Safety Element Introduction

The City's original Seismic Safety/Safety Element was adopted in 1979 and addressed physical hazards related to geology, earthquakes, fire and flooding. The 2013 update to the 1979 Seismic Safety/Safety Element is now referred to as the "Safety Element." It provides information about a variety of natural and human-caused hazards. It also provides improved maps depicting areas of the City that may be affected by hazards.

The 2013 Safety Element addresses several issues not included in the 1979 Seismic Safety/Safety Element, including hazards associated with the effects of climate change; hazardous material use; and public safety risks resulting from aircraft operations, the use of local highways and rail lines for the transport of hazardous materials, natural gas pipelines, electrical transmission lines, and electromagnetic fields. The 2013 Safety Element also provides information about public services provided by the City related to hazard and risk reduction programs, and describes emergency response planning programs that foster community resilience should a disaster occur. With a focus on risk reduction through enhanced information and policy guidance, the 2013 Safety Element also supports the land use permitting and environmental review processes.

WHY PREPARE A SAFETY ELEMENT?

The Safety Element is a required component of the City's General Plan and specific items to be addressed by the Safety Element are prescribed by California Government Code Section 65302(g). This Section states, in part, that a Safety Element is to be prepared "*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, liquefaction, and other seismic hazards…*"

Additional guidance regarding the preparation of the Safety Element is provided by the *General Plan Guidelines* (2003), prepared by the Governor's Office of Planning and Research. The *General Plan Guidelines* indicate that "*the aim of the safety element is to reduce the potential risk of death, injuries, property damage, and economic and social dislocation resulting from fires, floods, earthquakes, landslides, and other hazards."* The *Guidelines* also indicate that the Safety Element may address other relevant safety issues that are considered important.

Human-caused hazards can also result in serious effects to health and property, and are often created as a result of modern activities and technologies that our society has become dependent upon. In the Santa Barbara area, human-caused hazards can result from energy use and transmission, the use and transport of hazardous substances, and airport-related hazards.

Natural and human-caused hazards do not affect Santa Barbara uniformly as some areas of the City are more susceptible to the effects of certain hazards than other areas of the community. Hazard maps provided in the Safety Element depict the general locations and possible severity of various hazards and are important tools in identifying and reducing the potential effects of hazards and for hazard response planning.

HAZARDS, RISKS AND VULNERABILITY

The terms "hazard" and "risk" are interrelated but convey distinctly different concepts. A hazard can be a physical process, substance, or event that has the potential to produce harm to health or property. Should a hazard affect a property or community, the consequences of the event can be expressed in a variety of ways, but it is common to describe hazard-related outcomes as ranging between negligible and catastrophic. Another term that is commonly used in evaluating how hazards may affect a community is "vulnerability," which is used to express the degree of exposure to a particular hazard.

A risk is the likelihood of adverse effects resulting from exposure to a hazard. Risk is determined by assessing its two components: the possible consequences of being exposed to a hazard and the probability that the hazard may occur. The probability of a hazard occurring can be described as ranging between improbable and certain, or as having a low, moderate, or high potential to occur.

In land use planning, it is generally accepted that the effects of most natural and human-caused hazards can be reduced but not eliminated. Risk reduction can be achieved in many ways, but often involves requirements to avoid or minimize the use of areas commonly affected by a hazard, building structures that are resistant to the effects of specific hazards, and/or by implementing practices and procedures that minimize the potential for the hazard to occur or to reduce its effects should it occur. Since the risk of being exposed to hazards generally cannot be eliminated, an objective of the land use planning process is to minimize risk to the point that it becomes "acceptable."

Making a determination as to when a particular risk is considered acceptable includes factors other than risk probability and consequence. For example, a higher level of risk may be considered acceptable in instances when the risk exposure is voluntary rather than involuntary, or if overriding community benefits may be achieved by accepting a certain level of risk. Other considerations in the risk assessment process may include the technical feasibility and economic cost of achieving each additional increment of risk reduction, and how well the probability of risk occurrence and potential hazard outcomes are understood.

After considering these and other variables, the community and decision-makers determine what level of safety is considered sufficient, or in other terms, how safe is safe enough.

COMMUNITY RESILIENCE

An objective of implementing hazard-related risk reduction measures and planning for effective post-disaster response is to facilitate the rapid recovery of the community after a disaster occurs. The combined benefits of minimizing risk and pre-disaster planning are often referred to as "resiliency planning" and can reduce the effects of natural and other hazards in terms of injury and loss of life, property damage, and loss of natural and economic resources. Communities that actively engage in hazard and resiliency planning will likely be less seriously affected by a disaster, will recover faster when disasters occur, and endure less economic hardship than those communities that do not engage in planning-related efforts. Resiliency planning promotes recovery from the short- and long-term effects of natural disasters such as earthquakes, floods and fires. The principles of resiliency planning may also be applied to hazards that have not yet affected the community, such as the potential for a substantial rise in sea level.

The U.S. Department of Homeland Security defines "resilient" as the "*ability of systems, infrastructures, government, business, and citizenry to resist, absorb, recover from, or adapt to an adverse occurrence that may cause harm, destruction, or loss of national significance.*" Resiliency requires having a well-prepared community and good response actions by local government. Local police, fire, emergency medical services, emergency management, public health and medical providers, public works, and other community agencies are generally

the first to respond to an emergency or disaster and to provide assistance to the community. Private sector businesses and organizations also play a vital and essential role in the community's response following a disaster.

Education of the public is an important component of efforts to create a more resilient community. Those efforts should focus on increasing the public's awareness of risk levels and specific hazards as well as providing guidance on how to be self-reliant after a major disaster. Engaging the public in the resiliency planning process will improve the community's response after a disaster by increasing their ability to be self-sufficient. It will also increase awareness of what community response efforts will likely be provided during and after an emergency. Community education regarding pre-disaster planning efforts and post-disaster response capabilities should consider all members of the community, people with disabilities and their service providers and others with access and functional needs and pets.

The City's Office of Emergency Services (OES) conducts programs to increase the community's awareness of hazards and disaster preparedness. OES programs include: monthly newsletters providing information on hazards that may affect the City and how to prepare for and respond to an emergency; Community Emergency Response Team training; safety education for seniors, children and persons with disabilities; and programs for the Spanish-speaking community. These types of programs are important components of the City's resiliency planning efforts and should be continued and if possible expanded.

For hazards such as earthquakes, fires and floods, evaluating risk and planning for appropriate response and resiliency measures can be achieved, in part, by reviewing the effects of, and responses to past events. Studying previous response actions can illustrate how best to respond to future emergencies. Some potential hazards, however, could be unprecedented and there may be no appropriate response methodology to review and learn from. For example a large earthquake in the Santa Barbara region could damage bridges along U.S. 101 north and south of Santa Barbara, and landslides could close SR 154. Under such a scenario, Santa Barbara could be isolated from assistance and major response efforts by outside agencies for many hours or days.

Sea level rise presents different resiliency challenges as the extent of future sea level changes and predictions of potential consequences are still uncertain. In addition, should a substantial rise in sea level occur, the resulting consequences will likely not happen for many years. An initial assessment of the potential for flooding and inundation impacts to low-lying coastal areas of Santa Barbara due to a rise in sea level is provided by the *Santa Barbara Sea Level Vulnerability Study* (Griggs, 2012). This evaluation indicates that between the present (2012) and around the year 2050, there is a "moderate" probability (risk) of impacts to low-lying coastal areas and the magnitude of those impacts would also be considered to be "moderate." However, over a longer period, such as by the year 2100, the probability of flooding and inundation impacts to coastal areas becomes "very high" if sea level were to rise by approximately four feet as predictions indicate. Under such conditions, the magnitude of impacts from sea level rise is considered to be "high." The uncertainty associated with the timing and extent of future sea level conditions warrants the implementation of prudent response and adaptation planning measures commensurate with anticipated levels of risk during the near- and moderate-term planning horizons.

The City recently adopted a *Climate Action Plan* (2012) that outlines a variety of measures that would reduce risk to residents and important infrastructure resulting from climate change-related effects such as a substantial rise in sea level. Other hazards that could also be influenced by climate change, such as an increase in the frequency and intensity of flooding and wild fire hazards, would be addressed through the continued implementation of existing risk reduction and emergency response efforts and planning programs. If fire and

flooding hazards do increase as a result of climate change, existing risk reduction and response programs will take on added importance and could be implemented more often in the future.

As described above, the City of Santa Barbara, as well as Santa Barbara County, California and federal government agencies have devised and implemented a wide variety of emergency planning and response programs that are intended to reduce hazard-related risk, to provide assistance to communities during an emergency, and to aide in the short- and long-term response to a disaster. Local programs, such as the Santa Barbara *Emergency Operations Plan* and the *Multi Jurisdictional Hazard Mitigation Plan,* are reviewed and updated regularly to address new planning requirements, provide new information about how hazards may affect the community, and focus on changing risk reduction and emergency response priorities.

A vital aspect to increasing post-disaster resiliency is to minimize the amount of damage that may occur to critical structures and lifeline facilities during an event such as a fire, flood or earthquake. The *Multi Jurisdictional Hazard Mitigation Plan* assists in this effort by identifying City-owned critical facilities and the natural hazards that may affect them. The City-owned facilities and the hazards that may affect the facilities are summarized on Table 1. With the information provided by the *Multi Jurisdictional Hazard Mitigation Plan*, resources can be more effectively allocated to improve safety and hazard resistance at potentially affected facilities.

RELATIONSHIP TO OTHER GENERAL PLAN ELEMENTS AND PLANNING PROGRAMS

General Plan Elements

The Safety Element is one of the seven required elements of the general plan. California Government Code Section 65300.5 requires the general plan and its elements to be "*an integrated, internally consistent and compatible statement of policies…*"

The Safety Element is most closely related to the Land Use and Open Space Elements. The Land Use Element specifies the general distribution of land uses throughout the planning area and provides standards for population and building density. To minimize hazard exposure risk to the public, the Land Use Element should consider the hazard identification and evaluations provided by the Safety Element. By limiting development density in areas subject to geologic, fire, flooding and other safety hazards, the risk of loss of life, injury and property damage can be reduced. An objective of the Open Space Element is to preserve open space resources for public health and safety, including areas that require special management and regulation due to hazardous or special conditions, such as earthquake fault zones, floodplains, unstable slopes, and high fire risk.

Government Code Section 65302(g)(3) also requires a link between the Safety and Housing Elements. Upon each revision of the Housing Element, the local planning agency is required to review, and if necessary revise the Safety Element to identify new information that was not available during the previous revision of the Safety Element.

Other Local Planning Programs

In addition to the land use planning requirements of the General Plan, a variety of other hazard reduction programs have been adopted and implemented by the City. A brief description of some of these plans and programs is provided below.

Santa Barbara County Multi-Jurisdictional Hazard Mitigation Plan (2011)

This Plan addresses a variety of hazards that have the potential to affect Santa Barbara County and each of the incorporated cities, including: flooding and coastal storm surge, wildfire, earthquakes, landslides and coastal erosion, dam failure and tsunami. The *Multi-Jurisdictional Hazard Mitigation Plan* was prepared with input from each city in the County, interested public, city and county officials, and with the support of the State of California Emergency Management Agency and the Federal Emergency Management Agency.

The emphasis of the *Multi-Jurisdictional Hazard Mitigation Plan* is on the assessment and avoidance of identified risks, implementing loss reduction measures for existing risk exposures, and ensuring that critical services and facilities survive a disaster. The *Multi-Jurisdictional Hazard Mitigation Plan* also promotes compliance with state and federal program requirements, and inter-jurisdictional coordination of disaster preparedness and reduction programs.

The *Multi-Jurisdictional Hazard Mitigation Plan* includes an "Annex" (2011) or section that pertains specifically to each city in the County, including Santa Barbara. The Santa Barbara Annex to the *Multi-Jurisdictional Hazard Mitigation Plan* includes a hazard assessment, a vulnerability assessment that identifies areas of the City and "critical facilities" that may be affected by hazards, and recommended hazard reduction mitigation actions. The Santa Barbara Annex to the *Multi-Jurisdictional Hazard Mitigation Plan* was prepared in 2011 and adopted by the City in 2012. It is anticipated that the Santa Barbara Annex to the *Multi-Jurisdictional Hazard Mitigation Plan* will be updated at a minimum of every five years.

Geology and Geohazards Master Environmental Assessment, Technical Report and Evaluation Guidelines (2009)

These guidelines describe various geology-related hazards that may affect the City and provides maps depicting the location and severity of geologic conditions and hazards in the City. The hazard maps provided by the Geology and Geohazards Technical Report have been included in Safety Element Technical Background Report (Appendix J). The Geology and Geohazards Technical Report also describes geologic conditions that are to be considered when determining what level of site-specific geological investigation should be required for various types of development projects. It is the intent of these guidelines to provide standard procedures for preparing geologic and geohazard technical reports for new development projects.

Wildland Fire Plan (2004)

This Plan provides a fire hazard risk assessment based on various evaluation criteria such as topography, vegetation, building construction, road systems, water supply and Fire Department response times. The Plan also identifies fire hazard zones in the City, describes fire protection philosophies and strategies, and provides goals and policies regarding a variety of hazard reduction issues including fire protection codes and standards, post-fire rehabilitation, evacuation, vegetation (fuel) management and public education.

Local Coastal Program (2004)

This Program, comprised of a certified Land Use Plan and Implementation Plans, implements the California Coastal Act and applies to all areas of the City located within the coastal zone – an area generally within 1,000 feet of the coastline. A separate Local Coastal Program also applies to a portion of the Santa Barbara Municipal Airport and the Goleta Slough. Hazard-related information and policies provided by the updated Safety Element that are applicable to the coastal zone will be incorporated into the City Local Coastal Program and will become effective after certification by the City and California Coastal Commission.

