that serve the city are shown in Figure 1 and include:

1. Rolling Hills City Hall: 2 Portuguese Bend Road, Rolling Hills, CA
2. Rolling Hills Community Association: 1 Portuguese Bend Road, Rolling Hills, CA
3. Rancho Del Mar High School: 38 Crest Road West, Rolling Hills, CA
4. Storm Hill Park: Agua Magna Canyon, Rolling Hills, CA
5. Los Angeles County Sheriff's Lomita Station: 26123 Narbonne Avenue, Lomita, CA
6. Los Angeles County Fire Station No. 56: 12 Crest Road West, Rolling Hills, CA
7. Los Angeles County Communications Tower: 5741 Crestridge Road, Rancho Palos Verdes, CA
8. Southern California Edison Electrical Substation: Crestridge Road, Rancho Palos Verdes, CA
9. Southern California Edison Electrical Substation: Tarragon Road, Rancho Palos Verdes, CA
10. Southern California Edison Electrical Substation: 27873 Hawthorn Boulevard, Rancho Palos Verdes, CA
11. California Water Service Reservoir: Palos Verdes Drive North/Palos Verdes Drive East (SW corner), Rolling Hills Estates, CA
12. California Water Service Reservoir: 3960 East Crest Road, Rancho Palos Verdes, CA
13. California Water Service Reservoir: Via Canada, Rancho Palos Verdes, CA
14. California Water Service Reservoir: 1 Spur Lane, Rolling Hills, CA
15. California Water Service Reservoir: 60 Eastfield Drive, Rolling Hills, CA
16. Portuguese Bend Road
17. Crest Road

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Rolling Hills Community Association

Figure 1 Critical Facilities Map

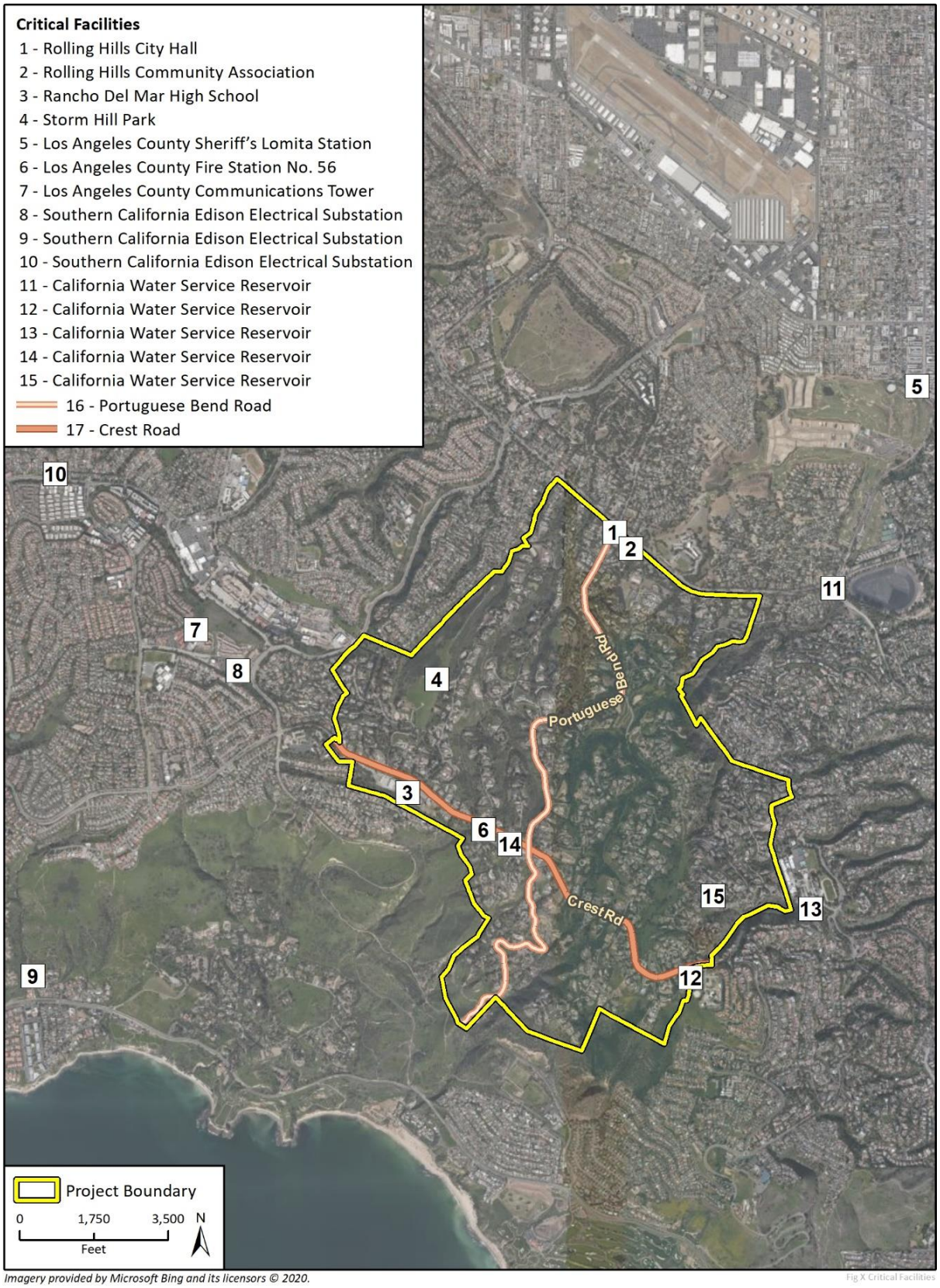

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Fig X Critical Facilities

Hazards of Concern

Geologic Hazards

Geologic processes that pose a threat to life, health, property, or infrastructure are considered geologic hazards. Natural geologic hazards that have the potential to affect Rolling Hills include seismic hazards, landslides, liquefaction, expansive soils, and weathering. In most cases, these natural processes cannot be prevented; however, the magnitude of destruction resulting from natural geologic hazards can be reduced through planning policies and measures.

Landslide Hazards

Landslide activity refers to a wide range of gravity driven downslope earth movement, including rockslides, rotational slips, mudslides, and shallow debris flows. Geological and geomorphological conditions such as soil type, soil strength, slope angle, and slope height predispose slopes for failure. Other factors affecting the susceptibility to slope failure include the amount of precipitation, vegetation on the slope, groundwater seepage, and human modifications to the slope. Landslides often result in damage to property and roadways and can cause them to become unsafe due to displacement of the subsurface.

Much of the existing development in Rolling Hills is located on hilly terrain and have a greater potential to experience landslide hazards. Many of the canyons in Rolling Hills exhibit steep slopes with little vegetation coverage, leaving them susceptible to slope failure. Figure 2 shows the landslide zones in the City of Rolling Hills, as mapped by the California Geological Survey (CGS). Landslide activity has been well documented in the region. Relicts of landslides and rockslides are present throughout the City of Rolling Hills.

The following major landslides have occurred in and adjacent to the city. All are in the landslide hazards areas identified in Figure 2:

- Portuguese Bend Landslide: Beginning in[2] 1956 over approximately 270 acres in Rancho Palos Verdes
- Abalone Cove Landslide: Beginning in 1974 over 80 acres in Rancho Palos Verdes
- Klondike Canyon Landslide: Beginning in 1979 over to the south near the coastline
- Flying Triangle Landslide: Beginning in 1970s or 1980s over approximately 70 acres in the southeast area of the city

The Flying Triangle Landslide, shown in Figure 2, continues to impact the southeast portion of the city through impacts to private roads and above-ground utility lines. This area is relatively unsuitable for development due to the ongoing changes in topography.

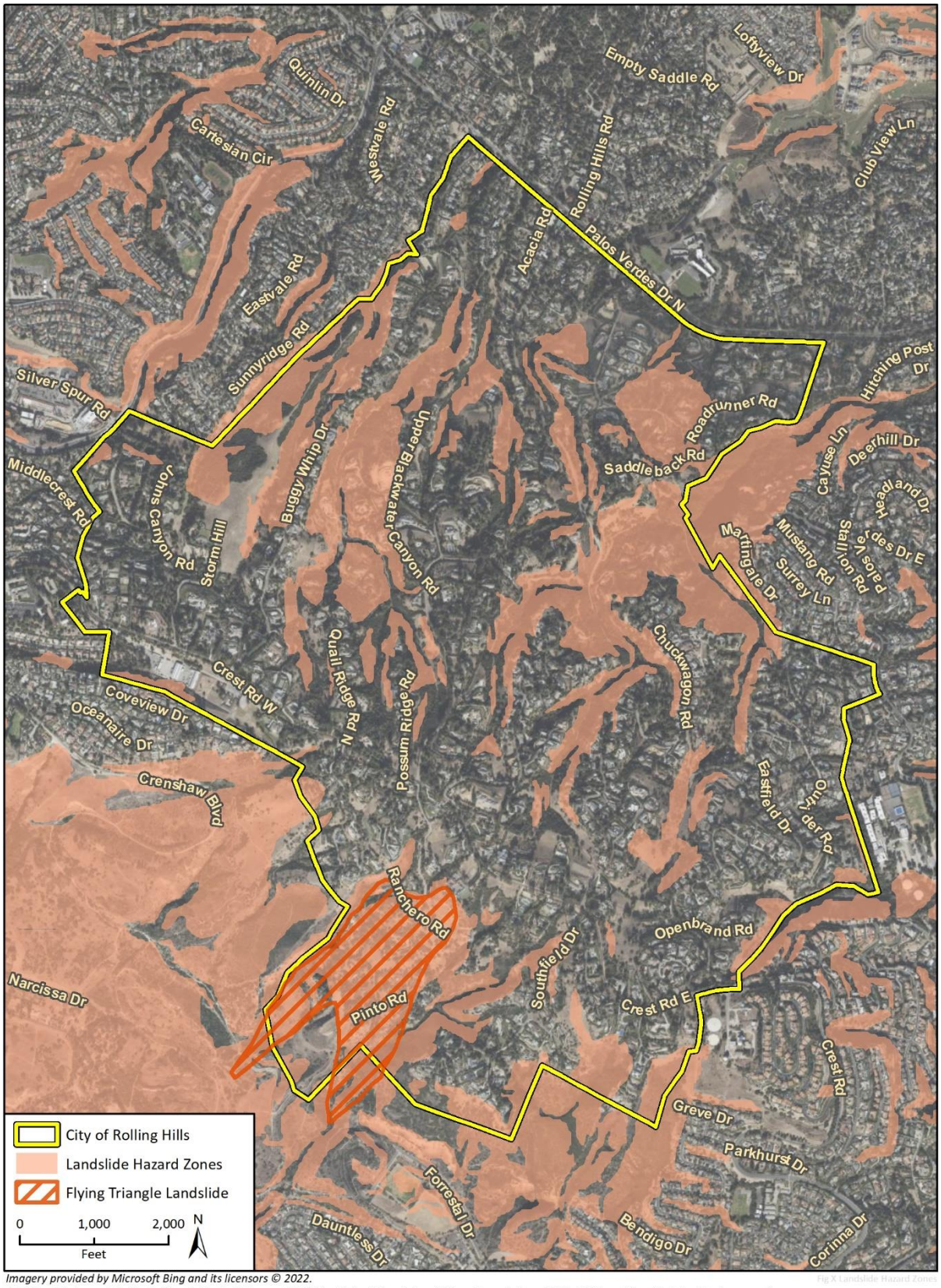
Seismic Hazards

Rolling Hills is in a seismically active region of southern California. The last major earthquake in the Los Angeles area was the 5.1 magnitude La Habra earthquake in 2014. Rolling Hills is within 50 miles of the Whittier fault, Newport-Inglewood fault, Palos Verdes fault, Malibu Coast fault, Cabrillo fault, Santa Monica fault, and Redondo Canyon fault. Analysis of seismic data from the region indicates that the Whittier and Newport-Inglewood faults may generate a maximum credible earthquake of magnitude 7.2 and 7.4, respectively (SCEC 2013). Figure 3 shows the faults in the vicinity of Rolling Hills.

Typically, seismic shaking and fault rupture are primary hazards as they occur as a direct result of the interaction between the seismic wave energy and the earth's surface. Secondary hazards, such as liquefaction and earthquake-induced landslides, occur as a result of the primary earthquake hazards.

[2] "Beginning in" is defined as the first noted event of major rock movement

Figure 2 Landslide Hazard Zones



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Additional data provided by California Geologic Survey, 2015. The Flying Triangle Landslide polygon is from USGS, 2021, and is subject to data inaccuracies.

Figure 3 Faults in the Vicinity of Rolling Hills

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Often, earthquake activity can result in other effects such as building damage/collapse, infrastructure failure, pipeline breakage, and damage to transportation and communication facilities. The size of the earthquake and distance from the fault rupture zone typically determine the severity of these events.

Seismic Shaking

Seismic shaking, or ground shaking, refers to the movement of the earth's surface resulting from the energy release by an earthquake. Seismic shaking is typically the primary cause of property damage resulting from earthquake activity. Seismic shaking can destroy buildings, roadways, powerlines, and pipelines. Energy transmitted through the ground can travel hundreds of miles and may cause damage in many locations simultaneously. Closer proximity to the fault rupture area results in stronger shaking in that location.

The amount of ground shaking that occurs in a location depends on the magnitude of the earthquake, the distance from the epicenter, and local soil conditions. The intensity of ground shaking is related to the peak ground velocity during an earthquake. As shown in Figure 4, the earthquake shaking potential for Rolling Hills is low to moderate. The intensity of seismic shaking is measured using the Modified Mercalli scale.

According to the CGS, an active fault is one that has experienced surface movement in the past 11,000 years. The city is located near a number of active faults, including the Cabrillo Fault in city limits. Table 3 includes a list of nearby faults, their respective distance from the city, the maximum credible earthquake generated from each fault, and the likelihood of earthquake occurrence in each case.

The San Andreas fault is located approximately 80 miles to the east of Rolling Hills. Although the San Andreas fault is located at a greater distance from the city, seismic shaking originating from earthquakes occurring along the San Andreas fault poses a threat to the city. Figure 3 identifies the active and inactive faults located in the city and vicinity.

Fault Rupture

Fault Rupture occurs when seismic movement on a fault break through the earth's surface. Hazards related to fault rupture arise when structures are built near or on top of an active fault. While there are a number of seismically active faults in the city and region, there are no active faults with the potential for ground rupture, defined by the Alquist-Priolo Earthquake Fault Zoning Act and delineated by CGS. Figure 3 shows the designated Alquist-Priolo study zones, the closest of which is the Newport-Inglewood Fault approximately nine miles northeast of the city.

Table 3 Active Faults Located less than 50 Miles from Rolling Hills

Fault Name*	Approximate Distance from Rolling Hills
Whittier	25 miles east
Newport-Inglewood	9 miles east
Palos Verdes	<1 mile north
Malibu Coast	20 miles northwest
Cabrillo	Located in the City boundaries
Santa Monica	20 miles north-northwest

*All faults listed are active. An active fault is one that has experienced surface movement in the past 11,000 years.

Liquefaction and Settlement

Liquefaction is a ground failure phenomenon that occurs as a result of a seismic event. Liquefaction increases water content in surface soils until the soil reaches a semi-liquid state, contributing to a reduction in support, and ultimately resulting in shifting or subsidence of buildings and utilities. Ground failure typically occurs when the following conditions exist:

- Loose, unconsolidated granular soils
- Shallow groundwater
- Strong seismic ground shaking

While Rolling Hills has moderate to high seismic shaking potential, the subsurface soils generally lack saturated alluvial deposits and thick, granular soils. Figure 5 shows the liquefaction hazard areas, which are in the low-lying areas to the east and north, generally surrounding the Los Angeles Harbor and Harbor Lake. Liquefaction potential for Rolling Hills is low, as shown in Figure 5.

Earthquake Induced Landslides

Ground failure or destabilization of slopes resulting from an earthquake can also occur following seismic activity in the form of Earthquake-Induced Landslides. Earthquake-induced landslides typically occur in areas with steep slopes or unstable soil conditions. As discussed above under Landslide Hazards, the risk of landslide activity in Rolling Hills is high. Much of the city overlies areas that have been identified as landslide zones by the CGS. Risk of landslide activity increases following rainfall events that result in saturated soils. Both shallow and deep seeded landslides have historically occurred in the city.

Flooding

Rolling Hills participates in the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program. According to the FEMA flood maps, the city is not located in a flood hazard area and currently has a less than 0.2 percent annual chance to be inundated by flood waters as a result of a storm event (FEMA 2008). Overall, the city is not in any immediate risk from flooding caused by overflowing water bodies or heavy rains. However, runoff and minor flooding pose a risk if drainage systems fail along canyon bottoms, where natural drainage leads.

