

Chapter Three – Hazard Prevention

INTRODUCTION

The Hazard Prevention Chapter of the Sierra Madre General Plan contains four components: fire safety, flood/landslide, seismic safety (all part of the State-mandated safety element) and noise (State-mandated noise element.)

AB 2140 authorizes a city, county, or a city and county to adopt a federally specified local hazard mitigation plan along with its safety element update. The local hazard mitigation plan must be approved by FEMA and the Office of Emergency Services to qualify jurisdictions for federal financial assistance. The local hazard mitigation plan is available online at www.cityofsierramadre.com/lhmp.

The City adopted the Sierra Madre Hazard Mitigation Plan (HMP) on January 11, 2020. The Hazard Mitigation Plan includes assessment of risks from earthquakes, floods, wildfires, landslides, and windstorms and provides mitigation strategies. The General Plan incorporates information and policies from the Hazard Mitigation Plan, including policies that augment previously adopted policies, address climate change adaptation and resilience, and address multiple hazards, windstorms, and utility safety and protection.

SB 1000 states that revisions or adoption of two or more elements of a general plan on or after January 1, 2018 trigger a requirement to “adopt or review the Environmental Justice Element, or the environmental justice goals, policies, and objectives in other elements.” An Environmental Justice Element is intended to reduce health risks to disadvantaged communities (DACs), promote civil engagement, and prioritize the needs of these communities.

Per the California EPA CalEnviroScreen mapping tool, the City does not contain any disadvantaged communities.

Sustainable policies and goals are called out by a green leaf icon.



Section One: Fire Safety

OVERVIEW OF EXISTING CONDITIONS

Fire protection in Sierra Madre is provided by the Sierra Madre Fire Department. The Fire Department is comprised of 17 full-time personnel: 1 fire chief, 1 administrative aide, 3 fire captains, 3 engineers, and 9 firefighter paramedics. The fire station is located at 242 W. Sierra Madre Blvd., next to City Hall. The daily manning of the Department consists of 1 captain, 1 fire engineer, and 3 firefighter paramedics. Battalion Chief coverage, for larger incidents, is provided by a contract agreement for incident management by the City of Arcadia. The Department is divided into 5 divisions: Administration, Operations, Emergency Medical Services, Training, and Prevention.

The Sierra Madre Fire Department responds to over 1,000 calls per year, with about 70 percent of those calls related to emergency medical services. The response time for an emergency is 4-5 minutes from the time the call is received at the regional Dispatch Center. All calls are received at the Police Department Dispatch that then transfers the call to the Verdugo Fire Communication Center for appropriate action. In addition to station alerting, members of the Fire Department receive dispatch information and notifications of an emergency forwarded directly to their mobile devices.

The Fire Department participates in the State Master Mutual Aid Agreement and has a mutual aid agreement with the cities within Area C, a group of local communities from Burbank to Monrovia and as far south as Monterey Park. On July 1, 2020 the City of Sierra Madre Fire Department was accepted as a participating member for Unified Response in the Verdugo Fire system. The Verdugo Fire system is comprised of 13 fire departments that operate under a single automatic aid agreement. When an emergency call is received at the Verdugo dispatch center, the closest available fire apparatus responds to the incident, regardless of jurisdiction. In addition, Sierra Madre provides first response services for Los Angeles County Fire Department and the U.S. Forest Service in the hillside brush areas immediately north of Sierra Madre City limits.

The closest hospitals and medical facilities outside of the high fire risk areas include the Sierra Madre Medical Center, Arcadia Methodist Hospital, Children’s Hospital Los Angeles–Arcadia, and Huntington Memorial Hospital in Pasadena.

High Fire Severity Zone

While Sierra Madre’s location at the base (southern foothills) of the San Gabriel Mountains affords the City with stunning views and other natural amenities, it also presents a significant wildfire hazard to people and structures. The natural, undeveloped slopes of the hillside areas within the City support open coastal sage scrub and chaparral habitats that are susceptible to wildfires common to the San Gabriel Mountains. Additionally, development in the canyon areas is characterized by narrow roads with tree canopy coverage. These tree canopies provide opportunities for hillside wildfires to spread, creating a potential fire hazard for residents of Sierra Madre.

The State of California maps Fire Hazard Severity Zones (FHSZ) throughout the state. An FHSZ is a mapped area that designates zones (based on factors such as fuel, slope, and fire weather) with varying degrees of fire hazard (i.e., moderate, high, and very high). FHSZ maps evaluate wildfire hazards, which are physical conditions that create a likelihood that an area will burn over a 30- to 50-year period. The Zones also include FHSZ for State Responsibility Area lands and separate Very High Fire Hazard Severity Zones for Local Responsibility Area lands. Moderate, high, and very high FHSZs are found in areas where the State has financial responsibility for fire protection and prevention (SRA). Only very high FHSZs are found in Local Responsibility Areas (LRAs).

Figure 3-1 shows State Responsibility Areas. Very High Fire Hazard Severity Zones for the City are shown in Figure 3-2. Areas of the City included in the Very High Fire Hazard Severity Zone are located-north of Grand View Avenue.-

In 2019, two separate bills (AB 747 and SB 99) were signed into law that added new requirements for disclosing residential development without at least two points of ingress and egress and addressing the presence and adequacy of evacuation routes in the general plan safety element. SB 99 (2019) amended GC § 65302(g)

to require that, upon the next revision of the housing element on or after January 1, 2020, the safety element must be updated to include information identifying residential developments in hazard areas that do not have at least two emergency evacuation routes (i.e., points of ingress and egress). Figure 3-3 shows areas of the City with less than two points of access.