Table 1
City of Santa Barbara Critical Facility Vulnerability Assessment

Critical Facility	Address	Flooding	Wildfire Severity Zone	Earthquake Vulnerability-Groundwater/ Liquefaction	Landslide	Dam Failure Hazard Zone	Tsunami Hazard Zone
Public Works/City Offices	630 and 635 Laguna Street	100-year zone		Moderate/High			
Cater Water Treatment Plant	1150 San Roque Road		Very High				
Ortega Well Treatment Plant	220 E. Ortega Street			Moderate/High			
Ortega Well Treatment Plant	631 Garden Street			Moderate/High			
Sheffield Treatment Plant	605 Mission Ridge Road		Very High				
Public Works	700 Anacapa Street			Moderate/High			
Water Treatment	3111 State Street			Moderate/Moderate		Within Zone	
Public Works	2491 Foothill Road		Very High	Moderate/Moderate			
Tunnel Reservoir	1500 Tunnel Road		Very High				
El Cielito	2410 Stanwood Drive		Very High				
Hope Reservoir	428 Centenella Lane						
Calle Las Caleras	3400 Calle Las Caleras						
Escondido Pump Station	2300 Skyline Way						
Vic Trace	1631 La Coronilla						
Skofield Pump Station	2117 Mount Calvary		Very High				
Public Works	605 Mission Ridge Road		Very High				
Bothin Pump Station	55 Crestview Lane		Very High				
Desalination Plant	525 E. Yanonali Street			High/High			Within Zone
El Estero WWTP	520 E. Yanonali Street			High/High			Within Zone
Skofield Park	1819 Las Canoas Road		Very High				
Stearns Wharf	219 Stearns Wharf	100-year zone		High/High			
Airport	500 Fowler Road	100-year zone		High/High			Within Zone
Harbor	various	100-year zone		High/High			Within Zone
City Hall	735 Anacapa Street						
Fire Station No. 1	121 W. Carrillo Street						

Table 1
City of Santa Barbara Critical Facility Vulnerability Assessment

Critical Facility	Address	Flooding	Wildfire Severity Zone	Earthquake Vulnerability-Groundwater/ Liquefaction	Landslide	Dam Failure Hazard Zone	Tsunami Hazard Zone
Fire Station No. 2	819 Cacique Street	100-year zone		Moderate/Moderate			
Fire Station No. 3	415 Sola Street			Moderate/High			
Fire Station No. 4	19 Ontare Road			Moderate/Moderate			
Fire Station No. 5	2505 Modoc Road			Moderate/Moderate			
Fire Station No. 6	1801 Cliff Drive			Moderate/Moderate			
Fire Station No. 7	2411 Stanwood Drive		Very High				
Fire Station No.8	40 Hartley Place	100-year zone		High/High			
Police Department Hdqtrs.	215 E. Figueroa Street						
Admin Well Corp.	402 E. Ortega Street	100-year zone		Moderate/High			
Recreation	1232 De La Vina Street						
Recreation	100 E. Carrillo Street						
Westside Community Center	629 Coronel Place			Moderate/Moderate			
Franklin Community Center	1136 E. Montecito Street			Moderate/Moderate			
Recreation	620 Laguna Street	100-year zone		Moderate/High			
Public Works	State St./Las Positas Rd.			Moderate/Moderate		Within Zone	
Marinas 1-4	Harbor			High/High			Within Zone
Navy Pier	Harbor			High/High			Within Zone
Ortega Well	Ortega St./Salsipuedes St.	100-year zone		Moderate/High			

Source: Modified from *City of Santa Barbara Annex to Santa Barbara County 2011 Multi-Hazard Mitigation Plan*

KEY

	Low risk
	Moderate risk from high groundwater/moderate risk from liquefaction
	Moderate risk from high groundwater/high risk from liquefaction
	High risk

Airport Land Use Plan (1993)

This Plan is administered by the Santa Barbara County Association of Governments. The Airport Land Use Plan establishes "clear zones" and "approach zones" around the Airport's runways, and provides land use requirements and land use population density requirements for those zones to protect people and property in the event of an aircraft accident.

Harbor Master Plan (1996)

This Plan is an appendix to the City's Local Coastal Program and provides background information and policies pertaining to the operation of the Harbor and its related facilities.

Airport Master Plan

The Federal Aviation Administration requires airports to maintain a master plan that is generally updated every five to ten years. The Aviation Facilities Plan has guided development at the Santa Barbara Airport for the past ten years and will be superseded by a new *Airport Master Plan*. The Master Plan is being prepared by the City and will address a variety of airport-related operation issues.

City Climate Action Plan (2012)

This Plan addresses a variety of climate change-related issues, including potential hazards such as sea level rise, flooding, and sea cliff retreat.

City Codes and Ordinances

The City has adopted a variety of regulatory programs that are intended to reduce the effects of hazards on the community. Several of these programs are described below.

The City Building Code

Municipal Code Chapter 22.04 adopts with amendments the requirements of the California Building Code (Title 24 of the California Code of Regulations). The Building Code contains provisions to address current standards related to the development of earthquake-resistant structures, and to address other seismic, geologic and soil conditions.

The Seismic Safety Ordinance

Municipal Code Chapter 22.18 provides standards for the retrofit of specified hazardous buildings, typically buildings generally referred to as unreinforced masonry buildings. The purpose of the Ordinance is to reduce the potential for damage or collapse of buildings during an earthquake.

The Flood Plain Management Code

Municipal Code Chapter 22.24 provides requirements for buildings located within designated 100-year floodplains. The purpose of the Code is to minimize public and private losses due to flood conditions.

The City Fire Code

Municipal Code Chapter 8.04 adopts with amendments the requirements of the International Fire Code and the California Fire Code (Title 24 of the California Code of Regulations). These codes provide specific provisions for building construction and vegetation management to reduce the risk of fire hazards.

LIMITATIONS

The Safety Element provides a general evaluation of public safety hazards that have the potential to affect the City of Santa Barbara. The Safety Element's identification and evaluation of hazards is based on the review of literature that was readily available at the time of the Element's preparation. No site-specific evaluations were conducted to assess the effects of hazards on individual properties or projects. The maps provided by the Safety Element depict the general areas that may be affected by hazards, and should not be interpreted as to precisely define hazard areas. The Element's maps should be used as an important reference during the land use evaluation and decision-making process, such as guiding decisions regarding when detailed site investigations should be required.

The Santa Barbara Community

GEOGRAPHIC AREAS

For the purposes of the Safety Element, the City of Santa Barbara can be described as consisting of eight major geographical areas: the Mesa, Waterfront, Eastside, Riviera, Downtown, Upper State, Westside and Las Positas areas. The locations of each of these geographic areas are depicted on Figure 1. A brief description of each area is provided below, and more detailed information about individual neighborhoods within each area is provided by the Land Use Element of the General Plan.

Mesa

The Mesa area is located in the southern portion of Santa Barbara and is bordered on its northern side by a steep slope that has been uplifted along the Mesa Fault and reaches a maximum elevation of about 400 feet. Due to the steep gradient of this slope, along with the presence of oak woodland and other native vegetation, this area has a high fire hazard designation. The remainder of the Mesa area is an elevated marine terrace that slopes moderately to gently southward until it terminates at the Pacific Ocean along a steep coastal bluff. Due to various geologic conditions, wave action and other factors, the sea cliffs erode landward at various rates, but in general at approximately four to 12 inches per year.

Waterfront

The Waterfront geographical area is a low-lying coastal portion of the City. Much of the level area south of Shoreline Drive was created in the early 1930's by sand that was trapped soon after the Harbor breakwater was completed. Portions of the Waterfront area are located within the 100-year floodplains of Mission Creek and Sycamore Creek, and other areas are located on land that was formerly an estuary (known as "El Estero") that extended northward to about Ortega Street. The Estero was filled during the 1920's and 1930's. The Waterfront area is the part of the City that has the highest potential to be affected by a tsunami or by a global climate change induced rise in sea level.

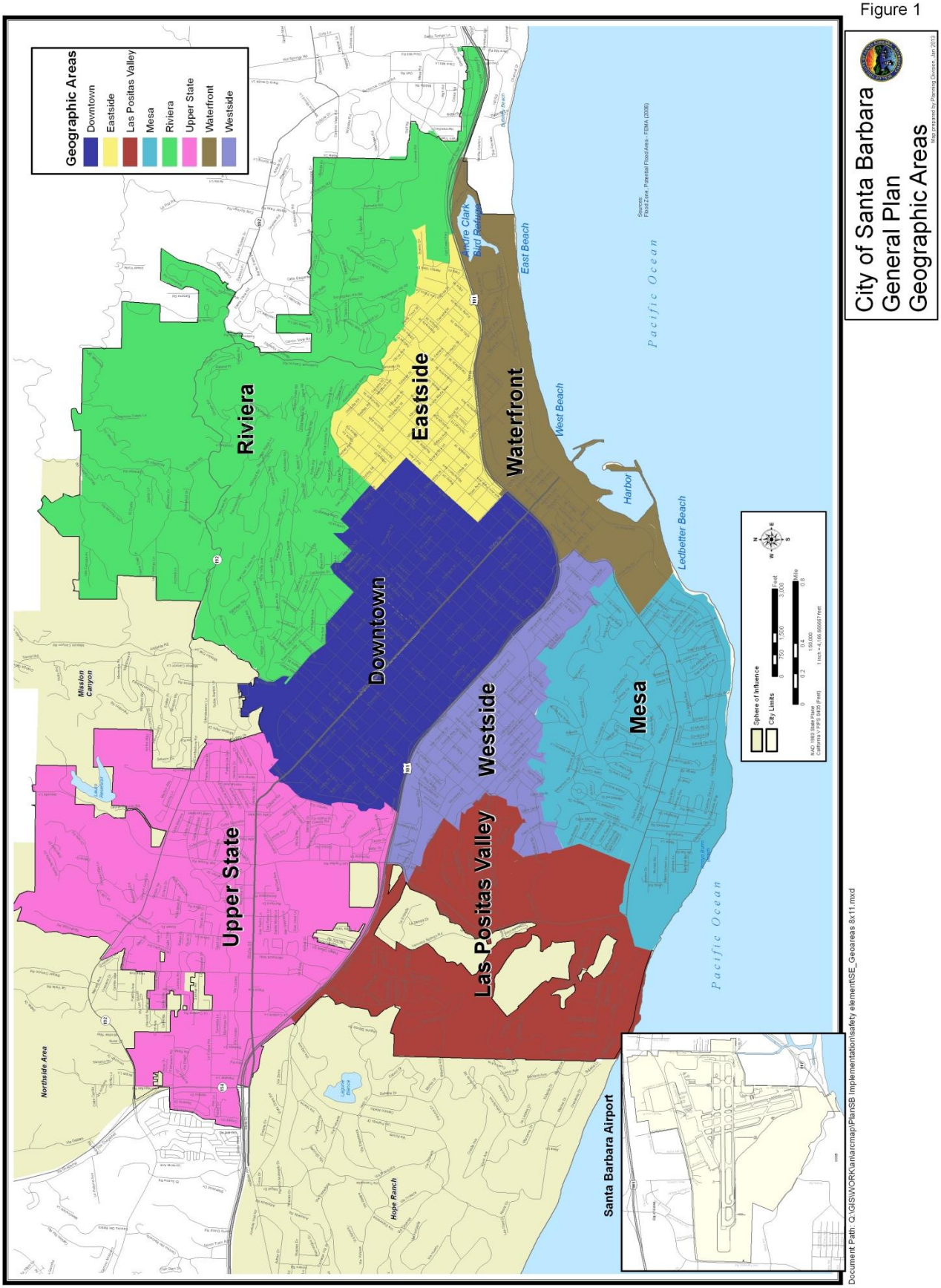
Eastside

The Eastside is a generally level area and a large portion of this area was also part of the historic Estero that was filled during the 1920's and 1930's. The lower portion of Sycamore Creek extends across the Eastside area.

Riviera

The slopes that form much of the Riviera are located along a topographic feature known as Mission Ridge, which has been raised over geologic time by upward movement along the Mission Ridge fault zone. The northernmost portions of the Riviera are located along the foothills of the Santa Ynez Mountains and have a maximum elevation of about 1,200 feet.

Figure 1


Geographic Areas
Downtown
Eastside
Las Positas Valley
Mesa
Riviera
Upper State
Waterfront
Westside
Riviera
Eastside
Waterfront
Downtown
Westside
Mesa
Las Positas Valley
Upper State
Pacific Ocean
Pacific Ocean
East Beach
West Beach
Harbor
Ledbetter Beach
Arroyo Burro Beach
Andree Clark Bird Refuge
Mission Canyon
Northside Area
Hope Ranch
Santa Barbara Airport
Sphere of Influence
City Limits
City of Santa Barbara
General Plan
Geographic Areas
Document Path: Q:\GIS\WORK\arcmap\PlanSE Implementation\safety element\SE_Geoareas 8x11.mxd

Due to the presence of steep slopes and complex geology, areas with active landslides are present in the Riviera area. Some portions of the Riviera area have a combination of steep slopes, abundant native vegetation and narrow winding roads, which contribute to a high wildfire hazard risk. Some neighborhoods in the Riviera area have been affected by recent wildfires, including the Sycamore Canyon Fire (1977), Tea Fire (2008) and Jesusita Fire (2009).

Downtown

The Downtown area includes Santa Barbara's commercial core, which sustained substantial damage during the 1925 Santa Barbara earthquake. Cottage Hospital is located in the northern portion of the Downtown area and was recently reconstructed to meet modern seismic building codes for hospitals. Mission Creek is located along the western and southern edges of the Downtown area.

Upper State

The topography of the Upper State area varies considerably and includes neighborhoods with relatively level topography and areas located along the lower foothills of the Santa Ynez Mountains. The northern portion of the Upper State area includes neighborhoods that have been designated as having a high fire hazard risk and suffered fire-related damage during the 2009 Jesusita Fire. Several creeks are located in the Upper State area, including San Roque, Arroyo Burro, Barger Canyon and Cieneguitas Creeks. The Lauro Reservoir is located north of and adjacent to the Upper State area

Westside

The Westside area is generally level; however, the southern border of this area abuts the steep slope that forms the northern edge of the Mesa. The Mesa fault extends through much of the Westside area.