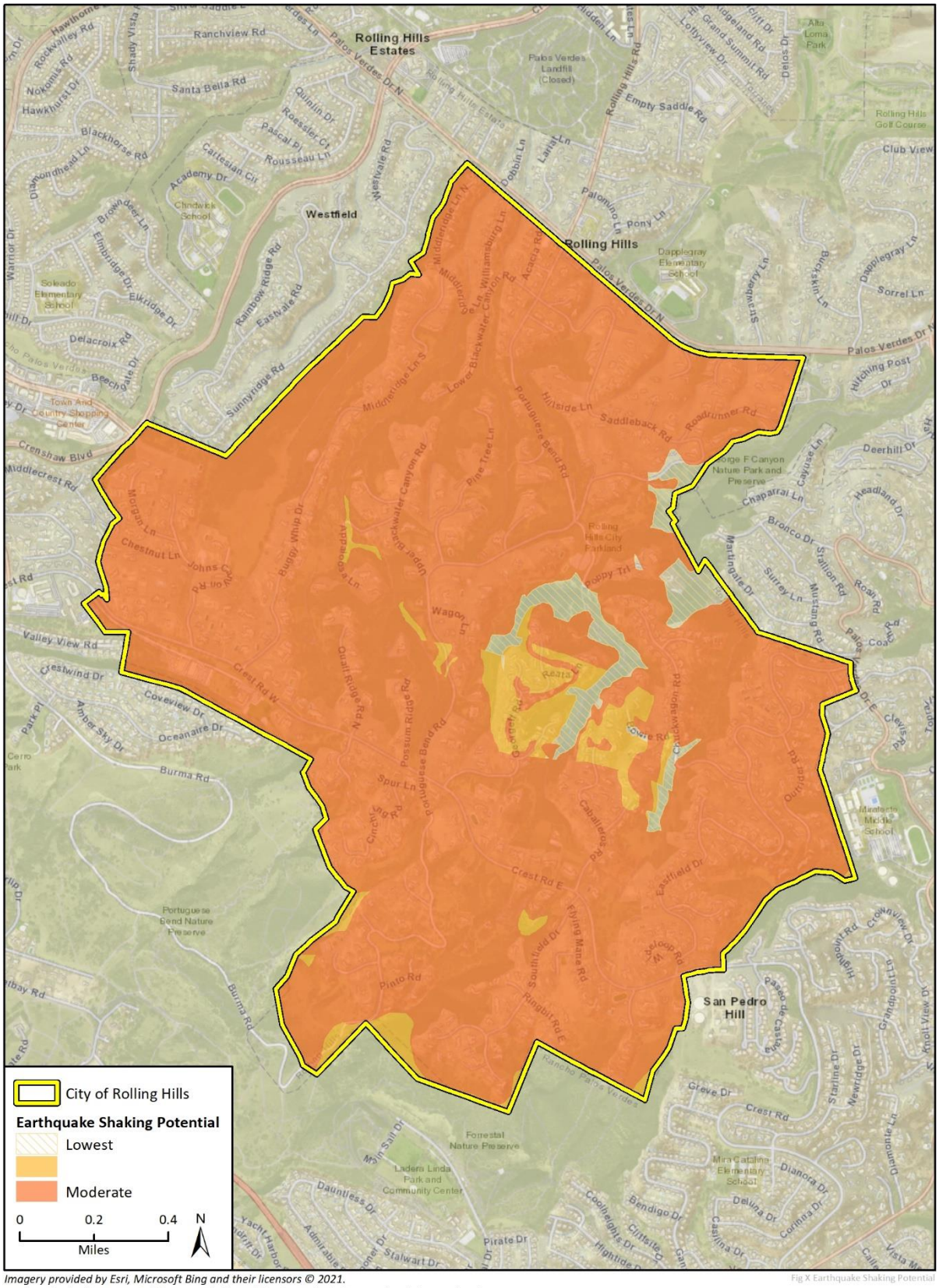
Dam Inundation

No water storage facilities that the State of California identifies as dams are located in Rolling Hills. Just outside city limits are three water storage facilities identified as dams, which include:

- **Palos Verdes Reservoir.** Owned by the Metropolitan Water District of Southern California and located at the southeast corner of Palos Verdes Drive East and Palos Verdes Drive North. According to the California Department of Water Resources, the reservoir can hold approximately 1,100 gallons of water and has an extremely high downstream hazard.
- **10 MG Walteria and 18 MG Walteria.** Two reinforced concrete tanks which are owned by the City of Torrance and located at Crenshaw Boulevard and Crest Road. The tanks can hold 31 and 58 acre-feet (AF) of water, respectively.

Senate Bill 92, adopted in 2017, is a new dam safety requirement that requires dam owners to map the downstream inundation areas for dams governed by the Department of Water Resources. Figure 6 shows the inundation areas for the nearby water storage facilities. Due to their locations and the topography of the area, the inundation areas do not enter or affect any portion of the city.

Figure 4 Rolling Hills Earthquake Shaking Potential



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Earthquake Shaking Potential data provided by California Geological Survey (CGS), last updated 2019.

Fig X Earthquake Shaking Potential

Figure 5 Rolling Hills Liquefaction Hazard Areas

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Additional data provided by California Geologic Survey, 2015.

Figure 6 Dam Inundation Areas

Imagery provided by Microsoft Bing and its licensors © 2020.
Additional data provided by California Department of Water Resources, 2020.

Wildland and Urban Fires

The entire City of Rolling Hills is designated a Very High Fire Hazard Severity Zone (VHFHSZ) by the California Department of Forestry and Fire Protection (CalFire), as shown in Figure 7. Rolling Hills terrain is comprised of several large and steep canyons that limit and challenge vegetation management and present conditions where a fire can quickly travels up and downslope to nearby homes. Due to the rural nature and large residential lots, many homes are surrounded by more substantial vegetation and dense brush than in more suburban settings. The bridle trails for hikers and equestrian access also contain dense vegetation and management difficulties, which contributes to the fire risk of the city. Electrical power lines pose a hazard to starting fires in the city if lines are not automatically de-energized when knocked down by extreme weather or if the surrounding vegetation is not adequately managed.

There is a history of fires in the city and the surrounding Palos Verdes Peninsula. Three major fires have been documented on the Peninsula and in the city in:

- 1923: an estimated 4,000 acres burned in Palos Verdes Hills
- 1945: 3,000 acres burned
- 1973: approximately 900-925 acres burned, 12 homes destroyed, and 10 homes damaged
- 2005: 212 acres burned near Del Cero Park
- 2009: 230 acres burned, 6 homes damaged, and forced 1,200 residents on the Peninsula to evacuate
- 2015: 3 acres burned

Los Angeles County Fire Station No. 56

Figure 7 Fire Hazard Zones

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Additional data provided by CalFire, 2020.

Fig X Critical Facilities and Fire Hazard Zones

For many of the developed residences in the city that are vulnerable to fires, their risk may increase with construction techniques that may not meet current wildfire standards. Rolling Hills Building Code and Los Angeles County Fire Department, under the VHFHSZ standards, require new development to include more stringent design and material standards for roofing, eaves, and rafter tails as well as exterior finishes and fire buffer zones. While compliance with these standards reduces the vulnerability to new structures, existing structures that have not complied with these standards may be susceptible to undue fire risk.

Existing Fire Risk Reduction Strategies

- Rolling Hills Municipal Code (RHMC) Chapter 8.24 Abatement of Nuisances, Chapter 8.30: Fire Fuel Abatement, and Chapter 15.20 Fire Code
- Los Angeles County Fire Department Fuel Modification Plans
- Los Angeles County Fire Code Section 4908
- Rolling Hills Community Wildfire Protection Plan vegetation management standard recommendations
- Rolling Hills Community Association fire fuel management strategies

Portuguese Bend Road, south of Crest Road

Hazardous Materials

According to the Department of Toxic Substances Control (DTSC), there are no hazardous waste sites or facilities in Rolling Hills (DTSC 2020). The city and surrounding area do not contain heavy industrial uses that would create a hazardous material risk in the event of a spill, release, or natural disaster.

The city is not located near any major transit routes involving transport of a substantial quantity of hazardous material through the city. However, the nearby oil refineries (located along Sepulveda Boulevard approximately six miles northeast) and Port operations (located approximately three miles to the east) could create air quality impacts if wind patterns and release events occur. Air quality impacts are discussed in the *Open Space and Conservation Element* of the Rolling Hills General Plan.

Community Communication

Emergency Response and Evacuation

Police Response and Crime

The Los Angeles County Sheriff's Department is contracted with the city to provide police services and protection to the city. The Lomita Station of the Sheriff's Department located at 26123 Narbonne Avenue serves the city.

According to the Lomita Station crimes report from January 1, 2020, through December 31, 2020, Rolling Hills had 7 reported crimes (LACSD 2020). The crimes were related to theft, burglary, and arson. Outside the city limits and in the Lomita District, 401 crimes were reported during this same period, 79 of which were violent crimes (LACSD 2021). The difference in crimes in the city and the surrounding area is attributed to the private nature of the city. There are three entrances to the city, all of which are gated and staffed 24 hours a day. Visitors are required to be on a resident's guest list to enter city limits, reducing crime in the city and demand on Los Angeles County Sheriff's Department.

Fire Response

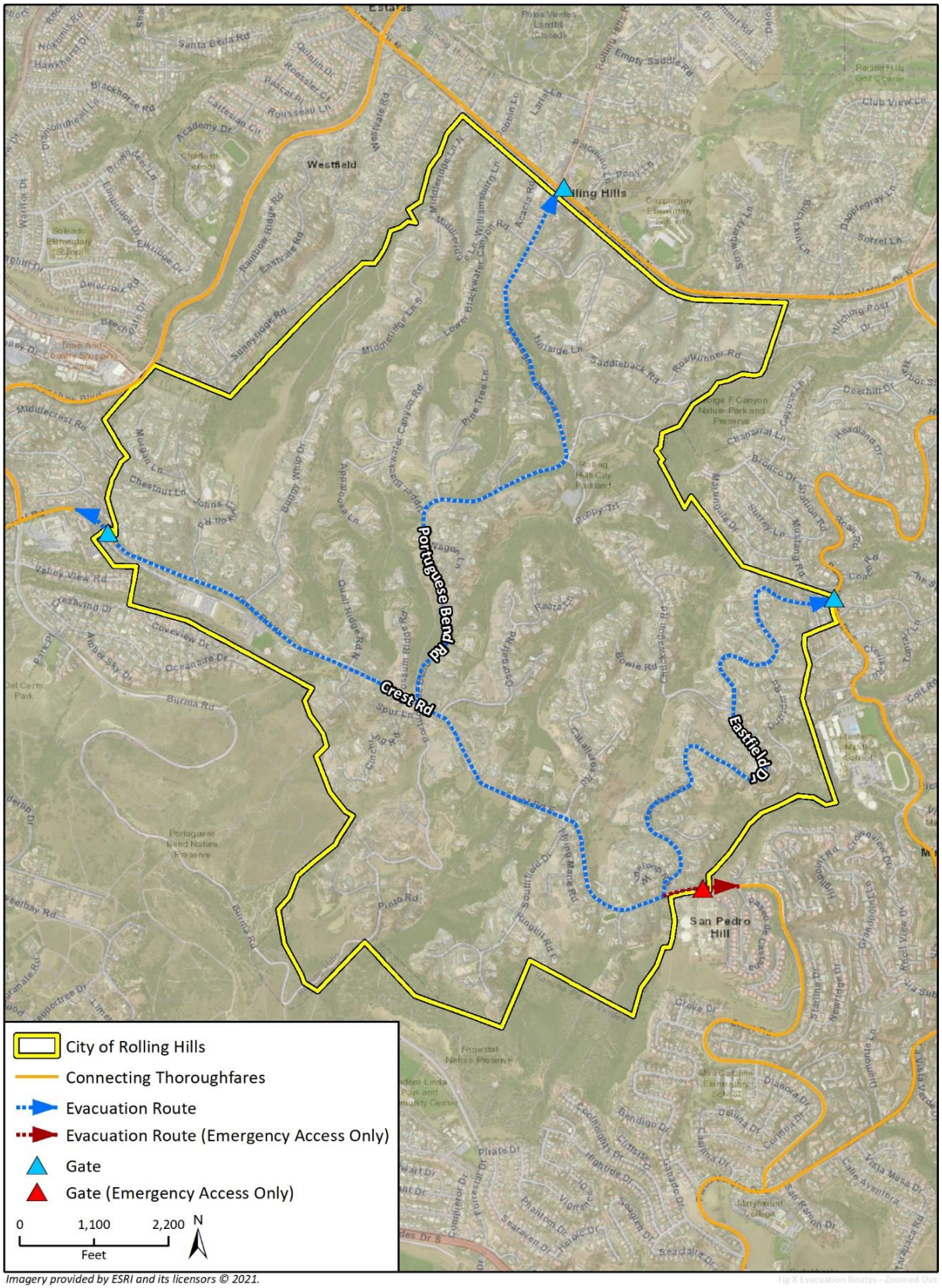
The Los Angeles County Fire Department provides emergency operations support to the City and participates in the California mutual aid system. Mutual aid is emergency assistance that is dispatched upon request across jurisdictional boundaries. Fire Station 56, located at 12 Crest Road West, serves the city under Battalion 14, which also serves the remaining Palos Verdes Peninsula, Lomita, and Avalon Canyon. Fire response constraints in the city include ability to access certain homes or areas due to inadequate road widths for fire maneuvering. One of the major topics of concern related to fire response in the city relates to vegetation clearing along roadways. Ten-foot clearance on each side of the roadway, especially the limited access roads, is important for fire response and evacuation during a fire, according to Scott Hale, Assistant Fire Chief.

Evacuation Strategies and Routes

Because a variety of hazards could affect city residents, it is vital to identify critical routes for evacuation in the event of a major event.

Senate Bill 99, adopted August 30, 2020, requires cities to "identify residential developments in any hazard area identified in the safety element that does not have at least two emergency evacuation routes." Due to the size of Rolling Hills and that it has four evacuation routes, no neighborhoods have been identified as not having two evacuation routes. As shown on the Figure 8, the evacuation routes also connect to major

Figure 8 Existing Evacuation Routes



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roadways in the area that are multi-directional such as Crenshaw Boulevard, Palos Verdes Drive North and Palos Verdes Drive East.

Figure 8 identifies the existing evacuation routes in the city, which are:

- Main Gate at Rolling Hills Road and Palos Verdes Drive North
- Crest Gate at Crest Road near Crenshaw Blvd
- Eastfield Gate at Eastfield Drive and Palos Verdes Drive East
- Crest Road East Gate at the end of Crest Road East

Crest Road East Gate has been updated with a motor and has no guards. This gate is available as an emergency exit to the city during emergencies. The City's recently adopted CWPP establishes evacuation strategies and methodologies, including:

- Using the City's Block Captains[3] as important coordinators for residents
- Communication goals between the City, emergency responders, Rolling Hills Community Association, and residents
- Details for residents regarding how people get notified during an evacuation
- Responsibilities and operations of the Emergency Operations Center

Disease Prevention

As evidenced by the COVID-19 pandemic, unforeseen infectious diseases can be disastrous for communities, especially vulnerable groups such as older adults, and people with compromised immune systems. The City worked diligently during the pandemic to minimize risk to community members. The Block Captains regularly checked in on old adults in the community,

Fire Station Trail

[3] The Rolling Hills Block Captain Program is a city-sponsored, resident-based community program of volunteers. Their role is to get to know neighbors, help them to prepare for an emergency, and be a liaison between first responders and City of Rolling Hills during an emergency.

finding out what residents needed, helping run errands, and providing hand sanitizer Additionally, the City disseminated information regularly including where to buy groceries at the beginning of the pandemic, testing information, and more. Policies regarding infectious disease can help expedite recovery and prepare the community for future risks.

Climate Change

Climate change is expected to affect future occurrences of natural hazards in and around Rolling Hills. Some hazards are projected to become more frequent and intense in the coming decades, and in some cases, climate impacts have already begun.

In developing the Safety Element, the City competed a Climate Change Vulnerability Assessment consistent with Government Code Section 65302(g), which assesses how the populations and assets in Rolling Hills are vulnerable to different climate hazards. The full Climate Change Vulnerability Assessment can be found in Appendix A: Existing Conditions Report. According to the Vulnerability Assessment, the city is most vulnerable to wildfire impacts, extreme heat, and landslide impacts from climate change.

According to the Vulnerability Assessment and the California's Fourth Climate Change Assessment, Rolling Hills can expect the following changes to natural hazard events:

- Projected annual average maximum temperature is expected to increase in Rolling Hills between 1.8- and 6.6-degrees Fahrenheit (°F) compared to 1990, depending on the greenhouse gas (GHG) emissions scenario.[4]
- Extreme heat events are also expected to increase in Rolling Hills. The annual number of average extreme heat days is projected to increase from a baseline of 4 between 1950 and 2005 to 8 or 14 between 2030 and 2099, depending on the GHG emissions scenario.
- Although only small changes in average precipitation are projected, the Los Angeles Region, which includes Rolling Hills, is expected to experience dry and wet precipitation extremes and higher frequency and severity of storms. Increasing storm intensity may exacerbate landslide hazards in the city. Warmer and drier conditions state-wide could increase the prevalence of drought conditions that could impact Rolling Hills.
- Wildfire is projected to increase over all of southern California.

Vulnerable Populations and Assets

As climate change occurs, communities will be affected to varying degrees and impacts depending on the hazard as well as how sensitive the communities are to impacts. Virtually all people and assets in a community will be affected by climate change in some way, but some communities may be more sensitive. The Vulnerability Assessment identified the following sensitivities:

Populations

- **Children.** Approximately 6.6 percent of the total population in Rolling Hills are ten years old or younger.
- **Persons in Poverty.** This is identified for people living in households with an income below the poverty limit, which is $26,200 for a household of four people. There are approximately 26 people in

[4] The Vulnerability Assessment uses two GHG emissions scenarios: Representative Concentration Pathway (RCP) 4.5 and RCP 8.5. RCP 4.5 describes a scenario in which GHG emissions peak around 2050 and then decline. RCP 8.5 is the scenario in which GHG emissions continue to rise through 2050 before leveling off around 2100.