Figure 3-1 State Responsibility Areas

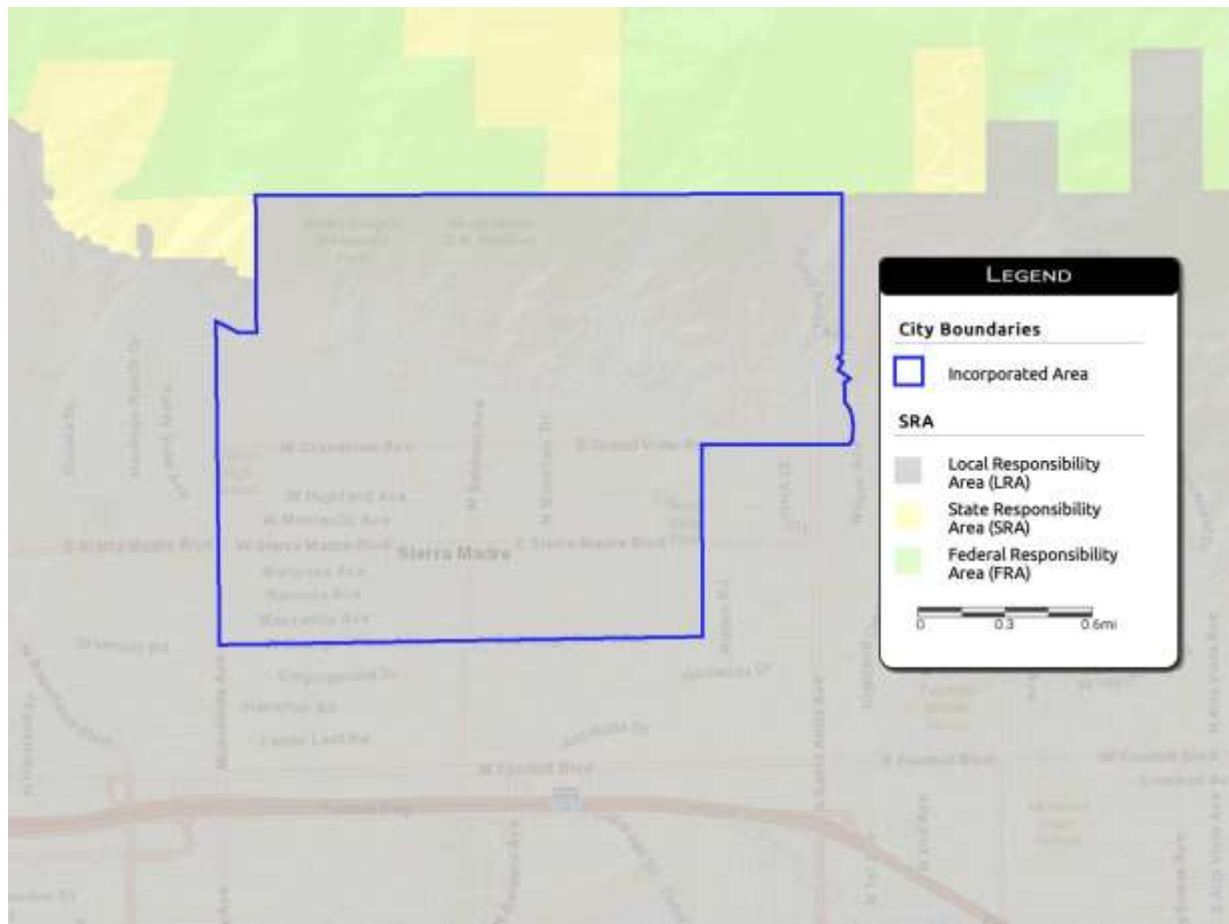


Figure 3-2 Very High Fire Hazard Severity Zone Map

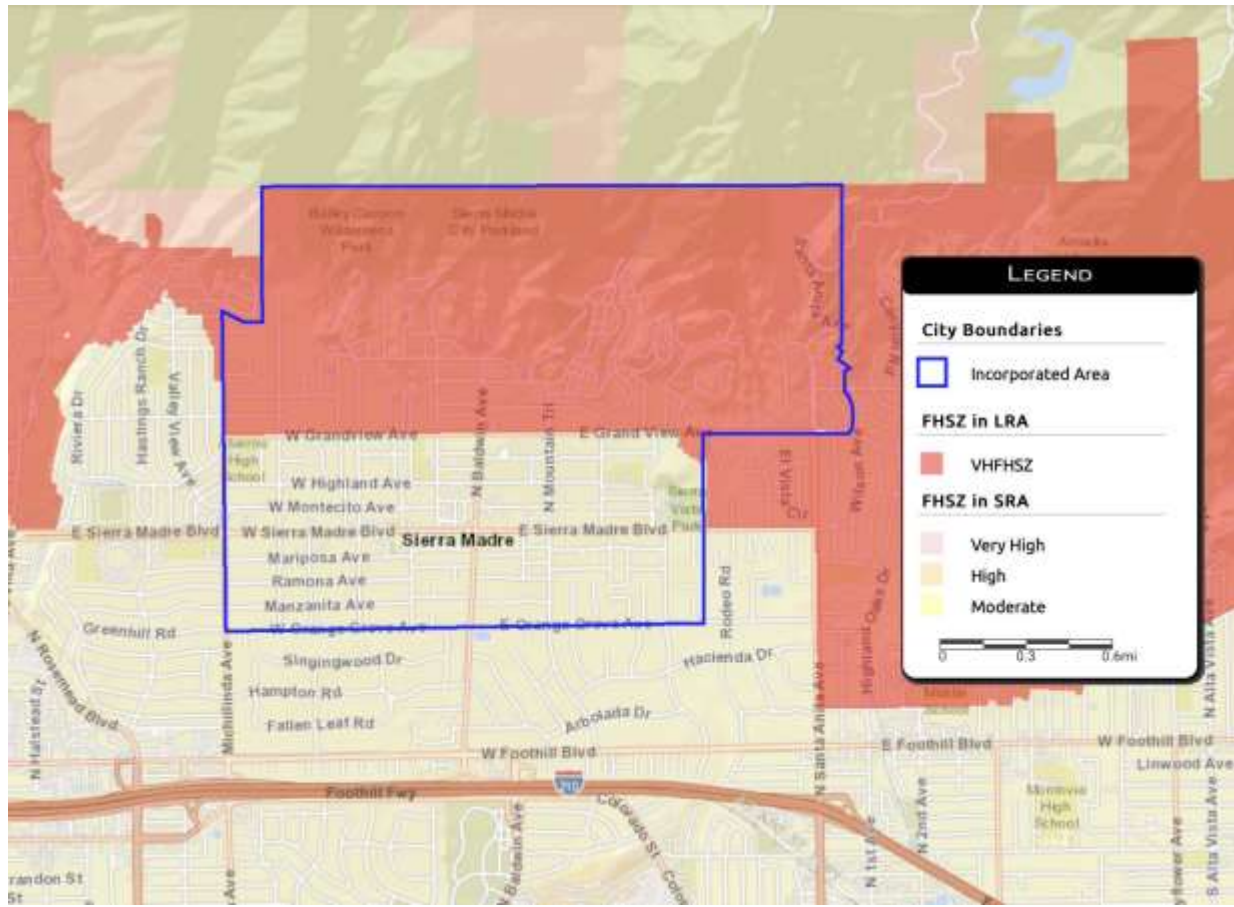


Figure 3-3 Residential Uses Having Less Than Two Points of Access



Large fires have been part of southern California for many years. As recently as Fall 2020, the Bobcat Fire created the need for evacuation orders and red flag parking restrictions in areas of the City. The fire was the second largest on record in Los Angeles County to date. Table 3-1 outlines the large historic fires in Los Angeles County in order of structures damaged.