Las Positas

Arroyo Burro Creek extends through the Las Positas area from north to south, and the creek has formed the Las Positas Valley, which has steep hillsides on its eastern and western sides. Areas of native vegetation on the steep slopes have resulted in much of the Las Positas area being designated as a high fire hazard zone. Also due to steep slopes, geologic and soil conditions, the undeveloped steep slopes on the western portion of the valley are susceptible to landslides.

Santa Barbara Municipal Airport

The Airport is an incorporated area approximately eight miles west of the City and is adjacent to the City of Goleta and the University of California at Santa Barbara. Much of the airport was originally constructed during World War II in conjunction with the development of a Marine Corps Air Station, and was developed by filling a portion of the Goleta Slough with fill material derived from nearby Mescalitan Island. The island was a formerly prominent feature located in the slough, but is now a small hill located between the Airport and State Route 217.

Geologic and Seismic Hazards

Geologic conditions in the Santa Barbara region are complex, and movement along regional and local faults over geologic time has shaped the Santa Barbara landscape. Geologic and seismic forces continue to affect Santa Barbara and have the potential to result in adverse to catastrophic effects on development in the City. When geologic and seismic processes and conditions have the potential to affect urban development, those conditions are often referred to as "hazards."

In conjunction with the City's planning and development review functions, seismic and geologic conditions are evaluated to assess the vulnerability of new and existing development to various hazards, and to identify ways to minimize risk to life, safety and property. One of the goals of the Safety Element is to assist and facilitate this review process. A brief description of the geologic and seismic hazards that may affect Santa Barbara is provided below. More detailed information and maps for each of the identified hazards is provided in the *Safety Element Technical Background Report* (Appendix J).

FAULT RUPTURE

A fault is a fracture in the earth's crust along which one side has moved relative to the other side. Movement along a fault can occur suddenly during an earthquake or very slowly in a process known as "creep." Fault rupture occurs when movement along a fault displaces or deforms the ground surface. Not all earthquakes result in fault rupture-related impacts, and when impacts do occur, it is generally as a result of large earthquake events. Ground rupture generally results in a small percentage of the total damage caused by an earthquake, but structures affected by ground rupture are usually severely damaged. Figure 6, Fault Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J), depicts the location or suspected location of the faults and fault systems in Santa Barbara that are identified as "apparently active" and present the highest risk of resulting in fault rupture impacts. A fault is considered to be "active" when there is evidence of fault movement occurring over the past 11,000 years. The apparently active faults depicted on Figure 6 include the Mission Ridge, Lagoon and Rocky Nook fault system, the More Ranch fault, and the Mesa fault. Other faults in the City depicted on Figure 6 are identified as "potentially active," which means that there is no evidence of movement along the faults between the last 11,000 to two million years.

Offset of the ground surface caused by fault rupture can range from several inches to tens of feet; therefore, it is typically not practical or feasible to reduce damage to structures caused by ground rupture through engineering design. The avoidance of areas that may be affected by ground rupture is generally the most appropriate risk reduction measure. This hazard reduction strategy, however, may not be feasible for linear structures such as roads and pipelines.

The *Geology and Geohazards Technical Report* describes methodologies to be used to evaluate the potential fault rupture impacts. Evaluation requirements vary depending on the type and use characteristics of a proposed building, as well as site-specific conditions. Reducing the risk of fault rupture impacts to new buildings is generally achieved by conducting site-specific investigations to determine the location and characteristics of a fault, and providing an adequate setback from the fault or fault zone to minimize the risk of impacts should movement along the fault occur in the future.

GROUND SHAKING

Energy released by movement along a fault radiates outward through the ground in the form of earthquake waves. As those waves pass through an area, they produce the ground shaking effects that are the predominant cause of earthquake-related damage. The severity of damage caused by ground shaking is controlled by many factors, including the magnitude of the earthquake, the distance to the location where the fault movement occurred, how long the ground shakes and the speed at which it shakes, local geologic conditions, and the design of affected buildings and structures.

Santa Barbara has been affected by ground shaking on numerous occasions during historic times. The most notable of these events was the earthquake of 1925, which caused extensive damage throughout much of the Downtown area. Additional information about the 1925 earthquake is provided on page 19.

The United States Geological Survey uses various computer models to estimate the probability of a certain area being affected by an earthquake of a given magnitude. It has been estimated that there is a 60-80 percent probability that the Santa Barbara area will be affected by a magnitude 5.0 or greater earthquake in the next 50 years, and that there is a 50-60 percent chance of a 6.0 magnitude earthquake and a 15-20 percent chance of 7.0 magnitude earthquake occurring in the next 50 years.

Ground shaking-related hazards are minimized primarily through the implementation of modern building codes. These regulations specify design standards for general structures, as well as increased standards for "essential facilities" such as hospitals, schools and certain public facilities. With respect to historic resources, in accord with the spirit and intent of the California State Historical Building Code, the City should interpret and apply building codes so that flexible yet equally safe alternatives can be substituted to promote the future vitality of historic resources. The City has also implemented programs to reduce hazards associated with the presence of unreinforced masonry buildings, which present a high risk of collapse during strong earthquakes.

1925 SANTA BARBARA EARTHQUAKE

The Santa Barbara Mission was damaged by the 1812 earthquake and rebuilt by 1820. The 1925 earthquake caused the extensive damage shown in this photograph.

The California Hotel opened four days before the earthquake and experienced heavy damage to brick walls that were not securely tied to the building. Some occupants left the building by lowering themselves to the street using bed sheets.

Many of the unreinforced masonry buildings along State Street were damaged or destroyed.

The earthquake occurred on June 29, 1925 at 6:44 a.m. and was caused by movement on a fault located in the Santa Barbara Channel. Santa Barbara had a population of about 25,000 in 1925, and the earthquake resulted in 13 fatalities. The number of casualties was probably reduced due to the early hour that the earthquake occurred.

No foreshocks were reported before the earthquake, however a water system pressure gauge recording card showed disturbances beginning at 3:27 am, which were likely caused by foreshocks. Then City Manager Herbert Nunn reported noticing a strong smell of oil at the beach soon before the earthquake occurred.

It was reported that strong ground shaking caused by the earthquake lasted 19 seconds, and four strong aftershocks occurred within 20 minutes after the quake. Additional aftershocks occurred for a year after the main earthquake. After the major shaking subsided, many of the buildings in the City's business district were destroyed or severely damaged. Unlike the 1906 San Francisco earthquake where much of the damage to the city was caused by the subsequent fire, gas and electrical power to Santa Barbara was turned off soon after the earthquake. Since no fires occurred after the Santa Barbara earthquake, the destructive force of the groundshaking could be clearly seen.

Most of the homes in the City experienced only minor damage, such as broken brick chimneys. Historian Walker A. Tompkins noted that after the earthquake one thing became obvious, "*the quake destroyed the shoddy and left the substantial.*" Newer buildings in the City that survived the earthquake included the Lobero Theater, Masonic Temple, the Daily News Building (the News Press Building), City Hall, the El Paseo and Presidio complexes, the main post office at State and Anapamu Streets (now the Art Museum), and Santa Barbara High School.

After the earthquake, the City embarked on a major reconstruction effort. As part of this program, policies were adopted to promote the construction of buildings in the Spanish Colonial Revival style. As a result, the earthquake had a substantial effect on the appearance of Santa Barbara today.

Photo Source: UCSB Institute for Crustal Studies

LIQUEFACTION

Liquefaction is a temporary loss of soil strength that can occur during moderate to large earthquakes. Liquefied soil will have a substantial loss of bearing strength, which may cause buildings in affected areas to settle or tilt. The resulting structural damage can range from minor to complete failure. Depending upon buoyancy differences between the liquefied soil and lightweight or unanchored underground structures such as pipelines, underground structures may float upward to the ground surface.

Three conditions must be present for liquefaction to occur: affected soils must be comprised of granular material such as sand; the soil must be saturated by groundwater; and the soil must be relatively loose. Of these three conditions, the saturation of soil by groundwater is the condition that has the potential to change over time, particularly in response to seasonal fluctuations in groundwater levels. Areas with shallow groundwater have a higher risk for liquefaction to occur, and in general, liquefaction risk is considered to be low when groundwater levels are more than about 60 feet below the ground surface. In areas with groundwater shallower than 60 feet, the liquefaction hazard may or may not be present, depending on the characteristics of the soil.

Potential liquefaction hazard risk zones in the City are depicted on Figure 9, Potential Liquefaction Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J). This map provides an update to the liquefaction hazard map provided by the *Geology and Geohazards Technical Report* and was prepared by identifying areas of the City with soil and groundwater characteristics that could contribute to an elevated risk of liquefaction. The *Safety Element Technical Background Report* (Appendix J) provides additional information regarding how the Safety Element liquefaction hazard map was prepared.

Areas of the City with the highest liquefaction risk generally include low-lying portions of the Waterfront, Eastside, Downtown, Westside and Las Positas areas of the City, as well as the Airport area. Many of the areas with a high liquefaction potential are located within the boundaries of the Estero that was formerly located in the lower portions of the City and was filled during the 1920's and 1930's.

Liquefaction is a mitigable hazard and its effects on structures can be minimized through a variety of project site modifications and/or building designs. The *Geology and Geohazards Technical Report* describes methodologies that are used to assess site-specific liquefaction hazards. Based on the results of site-specific investigations, appropriate site modifications, building foundation, and design measures can be implemented to minimize the risk of liquefaction and its associated effects.

TSUNAMI

A tsunami is a series of waves generated by a vertical displacement of the ocean floor, most commonly as a result of fault movement. As the waves enter shallow water along the coast, they slow down and the wave height increases. The waves may rise to several feet in height, although in rare cases may reach heights of tens of feet. The height of the waves will be influenced by many factors, including near-shore bathymetry (underwater topography), shape of the coastline, and tide conditions.

Tsunamis with the potential to affect Santa Barbara may be generated by an earthquake that occurs locally, such as in the Santa Barbara Channel or by a large earthquake that occurs at a distant location. The threat of a locally-generated tsunami affecting Santa Barbara is relatively low based on the low recurrence interval for large earthquakes originating in the Santa Barbara Channel. The City recently experienced relatively minor tsunami-related damage to facilities in the Harbor as a result of large earthquakes off the coast of Chile in 2010 and Japan in 2011. Additional information about the recent tsunami events in Santa Barbara is provided on page 22.

Figure 11, Tsunami Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J), depicts the location of the low-lying coastal areas of the City that may be susceptible to tsunami-related impacts. Portions of the City most likely to be susceptible to tsunami-related damage are generally located in the Waterfront and Airport areas.

Programs have been implemented at the federal, state and local level to identify tsunami-related hazards, reduce the risk of injury and damage caused by tsunamis, and to educate the public about tsunami-related hazards. At the local level, Santa Barbara was designated by the National Weather Service as a TsunamiReadyTM community in 2012. To be recognized as TsunamiReady, communities must have a 24-hour warning system, have more than one method to receive tsunami warnings and to alert the public, promote public readiness, and develop a tsunami response plan.

SEICHE

A seiche (pronounced saysh) is a wave or series of waves in an enclosed or semi-enclosed body of water such as a lake, reservoir, or harbor that can be generated by earthquake-related ground shaking, a landslide into the water body, wind, or a tsunami. If the seiche overtops the edge of the water body, it can run up onto adjacent land areas and result in property damage. The Lauro Reservoir and the Harbor are the water bodies in the City most susceptible to a seiche hazard. Providing appropriate setbacks between structures and areas that could experience seiche-related inundation is an effective method to reduce the risk of damage from this hazard.

LANDSLIDES

Landslides occur on sloping ground when the weight of the material that comprises the slope and the weight of objects placed on the slope exceed the strength of the slope material. The down-slope movement of earth material is part of the continuous and natural process of erosion; however, the stability of a slope can be adversely affected by a wide variety of factors, such as by adding water to a slope. Other factors that can decrease the stability of a slope include erosion of the toe of a slope, which removes support for overlying material; placing additional weight, such as structures, on the slope; changes to the slope's configuration by grading; earthquake-related groundshaking; and/or fires that remove vegetation from the surface of the slope.

RECENT TSUNAMI EVENTS IN SANTA BARBARA

Tsunami waves are often preceded by the retreat of ocean water along the coast. This picture shows the drop in water levels at the Santa Barbara Harbor before waves generated by the 2011 Japan earthquake arrived.

This picture also shows the drop in water level within the Harbor before the arrival of tsunami waves generated by the 2011 Japan earthquake.

As a result of the March 11, 2011 magnitude 9.0 earthquake off the coast of Japan, the West Coast/Alaska Tsunami Center issued a tsunami advisory for the California coast, and tsunami waves occurred in Santa Barbara about 11 hours after the earthquake occurred. Wave run up in the Harbor was about three feet in height, and the waves damaged a crane, bait barge and several boats. Total damage caused by the tsunami waves was estimated to be about $70,000.

On February 27, 2010, a magnitude 8.8 earthquake occurred along the central coast of Chile and a tsunami advisory was issued for California. Tsunami waves of about three feet in height were reported by tide gauges in the Santa Barbra Channel. In Santa Barbara, tsunami waves resulted beach erosion and the displacement of buoys. Tsunami wave surges from this event lasted more than 20 hours.