Rolling Hills who live in poverty, or approximately 1.6 percent of the total population for whom poverty status can be determined.

- **Persons with Chronic Health Conditions.** These are people who have a long-term or permanent health condition that can create regular challenges in their day-to-day lives. These health problems include obesity, cancer, heart disease, and arthritis. In addition, those with any kind of disability, including mobility challenges, hearing, or vision impairments, behavioral disabilities, and challenges living independently or taking care of themselves. Approximately 11.5 percent of the population have identified having a disability.
- **Renters.** These are people who live in homes that they (or the head of their household) do not own. Approximately 24 housing units, or 4 percent of the housing units in Rolling Hills, are renter-occupied.
- **Older Adults.** These are persons 65 years or older are more at risk for climate change impacts, especially those living alone. 28 percent of the population of Rolling Hills are over 65 years, and 15 percent of those over 65 years live alone.
- **Limited English Proficiency.** Approximately three percent of households have identified being limited English-speaking. Of those, a majority spoke Asian and Pacific Island languages and Spanish.

Infrastructure

- **Access Roads.** These roadways are one of a few, or the only, ways in and out of some communities or neighborhoods. The single or limited number of entry and exit points does not make the road itself more vulnerable than other roads, but loss of these roadways can effectively cut off large numbers of people from other areas in the Palos Verdes Peninsula and the rest of Los Angeles County. Portuguese Bend Road and Crest Road are the primary access roads into and out of the city.
- **Bridle Trails.** Throughout the community are over 25 miles of trails available to residents and non-city residents who obtain permits. The trails are maintained by the Rolling Hills Community Association and located primarily in canyon areas.
- **Electrical Substations.** Electrical substations are facilities that convert electricity from one voltage to another, making it suitable for long-distance transmission or for use by homes, businesses, and other electrical customers. There are no electrical substations located in city limits, but three are located near the city in Rancho Palos Verdes and owned/operated by Southern California Edison.
- **Electrical Utility Lines.** These lines transmit and deliver electricity from Southern California Edison to the city. The city has both underground and overhead electric utility lines.
- **Natural Gas Transmission Pipelines.** Natural gas pipelines carry large volumes of natural gas between communities. There are no transmission lines in the city. One transmission line ends at the intersection of Rolling Hills Road and Palos Verdes Drive North, adjacent to city limits.
- **Water Reservoirs and System.** The system that stores and supplies drinking water for residents. Palos Verdes Water District of the California Water Service supplies water to Rolling Hills. There are two California Water Service water reservoirs in the city limits.

Services

- **Public Safety Response.** Public safety services are provided by law enforcement

and fire agencies. These agencies include the Los Angeles County Sheriff and Fire Departments.

- **Water Services.** These services involve treating and transporting water to be used by customers and transporting and treating wastewater so it can be safely released into the environment. California Water Service provides drinking water to the city.
- **Energy Delivery.** Energy services in Rolling Hills include electricity and natural gas delivered through utility lines from Southern California Edison and Southern California Gas Company.

Vulnerability Assessment Results

The Vulnerability Assessment indicates that the city's populations, infrastructure, and services are most vulnerable to wildfire, extreme heat, and extreme precipitation events.

Populations

Vulnerable populations such as older adults, residents with chronic health conditions, and those with financial trouble are most at risk to extreme heat and wildfire impacts.

28 percent of the city's population is over 65 years. Older adults do not adjust as well as young people to sudden changes in temperature and are more likely to have medical conditions that can worsen with extreme heat (CDC 2017a). Older adults who are living alone are even more at risk as the actions necessary to mitigation extreme heat are more difficult alone. Getting water, changing clothes, showering, or turning on the air conditioner may be more difficult for older adults with physical disabilities and do not have a partner to assist them. Extreme heat can be highly dangerous to persons with chronic health conditions, because very high temperatures can exacerbate diabetes, cardiovascular conditions, respiratory ailments, and other diseases. Some of these people have weakened immune systems which can make them more likely to contract illnesses and vulnerable to human health hazards. In addition, they may be taking medications that make the effects of extreme heat worse (CDC 2017b). While there are not many households in poverty in the city, those who are have limited financial resources to upgrade their homes to have air conditioning to better resist extreme heat.

Older adults, residents with chronic health conditions, and those with financial trouble are the populations most at risk to wildfire impacts. Older adults are almost three times more likely to die in a fire than the overall population (USFA 2017), and typically have increased mobility or mental health issues. Therefore, older adults, especially those in the city living alone, have more difficulties evacuating to safe areas when there is a need. Those in Rolling Hills with limited financial resources are more unlikely to retrofit their homes to better resist climate-related hazards such as wildfires. In addition to direct impacts, indirect impacts such as poor air quality also creates public health hazards to the city. Recent California wildfires in August and September 2020 had areas of California recording the worst air quality in the world and highlighted the hazards of secondary impacts from wildfires, which could impact the city from fires throughout the State. Older adults and individuals with chronic health conditions are likely to be impacted most by these secondary impacts. Also, those with limited finances or without air conditioning would be impacted by secondary smoke impacts that occur during local and regional wildfires.

Infrastructure

Access roads, residential structures, and community facilities and government buildings are the most vulnerable

infrastructure to wildfire and extreme precipitation impacts from climate change.

All city infrastructure is located in a VHFHSZ. Portuguese Bend Road and Crest Road are critical for access to and evacuation from many areas of the city. Wildfires may not significantly damage the infrastructure, but they could result in closure or the inability to travel on them during wildfire events, which can isolate areas of the city and create severe health and safety risks. Wildfires are unlikely to substantially damage trails directly, but they can force widespread trail closures which are an important asset to the community.

The greatest potential impact of life and well-being would be to residential structures, which are the primary structures in the city. In addition, impacts to Rolling Hills Community Association and City Hall structures would impact community functions and government services.

Critical infrastructure most at risk in Rolling Hills to minor flooding impacts and landslides from increased storms would be access roads, bridle trails, electrical utility lines, and water systems. Because Portuguese Bend Road and Crest Road are critical for access to and evacuation from the city, any damage or closure can effectively isolate areas of the city, potentially creating severe health and safety risks. Bridle trails are predominantly located in canyon areas, which would be more susceptible to flooding and landslides. Landslides could impact utilities, as seen in the existing Flying Triangle Landslide area, which has moved utility lines above ground in certain areas due to the continuous movement of the earth in this area. Due to the limited accessibility of the city, there is a medium potential for impacts to access roads and bridle trails and a low potential impact for the remaining vulnerable infrastructure.

Services

Energy delivery, specifically electricity delivery, could be impacted from increased wildfires. Direct impacts to Southern California Edison electricity transmission infrastructure could impact power in the city. In addition, utility companies have begun shutting off power to areas to avoid wildfires during times when weather creates high wildfire risk. Public safety services could be strained during wildfire events, which are expected to increase.

Overall, climate change impacts from wildfire are projected to have the greatest potential impact to the city.

Goals, Policies, and Implementation

Hazard Mitigation

Goal 1 Minimization of Loss of Life, Injury, and Property Damage Resulting from Geologic Hazards

Policy 1.1 Ensure that existing structures throughout the City meet seismic safety standards and that new facilities are developed to updated standards.

Implementation Measure 1.1.1: The City will work with Los Angeles County Building and Safety Department and other agencies to ensuring that all proposed structures in the city meet current seismic safety code requirements.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building and Safety Department

Funding: General Fund and permit fees

Policy 1.2 Support earthquake strengthening and provision of alternative or backup services, such as water, sewer, electricity, and natural gas pipelines and connections, especially in areas of high seismic or geologic high hazard or where weak segments are identified by existing or future studies.

Implementation Measure 1.2.1: Require future development in active fault areas to provide geotechnical studies indicating the location of the fault trace relative to proposed improvements and identify appropriate mitigation. The City will evaluate the seismic risk to existing infrastructure in these areas and where appropriate, examine the feasibility of mitigating the risk over time.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building and Safety Department

Funding: General Fund and private developers

Policy 1.3 Enforce seismic design provisions from the California Building Code into all development and ensure adequate review and inspection.

Implementation Measure 1.3.1: The City will work with Los Angeles County Building and Safety Department and other agencies to ensuring that all proposed structures in the city meet current seismic safety code requirements.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building and Safety Department

Funding: General Fund and private developers

Implementation Measure 1.3.2: Require fault investigations along traces of the Palos Verdes and Cabrillo faults to comply with guidelines implemented by the Alquist-Priolo Special Studies Zone Act. Buildings for human occupancy should be set back a minimum of 50 feet from those faults that are shown to be active or from fault traces where the risk cannot be determined.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building and Safety Department

Funding: General Fund and private developers

Policy 1.4 Require review by a structural engineer when a critical building or facility undergoes substantial improvements.

Implementation Measure 1.4.1: City staff will review existing ordinances to ensure that the appropriate review requirements are included in them. In addition, the Seismic Safety Ordinance will require a structural engineer to review development proposals in designated Special Studies Zones.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building & Safety Department

Funding: General Fund and private developers

Policy 1.5 Ensure that water supplies are not interrupted by seismic events such as surface rupture, ground shaking or ground failure.

Implementation Measure 1.5.1: The City may conduct a seismic vulnerability assessment of current water supply systems to address peak load water supply requirements. If the vulnerability assessment indicates a potential interruption of water supply due to damage from a seismic event, designate emergency sources of water.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building & Safety Department

Funding: General Fund

Policy 1.6 Discourage development adjacent to earthquake faults and other geological hazards.

Implementation Measure 1.6.1: All development will comply with the Seismic Hazards Overlay Zone.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund and private developers

Policy 1.7 Continue to require preliminary investigations of tract sites by State-registered geotechnical engineers and certified engineering geologists (Chapter 70 County Building Code) and ensure regular inspection of grading operations.

Implementation Measure 1.7.1: The City will continue to enforce the Building Code and Safety regulations.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund

Goal 2 Minimization of Loss of Life, Injury, and Property Damage Due to Flood Hazards

Policy 2.1 Maintain storm drains to prevent local flooding and debris flows, and encourage residents to assist in maintaining those drains that are the responsibility of the homeowner.

Implementation Measure 2.1.1: The City will cooperate with the Los Angeles County Public Works Department to maintain storm drains in the City.

Timing: Immediate and ongoing

Agency: LA County Building & Safety Department

Funding: General Fund

Implementation Measure 2.1.2: The City will encourage homeowner maintenance of storm drains by developing educational materials to be added to the City website and included in the City's newsletter.

Timing: Immediate and ongoing

Agency: LA County Building & Safety Department

Funding: General Fund

Policy 2.2 Avoid construction in canyon bottoms and participate in the National Flood Insurance Program. Require new development or expansion of existing development adjacent to canyons to assess potential environmental impacts from increased run-off and erosion and evaluate appropriate mitigation. Mitigation measures should address projected impacts from climate change.

Implementation Measure 2.2.1: The City will evaluate the flood hazard potential and address climate change impacts in future environmental review. The City will ensure that development in areas designated as a Flood Hazard Overlay Zone mitigates potential flood impacts.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund and private developers

Implementation Measure 2.2.2: The City will require the submission of soil engineering reports for land development permits when soil erosion problems are suspected.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund and private developers

Goal 3 Minimization of Loss of Life, Injury, and Property Damage Resulting from Fire Hazards

Policy 3.1 Develop stringent initial site design and on-going maintenance standards incorporating adequate mitigation measures into individual developments to achieve an acceptable level of risk, considering the increased risk associated with increased wildland fire hazards due to climate change.

Implementation Measure 3.1.1: The City will work with the Los Angeles County Fire Department, Los Angeles County Sheriff's Department, and Rolling Hills Community Association to review current standards for wildfire prevention and improve standards and/or regulations where required.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 3.1.2: The City will implement recommended fire mitigation strategies from the Community Wildfire Protection Plan including infrastructure hardening and vegetation management for and around existing and new development.

Timing: Immediate and ongoing

Agency: Planning Department/Building & Safety Department

Funding: General Fund

Policy 3.2 Reduce potential fire ignition sources.

Implementation Measure 3.2.1: The City will continue to implement the utility undergrounding projects described in the Community Wildfire Protection Plan.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 3.2.2: Designate and publicize emergency access routes with the city and sub region. Prioritize undergrounding of utilities to enhance reliability of emergency access routes and minimize conflagration hazards from fallen power lines.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 3.3 Develop and implement a comprehensive retrofit strategy for existing structures.

Implementation Measure 3.3.1: The City will develop and implement a comprehensive retrofit strategy for existing structures and lifeline utilities in very high fire risk areas to increase public safety and reduce the risk of property loss and damage during wildfires.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building & Safety Department

Funding: General Fund

Implementation Measure 3.3.2: Enforce existing ordinances and regulations that apply to roofing materials. The City will enforce a Class A Roofing Ordinance for all structure, as described in the Community Wildfire Protection Plan. The City will require old roofs to be removed prior to reroofing to increase the fire-resistance of the structure.

Timing: Immediate and ongoing

Agency: Planning Department/Building & Safety Department

Funding: General Fund

Policy 3.4 Ensure that all new residential development has at least two emergency evacuations.

Implementation Measure 3.4.1: The City will review and update emergency response and evacuation plans and procedures annually to reflect current conditions and community needs.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building & Safety Department

Funding: General Fund

Implementation Measure 3.4.2: Create secondary access in communities with single access.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 3.4.3: Identify special populations and large animals, especially horses, that may need assistance to evacuate.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 3.5 Whenever feasible, locate the following outside flood and fire hazard zones: health care facilities, emergency shelters, fire stations, emergency command centers, and emergency communications facilities.

Implementation Measure 3.5.1: The City will require review of new essential facilities and, as necessary, development of measures to avoid flood and fire hazard impacts.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building & Safety Department

Funding: General Fund and private developers

Policy 3.6 Educate residents on fire hazard reduction strategies to employ on their properties, focusing on the most vulnerable populations such as older adults and individuals with chronic health conditions.

Implementation Measure 3.6.1: The City will promote vegetation management strategies outlined in the Community Wildfire Protection Plan (i.e., fuel management in canyons and fire fuel management standards for individual properties) in the City's quarterly newsletter, through the website, brochures, videos, and block captain meetings.

Timing: Immediate and ongoing

Agency: Planning Department and City Manager

Funding: General Fund

Policy 3.7 Work with the County to ensure that all fire equipment remains operable and adequate to respond to a major disaster.

Implementation Measure 3.7.1: City staff will monitor the City's fire protection rating and cooperate with the Fire Department in the correction of deficiencies.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 3.8 Require new development to meet or exceed hardening requirements in the most current version of the California Building Codes and California Fire Code.

Policy 3.9 Evaluate evacuation route capacity, safety, and viability under a range of emergency scenarios as part of the next update to the Rolling Hills Hazard Mitigation Plan, in accordance with AB 747.

Policy 3.10 Update the City's development standards to be in conformance with title 14, CCR, division 1.5, chapter 7, subchapter 2, articles 1-5 (commencing with section 1270) (SRA Fire Safe Regulations) and title 14, CCR, division 1.5, chapter 7, subchapter 3, article 3 (commencing with section 1299.01) (Fire Hazard Reduction Around Buildings and Structures Regulations).

Policy 3.11 Minimize risks to existing development by identifying existing non-conforming development to contemporary fire safe standards, in terms of road standards and vegetative hazard, and requiring all development to meet or exceed CCR, division 1.5, chapter 7, subchapter 2, articles 1-5 requirements (SRA Fire Safe Regulations).

Policy 3.12 Require fire protection plans for all new development.

Policy 3.13 Require all properties in the city to enforce precautionary measures to create defensible space including, but not limited to, maintaining a fire break by removing brush and flammable vegetation located within 30 feet of the property, maintaining any tree adjacent to or overhanging any building free of dead or dying wood, and maintaining roofs free of leaves, needles, or other dead vegetation growth, as described in the Rolling Hills Hazard Mitigation Plan.

Policy 3.14 Evaluate the City's capacity to adequately suppress wildfire, taking into account water supply availability, as part of the next Rolling Hills Hazard Mitigation Plan update.

Policy 3.15 Coordinate with Palos Verdes Water District to support the provision of adequate water availability throughout the City and provision of adequate water storage to meet future peak fire demand during times of peak domestic demands.

Policy 3.16 Maintain emergency roadways and improve them as necessary and appropriate to ensure ongoing serviceability.

Policy 3.17 Establish and maintain community fire breaks and fuel modification/reduction zones, including public and private road clearance.

Policy 3.18 Require that all homes have visible street addressing and signage.

Goal 4 Minimization of Impacts to Life and Property Associated with the Use, Storage, or Transport of Hazardous Materials

Policy 4.1 Restrict the travel of vehicles carrying hazardous material through the city.

Implementation Measure 4.1.1: The City will ensure the Los Angeles County Sheriff's Department enforce licensing and current laws regarding the transport of hazardous materials through the city.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 4.2 Work to promote the safe use and disposal of household hazardous wastes.

Implementation Measure 4.2.1: The City will work with agencies responsible for the disposal of household hazardous wastes.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Community Communication

Goal 5 Protection of the Community from Disasters and Emergencies

Policy 5.1 Designate and develop specific critical facilities as emergency centers to serve the entire City and work with other cities to maintain existing trauma care facilities that serve the region.