Table 3-1 Large Historic Fires in Los Angeles County 1923-2015

	Fire Name	Date	County	Acres	Structures	Deaths
1	Bel Air	November 1961	Los Angeles	6,090	484	0
2	Topanga	November 1993	Los Angeles	18,000	323	3
3	Kanan	October 1978	Los Angeles	25,385	224	0
4	Kinneloa	October 1993	Los Angeles	5,485	196	1
5	Station Fire	August 2009	Los Angeles	144,743	91	2
6	Calmpitt	September 1970	Los Angeles	105,212	86	4

SUMMARY OF FIRE SAFETY GOALS

1. A high level of fire safety for the citizenry.
2. Proactive and preventative fire protection for existing and new development.
3. Continued participation in mutual aid with cities throughout California.

OBJECTIVES AND POLICIES

The City has established the following objectives and policies for fire safety in Sierra Madre. The implementation measures are contained in the Implementation Chapter at the end of the General Plan.



Objective Hz1: Providing adequate service levels of fire protection that meets the needs of Sierra Madre residents, businesses and visitors.


Policies:


- Hz1.1 Maintain a combination volunteer and paid fighting force.
- Hz1.2 Promote public education about fire safety at home, in the community, and in the work place.
- Hz1.3 Continue to coordinate the provision of fire services with all public safety service providers and monitor their adequacy and responsiveness to community needs.
- Hz1.4 Encourage, facilitate, and participate in, where appropriate, the establishment of methods of communication between the Fire Department and Sierra Madre community members to discuss and resolve issues of responsiveness and sensitivity.


Objective Hz2: Providing adequate fire protection necessary for existing and future development.


Policies:


- Hz2.1 Continue to require all existing and new development to install and maintain adequate smoke detection systems. 
- Hz2.2 Continue to require all new development to install automatic fire sprinkler systems.
- Hz2.3 Continue to require review of building plans by a Fire Captain.
- Hz2. 4 Consider water availability in terms of quantity and water pressure for safety purposes when considering the size and location of new residential construction. 

- Hz2.5 Assess the impacts of incremental increases in development density and related traffic congestion on fire hazards and emergency response time, and ensure through the development review process that new development will not result in a reduction of fire protection services below acceptable levels. 

- Hz2.6 Continue to require that new development provides adequate hydrants and show sufficient evidence that there is adequate water supply/fire flow and that it is available to accommodate the fire protection needs of new construction. The City will cooperate with the San Gabriel Valley Municipal Water District (SGVMWD) for infrastructure upgrades needed to maintain the integrity of water supply. 

- Hz2.7 Protect the wild land/urban interface by considering fire hazards when evaluating projects in the canyon areas. 

- Hz2.8 Develop vegetation management plans that manage chemise and chaparral to ensure adequate firebreaks, to provide adequate access for fire protection water systems, and access for firefighting. 

- Hz2.9 Maintain and update hillside development standards which include fire prevention design measures. 

- Hz2.10 Work with Public Works, the Police Department and residents to develop a solution to parking issues that affect Fire Department access in the canyon areas.

- Hz2.11 Enhance emergency services to increase the efficiency of wildfire response and recovery activities through purchase of a Type 5 Vehicle. (HMP WF-1)

- Hz 2.12 All new residential developments in hazard areas shall have at least two emergency evacuation routes (i.e., points of ingress and egress)

- Hz2.13 After any large fire, redevelopment shall be re-evaluated.
- Hz2.14 All new development in the VHFSZ will comply with the most current version of the California Building Codes and California Fire Code.
- Hz2.15 All new development shall meet or exceed 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) for SRAs and/or VHFHSZs.
- Hz2.16 The locations of all new essential public facilities shall be located outside of the VHFSZs, when feasible.

Objective Hz3: Continuing the City’s participation in mutual aid throughout California.

Policies:

- Hz3.1 Continue to cooperate with Area C Fire Departments for second and third alarm calls and continue with the State-wide Mutual Aid Agreements.
- Hz3.2 Work with Public Works staff of adjacent jurisdictions to ensure that roadways are adequate for fire equipment.

Objective Hz4: Addressing emergency operations and disaster preparedness as a priority.




Policies:

- Hz4.1 Update the Emergency Operations Plan annually.
- Hz4.2 Maintain a fully operational Emergency Operations Center.

- Hz4.3 Enlist participation from the community and City staff for emergency operations.
- Hz4.4 Provide emergency operations training and conduct test runs.
- Hz4.5 Review and upgrade emergency operations equipment such as 911 equipment, and the police dispatch system as needed to maintain modern levels of service.
- Hz4.6 Develop and utilize emergency public communication systems.
- Hz4.7 Regularly review City evacuation routes for capacity, safety, and viability under a range of emergency scenarios.

Objective Hz5: Limiting fire hazard through brush and weed abatement.

Policies:

- Hz5.1 Mandate annual brush removal from April to June. 
- Hz5.2 Work with community groups in presenting information and trainings regarding wildfire prevention and awareness. 
- Hz5.3 Promote voluntary efforts in tree trimming, and brush and weed abatement. 
- Hz5.4 Identify funds by way of a tree assessment district or “environment fund” or other source of funds to pay for vegetation trimming and removal of dead wood on public property and private properties where vegetation is creating a canopy over public rights-of-way.
- Hz5.5 Develop a Vegetation Management Program. (HMP WF-7)

Hz5.6 Existing non-conforming development shall be mitigated to contemporary fire safe standards and vegetation hazards.

Objective Hz5.a Limit risk of wildfire through public education and development planning.

Policies:

- Hz5.a.1 Enhance outreach and education programs (e.g. CAL FIRE, Vegetation Management) and including at-risk populations aimed at mitigating wildfire hazards. (HMP WF-4)
- Hz5.a.2 Maintain contemporary collection of maps relating to the fire hazard to help educate and assist builders and homeowners in mitigating against wildfire. (HMP WF-3)
- Hz5.a.3 The City will require all new development to incorporate fire-safe design by requiring property owners to submit plans showing ingress/egress, evacuation routes, emergency vehicles access, visible home addressing and signage and fuel modification/fire –retardant zones.
- Hz5.a.4 Develop safe development codes to use as standards for fire protection for new development in SRAs or VHFHSZs that meet or exceed the statewide minimums in the SRA Fire Safe Regulations.
- Hz5.a.5 The City shall require that all on-going maintenance of vegetation clearance on public and private roads shall be maintained.
- Hz5.a.6 Long-term maintenance of fire reduction projects, including but not limited to, a roadside fuel reduction plan, defensible space clearances (including fuel breaks) around structures, subdivision, and other development in the VHFSZ.

- Hz5.a.7 The City shall continue to require vegetation management plans for all new development projects in the VHFHSZ.
- Hz5.a.8 The City shall require new development projects in VHFHSZ to prepare fire protection plans.
- Hz5.a.9 The City shall continue to require all new development projects in VHFHSZ to be constructed based on CBC 7A standards.

Objective Hz5.b: Avoid construction of new development in natural open space areas in Very High Fire Hazard Severity Zones.