Photo source: www.sbwatertaxi.com

The *Geology and Geohazards Technical Report* identified landslide-prone areas of the City based on the results of previous landslide identification and mapping efforts. Figure 13, Slope Failure Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J) depicts identified landslide hazard risk areas throughout the City and categorizes risk as "Very Low," "Low," "Moderate," and "High." Areas of the City designated as having a "High" landslide risk are considered to be naturally unstable and subject to slope failure even without being modified by grading or other development-related processes. Areas with a "High" landslide risk are generally located on: the Mesa north of Cliff Drive (SR 225); the steep slopes along the west side of the Las Positas area; the coastal bluffs in the southwestern part of the City; and much of the Riviera area. The Riviera area includes two areas of recent landsliding that are referred to as the "Conejo Road Landslide" and the "Canon View Road/Sycamore Canyon Landslide." Movement of slopes in these areas apparently began in response to heavy "El Niño" rain events in 1982-83. Additional slope movement occurred in January 2005 when heavy rains resulted in additional slope movement that resulted in the closure of a two-mile segment of State Route 144 (Sycamore Canyon Road), destroyed eight homes, and damaged other homes and structures.

The *Geology and Geohazards Technical Report* provides guidance for when site-specific slope stability investigations should be prepared for various types of development projects based on the project's location and the landslide risk designation. The objective of the investigations is to evaluate existing slope stability conditions and to determine if project-related modifications to a slope would have the potential to result in on- or off-site stability impacts. If necessary, the evaluation should also identify ways that the project and/or proposed changes to a slope can be modified to minimize stability-related impacts.

COASTAL BLUFF RETREAT

Coastal bluff retreat is an erosion- and landslide-related hazard that affects the bluffs located along the City's coast. In the Safety Element, the terms "sea cliff," "cliff," and "bluff" are used to describe the topographic feature located between the beach and the adjacent upland area. Typically, however, "cliff" or "bluff face" is used to describe the vertical or sloping area, and "bluff top" is used to describe the upland area landward of the coastal bluff edge. The "bluff edge" is the location from which bluff top setbacks are measured. The sloping cliff and adjacent upland area are collectively referred to as the "coastal bluff."

The height, slope and geologic characteristics of coastal bluffs are highly variable, and the bluff environment is very dynamic. There can also be great variation in the composition, structure and strength of the rocks and soil that form the bluffs. These conditions result in hazard assessment and risk reduction challenges not generally associated with natural or manufactured slopes located in inland areas.

Coastal bluff retreat is a continual, natural process caused by both marine and terrestrial erosion processes that cause the bluffs to "retreat," or move landward. Wave action is the predominant erosion process as waves can erode the base of the cliff and remove support for overlying material, which increases the potential for landslides to occur. Where beaches are wide and waves seldom reach the base of the cliff, terrestrial processes, such as erosion by stormwater runoff from bluff top areas over the face of the cliff, can be the dominant cause of coastal bluff retreat.

Coastal bluffs may appear to go unchanged for many years as erosion occurs slowly, generally by the gradual loss of soil and rock material that comprises the bluff. Conversely, extensive losses of material may occur suddenly due to large landslides that occur when the stability of the slope is adversely changed. The addition of water to the bluff during heavy rainfall events is a common trigger for landslides. Although large slope failures occur infrequently, these episodic events and the associated loss of material substantially influence the overall average rate of bluff retreat. Rates of bluff retreat can be delayed or accelerated by human actions. Seawalls and revetments can slow bluff retreat at a specific site, but can also result in increased beach sand erosion and accelerated erosion adjacent to the protective structure.

There are approximately four miles of coastal bluffs within the City limits, including the bluffs that form the southern boundary of the Mesa neighborhoods, and the bluffs adjacent to the Clark Estate and the Santa Barbara Cemetery. The height of the bluffs gradually decrease from west to east, with heights of about 150 feet located in the Douglas Family Preserve area; 100 feet in the West Mesa neighborhood; and about 50 feet along Shoreline Park in the East Mesa neighborhood. The bluffs are about 50 feet in height adjacent to the Cemetery in the East Beach neighborhood of the City.

Several large landslides have affected the Santa Barbara coastal bluffs in the recent past. On February 14, 1978, the El Camino de la Luz landslide encompassed an area approximately three acres and resulted in the destruction of two homes. On January 25, 2008, a landslide affected the bluff in Shoreline Park. This landslide extended 70 feet along the top of the bluff and moved the bluff edge landward 38 feet. Other landslide areas along the bluffs adjacent to the East and West Mesa neighborhoods are depicted on Figure 13, Slope Failure Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J).

Several different studies of coastal bluff retreat rates have been conducted in the Santa Barbara area. One study evaluated erosion rates over a 70-year period and determined that the highest retreat rate was approximately 12 inches per year, while the average erosion rate was eight inches per year. The *City of Santa Barbara Sea Level Rise Vulnerability Study* (Griggs, 2012) reports that based on a review of historical aerial photographs, average long-term bluff retreat rates in Santa Barbara ranged between six and 12 inches per year. Another study identified average bluff retreat rates of about four to 18 inches per year adjacent to the West and East Mesa neighborhoods, and just under six inches per year adjacent to the Clark Estate/Santa Barbara Cemetery.

The estimated rates of coastal bluff retreat vary due to local differences in the composition and structure of the bluffs, the effects of bluff-top development, and barriers located at the base of the cliffs such as cobbles, boulders, or rip rap. Although there can be a wide variation in the rate of retreat at individual sites and bluff retreat generally occurs in an episodic manner, the average rate of sea cliff retreat in Santa Barbara when measured over an extended period of time is historically about six to 12 inches per year. At that average rate, the City's coastal bluffs could be expected to retreat by approximately 10-20 feet over the next 20 years, and approximately 45 to 90 feet by 2100. It should be noted, however, that site-specific studies of coastal bluff retreat rates in Santa Barbara have also determined that average retreat rates may be substantially lower than area-wide averages.

The *Geology and Geohazards Technical Report* identifies areas adjacent to the current bluff edge that may be affected by sea cliff retreat over the next 75 years. A 75-year timeframe was used because this is the period of time used by the City as the expected design life of new structures, and if bluff retreat were to threaten a structure that is at least 75 old, the structure would likely be obsolete and ready for demolition for reasons other than encroaching erosion. Based on the estimate of 12 inches of bluff retreat per year, for planning purposes it could be expected that the bluff edge that existed in 2013 will retreat landward by approximately 75 feet over the next 75 years (2088). Figure 14, 75-Year Coastal Bluff Retreat Line, of the *Safety Element Technical Background Report* (Appendix J) depicts the areas of the City that could be affected by bluff retreat over the next 75 years. This figure presents a theoretical bluff retreat area that is to be used for planning purposes only. Actual rates of bluff retreat and the upland area that may be affected over the next 75 years will vary considerably due to site-specific geologic and other conditions.

An expected consequence of climate change caused by increasing concentrations of greenhouse gases in the Earth's atmosphere is a rise in sea level. As sea level rises, coastal bluffs will be more vulnerable to wave-related erosion, which is expected to result in an increase in existing bluff retreat rates. There is substantial variation in predictions of future increases in sea level, particularly for conditions between 2050 and 2100. The *City of Santa Barbara Sea Level Rise Vulnerability Study* concludes that there is a "moderate" potential for

bluff retreat rates to increase to approximately 12-24 inches per year over the short- to intermediate-term (2012 to 2050), and a "high" or "very high" probability for such increases over the intermediate- to long-term (2050-2100). If bluff retreat rates were to increase as projected, Santa Barbara could experience up to 80 to 160 feet of erosion landward of the present bluff edge by the year 2100.

The *Geology and Geohazards Technical Report* indicates that a site-specific coastal bluff retreat evaluation should be prepared if habitable structures, commercial/industrial buildings, essential facilities, and other improvements are proposed to be located seaward of the bluff retreat line depicted on Figure 14 of the *Safety Element Technical Background Report* (Appendix J), or within 50 feet of the bluff edge, whichever is greater. The required bluff retreat evaluation study should comply with the most recent methodology used by California Coastal Commission staff which is provided in Appendix B of the *Safety Element Technical Background Report*. In summary, the Coastal Commission staff methodology includes several analysis steps to determine the appropriate setbacks on coastal bluffs including determine the location of the bluff edge; perform slope stability analysis and need for slope stability setback; identify appropriate long-term erosion rates to evaluate bluff retreat rates at the project site and to identify a 75-year erosion setback line.

SOIL EROSION

Soil erosion occurs when wind, water, or ground disturbances cause soil particles to move and deposit elsewhere. Numerous conditions influence the susceptibility of soil to the effects of erosion, although the characteristics of the soil, vegetative cover and topography are important factors. The removal of vegetation by construction activities or wildfire can result in a substantial increase in erosion rates. Increases in soil erosion rates can result in increased sediment loads in receiving waters, which can adversely affect water quality and biological resources.

Potential soil erosion hazard areas in the City were identified by the *Geology and Geohazards Technical Report* as ranging from "Very High" to "Slight." The identified hazard zones are depicted on Figure 15, Erosion Potential Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J). In general, areas with a higher erosion hazard potential are located in hillside and sloping areas of the City. Numerous federal, state and local regulatory programs have been enacted to reduce the potential for erosion-related hazards.

EXPANSIVE SOIL

Expansive soils will expand when wet and shrink when they become dry. Water that causes the soil to swell may be derived from precipitation, irrigation, or other moisture sources. Repeated cycles of shrinking and swelling can cause building foundations, walls, ceilings, and floors to crack, and windows and doors to warp so that they do not function properly. Differential shrinking and swelling can also damage surface improvements such as roadways and sidewalks.

Soils located in the City that present a potential shrink/swell hazard were identified by the *Geology and Geohazards Technical Report* as ranging from "High" to "Very Low," and are depicted on Figure 16, Expansive Soil Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J). In general, areas that are underlain with soils that have a "High" shrink/swell potential are located throughout the City, but predominately in the Downtown, Mesa, and hillside areas in the northern and western portions of the City. The impacts of expansive soil hazards can be addressed if considered early in a development project's design, and the *Geology and Geohazards Technical Report* provides recommendations regarding the evaluation of potential expansive soil hazards at development project sites.

RADON

Radon is an invisible and odorless radioactive gas that is created by the decay of uranium and thorium that is naturally present in rocks and soils. Breathing air with elevated levels of radon gas can result in an increased risk of developing lung cancer. Radon gas can move from the soil and into buildings through cracks in slabs or basement walls, pores and cracks in concrete blocks, and openings around pipes. Since radon enters buildings from the adjacent soil, concentrations of the gas are generally highest in basements and in ground floor rooms. While all buildings have some potential for elevated radon levels, buildings located on rocks and soil containing elevated levels of uranium or thorium will have a greater likelihood of having elevated radon concentrations. The U.S Environmental Protection Agency and the California Department of Public Health recommends that individuals avoid long-term exposures to radon concentrations above 4 picocuries per liter (pCi/L).

Areas of the City that have a moderate to high potential for elevated radon concentrations were identified by the *Geology and Geohazards Technical Report* and are depicted on Figure 17, Radon Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J). Areas designated as having a "High" or "Moderate" radon potential are generally located in areas underlain by the Rincon or Monterey Formations, or soils derived from those formations. In general, areas designated as having a "High" or "Moderate" risk potential are located in the upper elevations of the Riviera and Upper State Street area, and portions of the Mesa and Las Positas areas. A common method to minimize the potential for exposure to radon is to install a soil depressurization system that uses a fan and ventilation pipes to create a vacuum below the building. Passive ventilation systems that do not rely on the use of a fan can be installed in new construction. Sealing foundation cracks, pipe penetrations and utility channels can also be an effective measure to reduce indoor radon concentrations.

HIGH GROUNDWATER

High groundwater is a hazard that can have an adverse effect on building construction, roads, storage tank installation, utility installation, and other projects with structural elements that penetrate the subsurface. Buildings and other facilities in areas with high groundwater can be subjected to moisture intrusion, and in some cases, tremendous buoyancy forces that may push up on the structure, potentially causing structural offsets at the ground surface or otherwise causing extensive damage. In general, groundwater within 15 feet of ground surface can create a nuisance and can require special structure design to address buoyancy and moisture intrusion.

Areas of the City that have the potential to be affected by high groundwater are depicted on Figure 18, Shallow Groundwater Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J). In general, areas of the City that have the potential for high groundwater-related hazards include low-lying portions of the Waterfront, Eastside, Downtown, Westside, the Airport and areas located adjacent to the major creeks in the City. While certain areas have been identified as having the potential to be affected by high groundwater levels, it should be recognized that there can be substantial variability in groundwater levels at a particular site seasonally, over time, and due to climatic conditions.

Fire Hazards

This section of the Safety Element provides a description of the two types of fire hazards that have the potential to affect Santa Barbara: fires that occur in wildland areas and structure fires. More detailed information regarding fire-related hazards and their effects on the City is provided in the *Safety Element Technical Background Report* (Appendix J).