Implementation Measure 5.1.1: The City will meet with other communities in the region to discuss the loss of trauma care centers in the region. The City will examine the feasibility of establishing the development of a critical/trauma care unit at one of the local clinics or hospitals in the region.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.2 Cooperate with the Los Angeles County Sheriff's Department to ensure that law enforcement services are ready and available to serve the city in the event of a major disaster.

Implementation Measure 5.2.1: City staff will monitor the City's contract and budget with the Sheriff's Department to ensure that adequate service levels are maintained.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.3 Develop and coordinate medical assistance procedures in the event of a major disaster.

Implementation Measure 5.3.1: City staff will develop and update the Emergency Operations Plan, which will be distributed to the community. The update of the Emergency Operations Plan will include an assessment of current emergency service and projected emergency service needs, and goals or standards for emergency services training for City staff and volunteers.

Timing: Ongoing

Agency: City Manager

Funding: General Fund

Policy 5.4 Inventory and, where necessary, acquire supplemental disaster communication equipment and other equipment, tools, and supplies used by Block Captains during an emergency.

Implementation Measure 5.4.1: City staff will complete an inventory of infrastructure needed to support emergency communications and equipment needed for use by Block Captains and the City to communicate during emergencies, as described in the Community Wildfire Protection Plan.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.4.2: A survey will be done by the City periodically to establish an inventory of equipment which could be used in the event of a major disaster.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.5 Ensure that adequate provisions are made to supply drinking water for extended periods of time in the event of a major disaster.

Implementation Measure 5.5.1: City staff will inventory sources of potable water that could be used in the event of an emergency and the means to distribute that water to residents and others in the Planning Area.

Timing: Immediate and ongoing

Agency: LA County Building & Safety Department

Funding: General Fund

Policy 5.6 Develop procedures to follow in the event of wildfire, flooding, erosion, and possible reservoir failure and investigate ways of reducing the likelihood of their occurrence.

Implementation Measure 5.6.1: The City will update the Hazard Mitigation Plan every five years to reduce the risk from hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the city.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.6.2: City staff will develop and maintain an Emergency Operations Plan, which will set forth an operating strategy for managing potential emergencies (as described in the Hazard Mitigation Plan)

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.7 Ensure that City Hall maintains a current emergency supply of water, food, blankets, and first aid to provide for all employees for a 3-day period.

Implementation Measure 5.7.1: A City staff person will be assigned the task of compiling a list of supplies and maintaining an adequate stockpile.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.8 Encourage private businesses to develop disaster preparedness plans for their employees.

Implementation Measure 5.8.1: The City will prepare and distribute a brochure outlining recommendations for stockpiling supplies for employees.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.9 Encourage residents to attend periodic training programs on wildfire mitigation and disaster planning, and to develop disaster preparedness and evacuation plans.

Implementation Measure 5.9.1: The City will work with the RHCA and Block Captains to launch a communication and education program that will include a workshop on How to Develop an Evacuation Plan for your Family, as described in the Community Wildfire Protection Plan.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.9.2: The City will work with the RHCA and Block Captains to promote training programs on wildfire mitigation and disaster planning through the newsletter and the City website.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.10 Support the development and further implementation of a peninsula-wide disaster plan.

Implementation Measure 5.10.1: The City will coordinate its disaster planning efforts with neighboring jurisdictions in the region as part of Hazard Mitigation Plan updates

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.11 Increase public awareness of City emergency response plans, evacuation routes and shelters, and in ways to reduce risks at the home and office, focusing on the most vulnerable populations such as older adults and individuals with chronic health conditions.

Implementation Measure 5.11.1: The City will prepare communication materials outlining procedures to follow in the event of a major disaster. These materials will be distributed to every household and business in the city.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.11.2: The City will maintain the City-wide Neighborhood Watch program.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.11.3: The City will define refuge areas in the event of a wildfire event to include in the Emergency Operations Plan. This effort will be led by the Fire Department and the Sherriff's Department.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.11.4: The City will distribute educational materials for large animal evacuation, consistent with Community Wildfire Protection Plan recommendations. This will include adding the information to the City website and including it in the City's newsletter during the fire season.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.11.5: The City will work with Block Captains to provide emergency education and information through the City's newsletter and website and by providing workshops and seminars described in the Community Wildfire Protection Plan.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.12 Maintain a Hazard Mitigation Plan.*

Implementation Measure 5.12.1: The City will coordinate with the American Red Cross and Los Angeles County Fire, Sheriff, and Public Social Services to develop specific plans for responding to emergencies as part of Hazard Mitigation Plan updates. The City will submit copies of its Hazard Mitigation Plan to the Los Angeles County Fire and Sheriff's Departments for review. The City will review similar plans prepared by neighboring cities.

Timing: Every five years

Agency: City Manager

Funding: General Fund

*The Local Hazard Mitigation Plan (LHMP or HMP) is a separate document adopted into the Safety Element of the General Plan by Resolution No. 1314 in compliance with AB 2140. It is available electronically at https://www.rolling-hills.org/government/planning_and_community_services/index.php.

Policy 5.13 Ensure maximum accessibility throughout the city in the event of a disaster.

Implementation Measure 5.13.1: The City will ensure that multipurpose trails are maintained in order to be serviceable by emergency vehicles in the event of a disaster.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.14 Ensure the reliability of essential facilities such as communications towers, electrical substations, water services, and first-response buildings in the event of an emergency through promoting grid resilience and energy independence. Work to implement on-site power generation through solar photovoltaic systems and battery storage.

Implementation Measure 5.14.1: The City will work with telecommunication providers to identify opportunities to improve reliability of cell service throughout the city.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.14.2: The City will work with electricity and natural gas providers to identify opportunities to promote grid resilience.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.14.3: The City will seek funding to enhance telecommunication service.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.14.4: The City will provide educational materials to residents (i.e., newsletter, webpage, brochure) to promote solar panels and battery storage installation on existing development.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.15 Minimize the risk of spread of infectious diseases and associated economic disruption.

Implementation Measure 5.15.1: The City will coordinate with the County of Los Angeles Public Health Department to provide testing and contact tracing resources to the Rolling Hills community.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.15.2: The City will maintain up-to-date public health services on the City's website.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.15.3: The City will explore the need for additional marketing campaigns to promote public safety protocol among City departments.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measures 5.15.4: The City will partner with local non-governmental organizations (NGOs) to provide additional support and services in the city.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measures 5.15.5: The City will partner with community groups and neighborhood organizations to advertise what resources are available to residents.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.16 Increase access to essential resources and facilitate effective communication in the community to accelerate recovery following such a disaster.

Implementation Measure 5.16.1: The City will connect the newly unemployed with talent-seeking industries, such as through a job portal.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Implementation Measure 5.16.2: The City will supplement federal relief efforts, such as creating a resilience fund for residents to assist those in need.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.17 Provide City officials with a basis for disaster preparedness decision making and establish a public education program for disaster preparedness.

Implementation Measure 5.17.1: The Emergency Services Coordinator will conduct annual meetings with City personnel to ensure they are familiar with procedures outlined in the Hazard Mitigation Plan and Emergency Operations Plan.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.18 Establish a line of command to ensure that the decision-making process will function satisfactorily in the event of a major disaster.

Implementation Measure 5.18.1: The City will implement the Hazard Mitigation Plan.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.19 Coordinate with citizen groups, such as Block Captains, and organizations to establish a viable body to provide emergency assistance in the event of a natural disaster.

Implementation Measure 5.19.1: The City Emergency Services Coordinator will work with local equestrian groups and other organizations to establish a Rolling Hills Search and Rescue Team.

Timing: Immediate and ongoing

Agency: City Manager and LA County Building & Safety Department

Funding: General Fund

Policy 5.20 Encourage cooperation among adjacent communities to provide back-up law enforcement assistance in emergency situations.

Implementation Measure 5.20.1: The City will submit copies of its Hazard Mitigation Plan updates to the Los Angeles County Fire and Sheriff's Departments for review. The City will review similar plans prepared by neighboring cities.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 5.21 Incorporate health threats into early warning systems.

Implementation Measures 5.21.1: Partner with the Los Angeles County Vector Control District and the Los Angeles County Department of Public Health to develop and enhance disaster and emergency early warning systems to incorporate objective data and information for potential health threats such as heat-illness, illnesses complicated by low air quality, precipitation events, and vector borne diseases due to climate change hazards.

Goal 6 Maintenance of Public Safety for All Residents

Policy 6.1 Work with, and support the Sheriff's Department in crime prevention and law enforcement efforts, to make sure there are adequate resources to meet the needs of the community.

Implementation Measure 6.1.1: The City will conduct an annual review of its contract with the Los Angeles County Sheriff's Department to ensure current service standards are maintained. Alternatives will be considered if service levels are considered inadequate.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 6.2 Cooperate with neighboring cities, Los Angeles County, California State and U.S. Federal agencies in crime prevention and law enforcement.

Implementation Measure 6.2.1: The City will continue to regularly coordinate with all law enforcement agencies in combating crime.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Policy 6.3 Evaluate the incidence of crime and develop measures needed to deter crime or apprehend the criminals.

Implementation Measure 6.3.1: The City will monitor crime statistics for the peninsula and the city. The City will meet with Los Angeles County on a regular basis to discuss programs, ordinances, and other measures that will be effective in combating crime.

Timing: Immediate and ongoing

Agency: City Manager

Funding: General Fund

Climate Change Adaptation and Resilience

Goal 7 Protection of the Community from the Effects of Climate Change

Policy 7.1 The City will continue to enforce updated State-mandated water conservation regulations.

Implementation Measure 7.1.1: The City will continue to update the City's zoning ordinance as necessary to enforce and implement State-mandated water conservation regulations.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund

Policy 7.2 Prepare for and adapt to the effects of climate change by considering climate change vulnerability in planning decisions, including those involving new public facilities and private development.

Implementation Measure 7.2.1: The City will:

a. Re-evaluate the City's Climate Change Vulnerability analysis over time, as new data becomes available
b. Update mitigation strategies and the City's vulnerability and adaptive capacity, as appropriate
c. Identify opportunities for new goals and policies related to climate change using the best available data.

Timing: Immediate and ongoing

Agency: Planning Department and LA County Building & Safety Department

Funding: General Fund

Policy 7.3 Amend the local building code to account for climate change stressors.

Implementation Measure 7.3.1: The City will amend the local building code to take into account additional stressors on buildings including, increased storm events and intensity, flood proofing for intermittent inundation, slope/soils, subsidence risk and erosion potential in securing foundations, building materials to reduce the impacts of high heat days, and fireproofing in preparation for increasing fire risk.

Timing: Immediate

Agency: Planning Department and LA County Building & Safety Department

Funding: General Fund

Policy 7.4 The City will engage surrounding jurisdictions in climate adaptation planning.

Implementation Measure 7.4.1: Ensure the community's engagement strategy for climate adaptation planning includes surrounding jurisdictions to identify synergies and harmonization of policies.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund

Policy 7.5 Partner with the South Bay Cities Council of Government to implement climate adaptation strategies at the sub-regional level.

Implementation Measure 7.5.1: Collaborate with the South Bay Cities Council of Governments Senior Services Working Group to ensure that service providers in and around Rolling Hills are educated on the climate risks of the area and steps they can take to better serve and protect vulnerable groups in Rolling Hills.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund

Implementation Measure 7.5.2: Implement climate adaptation strategies that can address issues at a local and sub-regional level and issues in which coordination and pooling of resources (i.e., emergency centers, transit agency support in an emergency, and large animal evacuation centers) is a benefit to all participating communities.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund

Policy 7.6 Update emergency/disaster response measures to account for increased heat days.

Implementation Measure 7.6.1: As part of the Hazard Mitigation Plan and Emergency Operations Plan, update response measures to account for an increased number of heat days and their impacts on current and future response mechanisms such as warning systems, emergency response and medical service coordination, and shelters.

Timing: Every five years

Agency: Planning Department

Funding: General Fund

Policy 7.7 Provide education on heat related illness.

Implementation Measure 7.7.1: Incorporate links and references on the City website and incorporate interpretive signage at multi-use path trailheads providing education on heat related illness and personal care steps.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund

Policy 7.8 Require air conditioning alternatives.

Implementation Measure 7.8.1: Require alternatives to air conditioning such as ceiling fans, air exchangers, increased insulation and low-solar-gain exterior materials to reduce peak electrical demands during high heat events to ensure reliability of the electrical grid.

Timing: Immediate and ongoing

Agency: Planning Department

Funding: General Fund

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Appendix A

Existing Conditions Report

Rolling Hills General Plan Safety Element

Existing Conditions Report

prepared by

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Rolling Hills, California 90274

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October 2020

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Summary

Key Findings

- The city is most at risks to impacts from wildfire, extreme heat, and landslide events, which are all anticipated to increase as a result of climate change impacts. Vulnerable populations such as older adults and residents with chronic health conditions are most at risk to extreme heat and wildfire impacts. Access roads and residential structures are also the most vulnerable to wildfire and landslide impacts from climate change.
- The city has a moderate risk for shaking potential from earthquakes.
- Flood risks in the city are minimal and limited to natural drainage areas in the canyons.
- Vegetation clearing along roadways is a concern and major goal for improving fire response and evacuation in the city.
- Evacuation strategies and education are important to reduce risk from hazards due to the lack of evacuation routes in the city and the remote development on private roads. The need to further analyze evacuation routes and access is one of the most recent changes in Safety Element requirements. A key opportunity for the Safety Element update is to address specific evacuation needs.
- The City has recently adopted a number of planning documents such as the Hazard Mitigation Plan and Community Wildfire Protection Plan, which seek to reduce the risk of hazards in the city. An opportunity for the Safety Element update would be to utilize existing recommendations from the Community Wildfire Protection Plan as implementation tools for the Safety Element.

Introduction

Section 65302(g) of the California Government Code requires that the General Plan include a Safety Element for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence and other geologic hazards; flooding, wildland and urban fire, and climate change adaptation and resilience. In addition, Safety Elements are required to address non-hazard specific issues such as peak load water supply, evacuation routes, and military installations.

This Existing Conditions Report is a comprehensive assessment of natural and man-made hazards for the City of Rolling Hills. The report serves as the foundation for the Safety Element and includes detailed Geographic Information System (GIS) hazard mapping and analyses. The following City plans were also utilized for this report along with existing local data from governmental agencies and scientific research: Hazard Mitigation Plan, Community Wildfire Protection Plan, and the existing Safety Element.

Setting

Rolling Hills covers an area of approximately three square-miles on the Palos Verdes peninsula, approximately 18 miles south of downtown Los Angeles. The topography of the city and peninsula area is unique in that it rises above the Los Angeles Basin with rolling hills, steep slopes, and canyons. The city itself is located in the San Pedro Hills. Due to its location near the coast, the area is cooler and has fewer air quality concerns compared to the nearby Los Angeles Basin. Table 1 summarizes the climatology of the area.

Table 1 Rolling Hills Climate Summary

Climate Character	Estimate
Annual Average Observed Maximum Temperature from 1961 - 1990 (Fahrenheit)	71
Annual Average Observed Minimum Temperature from 1961 – 1990 (Fahrenheit)	50
Annual Average Observed Precipitation from 1961 – 1990 (inches)	19

Source: Cal-Adapt 2021

Rolling Hills is a residential community that consists of large parcels and ranch-style homes and has a sizable older adult[1] population of about 513 (28% of the city's total population). The city is also an equestrian community, as many of residents are horse owners or have horses on their property. Important community demographic data for Rolling Hills is included in Table 2.

[1] An older adult is any adult over the age of 65 years old.