Policies:

- Hz5.b.1 Enhance outreach and education programs (e.g. CAL FIRE, Vegetation Management) aimed at mitigating wildfire hazards. (HMP WF-4)
- Hz5.b.2 Maintain contemporary collection of maps relating to the fire hazard to help educate and assist builders and homeowners in mitigating against wildfire. (HMP WF-3)

Section Two:

Flood/Landslide

OVERVIEW OF EXISTING CONDITIONS

Flooding

Flooding represents a potential hazard to population and buildings, and as such, it is a component of the State-mandated safety element. This section addresses the risks of flooding due to the City's natural terrain, vegetation, rainfall, runoff, and risks associated with flooding due to dam failure.

Flood Insurance Rate Maps (FIRM) are published by the Federal Emergency Management Agency (FEMA.) As part of the National Flood Insurance program, the maps delineate areas of special flood hazard. The 2008 FIRM for Sierra Madre designates the overwhelming majority of the City as Flood Zone X, defined as "Areas determined to be outside the 0.2% annual chance floodplain." A small segment of the community, centered along the Little Santa Anita Creek channel, is classified as Zone D, an "Area in which flood hazards are undetermined, but possible."

However, there are specific areas unmapped by FEMA within the City that are considered to be at special risk for flooding. All of these areas are against the foothills and are of significant risk of flooding and landslides, particularly after a brush fire. The canyon urban/wild land interface areas above the City are the most prone to major flooding. In the years immediately following a brush fire in the foothills, these areas can be an extreme hazard to persons and property during heavy rainfall events. Flood in these special risk areas can occur rapidly or slowly depending on the time transpired since the fire, the frequency of rainfall events, the duration of rainfall events, and the intensity of the precipitation. Special flood hazard areas located in the residential portion of the City are subject to minor flooding.

Flood hazards associated with stormwater runoff channeled from the mouths of canyons in the northern part of the City have generally been controlled by dams, debris basins, and flood control channels. There is one dam and a total of seven debris basins located within the City. Table 3-2 below lists the existing debris structures and dam in a west to east order.

Facility Name	Owned/Operated	Type	Capacity
Sunnyside Debris Basin	LA County Public Works	Earth	Fill .64 DDE
Bailey Canyon Debris Basin	LA County Public Works	Earth	Fill 1.60 DDE
Floral Debris Basin	Sierra Madre Public Works	Earth	Not available.
Auburn Debris Basin	LA County Public Works	Earth	Fill 1.12 DDE
Carter Debris Basin	LA County Public Works	Earth	Fill 1.06 DDE
Sierra Madre Dam	LA County Public Works	Concrete	Arch Dam 0.53 DDE
Sturtevant Debris Basin	LA County Public Works	Earth	Fill 0.85 DDE
Lannan Debris Basin	LA County Public Works	Earth	Fill 1.00 DDE

The acronym DDE in Table 3-2 indicates Design Debris Event, a term that Los Angeles County Department of Public Works uses to describe the maximum amount of debris a burned watershed could produce. As noted in Table 3-2, the Sunnyside, Floral, Sierra Madre Dam, and Sturtevant facilities do not have capacity to contain the amount of debris that their watersheds could produce. Therefore, residential areas below these facilities are potentially subject to post-fire debris flow damage.

While these debris facilities protect most of the large watersheds above Sierra Madre, some watershed areas remain in an unprotected condition. If burned in wildfires, these watersheds will produce debris during rainfall events that will flow unhindered into the community. The most notable of these is Stonehouse Canyon, a 67-acre watershed capable of producing over 20,000 cubic yards of debris. The watershed outlets onto Stonehouse Drive above its intersection with Grandview Avenue. Other uncontrolled watersheds that have been identified are listed in Table 3-3, again, west to east:

Table 3-3
Watershed Location Area Discharges
Unnamed canyon above Mater Dolorosa behind Retreat Center Main Building: 9 acres Mater Dolorosa private property
Hillside above the private extension of Auburn Avenue northeasterly of the north end of the private street: 6 Acres Private and public portions of Auburn Avenue
Unnamed canyon Parallel to and northwesterly from the private street section of Mt. Wilson Trail: 17 Acres across private property into Mt. Wilson Trail at East Mira Monte Avenue
Hillside above Skyland Drive northwesterly of 801 Skyland Drive: 19 Acres across private property into Skyland Drive Unnamed Canyon
Above Woodland Drive southwesterly of Sierra Madre Dam: 16 Acres across private property into the upper intersection of Woodland and Brookside Yucca Canyon* East end of Yucca Trail: 18 Acres Woodland Drive via Yucca Trail
* Los Angeles County Public Works has constructed debris structures in Yucca Canyon.

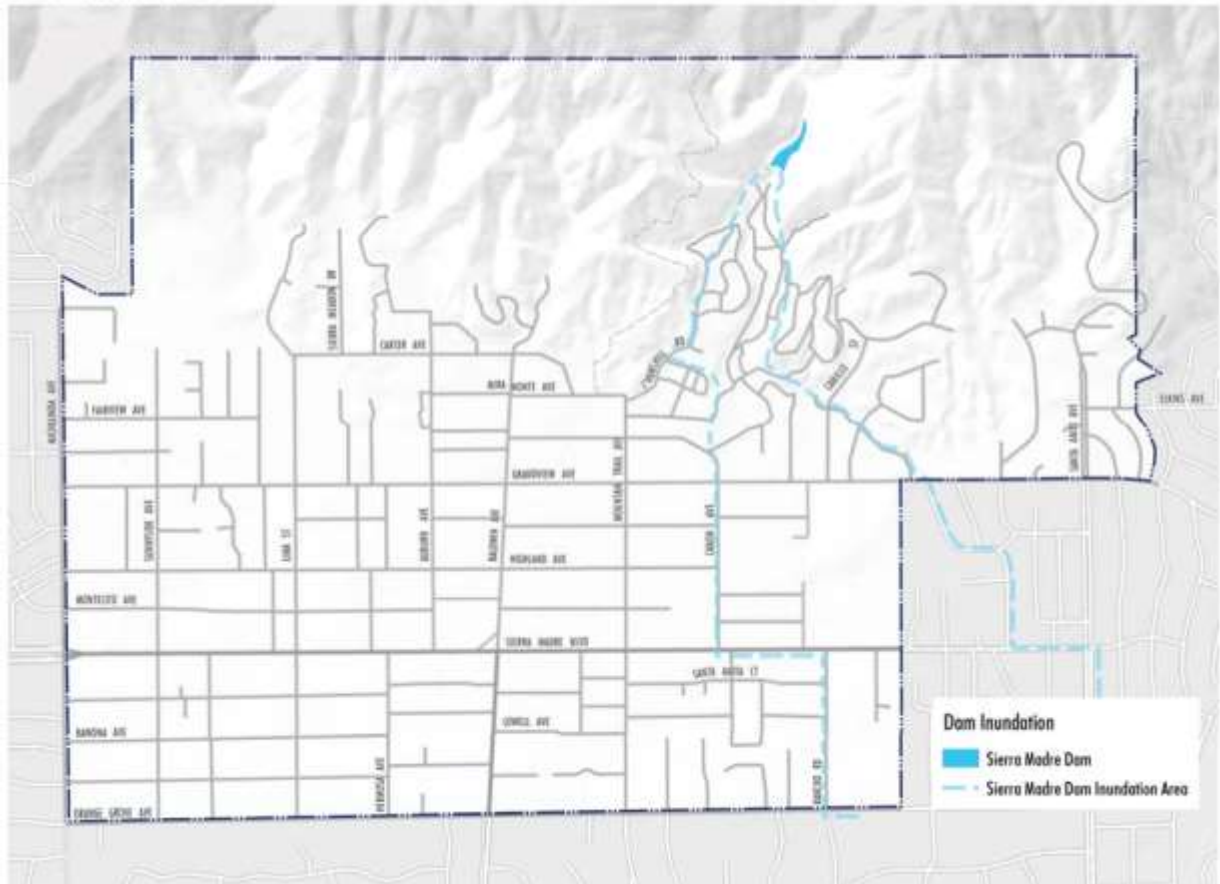
Flooding which occurs as a result of the structural failure of a dam is called dam inundation. Structural failure may be caused by seismic activity. Seismic activity may also cause dam inundation by the action of a seismically induced wave that overtops the dam without also causing dam failure. This action is referred to as a seiche. Landslides flowing into a reservoir are also a source of potential dam failure from overtopping.