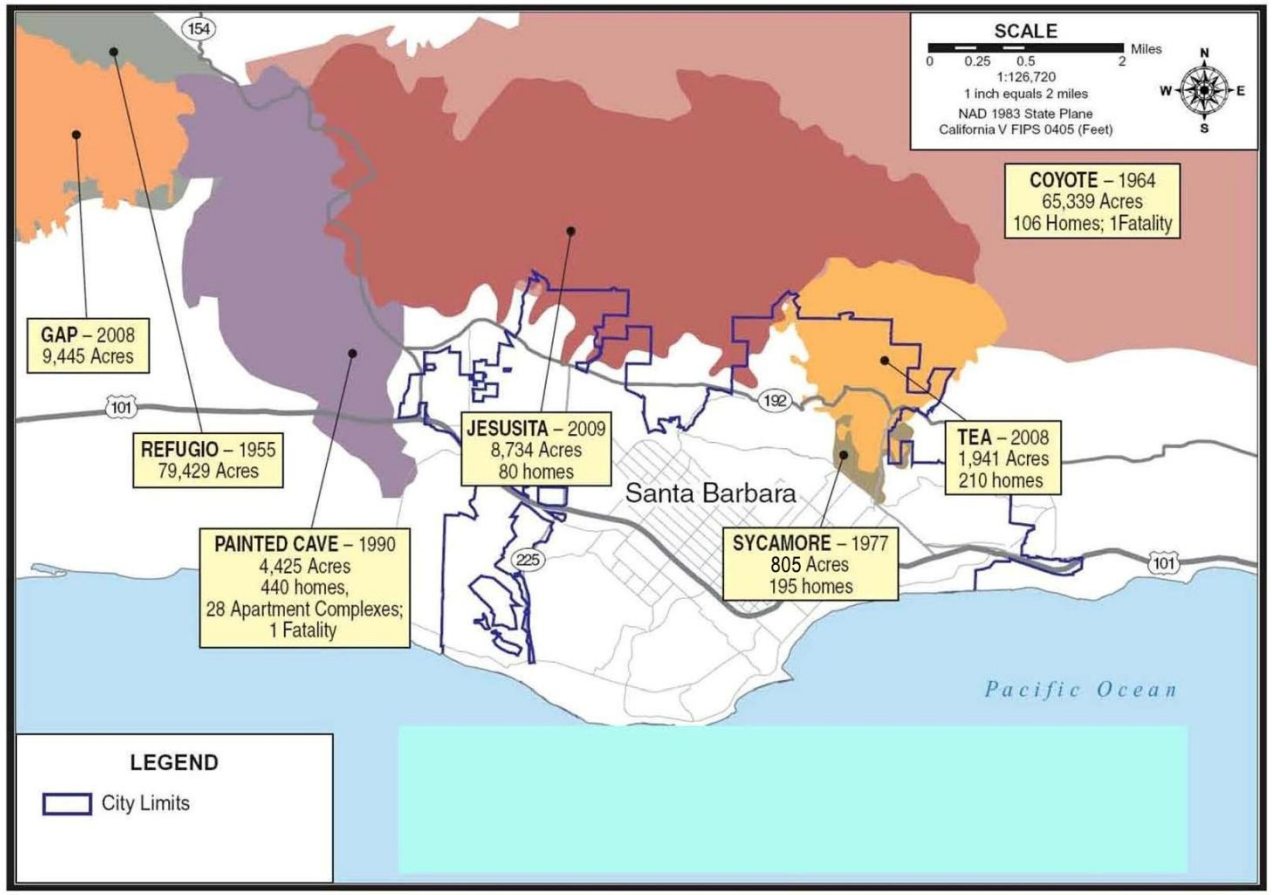
WILDLAND FIRE HAZARDS

Wildland fires are a natural process and plants native to chaparral habitats exhibit many diverse adaptations to survive fire. However, wildland fires can result in a multitude of adverse effects on the built environment, including the potential for loss of life, damage or destruction of public and private structures, loss of personal property, damage to infrastructure systems, and damage to recreation facilities and open space areas. Wildland fires can also result in the loss of hillside vegetation over extensive areas, which can result in a variety of adverse post-fire effects. The loss of protective vegetation can result in substantial increases in stormwater runoff, erosion and sedimentation, and can substantially increase the potential for and severity of landslides, mudslides and downstream flooding. A fire-related increase in these hazards may impact areas not directly affected by the fire and may result in extensive damage to downstream homes, roads, debris basins and other drainage and utility infrastructure, the impairment of water quality, and adverse impacts to aquatic habitats.

A wildland fire that occurs in the vicinity of urban development is often referred to as a "wildland-urban interface" fire. Wildland-urban interface zones are often designated as having a high wildfire hazard potential due to a combination of factors that increase the risk of a wildland fire. Property owners can implement a variety of construction and vegetation management practices to reduce the potential for wildfire-related damage, but must also accept the risk associated with living in a high fire hazard environment.

Wildland fires have been a significant part of Santa Barbara's history. Between 1964 and 2012, seven major wildfires have occurred in the Santa Barbara "front country," which is the area along the south-facing slope of the Santa Ynez Mountains between the Gaviota Pass to the west and the Santa Barbara/Ventura County line to the east. In total, these seven fires have burned over 100,000 acres, destroyed over 1,100 structures, and resulted in six fatalities. A map depicting areas that have been burned by recent wildfires is provided on page 30, and additional information about recent wildfires that have affected Santa Barbara is provided on page 31.

Conditions that contribute to a high wildfire hazard include the type, density and age of vegetation; weather conditions, such as high winds, low humidity and high heat; topography, such as steep slopes; access and roadway conditions; water supply; and response time required by Fire Department personnel and equipment. Other natural- and development-related conditions can also combine to influence the potential for and the severity of wildland fires. The Santa Barbara Fire Department's *Wildland Fire Plan* (2004) identified four high fire hazard zones in the City. The locations of the four fire hazard zones are depicted on Figure 20, High Fire Hazard Zones, of the *Safety Element Technical Background Report* (Appendix J) and are briefly described below.



Source: Santa Barbara General Plan Update Program EIR, 2010

City of Santa Barbara
General Plan
Santa Barbara Region Recent Wildfires

RECENT WILDFIRES IN SANTA BARBARA

The Jesusita Fire of 2009 burned the foothills north of and in the City of Santa Barbara.
(photo source: samedwardsfamily.com)

The 2008 Tea Fire started in Montecito on November 13 at 6:30 pm and was not controlled until November 17. Driven by sundowner winds gusting up to 70 miles an hour, the fire burned 1,940 acres and destroyed 210 homes. 106 of the burned homes were located in the City of Santa Barbara. A total of 2,235 firefighters and nine helicopters were used to fight the fire. Total suppression costs were estimated to be 5.7 million dollars.

Flames of the Jesusita Fire as seen from the waterfront area. Stearns Wharf is visible in the foreground.
(photo source: samedwardsfamily.com)

The 2009 Jesusita Fire started on May 5, 2009 in an area near Cathedral Peak and burned a total of 8,733 acres and 80 homes. Evacuation orders for affected areas were not lifted until May 13th. In total, 1,857 fire fighters, 111 fire engines, four helicopters and an air attack tanker were used to control the fire. Fire suppression costs were estimated to be 20 million dollars.

Flames from the 2008 Tea Fire are seen from De la Guerra Plaza adjacent to City Hall.
(photo source:a11news.com)

Strong winds blow smoke from the Jesusita Fire across the Santa Barbara Channel.
(photo source: earthobservatory.nasa.gov)

Extreme Foothill Zone

This zone has a combination of heavy vegetation located within the City and in the adjacent Los Padres National Forest, and slopes with a gradient greater than 30 percent. The majority of this zone is outside the Department's four-minute response time, and there are areas within the zone that have limited water supplies for fighting structure fires. The main roads in this zone meet Fire Department access standards; however, many smaller roads, driveways and bridges do not meet current standards. Portions of the Extreme Foothill Zone have been burned during recent fires, including the Coyote (1964), Sycamore Canyon (1977), Painted Cave (1990), Tea (2008) and Jesusita (2009) fires.

Foothill Zone

Vegetation in this zone includes a mix of heavy brush and canopy fuels provided by oak and eucalyptus trees; heavy vegetation in creek areas; and slopes with gradients that vary between 20 and 40 percent. The majority of this zone is within the Fire Department's four-minute response area; however, some of the main roads and many of the smaller residential roads do not meet the Department's road standards. This zone generally has adequate water supplies for fighting structure fires, which reduces potential fire hazards; however, the high density of residential structures located throughout this zone increases the wildfire hazard. The Foothill Zone has been affected by several wildfires, including the Coyote (1964), Sycamore Canyon (1977), Tea (2008) and Jesusita (2009) fires.

Coastal Zone

This zone has diverse pockets of vegetation, such as chaparral, oak forests, coastal sage scrub, landscape vegetation, agricultural lands and eucalyptus groves, and much of the vegetation occurs on slopes that range in gradient from 10 to 35 percent. The ocean's influence dominates weather patterns in this zone for most of the year; however, down canyon winds may occur that can cause the rapid spread of flames. The western portion of this zone is located beyond the Fire Department's four-minute response time standard. The majority of the roads in this zone meet the Fire Department's standards and water supplies also meet Fire Department requirements for fighting structure fires.

Coastal Interior Zone

The Coastal Interior high fire hazard zone has areas with moderate brush and heavy canopy fuels that are interspersed among areas with high concentrations of structures. The ocean's influence dominates weather patterns most of the year; however, down canyon winds can cause the rapid spread of flames on slopes that vary in gradient between 10 and 35 percent. This zone is within the Fire Department's four-minute response time standard, and the majority of the roads meet Fire Department's standards. This zone also meets the Fire Department's water supply standards.

Numerous regulatory requirements and risk reduction programs to minimize the effects of wildfires have been implemented by the City, as well as by state and federal agencies. In general, these requirements include standards related to fire prevention and suppression, and making structures more resistant to wildfires. Some of the wildfire hazard reduction measures implemented by the City of Santa Barbara Fire Department include the provisions of the *Wildland Fire Plan;* California Building Code and Municipal Code requirements; vegetation management programs to reduce the amount of combustible vegetation in wildland and urban areas; and defensible space standards that minimize the amount of vegetative fuel around a building or structure, which increases its probability of surviving a wildfire. A defensible space perimeter will also provide firefighters with a safer working environment as a fire approaches.

The Fire Department generally conducts very little vegetation management in creek areas located in high fire hazard zones; however, vegetation management activities are occasionally deemed necessary to minimize hazards along roads, bridges or key defensible spaces to be used for fire fighting. Before vegetation management activities are conducted in or near creek areas, the Fire Department prepares a vegetation management plan and measures to protect aquatic and riparian resources in the work area are identified and implemented. When required, the Department will obtain a Streambed Alteration Agreement (Fish and Game Code 1601) from the California Department of Fish and Wildlife prior to the implementation of the vegetation management work.

It is anticipated that future effects of climate change will include decreased precipitation, increased temperature, longer and more frequent periods of drought, and periodic high rainfall events that could result in an increase in the growth of grasses and other highly combustible vegetative fuels. These conditions would have the potential to result in an increase in the frequency and severity of wildfires in the Santa Barbara area. An increased risk for wildfires will place additional importance on the use of fire resistant construction techniques and the implementation of vegetation management programs, particularly in wildland-urban interface areas.

The City has implemented a variety of programs and procedures to assist property owners that have been affected by recent wildfires. Information and assistance can be obtained regarding a variety of fire-related reconstruction requirements, including debris removal; erosion control; development requirements for non-conforming buildings; requirements for soils reports; review and construction requirements for main and accessory structures; and the temporary use of residential trailers during construction. As part of the rebuilding effort, the City encourages homeowners to incorporate fire prevention, energy efficiency and sustainability measures into proposed residence designs.

STRUCTURE FIRES

The City of Santa Barbara Fire Department provides fire prevention, suppression and other emergency response services. In addition to responding to structure fires, the Fire Department responds to medical emergencies, accidents, hazardous material releases and rescues. The Fire Department also responds to aircraft emergencies at the Santa Barbara Airport. Non-emergency services provided by the Fire Department include conducting fire and life safety inspections, building inspections, fire code investigations, code compliance, development review and public education.

The Santa Barbara Fire Department operates seven fire stations and an aircraft fire fighting station at the Airport. In 2012, the Department had 89 firefighters to serve a resident population of approximately 90,000 people. This results in a fire fighter to resident ratio of almost one fire fighter per 1,000 residents, which is a good service ratio. The Fire Department estimates that during the day when visitors and out-of-town employees are present, the City's population increases to an average of approximately 123,000 people, which decreases the fire fighter to population served ratio.

Flooding Hazards

This section of the Safety Element provides a description of the three types of flooding hazards that have the potential to affect Santa Barbara: stream flooding that occurs when stormwater runoff overtops a creek's banks; coastal area flooding caused by ocean tides, sea level conditions and/or storm-generated waves; and the inundation of areas due to the failure of a dam. More detailed information regarding flooding-related hazards and their effects on the City is provided by the *Safety Element Technical Background Report* (Appendix J).

STREAM FLOODING

Stream flooding occurs when stormwater runoff in a stream channel exceeds the water carrying capacity of the channel, causing water to flow over the stream's banks. Stream channels located in the Santa Barbara area and their associated watersheds often experience short-duration, high-intensity rainfall events, which can result in high runoff rates and creek flows that rise quickly. Many of the natural creek channels in the City do not have the capacity to convey a sudden increase in flood flows that can occur during a large storm, and the areas with the greatest potential to experience out of channel flows are the lower creek reaches where streambed gradients flatten and channel bank tops are relatively low.

The magnitude and severity of flood events may be increased by a variety of natural- and development-related conditions. Natural factors can include the excessive growth of brush and trees within drainage channels, which may obstruct stream flows and result in an increase in floodwater heights. Fires within the watershed will result in the removal of vegetation that helps to control the amount and rate of stormwater runoff. Urban development often results in an increase in impervious surface areas, which changes the drainage area's stormwater runoff characteristics. These effects are referred to as "hydromodification" and can result in increased stormwater runoff volume, velocity, temperature, discharge duration, as well as an increase in erosion, sedimentation and other pollutants. The combined effect of more runoff reaching the stream channel in a reduced period of time can substantially increase flooding-related hazards and result in more severe and frequent floods.

Floods are generally described in term of their frequency of occurrence. For example, a 100-year flood is defined by evaluating the long-term average time period between floods of a certain size, and identifying the size of flood that has a one percent chance of occurring during any given year. A recurrence interval such as a 25-year or 100-year flood represents only the long-term statistical average time period between floods of a specific size. Floods of any size may occur at much shorter intervals or even within the same year.

To protect urban development from the impacts of flooding, stream channels are often "channelized" (i.e., straightened and/or lined with concrete or other material) to move water through the channel more efficiently. However, as runoff water emerges from the channelized section of the stream, it is often delivered to an unchannelized down-stream section at velocities that the natural section of the stream is not capable of adequately carrying. This can result in increased flooding impacts downstream and erosion of the stream bed and banks.