Table 2 Rolling Hills Demographic Characteristics

Demographic Characteristics	Estimate
General	
Total Population	1,860[1]
Population under 10 years	7 percent
Population over 65 years	28 percent[1]
Race	77 percent White, 18 percent Asian, 5 percent Hispanic/Latino
Disability (hearing, vision, cognitive, ambulatory)	12 percent
Housing	
Total Households	645[1]
Average Household Size	2.76
Owner-occupied Households	96 percent
Population over 65 years living alone	15 percent of those over 65 years
Employment	
Unemployment Rate	6 percent
Poverty Rate	2 percent
Median Income	$ 239,000
Insurance Coverage	97 percent

Source: U.S. Census 2018

[1]Information obtained from the Community Wildfire Protection Plan, which is includes more recent data than the U.S Census

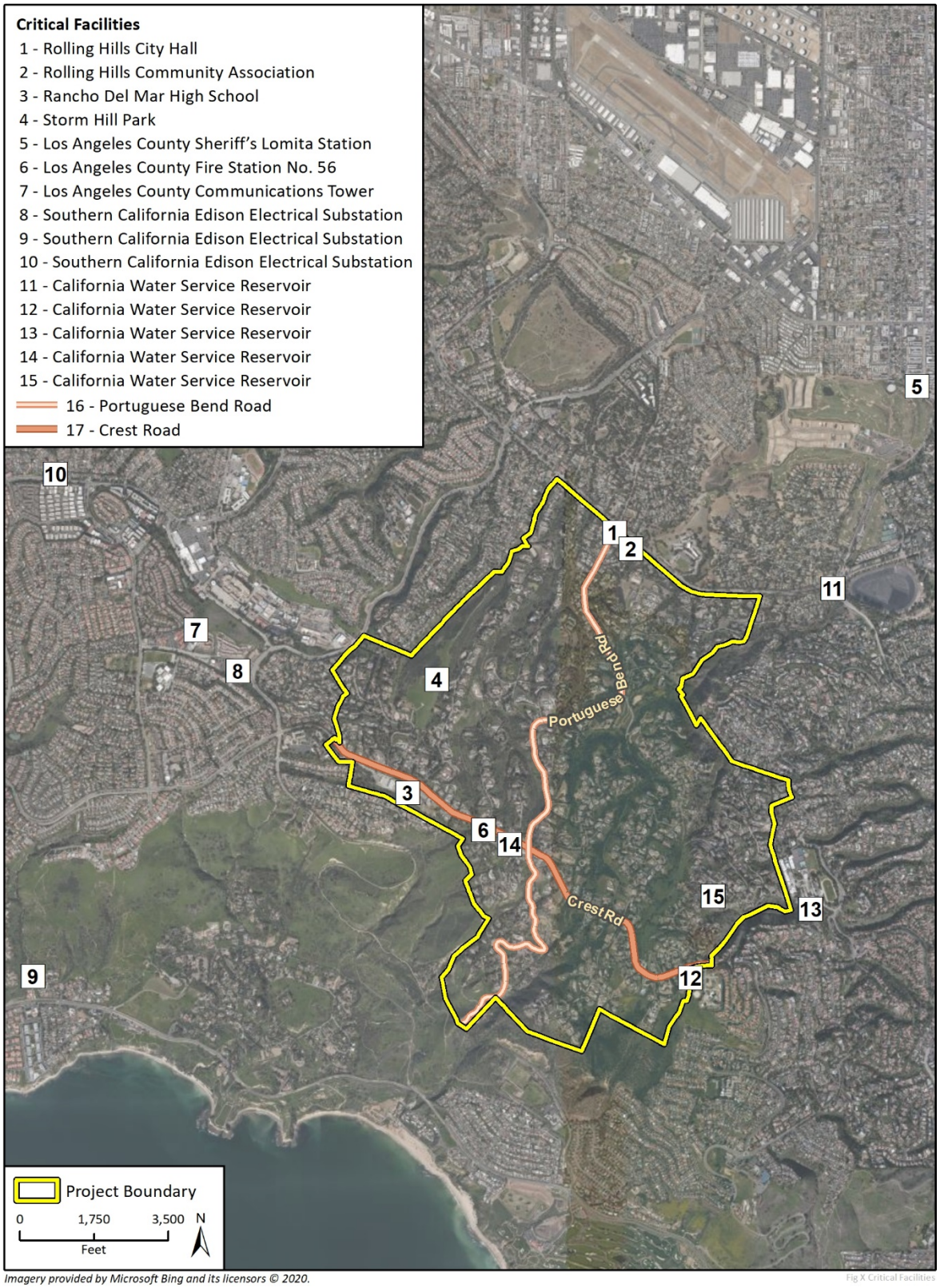
Critical Facilities and Infrastructure

Critical facilities are places that provide emergency services or serve people who would be impacted by an emergency. Examples include hospitals, fire stations, police stations, emergency services facilities, utility facilities, and communication facilities. Critical facilities can also include the transportation system and schools. Due to the size and composition of Rolling Hills, most of the critical facilities that serve the city are located outside of City limits. Critical facilities that serve the city are shown in Figure 1 and include:

1. Rolling Hills City Hall: 2 Portuguese Bend Road, Rolling Hills, CA
2. Rolling Hills Community Association: 1 Portuguese Bend Road, Rolling Hills, CA
3. Rancho Del Mar High School: 38 Crest Road West, Rolling Hills, CA
4. Storm Hill Park: Agua Magna Canyon, Rolling Hills
5. Los Angeles County Sheriff's Lomita Station: 26123 Narbonne Avenue, Lomita, CA
6. Los Angeles County Fire Station No. 56: 12 Crest Road West, Rolling Hills, CA
7. Los Angeles County Communications Tower: 5741 Crestridge Road, Rancho Palos Verdes, CA
8. Southern California Edison Electrical Substation: Crestridge Road, Rancho Palos Verdes, CA
9. Southern California Edison Electrical Substation: Tarragon Road, Rancho Palos Verdes, CA

10. Southern California Edison Electrical Substation: 27873 Hawthorn Boulevard, Rancho Palos Verdes, CA
11. California Water Service Reservoir: Palos Verdes Drive North/Palos Verdes Drive East (SW corner), Rolling Hills Estates, CA
12. California Water Service Reservoir: 3960 East Crest Road, Rancho Palos Verdes, CA
13. California Water Service Reservoir: Via Canada, Rancho Palos Verdes, CA
14. California Water Service Reservoir: 1 Spur Lane, Rolling Hills, CA
15. California Water Service Reservoir: 60 Eastfield Drive, Rolling Hills, CA
16. Portuguese Bend Road
17. Crest Road

Figure 1 Critical Facilities Map



Hazards of Concern

Geologic Hazards

Geologic processes that pose a threat to life, health, property, or infrastructure are considered geologic hazards. Natural geologic hazards that have the potential to affect Rolling Hills include seismic hazards, landslides, liquefaction, expansive soils, and weathering. In most cases, these natural processes cannot be prevented; however, the magnitude of destruction resulting from natural geologic hazards can be reduced through planning policies and measures.

Landslide Hazards

Landslide activity refers to a wide range of gravity driven downslope earth movement, including rockslides, rotational slips, mudslides, and shallow debris flows. Geological and geomorphological conditions such as soil type, soil strength, slope angle, and slope height predispose slopes to failure. Other factors affecting the susceptibility to slope failure include the amount of precipitation, vegetation on the slope, groundwater seepage, and human modifications to the slope. Landslides often result in damage to property and roadways and can cause them to become unsafe due to displacement of the subsurface.

A majority of the existing development in Rolling Hills is located on hilly terrain and have a greater potential to experience landslide hazards. Many of the canyons in Rolling Hills exhibit steep slopes with little vegetation coverage, leaving them susceptible to slope failure. Figure 2 shows the landslide zones within the City of Rolling Hills, as mapped by the California Geological Survey. Landslide activity has been well documented in the region. Relicts of landslides and rockslides are present throughout the City of Rolling Hills. The following major landslides have occurred within and adjacent to the city. All are within the landslide hazards areas identified in Figure 2:

- Portuguese Bend Landslide: Beginning in[2] 1956 over approximately 270 acres in Rancho Palos Verdes
- Abalone Cove Landslide: Beginning in 1974 over 80 acres in Rancho Palos Verdes
- Klondike Canyon Landslide: Beginning in 1979 over to the south near the coastline
- Flying Triangle Landslide: Beginning in 1970s or 1980s over approximately 70 acres in the south area of the city

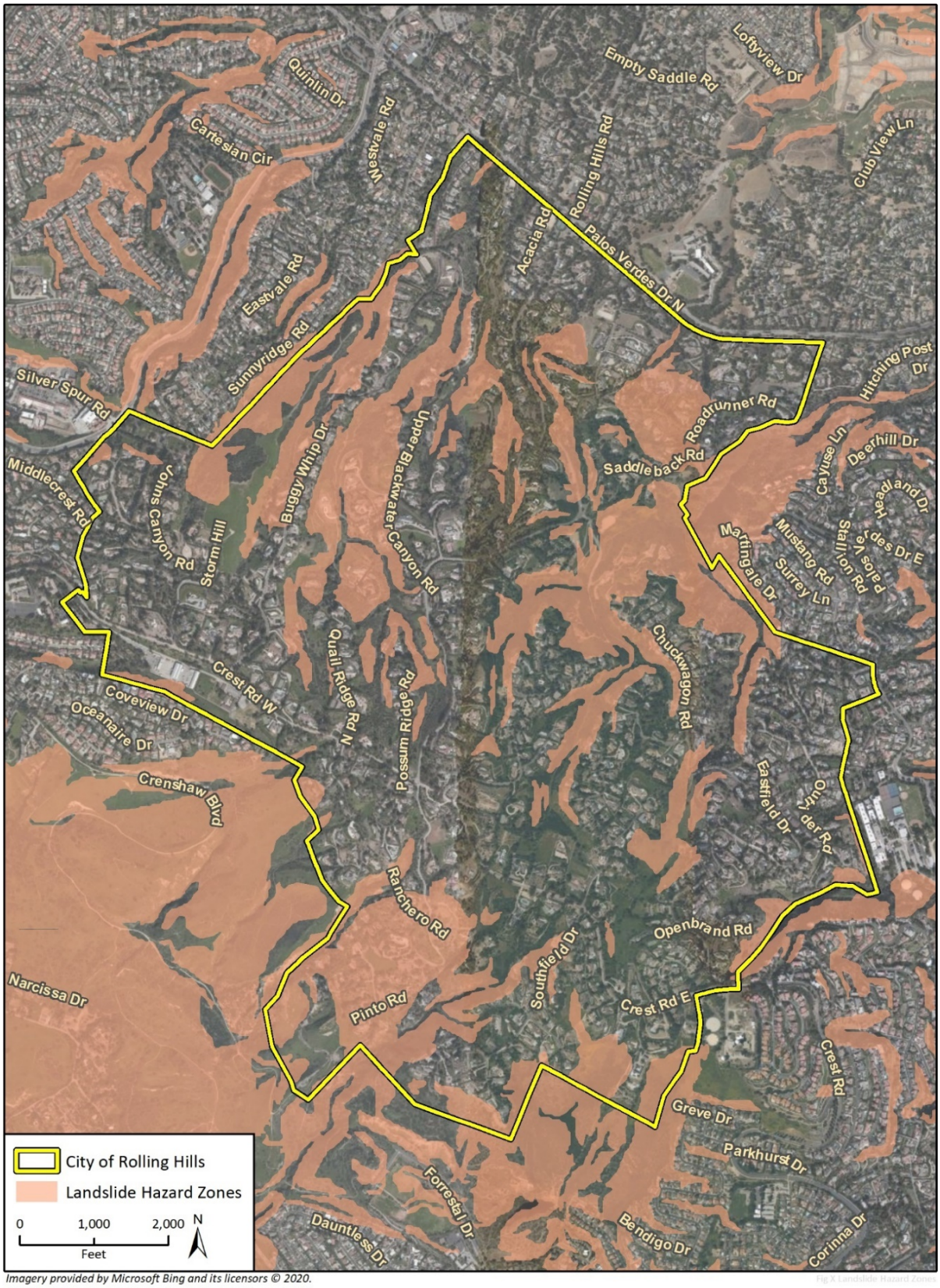
The Flying Triangle Landslide continues to impact the southeast portion of the city through impacts to private roads and requiring above-ground utility lines. This area is relatively unsuitable for development due to the ongoing changes in topography.

Seismic Hazards

Rolling Hills is located in a seismically active region of southern California. The last major earthquake in the Los Angeles area was the 5.1 magnitude La Habra earthquake in 2014. Rolling Hills is located within 50 miles of the Whittier fault, Newport-Inglewood fault, Palos Verdes fault, Malibu Coast

[2] "Beginning in" is defined as the first noted event of major rock movement

Figure 2 Landslide Hazard Zones



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Additional data provided by California Geologic Survey, 2015.

fault, Cabrillo fault, Santa Monica fault, and Redondo Canyon fault. Analysis of seismic data from the region indicates that the Whittier and Newport-Inglewood faults may generate a maximum credible earthquake of magnitude 7.2 and 7.4, respectively (Southern California Earthquake Center 2013). Figure 3 shows the faults in the vicinity of Rolling Hills.

Typically, seismic shaking and fault rupture are primary hazards as they occur as a direct result of the interaction between the seismic wave energy and the earth's surface. Secondary hazards, such as liquefaction and earthquake-induced landslides, occur as a result of the primary earthquake hazards. Often, earthquake activity can result in other effects such as building damage/collapse, infrastructure failure, pipeline breakage, and damage to transportation and communication facilities. The size of the earthquake and distance from the fault rupture zone typically determine the severity of these events.

Seismic Shaking

Seismic shaking, or ground shaking, refers to the movement of the earth's surface resulting from the energy release by an earthquake. Seismic shaking is typically the primary cause of property damage resulting from earthquake activity. Seismic shaking has the ability to destroy buildings, roadways, powerlines, and pipelines. Energy transmitted through the ground has the potential to travel hundreds of miles and may cause damage in many locations simultaneously. Closer proximity to the fault rupture area results in stronger shaking in that location.

The amount of ground shaking that occurs in a location is dependent on the magnitude of the earthquake, the distance from the epicenter, and local soil conditions. The intensity of ground shaking is related to the peak ground velocity during an earthquake. According to the CGS Map Sheet 48, the earthquake shaking potential for Rolling Hills is moderate. The intensity of seismic shaking is measured using the Modified Mercalli scale.

According to the California Geologic Survey, an active fault is one that has experienced surface movement in the past 11,000 years. The city is located near a number of active faults, including the Cabrillo Fault within city limits. Table 3 includes a list of nearby faults, their respective distance from the city, the maximum credible earthquake generated from each fault, and the likelihood of earthquake occurrence in each case.

Table 3 Faults Located within 50 Miles of Rolling Hills

Fault Name	Approximate Distance from Rolling Hills
Whittier	25 miles east
Newport-Inglewood	9 miles east
Palos Verdes	<1 mile north
Malibu Coast	20 miles northwest
Cabrillo	Located within the City boundaries in the southwest
Santa Monica	20 miles north-northwest

The San Andreas fault is located approximately 80 miles to the east of Rolling Hills. Although the San Andreas fault is located at a greater distance from the city, seismic shaking originating from earthquakes occurring along the San Andreas fault poses a threat to the city. Figure 3 identifies the active and inactive faults located within the city and vicinity.

Fault Rupture

Fault Rupture occurs when seismic movement on a fault breaks through the earth's surface. Hazards related to fault rupture arise when structures are built near or on top of an active fault. While there are a number of seismically active faults in the city and region, there are no active faults with the potential for ground rupture, defined by the Alquist-Priolo Earthquake Fault Zoning Act and delineated by CGS. Figure 3 shows the designated Alquist-Priolo study zones, the closest of which is the Newport-Inglewood Fault approximately nine miles northeast of the city.

Liquefaction and Settlement

Liquefaction is a ground failure phenomenon that occurs as a result of a seismic event. Liquefaction increases water content in surface soils until the soil reaches a semi-liquid state, contributing to a reduction in support, and ultimately resulting in shifting or subsidence of buildings and utilities. Ground failure typically occurs when the following conditions exist:

- Loose, unconsolidated granular soils
- Shallow groundwater
- Strong seismic ground shaking

While the Rolling Hills has moderate to high seismic shaking potential, the subsurface soils generally lack saturated alluvial deposits and thick, granular soils. Figure 4 shows the liquefaction hazard areas, which are located in the low-lying areas to the east and north, generally surrounding the Los Angeles Harbor and Harbor Lake. Liquefaction potential for Rolling Hills is low, as shown in Figure 4.

Earthquake Induced Landslides

Ground failure or destabilization of slopes resulting from an earthquake can also occur following seismic activity in the form of Earthquake-Induced Landslides. Earthquake-induced landslides typically occur in areas with steep slopes or unstable soil conditions. As discussed above under Landslide Hazards, the risk of landslide activity in Rolling Hills is high. Much of the city overlies areas that have been identified as landslide zones by the California Geological Survey. Risk of landslide activity increases following rainfall events that result in saturated soils. Both shallow and deep seeded landslides have historically occurred in the city.

Flooding

Rolling Hills participates in the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program. According to the FEMA flood maps, the city is not located in a flood hazard area and currently has a less than 0.2 percent annual chance to be inundated by flood waters as a result of a storm event (FEMA 2008). Overall, the city is not in any immediate risk from flooding caused by overflowing water bodies or heavy rains. However, runoff and minor flooding pose a risk if drainage systems fail along canyon bottoms, where natural drainage leads to.

Figure 3 Faults in the Vicinity of Rolling Hills

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Fig X Active Faults in Vicinity

Figure 4 Rolling Hills Liquefaction Hazard Areas

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Additional data provided by California Geologic Survey, 2015.

Dam Inundation

No water storage facilities that the State of California identifies as dams are located in Rolling Hills. Just outside city limits are three water storage facilities identified as dams, which include:

- **Palos Verdes Reservoir**: Owned by the Metropolitan Water District of Southern California and located at the southeast corner of Palos Verdes Drive East and Palos Verdes Drive North. According to the California Department of Water Resources, the reservoir can hold approximately 1,100 gallons of water and has an extremely high downstream hazard.
- **10 MG Walteria and 18 MG Walteria**: Two reinforced concrete tanks which are owned by the City of Torrance and located at Crenshaw Boulevard and Crest Road. The tanks can hold 31 and 58 acre-feet (AF) of water respectively.

Senate Bill 92, adopted in 2017, is a new dam safety requirement that requires dam owners to map the downstream inundation areas for dams governed by the Department of Water Resources. Figure 5 shows the inundation areas for the nearby water storage facilities. Due to their locations and the topography of the area, the inundation areas do not enter or affect any portion of the city.