The major dam which could have a significant impact on the City in the event of dam failure is the Little Santa Anita Dam/Sierra Madre Dam. However, failure of this dam during a catastrophic event, such as a severe earthquake, is considered a very unlikely event. Due to the method of construction of this dam, it has performed well in earthquakes, and failure is not expected to occur.

The area one quarter of a mile west of Santa Anita Canyon is an area requiring flood control. According to the Los Angeles County Public Works Department, the City is included in Big Santa Anita Dam’s inundation area. However, even though the dam is located 2 miles northeast of the City, the dam is not considered to be a threat to the City in the event of dam failure. The Sierra Madre Dam operates as a “dry” dam and contains water only during rain as a flood control device. Figure 3-4, illustrates Dam Inundation Area and provides location of Sierra Madre Dam.

Figure 3-4

Dam Inundation Area



Source: California Office of Emergency Services 2007

Landslides

Severe flooding can also undermine the integrity of the soils in the hillsides and cause landslides. Landslides represent only one step in the continuous natural erosion process, and represent a basic geologic hazard. Ground shaking from an earthquake could provide the stimulus to initiate downslope movement of an already unstable earth mass. Movement could also be triggered by heavy rains or by grading. The landslide areas in the City occur at elevations between 1,400 and 2,000 feet, thus above the urban areas.

Mudflows, also known as debris flows, are a type of landslide experienced in Sierra Madre. Mudflows involve very rapid downslope movement of saturated soil, sub-soil and weathered bedrock. Debris flows also include burned or partially burned plant materials. They originate in hillside areas where the soil horizon is

well developed, but the soil has poor drainage characteristics. Large mudflows may have the energy to uproot trees and to carry along boulders several feet in diameter. Because they can happen with little or no warning and because of the speed with which they move, mudflows can be quite destructive, especially along the bottom and at the mouths of canyons. Historically, mudslides have occurred in several locations within the northern portion of the City.

FLOOD/LANDSLIDE GOAL

A community that is protected from floods and landslides.

OBJECTIVES AND POLICIES

The City has established the following objectives and policies for flood/landslides in Sierra Madre. The implementation measures are contained in the Implementation Chapter at the end of the General Plan.

Objective Hz6: Addressing potential flooding and landslide hazards on public and private property.

Policies:

- Hz6.1 Require that all new development incorporates sufficient measures to mitigate flood hazards, including the design of containment systems to capture stormwater runoff on-site, and site grading that minimizes stormwater runoff from increased impervious surfaces, thereby addressing impacts to on-site structures and adjacent properties.

- Hz6.2 Require that the landscape of open space areas provide the maximum permeable surface area to reduce site runoff, and prohibit the paving of a majority of these areas.

- Hz6.3 Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas. (HMP LND-1)

- Hz6.4 To the extent feasible, provide protective measures designed to limit debris flow resulting from the fire/mudflow sequence, thereby reducing the threat to life and property relative to existing development in threatened areas including debris basins enhancements, and property purchases. (HMP LND-6)
- Hz6.5 Amend Hillside Management Zone. (HMP LND-7)

Objective Hz7: Providing adequate response in case of flooding emergency.

Policies:

- Hz7.1 In the event of a flood, coordinate Fire Department emergency operations with the Sierra Madre Police Department, the Sierra Madre Public Works Department, the Sierra Madre Volunteer Search and Rescue Team, and other public agencies utilizing Incident Command and the National Incident Management System (NIMS.).
- Hz7.2 Encourage implementation of emergency evacuation drills to prepare for the event of floods.
- Hz7.3 Locate, when feasible, new essential public facilities outside of flood hazard zones, (outside of any hazard or disaster area/zones) including hospitals and health care facilities, emergency shelters, fire stations, emergency command centers, and emergency communications facilities.
- Hz7.4 Establish cooperative working relationships among public agencies with responsibilities for flood protection.

Objective Hz8: Maintaining adequate infrastructure to prevent flooding hazards.

Policies:

- Hz8.1 Require that residential tract developers be responsible for construction of drainage/storm drain systems improvements that are compatible with City and County systems within or adjacent to their project site.
- Hz8.2 Install required public storm drainage improvements.
- Hz8.3 To the extent feasible, the City shall continue to cooperate with and facilitate L.A. County's maintenance efforts to keep the debris basins clean.
- Hz8.4 Identify surface water drainage obstructions for all parts of the City of Sierra Madre. (HMP FLD-2)
- Hz8.5 Capture flood waters to lessen the flow within the City streets. (HMP FLD-3)

Objective Hz9: Maintaining updated information on flood hazards.

Policies:

- Hz9.1 Obtain and make available to the public updated flood hazard maps prepared by FEMA.
- Hz9.2 Evaluate studies of streams, as they become available, to identify any changes.
- Hz9.3 Work with the National Flood Insurance Program (NFIP) to have the FIRM updated for the project area. (HMP FLD-12)

Section Three:

Seismic Safety

OVERVIEW OF EXISTING CONDITIONS

The City of Sierra Madre is located in a geologically complex area that has a very active history of seismic activity due to the large number of faults in the region.