Four major watersheds drain through the City of Santa Barbara to the Pacific Ocean. The creeks that drain those watersheds include Arroyo Burro Creek, Mission Creek, Sycamore Creek and the Laguna Channel. The Arroyo Burro, Mission and Sycamore Creeks originate in the Santa Ynez Mountains and drain areas within the Los Padres National Forest as well as developed areas of the City. The Laguna Channel watershed drains an almost entirely urbanized watershed within the City. The Santa Barbara Municipal Airport is located on low-lying ground within the historic boundaries of the Goleta Slough, and is also in an area where four major creeks are located: San Pedro, Tecolotito, Carneros and Las Vegas Creeks.

The Federal Emergency Management Agency (FEMA) has designated flood hazard zones throughout the City, and areas subject to inundation during a 100-year storm are depicted on Flood Insurance Rate Maps. The boundaries of designated flood hazard areas may be updated by FEMA from time to time to reflect changed conditions within the watershed or to provide more accurate information about areas that may be subject to flooding. The designated 100-year flood zone areas in the City are generally depicted on Figure 24, 100-Year Flood Plain, of the *Safety Element Technical Background Report* (Appendix J) and are briefly described below. The locations of individual neighborhoods that may be affected by flooding are described by the Land Use Element.

Arroyo Burro Creek

Floodwater from Arroyo Burro Creek during a 100-year storm may inundate an area north of and adjacent to U.S. 101 in the southeastern portion of the Upper State neighborhood. On the south side of the highway, areas of the Hidden Valley neighborhood may also be flooded. Small areas in the San Roque and Hitchcock neighborhoods adjacent to San Roque Creek, a tributary to Arroyo Burro Creek, may also experience flooding-related impacts.

Mission Creek

Flood zones along the northern portions of Mission Creek are generally confined to the creek channel until the creek enters the Oak Park neighborhood, where 100-year flood zones have been designated along the western portion and in the southeastern area of the neighborhood. Along the lower reaches of the creek, flooding may affect areas located in the West Downtown, Lower State, West Beach, and Waterfront neighborhoods. Floodwater from Mission Creek can also enter the Laguna Channel watershed, which adversely affects the ability of the Laguna Channel to convey flood flows.

Sycamore Creek

Runoff from a 100-year storm is generally contained within or adjacent to the Sycamore Creek channel until it reaches the Eastside neighborhood, where the southern portion of the neighborhood may experience flooding. Sycamore Creek can also cause flooding impacts in portions of the East Beach neighborhood, where overbank flows occur due to a reduction in the creek channel slope and the resulting reduction in channel conveyance capacity.

Laguna Channel

Flooding associated with the Laguna Channel during a 100-year storm can affect portions of the Lower State and Milpas neighborhoods, the western end of the East Beach neighborhood, and extensive areas of the Waterfront and Lower East neighborhoods.

Airport Area

Extensive areas located at and adjacent to the Airport may be inundated during a 100-year storm. The new terminal building was constructed in accordance with the requirements of the City's Floodplain Ordinance, which required the structure to be elevated to the 100-year flood water elevation.

Flooding can be increased in low-lying areas located near the areas where creek or drainage channels discharge to the ocean when high tides coincide with intense rainfall events. The higher sea level conditions caused by high tides can slow the flow of water before it reaches the ocean, causing flood flows to back up into flood-prone areas located near the coast.

Numerous regulatory requirements and risk reduction programs have been implemented by federal, state and local agencies to minimize the effects of stream flooding. In general, these requirements include programs that reduce the potential for damage to structures and to provide and maintain flood control facilities. Some of the measures that reduce the risk and consequences of flooding in the City include the National Flood Insurance Program; the construction, operation and maintenance of flood control and drainage infrastructure by the Santa Barbara County Flood Control District and the City Public Works Department; and the City's Flood Plain Management Ordinance (Municipal Code Chapter 22.24) and Development Along Creeks Ordinance (Municipal Code Chapter 28.87).

Although the effects of climate change may result in overall drier conditions and a decrease in average amounts of precipitation, it is expected that the number of intense rainfall events will increase. If large storms occur more frequently, a corresponding increase in the frequency and severity of stream flooding is likely to occur and more extensive areas could be affected by flooding. In addition to an increase in storm intensity and frequency, flooding in coastal areas where streams meet the coast may be increased due to a rise in sea level. Accelerated sea level rise in California due to climate change is forecasted to be in the range of five to eight inches by the year 2030, 10-12 inches by 2050, and 31-69 inches by 2100.

DAM FAILURE

Dam inundation is the flooding of lands due to the release of impounded water resulting from the failure or overtopping of a dam. Dams can fail for one or a combination of reasons, including: overtopping caused by floods that exceed the capacity of the dam; failure of materials used in construction of the dam; movement and/or failure of the foundation supporting the dam; inadequate maintenance; or deliberate acts of sabotage.

The Lauro Dam and Reservoir is located north of and adjacent to the City limits and would have the potential to result in inundation impacts to the City should a failure of the dam occur. The dam was constructed in 1952 by the Bureau of Reclamation as part of the Cachuma Project, and is operated by the Cachuma Operations and Maintenance Board. The Bureau of Reclamation and other federal agencies, such as FEMA, have established extensive regulatory requirements and programs that require ongoing inspection and maintenance of federally-owned dams. In addition to these programs, seismic strengthening modifications to the dam were completed in 2007. With the continued implementation of existing programs, the risk of a catastrophic dam failure of the Lauro Dam and resulting effects in the City is very low.

COASTAL FLOODING AND INUNDATION

Coastal flooding refers to a temporary covering of areas on or near the coastline caused by stream flow, high tides, ocean storm conditions, or a combination of those processes. Coastal inundation refers to a permanent covering of an area by ocean water. Beach and adjacent low-lying areas would be the most susceptible to the effects of coastal inundation.

Coastal flooding in Santa Barbara has generally occurred as a result of large, storm-generated ocean waves moving onshore combined with high tide conditions. Figure 25, Coastal Storm Surge Hazard Areas, of the *Safety Element Technical Background Report* (Appendix J) depicts areas of the City that could be flooded as a result of storm surge during a 100-year storm under existing sea level conditions. Coastal areas that would be expected to incur temporary flooding-related damage include most beaches and adjacent areas as far inland as Shoreline Drive and Cabrillo Boulevard.

Figure 25 also depicts areas that could be affected by coastal flooding caused by a 100-year storm plus the effects of a 55-inch increase in sea level. Such an increase in sea level is near the high end of sea level rise projections for conditions that could exist by the year 2100. Under such possible future conditions, the areas that could be affected by coastal flooding are located substantially further inland than under existing sea level conditions, and include much of the East Beach, Lower East and Laguna neighborhoods. Future coastal flooding conditions at the Airport would also be expected to increase in terms of frequency and severity, with additional low-lying areas near the airport experiencing the effects of coastal flooding during large storms.

There is a level of uncertainty associated with predicting how sea level rise conditions will affect coastal and inland areas because it is not known how fast or how much sea level conditions will continue to change in the future. However, it is reasonable to expect that as sea level increases, impacts resulting from coastal flooding will also increase.

The potential for City beaches and adjacent areas to be inundated as a result of a climate change-related increase in sea level will be controlled by factors such as the future rate and magnitude of sea level rise, and the width and elevation of the City's beaches. Projections regarding the possible magnitude of sea level rise vary substantially; however, the *City of Santa Barbara Sea Level Rise Vulnerability Study* concluded that over an intermediate time frame (to 2050) a projected 14-inch rise in sea level would have a low probability of resulting in a permanent loss of City beaches. If sea levels were to continue to rise, areas that would have formerly only been temporarily flooded or submerged during very high tides and/or large El Niño storms would gradually begin to be inundated permanently. Over a long-term period (to 2100), a 55-inch rise in sea level would substantially increase the probability of permanent beach and adjacent area inundation.

Hazardous Materials

The benefits derived from the use of chemicals are substantial but due to their widespread use, occasional accidental releases to the environment occur. In addition to hazardous materials used by commercial, industrial and institutional uses, hazardous materials such as cleaners, paint, automotive and garden products, hobby supplies, and swimming pool chemicals are used in substantial quantities in residential areas. The improper use or disposal of these types of hazardous materials can have adverse health, safety and environmental consequences. An emerging health and safety issue is the improper disposal of pharmaceuticals, which when introduced into the environment can affect human health and ecosystems.

The Santa Barbara County Fire Department's Site Mitigation Unit and Leaking Underground Fuel Tank programs provide regulatory oversight for the assessment and remediation of hazardous material release sites within the City of Santa Barbara. Several state agencies also provide remediation oversight and information that identifies sites with soil and groundwater contamination, including the California Environmental Protection Agency, Department of Toxic Substances Control, and the California State Water Resources Control Board.

The areas of the City with the highest concentration of contaminated sites are generally located in the commercial and industrial areas of the Downtown, Eastside and Waterfront/Harbor areas; in the vicinity of Cottage Hospital; along Cliff Drive in the Mesa area; along Upper State Street; and at and near the Airport. The areas of the City where hazardous material release sites are most commonly located are depicted on Figure 26, Hazardous Material Release Areas, of the *Safety Element Technical Background Report* (Appendix J).

One of the regulatory programs commonly used to minimize risk from hazardous materials is the requirement for businesses that use hazardous material in excess of specified quantities to prepare a Hazardous Material Business Plan. Business Plans provide information that may be used by first responders to prevent or mitigate impacts to public health and safety and the environment resulting from a release or threatened release of a hazardous material. Business Plans are also used to satisfy federal and state Community Right-To-Know laws that require disclosure of hazardous material use characteristics to the public.

Public Safety

Public safety issues addressed by this Safety Element include risk from aircraft operations at the Santa Barbara Municipal Airport; the transport of hazardous materials along local highways and rail lines through the City; the presence of natural gas transmission and distribution pipelines; and the creation of electromagnetic fields by high voltage transmission lines. More detailed information regarding these hazards and their effects on the City is provided in the *Safety Element Technical Background Report* (Appendix J).

AIRCRAFT OPERATIONS

To assist in the evaluation of land use compatibility issues involving airports, in 1967 the California Legislature authorized the formation of Airport Land Use Commissions and the preparation of Airport Compatibility Land Use Plans. It is the objective of these planning programs to minimize the public's exposure to safety hazards while providing for the orderly expansion of airports where needed. An *Airport Land Use Plan* for the public airports in Santa Barbara County was adopted in 1993 and is administered by the Santa Barbara County Association of Governments (SBCAG). SBCAG and the Santa Barbara Airport Department update the *Airport Land Use Plan* periodically.

The type and intensity of future development that may occur on City property at and adjacent to the Airport is controlled by several land use planning programs, including the requirements of the Airport Zoning Ordinance, Title 29 of the Municipal Code; the *Airport Industrial Area Specific Plan; City of Santa Barbara Coastal Plan for the Airport and Goleta Slough;* and the *Aviation Facilities Plan.* In addition, future land uses on Airport property would be required to comply with the standards established by the most-current version of the *Airport Land Use Plan,* as well as Federal Aviation Administration (FAA) and other applicable safety regulations.

The potential for future development on properties located in the vicinity of the Airport to result in land use or safety conflicts would be minimized by complying with existing FAA regulations and reviewing projects to ensure that they are consistent with the land use planning objectives of the most-current *Airport Land Use Plan* and the *California Airport Land Use Planning Handbook.* It should also be noted that helicopter and aircraft activity related to Cottage Hospital and potentially other locations may create potential aviation hazards for surrounding neighborhoods and land uses.

HAZARDOUS MATERIAL TRANSPORT

U.S. 101 and the Union Pacific Railroad extend through Santa Barbara from east to west and both are used for the transportation of hazardous materials. The City has limited control over the volume and type of materials transported along these major transportation corridors and it can be expected that various types of hazardous materials, including explosives, compressed and liquefied gasses, petroleum products, agricultural chemicals, industrial chemicals, military ordnance, radioactive material and hazardous wastes will pass through the City on a regular basis. The potential for a spill or leak to occur while hazardous materials are being transported through the City is very low; however, the consequences of such an event have the potential to be high.

Another major transportation facility in the Santa Barbara area is SR 154; however, the transportation of hazardous waste is restricted along the portion of SR 154 that extends between its southern junction with U.S. 101 and the SR 246 intersection near Solvang. In addition, the California Assembly passed House Resolution HR 31 in 2012, which urges truck drivers traveling through Santa Barbara County to continue on State Highway Route 101 rather than using SR 154.

In the event of a transportation-related hazardous material release, emergency response is provided by the California Highway Patrol, City Fire Department and the Santa Barbara County Fire Department, along with Caltrans and local Sheriff and Police Departments to provide containment, enforcement and traffic routing assistance. If necessary, the California Emergency Management Agency (Cal EMA) Hazardous Materials Section will coordinate the implementation of a hazardous material emergency response. This includes providing state and local managers with emergency coordination and technical assistance.

NATURAL GAS PIPELINES

Risks to the public from natural gas pipelines result from the potential for an unintentional release, which can impact surrounding populations, property, and the environment. These consequences may result from fires or explosions caused by ignition of the released gas, as well as possible toxicity and asphyxiation effects. Pipeline releases can occur due to a variety of causes, including internal and external corrosion, excavation damage, mechanical failure, operator error, and natural force damage (e.g., earthquakes).

Although natural gas pipeline incidents are infrequent, such an event has the potential to result in significant consequences that may impact the general public. This was evidenced in 2010 in the City of San Bruno when a 30-inch natural gas transmission pipeline ruptured and the ensuing explosion and fire killed eight people, destroyed 37 homes, damaged 18 homes and resulted in numerous injuries.

In the Santa Barbara area, the Southern California Gas Company is the natural gas utility company and operates a system of natural gas transmission and distribution lines that are generally located in the northern portion of the City, along the waterfront and on airport property. The Gas Company implements a pipeline safety program that includes measures such as: odorizing gas so leaks are more easily detectable; conducting leak surveys and pipeline patrols to identify missing pipeline markers, indicators of pipeline leaks, and construction activity that could damage a pipeline; interior and exterior pipeline corrosion control measures; and inspection and maintenance of valves, underground vaults, pipeline crossings, and pressure-relief devices. Pipeline safety programs are also implemented by various state and federal agencies.