Wildland and Urban Fires

The entire City of Rolling Hills is designated a Very High Fire Hazard Severity Zone (VHFHSZ) by the California Department of Forestry and Fire Protection (CalFire), as shown in Figure 6. Rolling Hills terrain is comprised of several large and steep canyons that limit and challenge vegetation management and present conditions where a fire can quickly travels up and downslope to nearby homes. Due to the rural nature and large residential lots, many homes are surrounded by substantial vegetation and dense brush than in more suburban settings. The bridle trails for hikers and equestrian access also contain dense vegetation and management difficulties, which contributes to the fire risk of the city. Electrical power lines pose a hazard to starting fires in the city if lines are not automatically de-energized when knocked down by extreme weather or if the surrounding vegetation is not adequately managed.

There is a history of fires in the city and the surrounding Palos Verdes Peninsula. Three major fires have been documented on the Peninsula and in the city in:

- 1973: almost 1,000 acres burned, and 13 homes destroyed
- 2005: 212 acres burned near Del Cero Park
- 2009: 230 acres burned and forced 1,200 residents on the Peninsula to evacuate

For many of the developed residences in the city that are vulnerable to fires, their risk may increase with the presence of construction techniques that may not meet current wildfire standards. Rolling Hills Building Code and Los Angeles County Fire Department, under the VHFHSZ standards, require new development to include more stringent design and material standards for roofing, eaves, and rafter tails as well as exterior finishes and fire buffer zones. While compliance with these standards reduces the vulnerability to new structures, existing structures that have not complied with these standards may be susceptible to undue fire risk.

Existing Fire Risk Reduction Strategies

- Rolling Hills Municipal Code (RHMC) Chapter 8.30: Fire Fuel Abatement
- VHRHSZ building requirements

- Los Angeles County Fire Department property line and structure vegetation buffer requirements
- Rolling Hills Community Wildfire Protection Plan vegetation management standard recommendations
- Rolling Hills Community Association

Figure 5 Dam Inundation Areas

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Additional data provided by California Department of Water Resources, 2020.

Figure 6 Fire Hazard Zones

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Additional data provided by CalFire, 2020.

Hazardous Materials

According to the Department of Toxic Substances Control (DTSC), there are no hazardous waste sites or facilities in Rolling Hills (DTSC 2020). The city and surrounding area do not contain heavy industrial uses that would create a hazardous material risk in the event of a spill, release, or natural disaster.

The city is not located near any major transit routes involving transport of a substantial quantity of hazardous material through the city. However, the nearby oil refineries (located along Sepulveda Boulevard approximately six miles northeast) and Port operations (located approximately three miles to the east) could create air quality impacts if wind patterns and release events occur. Air quality impacts are discussed in the *Open Space and Conservation Element* of the Rolling Hills General Plan.

Emergency Response and Evacuation

Police Response and Crime

The Los Angeles County Sheriff's Department is contracted with the city to provide police services and protection to the city. The Lomita Station of the Sheriff's Department located at 26123 Narbonne Avenue, approximately 1.5 miles northeast of the Portuguese Bend Road entrance, serves the city.

According to the Lomita Station crimes report from January 1, 2020, through June 30, 2020, Rolling Hills had three reported crimes (LACSD 2020). The crimes were related to theft, assault, and burglary. Outside the city limits and in the Lomita District, 433 crimes were reported during this same period, 71 of which were violent crimes (LACSD 2020). The difference in crimes in the city and the surrounding area is attributed to the private nature of the City. There are three entrances to the city, all of which are gated and staffed 24 hours a day. Visitors are required to be on a resident's guest list in order to enter city limits. This reduces crime within the city and demand on Los Angeles County Sheriff's Department.

Fire Response

The Los Angeles County Fire Department provides emergency operations support to the City. Fire Station 56, located at 12 Crest Road West, serves the city under Battalion 14, which also serves the remaining Palos Verdes Peninsula, Lomita, and Catalina Island. Fire response constraints in the city include ability to access certain homes or areas due to inadequate road widths for fire maneuvering. One of the major topics of concern related to fire response in the city relates to vegetation clearing along roadways. Ten-foot clearance on each side of the roadway, especially the limited access roads, is important for fire response and evacuation during a fire, according to Scott Hale, Assistant Fire Chief.

Evacuation Strategies and Routes

Because a variety of hazards could affect city residents, it is vital to identify critical routes for evacuation in the event of a major event. Figure 7 identifies the existing evacuation routes in the city, which are limited to:

- Main Gate at Rolling Hills Road and Palos Verdes Drive North

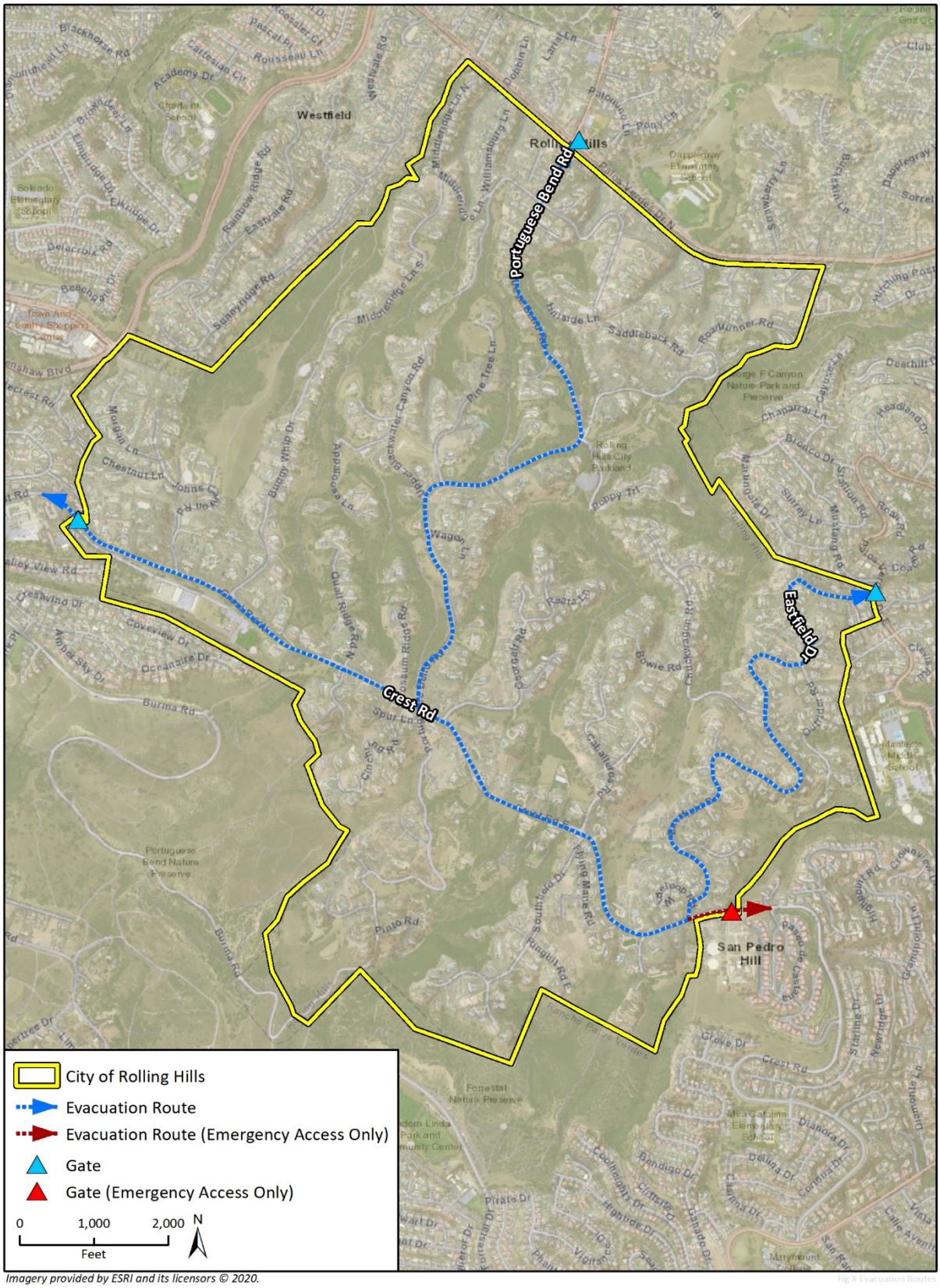
- Crest Gate at Crest Road near Crenshaw Blvd
- Eastfield Gate at Eastfield Drive and Palos Verdes Drive East
- Crest Road East Gate at the end of Crest Road East

Crest Road East Gate at the end of Crest Road East gate has recently been updated with a motor and has no guards. This gate is available as an emergency exit to the city during emergencies. The recently adopted Community Wildfire Protection Plan for the city establishes evacuation strategies and methodologies for the city, which include:

- Using the City's Block Captains as important coordinators and managers of residents in the 24 City zones[3]
- Communication goals between the City, emergency responders, Rolling Hills Community Association, and residents
- Details for residents regarding how people get notified during an actual evacuation and the responsibilities and operations of the Emergency Operations Center
- Traffic control responsibilities and levels
- Identification of special need residents who may need specific attention and/or assistance

[3] The city is divided into 24 zones and each zone has 2-3 block captains to represent the residents within the zone.

Figure 7 Existing Evacuation Routes



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Climate Change Vulnerability

In accordance with Senate Bill 379, this section provides a climate change vulnerability assessment for Rolling Hills, which evaluates the potential impacts of climate change on community assets and populations. The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report defines vulnerability as "the propensity or predisposition to be adversely affected." It adds that vulnerability "encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt" (IPCC, 2013). Understanding the vulnerabilities that the city may face due to climate change provides a foundation to define future adaptation strategies for the Safety Element update and other planning efforts in Rolling Hills and the region.

Consistent with the California Adaptation Planning Guide (Cal OES 2020) the assessment is comprised of the following five elements:

- **Exposure** – the nature and degree to which the community experiences a stress or hazard;
- **Sensitivity** – the aspects of the community (i.e., people, structures, and functions) most affected by the identified exposures;
- **Potential Impacts** – the nature and degree to which the community is affected by a given stressor, change, or disturbance;
- **Adaptive Capacity** – the ability to cope with extreme events, to make changes, or to transform to a greater extent, including the ability to moderate potential damages and to take advantage of opportunities; and
- **Vulnerability Scoring** – systematic scoring based on potential impacts and adaptive capacity, to inform major climate vulnerabilities to address adaptation framework strategies.

In addition to City data, Cal-Adapt was used to complete the assessment. Cal-Adapt is an interactive, online platform developed by the University of California and Berkeley to synthesize climate change projections and climate impact research for California's scientists and planners. This assessment uses Cal-Adapt to study potential future changes in average and extreme temperatures, precipitation, wildfire, and storms. Cal-Adapt is consistent with State guidance to use the "best available science" for evaluating climate change vulnerability.

This assessment uses two greenhouse gas (GHG) emissions scenarios included in Cal-Adapts analysis: Representative Concentration Pathway (RCP) 4.5 and RCP 8.5. RCP 4.5 describes a scenario in which GHG emissions peak around 2050, decline over the next 30 years and then stabilize by 2100 while RCP 8.5 is the scenario in which GHG emissions continue to rise through the middle of the century before leveling off around 2100. The climate projections used in this report are from four models selected by California's Climate Action Team Research Working Group and the California Department of Water Resources. These models include:

- A *warm/dry* simulation (HadGEM2-ES)
- A *cooler/wetter* simulation (CNRM-CM5)
- An *average* simulation (CanESM2)

- The model that presents a simulation most unlike these three and incorporates 10 other models, for full representation of possible forecasts (MIROC5)[4]

The average of the model projections is used in this analysis.

Exposure

Climate change is a global phenomenon that has the potential to adversely affect local health, natural resources, infrastructure, emergency response, and many other facets of society. Projected changes to climate are dependent on location. According to Cal-Adapt, climate change could lead to increasing temperatures, temperature extremes, and changes in precipitation patterns in Rolling Hills. These conditions could lead to exposure associated with extreme heat, drought, wildfires, and extreme storms in the region. The climate hazards of concern for Rolling Hills addressed in this analysis are:

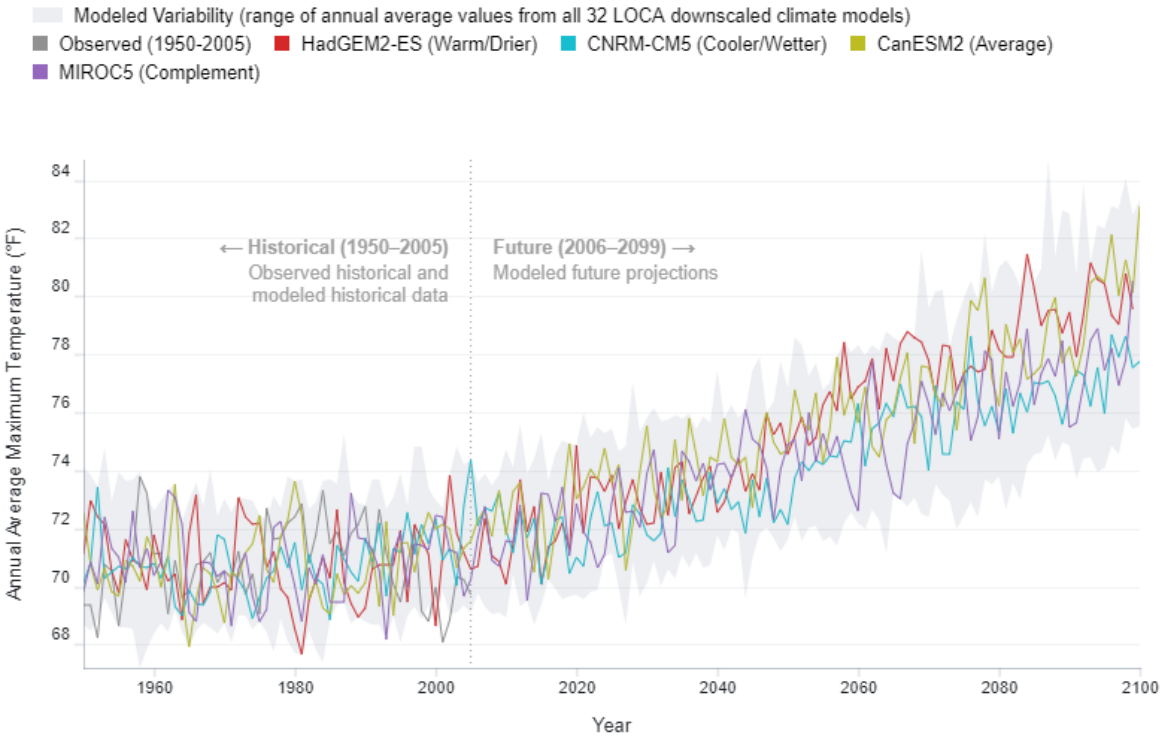
- Extreme Heat
- Storms and Extreme Weather
- Drought
- Wildfire

Extreme Heat

Figure 8 below shows observed and projected annual average maximum temperature in Rolling Hills. As shown in Figure 8, average temperatures in the city and region have increased, which is a trend at both the local scale and the global scale. Compared to 1990, annual average maximum temperatures in Rolling Hills are expected to rise between 1.8°F and 6.6°F by the end of the century, depending on the GHG emissions scenario (CEC 2020).

[4] There were 10 California GCM models that were ranked from 1-10 by California's Climate Action Team Research Working Group and the California Department of Water Resources for different temperature and precipitation factors. The models ranged from the "warm/dry" model which had all metrics closest to 1 to the "cool/wet" model which had all metrics closest to 10. The MIROC5 displays a pattern of ranking that is most unlike the other 3 models and therefore, is included to represent the full spread of all 10 model simulations.

Figure 8 Historical and Projected Annual Average Maximum Temperature in Rolling Hills[5]



Extreme heat is a period when temperatures are abnormally high relative to the normal temperature range. There are generally three types of extreme heat events:

- **Extreme Heat Days**: a day during which the maximum temperature surpasses 98 percent of all historic high temperatures for the area, using the time between April and October from 1950 to 2005 as the baseline
- **Warm Nights**: a day between April to October when the minimum temperature exceeds 98 percent of all historic minimum daytime temperatures observed between 1950 to 2005
- **Extreme Heat Waves**: a successive series of extreme heat days and warm nights where extreme temperatures do not abate. While no universally accepted minimum length of time for a heatwave event exists, Cal-Adapt considers four, successive extreme heat days and warm nights to be the minimum threshold for an extreme heatwave

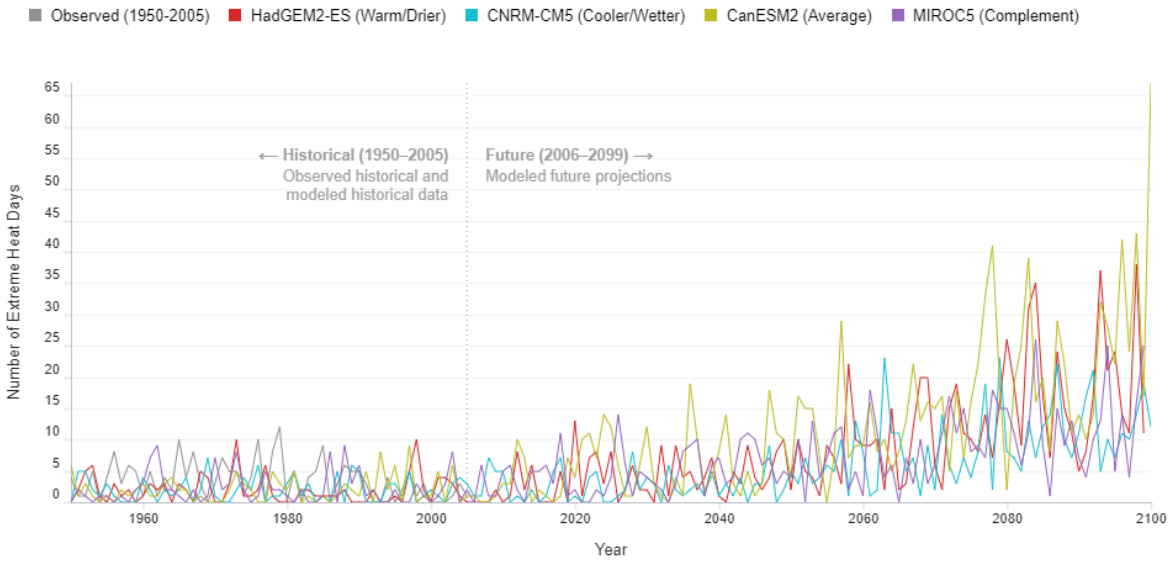
Extreme heat events will feel different from region to region since different areas have different historic high temperatures. For example, an extreme heat day on the coast will feel different than an extreme heat day in the desert. According to Cal-Adapt, an extreme heat day in Rolling Hills involves a temperature that exceeds 91.7° F (CEC 2020).