There are several active and potentially active faults located in the vicinity of the City. The nearest fault is the Sierra Madre Fault Zone which passes through the northern part of the City in a west-northwesterly direction. This fault zone consists of several sub-parallel branches found at the base of the mountains and within the one-quarter mile of slope above the mountain base. The Clamshell-Sawpit Fault, an off-shoot of the Sierra Madre Fault Zone, located approximately 1.5 miles east of Sierra Madre, and which generated the 1991 Sierra Madre earthquake, is a branch of the Sierra Madre Fault Zone. This earthquake resulted in \$12.5 million in damages, including damage to 403 structures, 22 homes condemned, and 36 toppled chimneys; there were also 18 reported injuries. Another active fault in proximity to the City is the Raymond Fault located approximately 1.5 miles to the south.

Faults are continually being found by geologists/seismologists within the region. These scientists have identified almost 100 faults in the Los Angeles area that are suspected of being capable of generating earthquakes with magnitudes of 6.0 or greater. Included within the newly discovered faults are faults that are classified as “blind thrusts”. These faults do not reach the ground surface but do connect many of the known surficial faults at depth and underlie nearly the entire Los Angeles, San Fernando and San Gabriel basins. The January 1994 magnitude 6.7 Northridge Earthquake occurred on a north-dipping thrust fault connected to a buried thrust and produced severe ground motion over a wide area. It also caused 57 deaths, 9,253 injuries and left over 20,000 displaced. An earthquake on any of these many faults would represent a hazard in the region.

The U.S. Geological Survey and the Southern California Earthquake Center say that the Los Angeles area could expect one earthquake every year of magnitude 5.0 for the foreseeable future. The most likely major seismic events to affect Sierra Madre within the next 50 to 200 years most likely would occur as the result of movement along the Sierra Madre Fault, a blind thrust, or the San Andreas Fault.

A major earthquake occurring in or near Sierra Madre may cause many deaths and injuries, extensive property damage, fires, hazardous spills, and other hazards, as evidenced by the 1991 Sierra Madre earthquake. The effects could be aggravated by aftershocks and by the secondary effects of fire, hazardous material/chemical accidents, and possible failure of the waterways and dams.

On a citywide basis, the Sierra Madre, the Raymond, a blind thrust, and the San Andreas are faults considered to represent the greatest hazard to the City. Although significant earthquakes may occur on faults other than those identified, these faults are considered most likely to cause damage in the City. The Sierra Madre Fault Zone is the principal seismic hazard due not only to its potential for ground rupture, but also potential for seismic shaking. The consequences of strong seismic shaking are of greater significance over a far wider area than is ground rupture by active faulting.

Earthquakes are caused by the violent and abrupt release of strain built up along faults. When a fault ruptures, energy spreads in the form of seismic waves. Seismic waves are categorized into two groups: body waves and surface waves. Body waves travel through the earth's crust and eventually reach the ground interface creating surface waves. Both body waves and surface waves cause the ground to vibrate up and down and side to side at different frequencies depending on the frequency content of the earthquake rupture mechanism, the distance from the earthquake origin to a particular site, and the path and material through which the seismic waves spread.

Hazards associated with seismic waves include ground rupture, ground shaking, land sliding, flooding, liquefaction, tsunamis and seiches. The potential hazards that the City could face in an earthquake include the following:

Ground Rupture

Ground rupture represents the primary hazard associated with earthquakes since it is the initial result of seismic events. Surface rupture poses a difficult seismic problem from an engineering standpoint because it is far more expensive and complicated to design a foundation and structure to withstand the displacement of even fractions of a foot than to build without consideration of rupture. Such ground fractures can cause parallel displacement in the foundation, causing buildings to crack and split. Development should be avoided in areas of high fault rupture potential.

Ground Shaking

The most significant earthquake action in terms of potential structural damage and loss of life is ground shaking. Ground shaking is the movement of the earth's surface in response to a seismic event. The intensity of the ground shaking and the resultant damages are determined by the magnitude of the earthquake, distance from the epicenter, and characteristics of surface geology. This hazard is the primary cause of the collapse of buildings and other structures.

Increased hazards from earthquakes occur when the seismic activity occurs in a highly urbanized area. The significance of ground shaking action from an earthquake is directly related to the density and type of buildings, and the number of people exposed to its effect.

Liquefaction

Liquefaction is a phenomenon involving the loss of shear strength of soil. Liquefaction occurs in saturated soils, in which the space between individual soil particles is completely filled with water. This water exerts a pressure on the soil particles that influences how tightly the soil particles themselves are pressed together. Prior to an earthquake, the water pressure is relatively low. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other. If the liquefying layer is near the surface, the effects are much like that of quicksand on any structure located on it. If the layer is in the subsurface, it may provide a sliding surface for the material above it.

Liquefaction typically occurs in areas where the groundwater surface is less than 30 feet below the ground surface and where the soils are composed predominantly of poorly consolidated fine sand. During

and after a severe rain, liquefaction could occur should a moderate to severe earthquake take place. There is one area of the City vulnerable to liquefaction as illustrated in Figure 3-5.