ELECTROMAGNETIC FIELDS

Electric and magnetic fields are created by high voltage electricity transmission lines, distribution lines that bring electricity into structures, wiring within households, and by common household appliances that use electricity. The strength of electric and magnetic fields produced by electrical lines and appliances diminishes quickly as the distance from the source of the field increases.

Since the mid-1970's, a variety of scientific studies have demonstrated that biological changes can be produced by electric and magnetic fields. More recent scientific research has focused on exposure to electromagnetic fields (EMF) rather than electric fields. Although some studies raised the possibility of emotional, behavioral, and reproduction effects, public concern regarding EMF exposure has focused primarily on a statistical association between magnetic fields and cancer. Although the results of studies regarding this issue vary, most have concluded that there is insufficient data to conclude that there is a cause and effect relationship between EMF and cancer.

Southern California Edison (SCE) provides electrical service to the City. The transmission system in the City includes several large tower-mounted 66 kilovolt (kV) lines extending east to west along the base of the Santa Ynez Mountains, approximately two miles north of the City. The electrical distribution system operates at 2.4 kV, 4.16 kV and 16.5 kV and is distributed as needed throughout the City. Approximately 30 percent of the City's distribution system is underground.

There are no federal or California numerical thresholds for exposure to electromagnetic fields. In 2006, the California Public Utility Commission determined that it is appropriate for utilities to continue to take no-cost or low-cost measures where feasible to reduce EMF exposure from new or upgraded utilities (CPUC Decision D.06-01-042). These types of actions may include design changes to utility systems; routing lines to limit exposures to areas of concentrated population and group facilities such as schools and hospitals; installing taller distribution line support structures; widening right of way corridors; and the burial of distribution lines.

On a local level, it has been the City of Santa Barbara's policy to limit EMF exposure in land use decisions as feasible to do so. Reducing EMF exposure may be achieved by implementing a practice referred to as "prudent avoidance," which is a principle of risk management indicating that reasonable efforts to minimize potential risk should be taken when the actual magnitude of the risk is unknown.

When electromagnetic energy moves through electrical wires, the movement results in the generation of electric and magnetic fields. When electromagnetic energy moves from one point to another by waves propagated through space, the movement is accompanied by the formation of radiowaves (or radio frequency radiation). The potential for exposure to radio waves is commonly a concern associated with the installation and operation of telecommunication facilities. The 1996 Telecommunications Act is administered by the Federal Communications Commission and established standards regarding the construction, modification and placement of facilities such as towers for telecommunication systems. The Act established limits for occupational and general population exposure to radio frequency radiation, and also preempts state and local government regulation of telecommunication facilities on the basis of environmental effects of radio frequency emissions.

Public Services

The City of Santa Barbara provides a wide variety of services to protect and enhance the health, safety and general well-being of the City's residents. Public services provided by the City include widely-used infrastructure systems such as potable water production, treatment and distribution; wastewater collection and treatment; road construction and maintenance; solid waste collection, recycling and disposal services; and the operation and maintenance of the City's airport and harbor. Other public services provided by the City include public safety functions such as police and fire protection, and parks and recreation facilities and functions.

Public services provided by the City, such as fire and police protection services, are essential to reduce risk and manage events associated with safety-related hazards. The effective delivery of emergency response efforts in the aftermath of a disaster or accident is influenced by the ability of local emergency response organizations and infrastructure systems to operate at or near planned capabilities. Providing improvements to the City's critical emergency response infrastructure, such as upgrades to fire stations or the replacement of the aging Police Department building, receives ongoing attention as part of the City's annual budget and capital improvement processes. A review of unfunded capital improvement projects was conducted by the City and culminated in a report titled *Keeping Santa Barbara in Shape, Infrastructure Financing Report for the City of Santa Barbara (2008).* In addition to identifying various public service and emergency response infrastructure deficiencies, the report identified financing mechanisms that may provide funding to implement needed infrastructure improvements. The Santa Barbara Annex to the *Multi-Jurisdictional Hazard Mitigation Plan* also includes recommended actions to reduce risks to City-owned infrastructure that may result from geologic, fire and flooding hazards to increase the likelihood that critical services and facilities will remain functional after a disaster. The actions recommended by the Santa Barbara Annex are reviewed and revised at least every five years to reflect updated hazard reduction priorities and funding constraints.

Other public service infrastructure systems and programs facilitate emergency response capabilities, such as providing adequate long-term water supplies and maintaining reliable water delivery systems. As indicated by the City's *Climate Action Plan* (2012), maintaining adequate water supplies could become a priority if future weather changes result in less water storage and water availability in California due to decreased average rainfall, more droughts, less precipitation as snow, and earlier melting of snow pack. Warmer weather would also increase demand for irrigation of agriculture and landscaping. Providing and maintaining safe road systems is also an essential component of the City's ability to provide emergency response services and to facilitate evacuations during emergency events.

A vital public service function conducted by the City is a comprehensive program of emergency preparedness. Pre-emergency planning conducted by the City is coordinated with a multitude of Federal and State agencies and regulations, Santa Barbara County and other nearby counties, and other nearby cities. The following information provides a brief overview of the emergency preparedness actions and planning programs that have been implemented by the City.

EMERGENCY PREPARDNESS

The purpose of emergency planning is to identify policies and actions that can be implemented over the long-term to reduce risk and the potential for future losses, to respond effectively to emergency or disaster conditions and minimize social disruption, and to aid in post-disaster recovery. There are many aspects to emergency planning; however, the basic concepts include developing plans and procedures, maintaining risk reduction and loss prevention programs, managing available resources to respond during an emergency, implementing mutual aid agreements, training people and educating the public.

Many local, regional, state-wide and federal emergency preparedness and response programs have been prepared to assist in emergency management and recovery.

City of Santa Barbara

Emergency Response Planning

One of the major elements of the City's emergency planning program is the **Emergency Operations Plan** (2007). The Emergency Operation Plan outlines response procedures that would be implemented after a natural disaster, technological incident, or security incident. The objective of the plan is to establish an effective organization capable of responding to emergency situations using all appropriate facilities and personnel in the City. The Emergency Operation Plan assigns tasks and specifies policies and procedures for the coordination of emergency staff and service elements, and identifies emergency response actions for large-scale emergencies. These measures are to be implemented in manner reflecting effective and economical allocation of resources for the maximum benefit and protection of the civilian population in time of emergency.

The Emergency Operation Plan was developed as part of the California Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS), and is an extension of the State Emergency Plan and the National Response Plan (NRP). SEMS has been adopted by the City to manage responses to multi-agency and multi-jurisdiction emergencies and to facilitate communication and coordination between responding agencies. Local governments must use SEMS to be eligible to recover costs under State's Disaster Assistance Programs. Following a presidential disaster declaration, NIMS and the Hazard Mitigation Grant Program are activated. The purpose of these programs is to fund projects that are cost-effective and substantially reduce the risk of future damage, hardship, loss, or suffering from a major natural disaster.

The Emergency Operations Plan outlines the responsibilities of the various City government departments during emergency situations. The Fire Department's role includes direct response to fires, medical emergencies, environmental emergencies, and natural disasters. Fire Department responses may also be coordinated with mutual aid agreements with other local, state and federal agencies. The Department's Office of Emergency Services coordinates the City's response to disasters, educates residents regarding disaster preparedness, and operates the City's Emergency Operations Center. The Emergency Operations Center is activated when field response agencies need support during any significant incident. The Office of Emergency Services also coordinates emergency service functions of the City with other public agencies and affected citizens, corporations and organizations. In many emergency situations, Police Department officers are among the first responders and implement traffic control and evacuations. The Public Works Department participates in a wide variety of activities, including: recovery operations; coordinating with public utility companies; providing transportation for emergency agencies of the City; assuring that an adequate supply of water is available for emergency requirements, that an adequate supply of potable water is

available, and that adequate sanitary facilities are provided; and assisting in and providing for traffic controls and warning signs. In the event of a natural disaster, the Waterfront Department, Community Development and Building Divisions, Airport and Parks and Recreation Departments may also have emergency response duties.

The Emergency Operations Plan also outlines specific disaster response and recovery objectives. Short term recovery objectives include:

Utility restoration

Expanded social, medical, and mental health services

Re-establishment of City government operations

Clearing and repairing transportation routes

Debris removal

Cleanup operations

Abatement and demolition of hazardous structures.

The major objectives of long-term recovery operations include:

Coordinating delivery of social and health services

Review of potential improvements in land use planning

Re-establishing the local economy to pre-disaster levels

Recovery of disaster response costs

Effectively integrating mitigation strategies into recovery planning and operations.

Improving the Santa Barbara Emergency Operations Plan

The City of Santa Barbara's **Emergency Services Organization** is managed by the Emergency Services Council and is comprised of all officers and employees of the City, together with those volunteer forces enrolled to aid the City during a disaster, and all groups, organizations and persons who may by agreement or operation of law be charged with duties related to the protection of life and property in the City during a disaster. These groups include, but are not limited to: school districts, the Santa Barbara Community College District, Santa Barbara Metropolitan Transit District, American Red Cross, and the Amateur Radio Emergency Services.

The City uses the Santa Barbara County Sheriff's **Reverse 911** system, which has the ability to alert the public regarding emergency events by sending recorded messages to local phone numbers. The system can be used to alert specific neighborhoods or the entire city about conditions such as evacuation warnings, flood and fire events, hazardous material spills, and missing persons. Landline phone numbers are on the Reverse 911 list even if the number is unlisted. Digital or internet telephone service must be "E911 Compliant" to receive Reverse 911 calls. Cell phone numbers must be added to the Sheriff's Reverse 911 database, which can be done through the Sheriff's Reverse 911 registration internet site.

Evacuation Planning

Another major component of the City's emergency response planning efforts pertains to evacuating areas in response to a fire, flood, tsunami warning or other similar incidents. Evacuation planning has been described as being "a process not a product"; however, the Fire Department has developed and maintains evacuation

plans and procedures, particularly in regard to the evacuation of high fire hazard areas in the foothill areas of the City. Fire evacuation plans and procedures maintained by the Fire Department are described in the *Wildland Fire Plan* (2004) and are summarized below.

The identification of areas to be evacuated, the timing of voluntary evacuation warnings and mandatory evacuation orders, and the identification of evacuation routes is typically determined from information received from Fire Department units regarding fire behavior conditions and movement. Directing the evacuation of neighborhoods during a wildfire is primarily the responsibility of the Police Department and cooperating law enforcement agencies.

The Fire Department's evacuation plan separates the high fire hazard areas throughout the Santa Barbara front country (the Extreme Foothill Zone and Foothill Zone identified on Figure 20, High Fire Hazard Zones, of the *Safety Element Technical Background Report*) into "evacuation blocks." The boundaries of individual blocks were determined based on the topography of major canyons and the existing road system. Fire response and evacuation planning for each block considers and includes items such as traffic closure points, fire equipment response routes, fire resources that would respond to a fire based on first, second and third alarms, probable evacuation routes, incident command posts to facilitate management of the fire, fire staging areas for equipment and personnel, evacuation centers for civilians and animals, and other fire-related risks that may be unique to an individual block.

The road system within each evacuation block was evaluated to determine the best routes to use for fire response equipment and probable evacuation routes. Efforts were made to separate fire response routes and evacuation routes where possible; however, in many blocks this is not feasible. It must be emphasized that the identified response and evacuation routes identified by the *Wildland Fire Plan* may be modified at the time of the incident in response to fire conditions. Therefore, the identified roadways should only be considered as probable evacuation routes.

Evacuations are conducted to the extent possible by issuing warnings and orders to individual evacuation blocks based on location and characteristics of the fire. By phasing evacuation operations, the potential for severe roadway congestion can be minimized. Notifications to specific evacuation blocks can be disseminated in a variety of ways, including Reverse 911 calls, radio and television announcements, social media, emergency response equipment public address systems, and door to door notifications.

The Fire Department continues to study and plan for evacuation events. Future updates to existing evacuation procedures will consider factors such as studies of how the public can be expected to respond to emergency conditions, and lessons learned from evacuations conducted in response to recent fires in Santa Barbara and other locations.

Santa Barbara County

The Santa Barbara County **Office of Emergency Management** is responsible for emergency planning and coordination among the Santa Barbara Operational Area entities, which includes:

- Each of the incorporated cities in the County.
- Special districts, including the Air Pollution Control District; and fire, sanitary, school, vector control, and water districts.
- Volunteer Organizations, including the American Red Cross, Amateur Radio Emergency Services, Equine Evacuation, and Montecito Emergency Response & Recovery Action Group, and Volunteer Organizations Active in Disasters.

Industry Groups such as, Community Awareness and Emergency Response, petroleum industry mutual aid group, and the Santa Barbara Industrial Association.

The Office of Emergency Management also coordinates with the emergency services offices of Ventura and San Luis Obispo Counties; prepares and maintains the *Santa Barbara County Operational Area Multi-hazard Functional Plan* and the *Santa Barbara County Multi-Jurisdictional Hazard Mitigation Plan*; maintains and operates the County Emergency Operations Center, coordinates disaster plans and exercises with the County's incorporated cities; assists County departments in developing department emergency plans, and provides public education.

The *Santa Barbara County Multi-Jurisdictional Hazard Mitigation Plan* addresses a variety of hazards that have the potential to affect Santa Barbara County and the City of Santa Barbara, and hazard-related issues specifically related to Santa Barbara are addressed in the Santa Barbara Annex to the Plan. Overall, the analysis and risk reduction programs and recommendations included in the Plan are provided to achieve three hazard reduction goals:

Promote disaster-resistant future development.

Build and support capacity and commitment for existing assets, including people, critical facilities/infrastructure, and public facilities, to become less vulnerable to hazards.