Historically (between 1950 and 2005), Rolling Hills experienced an average four extreme heat days per year, typically occurring between April and October. As a result of rising average temperatures and climate change as discussed above, the city is projected to experience between 8 and 14 extreme heat days annually from 2030 to 2099 under medium and high emissions projections (CEC

[5] Chart shows annual average maximum temperature for Rolling Hills (Grid Cell 33.78125, -118.34375) under RCP 8.5 (emissions continue to rise strongly through 2050 and plateau around 2100)

2020). As shown in Figure 9, the number of extreme heat days each year is variable, but overall they are increasing from historic averages and would continue to increase through the century.

Figure 9 Number of Extreme Heat Days by Year in Rolling Hills[6]



Extreme heat waves are defined as four or more consecutive extreme heat days. These events have been historically infrequent in Rolling Hills, with the historical average being 0.3 heat waves annually. The city is expected to experience a minor increase in heat wave frequency as the climate changes. Between 2030 and 2099, the city is projected to experience between 0.4 and 1.1 heat waves per year (CEC 2020).

Drought

Droughts are somewhat frequent in California, and currently approximately 42 percent of California's population are in a drought, or in an abnormally dry area (NIDIS 2020). Changes in weather patterns resulting in increases in global average temperatures are already causing decreases in snowpack, which provides as much as a third of California's water supply (DWR 2019). According to the U.S. Drought Monitor, Los Angeles County and Rolling Hills are not currently experiencing drought conditions based on this mapping (National Drought Mitigation Center 2020). Southern California is not currently considered to be in a drought condition, while other parts of the State (northern California and the Sierra Nevada mountain range) are experiencing moderate drought conditions due to lower than average precipitation.

The projected changes in annual precipitation for Rolling Hills are shown in Table 4. Under both the medium and high GHG emissions scenarios, Rolling Hills is not expected to experience substantial changes in average precipitation. However, the city would experience increased variability in precipitation. The city's minimum annual precipitation would decrease while the maximum annual precipitation would increase under both emissions scenarios.

[6] Chart shows the number of days in a year when daily maximum temperature is above the extreme hear threshold of 91.7° F for Rolling Hills (Grid Cell 33.78125, -118.34375) under RCP 8.5

Table 4 Changes in Annual Average Precipitation

Scenario	Annual Precipitation		
	Minimum (inches)	Average (inches)	Maximum (inches)
Historical Average (1950-2005)	6.7	19.2	37.0
Medium Emissions Scenario (2030-2099)	6.0	21.3	48.2
High Emissions Scenario (2030-2099)	4.8	22.2	57.0

Source: CEC 2020

While overall precipitation levels are expected to change substantially in the city, a drought may occur when conditions in areas where water sources are located experience drought conditions, even though the local region does not. Rolling Hills obtains its water from the Palos Verdes District of the California Water Service. Water supply from the District to this area is purchased from the Metropolitan Water District of Southern California (MWD), which imports its water from the Colorado River and State Water Project from northern California.

Recent research suggests that extended drought occurrence could become more pervasive in future decades (CEC 2020). An extended drought scenario is predicted for all of California from 2051 to 2070 under a climate model using business as usual conditions. The extended drought scenario is based on the average annual precipitation over 20 years. This average value equates to 78 percent of the historic median annual precipitation averaged for the North Coast and Sierra California Climate Tracker regions. Overall precipitation levels in the city are not expected to be significantly impacted. However, variability in precipitation and drought conditions in other areas of the state could impact water supply.

Wildfire

Wildfire hazards to the city are widespread and discussed above under Hazards of Concern. Wildfires in the city are influenced by a range of factors including droughts, severe winds, wildfire fuel (i.e. dry vegetation), and previous wildfire suppression activity. Climate change is expected to exacerbate wildfire risk by creating hotter and drier landscapes, as discussed above under Extreme Heat, which are more susceptible to burning.

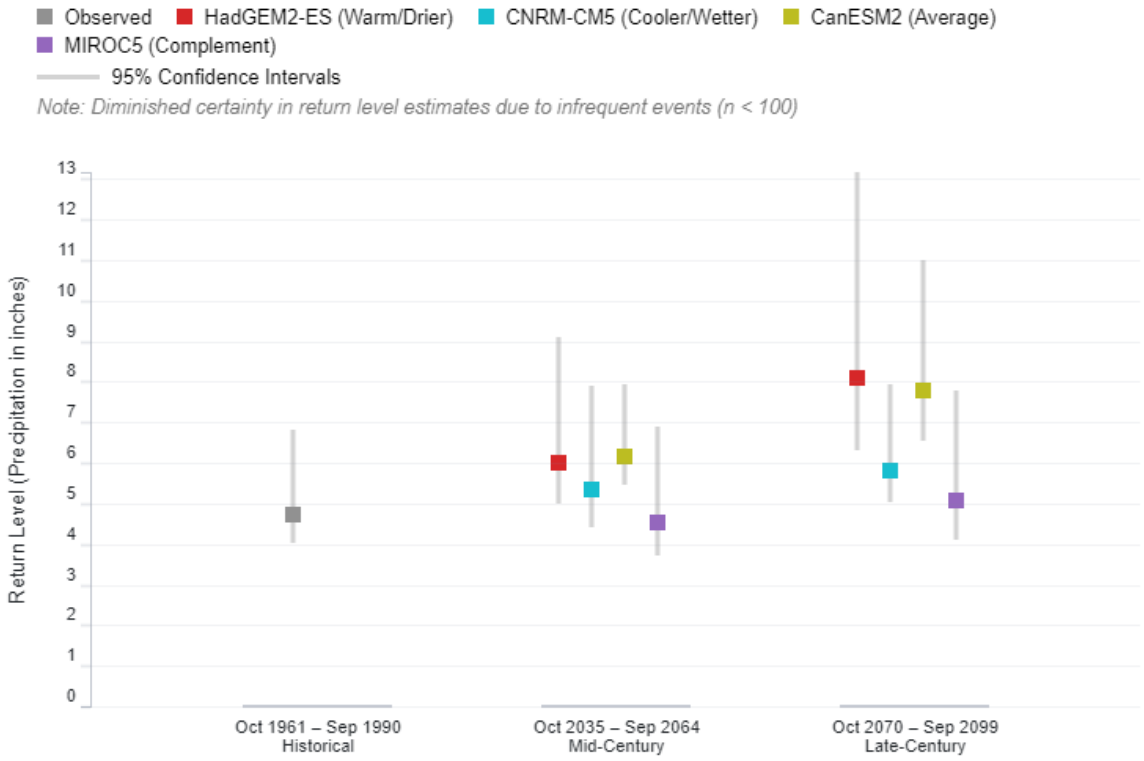
Cal-Adapt provides projections for annual mean hectares burned. This projection only accounts for areas that could experience wildfire events. Los Angeles County wildfire occurrence is anticipated to increase under all emissions and population scenarios from historic averages (CEC 2020). In 2020 alone, California has experienced six of the 20 largest fires in modern history and as of the date of this report, over three million acres of land have burned. These fires arose during extreme fire weather conditions and record-breaking heat waves across California. The observed frequency of autumn days with extreme fire weather, which are associated with extreme autumn wildfires, has more than doubled in California since the early 1980s (Goss et al. 2020). Due to the increases in factors that contribute to wildfires (variability in precipitation, hotter and dryer landscapes) and because the city is in a VHFZSZ, it is expected to see an increase in wildfire hazards due to climate change.

Storms and Extreme Weather

A warming climate is likely to influence the frequency and intensity of storms. Both increased temperatures and altered precipitation patterns can lead to altered seasons and intense rainstorms in Rolling Hills. As depicted in Figure 10, there is a high degree of variability in these extreme

precipitation event projections, with some models projecting little to no change while others project increased intensity (CEC 2020) These projections further vary depending on the return period[7] selected. Increasing intensity of rainstorms could result in more flooding, which could adversely affect human safety in Rolling Hills. During years of intense levels of precipitation and storms, the city could also see an increase in the number of landslides or make landslides greater than usual. Due to the number of landslide hazard zones in the city, as shown in 2, Rolling Hills may see an increase in landslides due to changes in precipitation from climate change.

Figure 10 Changes in Intensity of Extreme Precipitation Events in Rolling Hills[8]



Community Sensitivity

As climate change occurs, communities will be affected to varying degrees depending on the exposure levels as well as how sensitive the communities are to impacts. Virtually all people and assets in a community will be affected by climate change in some way. However, it is not usually feasible to assess the vulnerability of every population group or every asset in the community. The sensitivity of a community depends on the aspects of the community (i.e., specific populations and assets) most affected by the identified exposures, and how prevalent they are in the community.

As described in the Exposure section above, the most likely primary impacts of climate change that Rolling Hills may experience include extreme heat, increases in wildfire risk and prevalence, and drought conditions affecting water supply. This section of the Vulnerability Analysis identifies the

[7] Average time between extreme events (e.g., "1 in 100-year event")

[8] Chart shows estimated intensity (*Return Level*) of Extreme Precipitation events which are exceeded on average once every 20 years (*Return Period*) for Rolling Hills (Grid Cell 33.78125, -118.34375) under RCP 8.5 emissions scenario. Extreme precipitation events are described as days during a water year (Oct-Sept) with 2-day rainfall totals above an extreme threshold of 1.02 inches.

sensitive areas of the Rolling Hills community from the demographic and community facility information in the Introduction section above and is based on the following categories:

- Populations
- Infrastructure
- Buildings and Facilities
- Services

Populations

The vulnerability assessment considers the following population groups that may be disproportionally harmed by the impacts of climate change in Rolling Hills.

Children: Approximately 6.6 percent of the total population in Rolling Hills are ten years old or younger.

Persons in poverty: This is identified for people living in households with an income below the poverty limit, which is $26,200 for a household of four people. There are approximately 26 people in Rolling Hills who live in poverty, or approximately 1.6 percent of the total population for whom poverty status can be determined.

Persons with chronic health conditions: These are people who have a long-term or permanent health condition that can create regular challenges in their day-to-day lives. These health problems include obesity, cancer, heart disease, and arthritis. In addition, those with any kind of disability, including mobility challenges, hearing, or vision impairments, behavioral disabilities, and challenges living independently or taking care of themselves. Approximately 11.5 percent of the population have identified having a disability.

Renters: These are people who live in homes that they (or the head of their household) do not own. Approximately 24 housing units, or 4 percent of the housing units in Rolling Hills, are renter-occupied.

Older adults: These are persons 65 years or older are more at risk for climate change impacts, especially those living alone. 28 percent of the population of Rolling Hills are over 65 years, and 15 percent of those over 65 years live alone.

Limited English proficiency: Approximately three percent of households have identified being limited English-speaking. Of those, a majority spoke Asian and Pacific Island languages and Spanish.

Infrastructure

The vulnerability assessment considers the following infrastructure in the city that was identified as bring sensitive to climate change impacts.

Access Roads: These roadways are one of a few, or the only, ways in and out of some communities or neighborhoods. The single or limited number of entry and exit points does not make the road itself more vulnerable than other roads, but loss of these roadways can effectively cut off large numbers of people from other areas in the Palos Verdes Peninsula and the rest of Los Angeles County. Portuguese Bend Road and Crest Road are the primary access roads into and out of the city.

Bridle Trails: Throughout the community are over 25 miles of trails available to city residents and non-city residents who obtain permits. The trails are maintained by the Rolling Hills Community Association and located primarily in canyon areas.

Electrical Substations: Electrical substations are facilities that convert electricity from one voltage to another, making it suitable for long-distance transmission or for use by homes, businesses, and other electrical customers. There are no electrical substations located within city limits, but three are located near the city in Rancho Palos Verdes and owned/operated by Southern California Edison.

Electrical Utility Lines: These lines transmit and deliver electricity from Southern California Edison to the city. The city has both underground and overhead electric utility lines.

Natural Gas Transmission Pipelines: Natural gas pipelines carry large volumes of natural gas between communities. There are no transmissions lines in the city. One transmission line ends at the intersection of Rolling Hills Road and Palos Verdes Drive, adjacent to city limits.

Water Reservoirs and System: The system that stores and supplies drinking water for residents. Palos Verdes Water District of the California Water Service supplies water to Rolling Hills. There are two California Water Service water reservoirs within the city limits.

Building and Facilities

Residential Structures: Residential structures in Rolling Hills consist of single-family dwellings and are the main type of building in the city.

Community Facilities and Government Buildings: Community and government facilities are public properties and are important to the residents as well as the operation of the city. Rolling Hills is a private community. Therefore, community and government facilities are available only to its residents, which are the Rolling Hills Community Association and City Hall.

Community Parks: Storm Hill is an open space area owned by the City which is utilized for equestrian purposes. The City also has two equestrian rings and tennis courts.

Schools: Rancho Del Mar High School is the only school in the city

Public Safety Facilities: Public safety facilities include sheriff and fire buildings. Los Angeles County Fire Station 56 is located within the city. The Lomita Station of the Los Angeles County Sheriff serves the city but is not located within the city limits.

Services

Public Safety Response: Public safety services are provided by law enforcement and fire agencies. These agencies include the Los Angeles County Sheriff and Fire Departments.

Water Services: These services involve treating and transporting water to be used by customers and transporting and treating wastewater so it can be safely released into the environment. California Water Service provides drinking water to the city.

Energy delivery: Energy services in Rolling Hills include electricity and natural gas delivered through utility lines from Southern California Edison and Southern California Gas Company.

Potential Impacts

Impact vulnerability is the nature and degree to which the community is affected by a given stressor, change, or disturbance. As climate change continues to progress, increased stress to vulnerable community populations, infrastructure, building and facilities, and services are expected. As described in the Exposure section above, the most likely primary impacts of climate change

Rolling Hills may experience include extreme heat, wildfire, and drought conditions impacting water supply. The vulnerability of Rolling Hills to the primary exposures of climate change is discussed below. The vulnerability scores discussed in the Vulnerability Scoring section are based on the potential impact analysis below. Each of the vulnerable areas in the city were given a low, medium, or high vulnerability to the potential impacts, based off the descriptions in the Vulnerability Scoring section.

Temperature and Extreme Heat

As describe in the Exposure section above, Rolling Hills may experience a variety of impacts from climate change, which include an increase of average annual maximum temperature between 1.8°F and 6.6°F by the end of the century (CEC 2020) This increase in temperature may result in changes in seasonal patterns, an increase in heat waves, drought, and potentially increased storm frequency and intensity. Rolling Hills is expected to experience between 8 and 14 extreme heat days annually. Overall quality of life in the city would be impacted during extreme heat events as outdoor activities would be limited and overall comfort reduced.

The potential direct and indirect impacts to community populations, infrastructure, building and facilities, and services are described below.

Populations

The vulnerable populations discussed above that are most at risk to extreme heat impacts from climate change are older adults, individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses, children, and those who are economically disadvantaged.

The primary vulnerable population to temperature increases and extreme heat in Rolling Hills is older adults, as 28 percent of the city's population is over 65 years. Older adults do not adjust as well as young people to sudden changes in temperature and are more likely to have medical conditions that can worsen with extreme heat (CDC 2017a). Older adults who are living along are even more at risk as the actions necessary to mitigation extreme heat are more difficult alone. Getting water, changing clothes, showering, or turning on the air conditioner may be more difficult for older adults with physical disabilities and do not have a living partner to assist them. Children are also at risk to extreme heat impacts, especially those under the age of four, due to their less-developed physiology, immune system, and dependence on others (CDC 2019).

Extreme heat can be highly dangerous to persons with chronic health conditions, because very high temperatures can exacerbate diabetes, cardiovascular conditions, respiratory ailments, and other diseases. Some of these people have weakened immune systems which can make them more likely to contract illnesses and vulnerable to human health hazards. In addition, they may be taking medications that make the effects of extreme heat worse (CDC 2017b).

While there are not many households in poverty in the city, those who are have limited financial resources to upgrade their homes and use air conditioning to better resist extreme heat.

Each of the vulnerable populations has a high potential impact from extreme heat.