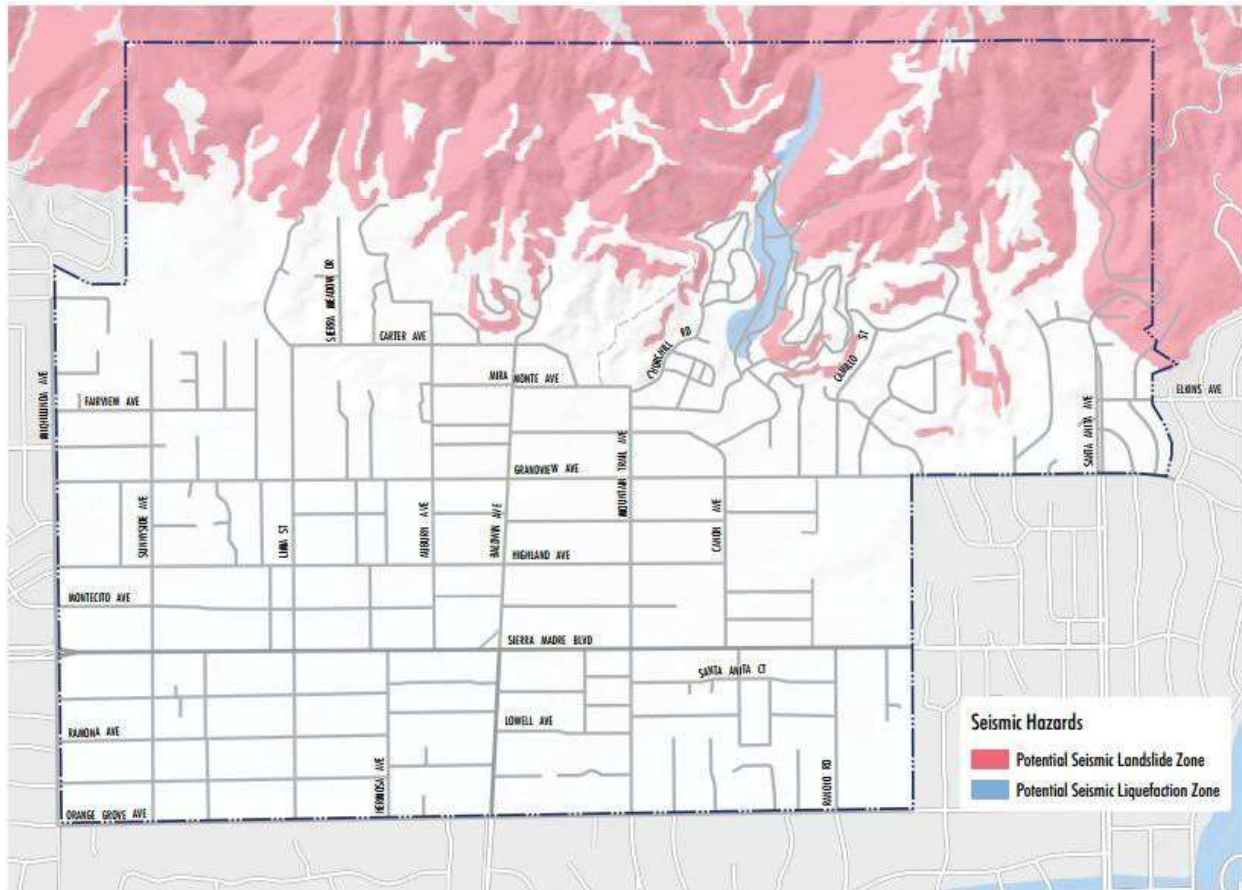
Landslides

Landslides can occur for various reasons. For example, severe flooding can undermine the integrity of the soils in the hillsides, therefore causing instability. Landslides may also occur as the result of brush fires, which weaken the soil by removing vegetation integral to its support structure. Ground shaking from an earthquake presents an additional risk; seismic activity of this type can easily initiate a downslope movement.

Landslides in the City typically occur at elevations of between 1,400 and 2,000 feet, well above the urban area of the City. A common type of landslide experienced in Sierra Madre is known as a mudflow. This type of landslide involves very rapid downslope movement of saturated soil, sub soil and weathered bedrock. Large mudflows may have enough force to uproot trees and to carry along boulders several feet in diameter. Due to their fast speeds, mudflows can be very destructive especially along the bottom and the mouths of canyons. Mudslides have generally occurred in several locations within the northern foothill areas of the City. Figure 3-5 illustrates the location of areas in the City with potential of landslides.

The City's policies and programs for seismic safety are designed to reduce death, injuries, damage to property and economic and social dislocation that could result from earthquakes and related geologic hazards, as well as to enhance the preparedness of City agencies and the community in general to survive, respond to, and recover from a major earthquake.

Figure 3-5: Potential Landslide Zones and Potential Liquefaction Zones



SUMMARY OF SEISMIC SAFETY GOALS

1. Land development that recognizes and addresses seismic threats when it occurs in areas of the City located on or along a fault. 🌿
2. Minimal loss of life, injury, property damage, economic and social dislocation, and disruption of vital services due to earthquakes. 🌿
3. A multi-hazard emergency disaster plan that includes seismic safety. 🌿
4. Effective citywide response to, and rapid recovery from an earthquake. 🌿

OBJECTIVES AND POLICIES

The City has established the following objectives and policies for seismic safety in Sierra Madre. The implementation measures are contained in the Implementation Chapter at the end of the General Plan.

Objective Hz40: Assessing the viability of development based on seismic safety considerations.

Policies:

- Hz10.1 Require that earthquake survival and efficient post-disaster functioning be a primary concern in the siting, design and construction standards for essential facilities in Sierra Madre. 🍃
- Hz10.2. Investigate the limitations on the location of new or altered residences and critical, sensitive and high occupancy facilities in areas near active faults, and consider conducting a comprehensive geologic investigation to show where active faults pose a hazard to structures. 🍃
- Hz10.3 Investigate requiring that proposed new or altered residences and critical, sensitive, and high occupancy facilities located in areas near active faults are not approved unless necessary subsurface fault investigations have first been completed. 🍃
- Hz10.4 Investigate requiring a thorough subsurface fault investigation be conducted for any proposed habitable structure on private property in close proximity of an active fault zone, and monitor any trenching for public buried water lines in the same area. Assign a City employee the duty of collecting and assessing of data gathered from the above listed efforts with help of a registered geologist. 🍃
- Hz10.5 Create a central depository of all Sierra Madre geologic information the City obtains through any project approvals process, including any governmental projects.

Objective Hz11: Minimizing to the extent possible the loss of life, serious injuries, and major social and economic disruption caused by the collapse of or severe damage to vulnerable buildings in an earthquake. 🍃

Policies:

- Hz11.1 Promote public awareness of the need to upgrade seismically hazardous buildings for the protection of health and safety in the City. 🍃
- Hz11.2 Encourage seismic review of buildings. 🍃
- Hz11.3 Promote seismic upgrading of older residential and commercial structures with special attention given to historic structures. 🍃

Objective Hz12: Enhancing the preparedness by City agencies and the community to respond to and recover from a major earthquake. 🍃

Policies:

- Hz12.1 Maintain and update multi-hazard emergency preparedness plan for the City that includes seismic safety. 🍃
- Hz12.2 Maintain and upgrade the City's disaster response plans at least annually, conduct periodic tests of their practicality and effectiveness, and involve residents and business in the preparation and testing of the plans. 🍃
- Hz12.3 Prepare and disseminate to residents and businesses information regarding seismic risks affecting the City, measures to protect life and property before and during an earthquake, and emergency procedures to follow after an earthquake. 🍃

- Hz12.4 Incorporate planning for potential incidents affecting critical, sensitive and high-occupancy facilities into the City’s contingency plans for disaster response and recovery. 🍃
- Hz12.5 Ensure that emergency preparedness is the mutual responsibility of City agencies, City residents and the business community. 🍃
- Hz12.6 Develop and implement ongoing City-wide programs for disaster preparedness and recovery planning. 🍃

Objective Hz13: Implementing seismic policies effectively.