Infrastructure

Extreme heat and temperature increase due to climate change would not directly impact infrastructure in Rolling Hills. Indirect impacts on electrical substations and utility lines could occur from increased use of the system from running air conditioners, leading to power outages in the

city. In addition, indirect impacts to the water system through increased evaporation or water use could occur. These infrastructure facilities would have a medium potential impact from extreme heat.

Building and Facilities

Extreme heat and temperature increase due to climate change

would not directly affect buildings or facilities in Rolling Hills. Extreme heat and temperature increases could impact the ability for residents to enjoy community park facilities. In addition, extreme heat could create wildfire conditions which could indirectly impact all buildings and facilities within the city. Overall, there is a low potential impact from extreme heat to City buildings and facilities.

Services

The important services discussed above that are most at risk to extreme heat impacts from climate change are water services and energy delivery.

High temperatures would contribute to a reduced water supply. For instance, higher temperatures will melt the Sierra snowpack earlier and drive the snowline higher. In addition to a reduction in precipitation falling as snow, higher temperatures would result in less snowpack to supply water to California users (CNRA 2009). Increased temperatures could therefore result in decreased potable water supply for the city which relies on imported water from the State Water Project and Colorado River water (Cal Water 2016). Therefore, there is a medium potential impact for high temperatures and drought on the city.

Long periods of intense heat may result in increased use of electricity for home cooling purposes that could tax the overall electrical system and result in electricity restrictions or blackouts. During extreme heat events in August 2020, California had its first rolling blackouts since 2001. Therefore, the city will experience greater potential for power outages due to climate change and has a medium potential impact.

Storms/Extreme Weather and Drought

As mentioned in the Exposure section above, the storm and extreme weather projections for Rolling Hills show variability, with some models projecting little to no change while others project increased intensity. This could result in impacts to community populations, infrastructure, building and facilities, and services, particularly related to temporary flooding and landslides which can be triggered from intense rainfall events. The city currently has a less than 0.2 percent annual chance to be inundated by flood waters as a result of a storm event (FEMA 2008). Increases in intense precipitation could result in slope failures in landslide prone areas shown in Figure 2, including the existing Flying Triangle Landslide area.

As discussed in the Exposure section above, Rolling Hills is not expected to experience substantial changes in average precipitation. However, the city receives its water from the Colorado River and State Water Project from northern California, and extended drought scenario is predicted for these areas, which equates to 78 percent of the historic median annual precipitation. Therefore, areas that supply water to Rolling Hills and other jurisdictions are expected to see a 22 percent reduction of their water supply, which could reduce the amount of potable water available for delivery to the city.

Populations

The city's older adults and those with chronic health conditions are the populations in Rolling Hills that are more at risk of injury and or death resulting from minor floods or fallen trees created by more intense storms induced by climate change. Indirect impacts to these populations from impacts to the transportation system could include reduced access to emergency response and health centers for those who need consistent medical care. There is a medium potential for impacts to these vulnerable populations.

Infrastructure

Critical infrastructure most at risk in Rolling Hills to minor flooding impacts and landslides from increased storms would be access roads, bridle trails, electrical utility lines, and water systems. Because Portuguese Bend Road and Crest Road are critical for access to and evacuation from the city, any damage or closure can effectively isolate areas of the city, potentially creating severe health and safety risks. Bridle trails are predominantly located in canyon areas, which would be more susceptible to flooding and landslides. Landslides could impact utilities, as seen in the existing Flying Triangle Landslide area, which has moved utility lines above ground in certain areas due to the continuous movement of the earth in this area. Due to the limited accessibility of the city, there is a medium potential impact for access roads and bridle trails and a low potential impact for the remaining vulnerable infrastructure.

Building and Facilities

Buildings and facilities most at risk from impacts of more intense storms would be residential structures and community parks. The proper functioning residential septic systems could be impacted by more intense rainfall and minor flooding. In addition, landslides could be triggered as indirect impacts from more intense storms and rainfall. Residential structures located in landslide hazard areas shown in Figure 2 could be impacted. In addition, the Storm Hill open space area is an important facility in the city and is also located in a landslide area. Due to the variability in weather projections, there is a low potential impact for buildings and facilities.

Services

Increased storm intensity and drought conditions from climate change could impact public safety response, energy delivery and water services in the city. Emergency response systems could be impacted from flooding or landslides within or outside of city limits, which could restrict the ability for emergency response to access the city and impact response times.

More intense storms could adversely affect electricity delivery from Southern California Edison from power outages caused by downed electrical utility lines from wind of landslide events. In addition, water service from the California Water Service Palos Verdes District could be affected by increased drought conditions throughout the state. There is a medium potential impact for buildings and facilities.

Wildfire

Wildfires in Los Angeles County are projected to increase under all emissions and population scenarios. As discussed in the Exposure section above, wildfire hazards to the city are widespread and wildfire conditions are expected to be exacerbated by a range of factors including droughts,

more severe winds, wildfire fuel (i.e., dry vegetation), and hotter and drier landscapes from increased temperatures and extreme heat.

Populations

The vulnerable populations discussed above that are most at risk to increases in wildfire from climate change are older adults, persons in poverty, and persons with chronic health conditions. Older adults are almost three times more likely to die in a fire than the overall population (USFA 2017), and typically have increased mobility issues or mental health. Therefore, older adults, especially those in the city living alone, have more difficulties evacuating to safe areas when there is a need. Those in Rolling Hills with limited financial resources are more unlikely to retrofit their homes to better resist climate-related hazards such as wildfires.

In addition to direct impacts, indirect impacts such as poor air quality also creates public health hazards to the city. Recent California wildfires in August and September 2020 had areas of California recording the worst air quality in the world and highlighted the hazards of secondary impacts from wildfires, which could impact the city from fires throughout the State. Older adults and individuals with chronic health conditions are likely to be impacted most by these secondary impacts. Also, those with limited finances or without air conditioning would be impacted by secondary smoke impacts that occur during local and regional wildfires. There is a high potential for wildfire impacts on the vulnerable populations.

Infrastructure

All city infrastructure is located in a VHFHSZ. The critical infrastructure most at risk to increased wildfire impacts would be access roads, bridle trails, above ground electrical utility lines, and water systems. Portuguese Bend Road and Crest Road are critical for access to and evacuation from many areas of the city. Wildfires may not significantly damage the infrastructure, but they could result in closure or the inability to travel on them during wildfire events, which can isolate areas of the city and create severe health and safety risks. There is a high potential for impacts to access roads from wildfires.

Wildfires are unlikely to substantially damage trails directly, but they can force widespread trail closures which are an important asset to the community. Above ground electrical lines are also at risk from wildfires and could impact electricity services to residents in Rolling Hills. Water systems could be directly affected by wildfires in addition to indirect impacts from water use from firefighting activities and peak load water supply in remote portions of the city. There is a medium potential for impact to these infrastructures.

Building and Facilities

As discussed under Hazards of Concern section, all of Rolling Hills is designated a VHFHSZ. Therefore, all buildings and facilities within the city are at risk of increased wildfires caused by climate change. The greatest potential impact of life and well-being would be to residential structures, which are the primary structures in the city. In addition, impacts to Rolling Hills Community Association and City Hall structures would impact community functions and government services. There is a high potential for impact to buildings and facilities from wildfire.

Services

Energy delivery, specifically electricity delivery, could be impacted from increased wildfires. Direct impacts to Southern California Edison electricity transmission infrastructure could impact power in the city. In addition, utility companies have begun shutting off power to areas to avoid wildfires during times when weather creates high wildfire risk. In addition, public safety services could be strained during wildfire events, which are expected to increase. There is a medium potential for impacts to services in the city from wildfire.

Adaptive Capacity

Adaptive capacity is the current ability to cope with climate change impacts to community populations and assets (Cal OES 2020). Specifically, adaptative capacity is the ability to mitigate the potential impacts and damages or take advantage of the opportunities from climate change. Many communities have adaptive capacity in the form of policies, plans, programs, or institutions. Rolling Hills has actively taken steps to increase the city's adaptive capacity, which include preparing a community wildfire protection plan, hazard mitigation plan, undergrounding utility lines, and adopting strict new building standards. Table 5 lists various guiding documents, projects, plans, and policies that have an underlying emphasis on adaptive capacity in the city.

Table 5 Rolling Hills Existing Adaptive Capacity

Project, Policy, or Plan	Year Established	Climate Change Impact
City of Rolling Hill Community Wildfire Protection Plan	2020	Wildfire
City of Rolling Hills Safety Element	2003	Wildfire, Storms
California Water Service Palos Verdes Water District Urban Water Management Plan	2016	Drought
Utility Undergrounding Requirement	n/a	Wildfire
Fire Prevention Power Line Undergrounding	2020	Wildfire
RHMC Chapter 8.30: Fire Fuel Abatement	n/a	Wildfire
Hazard Mitigation Plan	2019	Wildfire, Drought, Storm-induced Landslides
Emergency Operations Plan	2020	Wildfire, Storm, Extreme Heat
Emergency Notification and Notify Me	n/a	Wildfire, Storms
VHFHSZ Building Requirements	n/a	Wildfire
Rolling Hills Municipal Code Requirements for lot slope and lot stability	n/a	Storm-Induced Landslides

Rolling Hills has a number of plans and policies specific to wildfire hazards. The city's recently adopted the Community Wildfire Protection Plan that includes fire mitigation strategies and evacuations strategies specific for the city. In addition, the Hazard Mitigation Plan provides an analysis of historical hazards, a local hazard assessment, hazard impacts on the community, and recommended mitigation strategies. The City requires the undergrounding of utility lines with specific home upgrades and has a reimbursement program for utility pole replacement. In addition, building code requirements for development within VHFHSZ, such as Class A roofing, would help reduce wildfire impacts to structures in the city.

The Rolling Hills Building and Zoning Codes include controls on development on steep slopes and canyon bottoms. In addition, development requires proof of stability of the property through geotechnical reports and only a percentage of each lot can be disturbed.

The Palos Verdes Water District's Urban Water Management Plan (UWMP) provides water supply and demand projections and includes a climate change analysis. The 2015 UWMP projected that water supply reductions to the District due to climate change would be small for through the end of the century. In addition, the UWMP includes a water shortage contingency plan and demand reduction measures in the event water supply to the District is impacts from drought due to climate change.

In addition, the city's population has a high degree of adaptive capacity due to the high levels of home ownership, low poverty levels, and high average income levels. These characteristics improve resident's ability to upgrade their homes and come back from potential impacts to their property from wildfire and extreme storm events.

Vulnerability Scoring

Vulnerability scores are based on the combination of potential impacts from climate hazards and adaptive capacity in order to identify the climate vulnerabilities in the city to address with additional adaptation strategies. A vulnerability score was determined for each sensitivity area based on the potential impacts and adaptive capacity from climate change in the city. Vulnerability was accessed on a scale from 1 to 5:

- V-1: Minimal Vulnerability
- V-2: Low Vulnerability
- V-3: Moderate Vulnerability
- V-4: High
- V-5: Severe

Cal OES recommended the following scoring rubric to determine the vulnerability score for the potential impacts and adaptive capacity.

- **Low Potential Impact**: Impact is unlikely based on projected exposure; would result in minor consequences to public health, safety, and/or other metrics of concern
- **Medium Potential Impact**: Impact is somewhat likely based on projected exposure; would result in some consequences to public health, safety, and/or other metrics of concern
- **High Potential Impact**: Impact is highly likely based on projected exposure; would result in substantial consequences to public health, safety, and/or other metrics of concern
- **Low Adaptive Capacity**: The population or asset lacks capacity to manage climate impact; major changes would be required
- **Medium Adaptive Capacity**: The population or asset has some capacity to manage climate impact; some changes would be required
- **High Adaptive Capacity**: The population or asset has high capacity to manage climate impact; minimal to no changes are required

Table 6 shows how the final vulnerability score was determined. To summarize, potential impacts from climate change that are highly likely to occur in the city based on projected exposure would

create a high vulnerability score. However, if the city has a high adaptive capacity to manage the impact, then the overall vulnerability score would be reduced.

Table 6 Vulnerability Score Matrix

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

The vulnerability scoring for the identified population and assets for each climate impact is included below in Table 7 and based on Cal OES California Adaptation Planning Guide. For those populations and assets that are not anticipated to be impacted directly or indirectly from the identified climate impacts, no vulnerabilty score or color is provided. For example, drought impacts on children were determined to not be a threat in Rolling Hills.

For the purposes of this vulnerability assessment, a score of V-4 or V-5 is considered significant. Populations and assets that score at least a V-4 for one or more exposures are considered substantially vulnerable. As shown in Table 7, the potential impacts from climate change the city's population and assets are most vulnerable to are wildfire, extreme heat, and landslides. Vulnerable populations such as older adults, residents with chronic health conditions, and those with financial trouble are most at risk to extreme heat and wildfire impacts and are substantially vulnerable to climate change impacts in the city. Access roads and residential structures are also the most vulnerable to wildfire and landslide impacts from climate change. Overall, climate change impacts on wildfire are the greatest potential impact to the city. While the City has adopted a significant number of adaptation strategies related to wildfire impacts, because they were recently adopted and some of the strategies were included as recommendations, it will be important to determine and monitor if implementation is occurring and which recommendations should be included in the Safety Element update.

This vulnerability assessment and the results in Table 7 will be used to identify specific policies and implementable strategies for adapting to climate change in the Safety Element, thus making the Rolling Hills community more resilient.

Table 7 Vulnerability Assessment Results

Community Sensitivity	Storms/Extreme Weather	Extreme Heat	Wildfire	Landslides
Population				
Children		V-3	V-2	V-2
Persons with Chronic Health Conditions	V-2	V-4	V-4	V-2
Persons in Poverty	V-2	V-3	V-4	V-2
Renters		V-3	V-2	V-2
Older Adults	V-2	V-4	V-4	V-2
Limited English Speaking			V-2	V-2
Infrastructure				
Access Roads	V-2		V-4	V-3
Bridle Trails	V-2		V-3	V-2
Electrical Substations	V-1	V-2	V-3	
Electrical Utility Lines	V-2	V-1	V-3	V-2
Natural Gas Transmission Pipelines			V-2	V-2
Water Reservoirs and Systems	V-1	V-2	V-3	V-3
Buildings and Facilities				
Residential Structures	V-1		V-5	V-3
Community Facilities and Government Buildings	V-1		V-4	V-1
Community Parks	V-1	V-1	V-3	V-3
Schools	V-1		V-3	V-1
Public Safety Facilities	V-1		V-3	V-1

Community Sensitivity	Storms/Extreme Weather	Extreme Heat	Wildfire	Landslides
Services				
Public Safety Response	V-2		V-3	V-1
Water Services	V-2	V-2	V-3	V-2
Energy Delivery	V-2	V-3	V-4	V-2

Notes: Drought was not included in this table because the city's vulnerability to drought is primarily low. White boxes indicate very low to now vulnerability.

Summary of Issues and Opportunities

Existing hazards of concern in the city that should be a major focus of the Safety Element update include landslide and wildfire hazards. In addition, emergency response and evacuation should be a focus due to the city's accessibility issues. Climate change is expected to increase potential hazards the city experiences. From the vulnerability analysis, the city is most vulnerable to wildfire impacts, extreme heat, and landslides impacts from climate change.

Hazards of Concern and Community Sensitivity

While there are a number of hazards that could impacts the city, the following are hazards of concern that pose the greatest challenge to the city.

Wildfire

The greatest hazard of concern for the city is wildfire as the entire city limits are within a VHFHSZ and the city contains many remote areas and limited evacuation routes. Some existing residential and accessory structures are not built to current standards that apply to VHFHSZ and as a result many of these structures may require mitigation and retrofit to reduce this potential threat. The area's most vulnerable to wildfire impacts include older adults, persons with chronic health conditions, residential structures, government and community buildings, and access roads.

Landslides

Landslides are also a major concern for the city, whether they are earthquake induced, induced from high precipitation events, or occur due to the underlying soil conditions. Existing landslides are impacting the southern portion of the city. Climate change has the potential to create more landslide events if Rolling Hills experiences more intense storms and precipitation events. The area's most vulnerable to landslide impacts include access roads, residential structures, and community parks.

Extreme Heat

The city is expected to see increases in the number and length of extreme heat days and events due to climate change, which could impact vulnerable people in the city and lead to increased wildfire risks. The area's most vulnerable to extreme heat impacts from climate change include older adults, persons with chronic health conditions, and the energy system.

Opportunities

The need to further analyze evacuation routes and access is one of the most recent changes in Safety Element requirements. These new requirements focus on the identification of areas where routes are lacking or inadequate. A key opportunity for the Safety Element update is address specific evacuation needs.

The City has recently adopted a number of planning documents, such as the Hazard Mitigation Plan and Community Wildfire Protection Plan, that seek to reduce the risk of hazards in the city. Many of the strategies included in these documents are recommendations and are used for educational purposes. An opportunity for the Safety Element update would be to include the recommendations

as implementation tools for the Safety Element and to conduct outreach with the community to determine if community preparedness is occurring.

The California Legislature recently adopted Senate Bill 182 (SB 182) and is awaiting Governor approval. SB 182 would require the Safety Element to include a comprehensive retrofit strategy as necessary to reduce the risk of property loss and damage during wildfires. Additionally, in order to reduce development pressures in the VHFHSZ through the Regional Housing Needs Allocation process, SB 182 requires a lower proportion of state housing allocation to jurisdictions that meet specified conditions. The City should monitor and incorporate these elements as necessary.

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