Policies:

- Hz13.1 Provide residents and business owners with a continuing awareness and expanding knowledge of the seismic hazards affecting the City. 🍃
- Hz13.2 Adopt and maintain high standards for seismic performance of buildings, through prompt adoption and careful enforcement of the best available standards for seismic design. 🍃
- Hz13.3 Adopt a wood soft first-story ordinance and program to retrofit potentially vulnerable buildings.
- Hz13.4 Utilize contemporary seismic maps during plan/permit review process. (HMP EQ-1)
- Hz13.5 Incorporate the Regional Earthquake Transportation Evacuation Route updated developed by the Area D Disaster Management Area Coordinators into the Emergency Operations Plan. (HMP EQ-2)
- Hz13.6 Identify funding sources for structural and non-structural retrofitting of City-owned structures that are seismically vulnerable (e.g. City Library). (HMP EQ-3)

- Hz13.7 Encourage purchase of earthquake hazard insurance for private properties and uninsured City-owned properties. (HMP EQ-4)
- Hz13.8 Encourage hazard reduction with non- structural and structural earthquake retrofits and other strategies in homes, businesses, and City facilities. (HMP EQ-6)
- Hz13.9 Replace water mains in fault zones with seismic pipe thereby maintaining water system integrity and reducing the threat to life and property loss by providing fire suppression. (HMP EQ-7)
- Hz13.10 Renovate main booster plant with new booster pumps and control panels thereby ensuring reliable water delivery to City's distribution system. (HMP EQ-8)
- Hz13.11 Seismically retrofit the Auburn reservoir; thereby preserving stored water for domestic use and fire suppression. (HMP EQ-9)

Section Five: Multi-Hazards

OVERVIEW OF EXISTING CONDITIONS

The City's 2020 Hazard Mitigation Plan (HMP) addresses hazards that could affect the long-term quality of life, safety, and viability for residents and business. Policies addressing multi-hazards are intended to reduce risks for more than one specific hazard and hazard-specific action items included in the Hazard Mitigation Plan.

Multi-hazards in the City include wildland and urban fires, seismic events, flooding, landslides, and windstorms. These events have the potential to create hazardous conditions throughout the City that require addressing on a citywide scale. Funding to address these issues may be available through programming in the City's Capital Improvement Program, General Fund, and grants.

The Capital Improvement Program, depending on the budgetary environment, is updated every 5 years. The CIP includes infrastructure projects built and owned by the City. As such, the CIP is an excellent medium for funding and implementing action items from the Mitigation Plan. The Mitigation Actions Matrix includes several items from the existing CIP. The authors of the CIP served on the Planning Team and are already looking to funding addition Mitigation Plan action items in future CIPs.

The General Fund is the budget document that guides all of the City's expenditures and is updated on an annual basis. Although primarily a funding mechanism, it also includes descriptions and details associated with tasks and projects.

Grants come from a wide variety of sources – some annually and other triggered by events like disasters. Whatever the source, the City uses the General Fund to identify successful grants as funding sources.

MULTI-HAZARD GOAL

Objective Hz16: Take steps that address multi-hazards in the City.

Policies:

- Hz16.1 Integrate the goals and action items from the City of Sierra Madre Hazard Mitigation Plan into existing regulatory documents and programs, where appropriate. (HMP MH-1)
- Hz16.2 Identify and pursue funding opportunities to develop and implement neighborhood and city mitigation activities. (HMP MH-2)
- Hz16.3 Develop inventories of Unreinforced Masonry Buildings and Soft-Story Structures. (HMP MH-6)
- Hz16.4 Buy Vactor to pneumatically collect liquids, sludges, slurries, sewage or other spills from a location thereby reducing the threat of exposure to hazardous spills. (HMP MH-10)

Section Six: Windstorms

OVERVIEW OF EXISTING CONDITIONS

Severe windstorms can pose a significant risk to life and property in Sierra Madre by creating conditions that disrupt essential systems such as public utilities, telecommunications and transportation routes. High winds can and do occasionally cause tornado-like damage to local homes and businesses. High winds can have destructive impacts, especially to trees, power lines, and utility services.

In December 2011, severe winds caused building damage to 34 residences in Sierra Madre, including eight homes which reported major structural damage and were forced to evacuate and seven homes and one business which had restricted access. The severe winds uprooted many trees and snapped limbs, which attributed to structure damage. Downed electrical power lines significantly impacted the City, which caused complete power outages for up to seven days for portions of the City. Preliminary cost estimates to repair damaged residential structures was costly, including the costs for the extensive clean-up of vegetation debris that obstructed street access following the windstorm.

WINDSTORMS GOAL

Objective Hz17: Reduce the potential impact of windstorms that can cause injury, loss of life, structural and infrastructure damage through education, awareness, and preparation.

Policies:

- Hz17.1 Develop Public Awareness Campaign: To provide public education materials to City residents pertaining to the protection of life and property before, during, and after a windstorm. (HMP WND-1)

- Hz17.2 Create local City awareness of tree appropriateness in regard to the Fire Code Sections relevant to utility operations. (HMP WND-2)
- Hz17.3 Encourage property owners and Critical Facilities to purchase and/or test backup power facilities for use during a power failure. Create an equipment/testing log to ensure backup power equipment is in working service. (HMP WND-3)

Section Seven: Utility Safety

OVERVIEW OF EXISTING CONDITIONS

Electricity throughout the planning areas is provided by Southern California Edison. In 2018, the California Public Utilities Commission (CPUC) directed California's three largest energy companies to coordinate to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may now be shut off for reasons of public safety in an effort to prevent a wildfire. This new protocol is referred to as Public Safety Power Shutoff (PSPS).

Additionally, although a power outage would affect all occupants of the City, it would potentially more critically impact medically challenged individuals with health care equipment reliant on electricity (e.g. oxygen), businesses, emergency service locations, and vulnerable populations center (e.g. schools).

While significant strides have been made to upgrade the City's water system, multiple components of the water infrastructure system have reached the end of their service lives. Planned water system improvements are planned to improve water supply reliability, rather than system capacity.

Due to potentially unreliable groundwater supplies from the Raymond Groundwater Basin and the unreliability of the emergency connection with the City of Arcadia, San Gabriel Valley Municipal Water District (SGVMWD) is coordinating with the Metropolitan Water District (MWD) to construct an emergency interconnection with the MWD Foothill Feeder, which runs through Sierra Madre. This would allow the City of Sierra Madre to access treated imported water directly from MWD. Such water would be available only under emergency conditions when the City's wells cannot produce sufficient groundwater from the Raymond Groundwater Basin and emergency supplies are not available from the City of Arcadia.

UTILITY SAFETY GOAL

Objective Hz18: Reduce risk of injury, loss of life, and disruption or damage of public infrastructure and increase utility safety, security, and adequacy through monitoring and infrastructure upgrades.

Policies:

- Hz18.1 Install Public Safety protective shut-offs for power. (HMP UT-1)

- Hz18.2 Prepare public and emergency services for Public Safety Power Shutoffs (PSPS) by providing back-up generators for critical City facilities and at-risk members of the community. Pursue solar power and energy storage as alternative sources of power during PSPS events for critical City facilities. (HMP UT-2)

- Hz18.3 Secure adequate water surplus and sources during drought years to meet demands of public health and safety and emergency response. (HMP UT-3)

- Hz18.4 Identify alternative sources of water and distribution capabilities in the event of a system-wide contamination emergency. (HMP UT-4)

- Hz18.5 Make necessary upgrades to sewer infrastructure and overflow response actions to prevent major sewer overflows. (HMP UT-2)