Enhance hazard mitigation coordination and communication.

State of California

The **California Emergency Management Agency** (Cal EMA) is the primary emergency response and coordination agency for the State and was established as part of the Governor's Office in 2009 by Assembly Bill 38 (Nava), which merged the duties, powers, purposes, and responsibilities of the former Governor's Office of Emergency Services with those of the Governor's Office of Homeland Security.

Cal EMA is responsible for the coordination of state agency response to major disasters and support of local government. The Agency is responsible for assuring the State's readiness to respond to and recover from all hazards, including natural, manmade, and war-caused emergencies and disasters, and for assisting local governments in their emergency preparedness, response, recovery, and hazard mitigation efforts. During major emergencies, Cal EMA will coordinate region-wide and mutual aide responses to emergencies; provide equipment and support to local agencies; and provide search and rescue support. Cal EMA also maintains a 24-hour hazardous material release hotline, and relays spill reports to other state and federal response and regulatory agencies. Cal EMA serves as the "grantee" for federal disaster assistance, principally from the Federal Emergency Management Agency (FEMA), and helps local governments assess damages and assists them with federal and state grant and loan applications.

Federal Emergency Management Agency (FEMA)

FEMA's mission is to "support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards." FEMA has many roles; however, a primary responsibility is to coordinate the response to a disaster that has occurred in the United States and that overwhelms the resources of local and state authorities. The Governor of the state in which the disaster occurs must declare a state of emergency and formally request from the President that FEMA and the federal government respond to the disaster. FEMA provides a wide variety of services, including disaster response preparation, disaster survivor assistance, and disaster response and recovery operations.

Goals, Policies and Implementation

A top priority for the City is to prepare for hazard events that cannot be avoided, such as earthquakes, fires and floods; and to facilitate the recovery of the community after a disaster occurs. The combined benefits of minimizing hazard-related risk and pre-disaster planning supports the general safety and well-being of the community, and promotes community resiliency by reducing the effects of hazards in terms of injury and loss of life, property damage, and loss of natural and economic resources.

An important function of the City's development review process is to identify and evaluate natural and human-caused hazards that may adversely affect a project or the community, and to reduce hazard-related risk by methods such as hazard avoidance, project design measures, compliance with regulations, and the implementation of mitigation measures. The Safety Element facilitates this important planning function by providing information that guides the evaluation of hazard-related effects; by providing policies that protect the community from hazard-related risk; and by supporting the implementation of programs intended to enable and expedite the recovery of the community after a disaster occurs.

The following goals, policies and possible implementation actions are intended to reduce the effects of natural and human-caused hazards that have the potential to affect Santa Barbara. The goals, policies and implementation actions have been developed during the preparation of Safety Element Update. Other policy development sources include the 2011 General Plan, the City's Climate Action Plan, the City's Local Coastal Program, and the original 1979 Seismic Safety/Safety Element.

GOALS

- ***Public Safety:*** Protect life, property and public well-being from natural and human-caused hazards.
- ***Community Resilience:*** Promote community resilience through risk reduction, public education and emergency response planning and programs.
- ***Hazard Risk Reduction:*** Use the development review process to minimize public and private risk and minimize exposure of people and property to risks of damage or injury caused by natural and man-made hazards.

Community Resilience

S1. **Emergency Response Plans.** Work cooperatively with federal, state, county, and other local jurisdictions to promote a high level of readiness to respond to emergencies, to update emergency response plans as needed, and to avoid and reduce the effects of disasters and emergencies on the City and its residents.

S2. **People with Disabilities.** Update City evacuation plans and other emergency or contingency plans with provisions addressing the safety of people with special needs or disabilities.

S3. **Emergency Workforce.** Work cooperatively with other jurisdictions in the South Coast Region to ensure that essential workers are available and ready to respond adequately and with timeliness in the event of a disaster.

S4. **City Disaster Service Workers.** Encourage City employees to have personal and family disaster plans, and provide that they understand their roles and responsibilities as disaster service workers.

S5. **Public Education.** Promote public education on emergency and disaster preparedness to enhance individual and overall community resilience.

S6. **Community Resilience Planning.** Encourage regional resiliency planning processes to help improve initial local response/relief efforts, subsequent recovery phases after emergencies, and ongoing community self-sufficiency and sustainability.

Possible Implementation Actions to be Considered

6.1 Resilience Planning Products. Develop the following as part of community resilience planning efforts:

a. Maps and a data base of relief facilities, resources, businesses, and people that can help provide community relief during emergencies; the means for informing the public of resources data base; and a process for maintaining and updating data base information.

b. An outline and example for development of neighborhood resiliency plans.

c. An outline of additional community actions or projects for improvement to facilities, equipment, supplies, etc. that would benefit community resiliency (e.g., communications systems improvements).

6.2 Resilience Plan Process. Conduct the resilience planning process as a broad, cross-sector effort in coordination with the South Coast Region to engage public and institutional involvement, including:

Public safety agencies

Neighborhood groups and homeowner associations

Businesses, non-profit groups, and other non-governmental entities

Health care facilities and practitioners (e.g., hospital, clinics)

Relief supplies and volunteers (e.g., Red Cross, Direct Relief International)

Hotels and institutional facilities (e.g., schools; churches, retirement facilities and other group homes, Fairgrounds)

Water, wastewater, waste management agencies/companies (including debris removal)

City Harbormaster, Harbor Patrol and Waterfront Rescue and Operations Staff

Local agriculture, groceries, and restaurants

Energy utilities and energy companies

Transportation companies and agencies

Communications companies

Ham radio operators

Animal care facilities; funeral facilities; and other special needs facilities

Local government departments and special districts (information systems; building & safety; animal control, vector control; etc.).

S6.3 Neighborhood Resilience Plans. Promote development of neighborhood level plans to improve initial emergency response, subsequent recovery, and ongoing self-sufficiency. These plans could also be developed as part of broader Sustainable Neighborhood Plans identified in the General Plan Land Use Element.

Hazard Risk Reduction

Development Review

S7. **Hazard Reduction.** Identify, evaluate and implement risk reduction measures during the development review and permitting process to reduce the effects of hazards to an acceptable level of risk. Project design measures shall be implemented as applicable to avoid or reduce hazards and comply with associated regulations.

S8. **Information Resources.** Maps depicting areas affected by natural and human-caused hazards shall be maintained by the City. These maps may be updated from time to time when new information regarding the location or severity of hazards becomes available.

S9. **Risk Evaluation.** Proposals for new development may be required to provide an evaluation of how natural and human-caused hazards may adversely affect the project, whether the project may create or exacerbate hazards, and to identify feasible measures to reduce hazard-related risk to an acceptable level. Required hazard evaluation reports are to be prepared and signed by a qualified individual acceptable to the City. At its discretion, the City may require peer review of submitted reports.

Factors to be considered in determining whether a risk evaluation is required include but are not limited to:

a. Location of the project in relation to City hazard maps and other hazards information
b. Potential for the project to exacerbate natural or human-caused hazards
c. Potential for the project to be impacted by natural and human-caused hazards
d. Potential severity of hazard-related impacts
e. Intended use of the site or proposed structures
f. Potential consequences should the project be affected by one or more hazards
g. Federal, state hazard regulations, building code requirements, and recommendations of the *Geology and Geohazards Master Environmental Assessment, Technical Report and Evaluation Guidelines and other similar regulations and guidelines.*

S10. **Adaptation in Development.** New public and private development or substantial redevelopment or reuse projects shall consider the useful life of proposed structures in conjunction with available climate change information, and incorporate adaptation measures in the location, siting, and design of structures.

Possible Implementation Actions to be Considered

S10.1. Adaptation Guidelines. The City shall prepare adaptation guidelines for development projects, and provide available information about potential climate change hazards to developers.

Geologic and Seismic Hazards

S11. **Fault Rupture.** Avoid placing new structures for human occupancy across or adjacent to active faults.

a. Fault Setbacks. Structures for human occupancy should generally be set back 50 feet from the location of an active fault as determined by a site-specific fault investigation. This setback distance may be altered based on the recommendations of the site-specific fault evaluation.

b. Utilities that Cross Faults. For linear utility infrastructure (e.g., water, sewer, gas pipelines) that must cross an active fault, appropriate safety measures shall be provided. Examples of appropriate safety measures include providing shut-off valves on both sides of the fault, motion sensitive shut-off valves, and/or appropriate structural engineering to accommodate anticipated levels of ground movement or surface warping.

S12. **Ground Shaking.** Reduce the effects of earthquake ground shaking through appropriate building design requirements for new buildings and retrofit measures for existing buildings.

a. Minimize the Effects of Ground Shaking. The City shall implement applicable building code requirements and the recommendations of site-specific soil and geologic investigations to minimize the effects of ground shaking on new development. Building code requirements pertaining to essential and critical facilities (e.g., schools, emergency service facilities, and utilities) shall also be implemented to reduce earthquake-related hazards.

b. Building Code Updates. The City will minimize ground shaking-related hazards to structures by continuing to review, amend, and adopt updated provisions of the California Building Code to incorporate and implement building design requirements.

c. Unreinforced Masonry Buildings. Implement existing building retrofit programs that address structural deficiencies in existing buildings that have the potential to result in significant safety hazards during earthquakes.

Possible Implementation Actions to be Considered

S12.1 Seismic Strengthening. Promote and implement a prescriptive seismic strengthening program to reduce the potential for damage to existing structures that do not meet current building code requirements.

S12.2 Inventory. Conduct a citywide inventory of soft-story buildings. These are buildings that were constructed prior to modern seismic safety building codes and that have inadequate seismic support on the ground floor.

S13. **Liquefaction.** Site preparation and foundation design recommendations identified by City approved project-specific soils investigations shall be included in proposed building plans. These may include measures such as excavation of liquefiable soils and recompaction, densification of soils, and/or specific foundation and structure designs.

S14. **Tsunami** (Seismic sea waves). New development in areas designated as a tsunami hazard zone shall be designed to minimize the potential for tsunami-related damage to the extent possible.

Possible Implementation Actions to be Considered

S14.1 Minimize Open Storage Areas. Consider amending the Local Coastal Program to discourage land uses that require extensive areas of open storage within the designated tsunami hazard area, in order to reduce the amount of potential debris generated by a tsunami.

S14.2 Minimize Structural Damage. To the extent possible, design new projects within the designated tsunami hazard zone to divert water to acceptable locations using structures such as walls, compacted terraces and berms, and parking structures, in order to minimize damage to structures intended for human occupancy. Encourage retrofits to existing development.

S15. **TsunamiReady Designation.** The City shall continue to implement the tsunami warning system capabilities, public education and readiness measures, and response planning programs necessary to be designated a TsunamiReady community.

S16. **Seiche.** Potential seiche hazards (earthquake, wind and landslide-generated waves in an enclosed water body) shall be considered during the design, environmental review, and permitting of new development located adjacent to the Harbor and Lauro Reservoir. Setbacks, drainage design, and coordination with down-slope properties are examples of measures that may be considered.

S17. **Slope Failure.** Discourage new development in areas where substantial slope movement has occurred in recent or historic times. New development in areas with high or moderate slope failure risk shall incorporate design and construction techniques that lessen slope failure risk to the extent feasible. Addressing slope stability issues may include measures such as avoidance of the hazardous area; removal of unstable material; engineered grading; drainage control; use of deep-rooted, drought-tolerant vegetation; use of use of slope retaining walls, and foundation support incorporating reinforced concrete piers.

S18. **Steep Slopes.** To minimize the potential for hazards such as severe erosion and landslides, grading on slopes greater than 30% should not be permitted.

S19. **Soil Erosion.** Incorporate long-term and construction-related measures in development as needed to address soil erosion. General management approaches for long-term site development include removal or recompaction of erosive soils; engineered slopes and grades; landscaping, and use of geotextiles. Best Management Practices to control erosion and sedimentation during construction may include use of silt fencing, straw bales, filter fabrics, or gravel.

S20. **Expansive Soils.** Implement appropriate site preparation and structural design measures in development to minimize the effects of expansive soils. Examples of measures include site layout to avoid or reduce hazard, control of site drainage, and specific foundation or structural designs such as reinforced foundations.

S21. **Radon.** New buildings intended for human occupancy located in areas with geologic formations having high potential for elevated radon concentrations shall incorporate appropriate control measures into the design of buildings. Control measures may include measures such as mechanical barriers and sealing of ducts and cracks, ventilation design, and depressurizing soil below the foundation.

S22. **High Groundwater.** Development in areas with known high groundwater conditions, or where historic high groundwater levels could return to previous high levels, shall be required to implement appropriate project design and control measures to adequately reduce the hazard.

a. Minimize the Effects of High Groundwater. Proposed building projects located in areas with existing or historic high groundwater conditions should determine a "design groundwater elevation" based on a review of current and historic groundwater level data and provide measures to minimize the potential for adverse effects.

Coastal Bluff Development

S23. **Coastal Bluff Development Guidelines.** The following guidelines shall be used to evaluate proposed development on coastal bluffs:

a. Setbacks from the bluff edge shall be adequate to address long-term erosion and slope stability issues.

b. Development, redevelopment, renovations, and additions on bluff top parcels shall be located and designed so that they will not be adversely affected by the long-term erosion of the adjacent cliff. A minimum period of 75 years shall be considered when evaluating the effects of bluff retreat over the life of a project. New development shall be placed at a distance away from the bluff edge such that the long-term erosion of the bluff will not seriously affect the structure during its expected lifetime.

c. All development, redevelopment, renovations and additions on bluff top parcels shall be located and designed so that erosion of the bluff at the project site or other locations will not be exacerbated. This includes, but is not limited to, locating and designing structures and other improvements to prevent a substantial increase in water percolation, weight placed near the bluff edge, and drainage over the bluff edge and down the cliff face.

d. For proposed new development which may become threatened by bluff erosion, coastal development permit conditions shall require demolition by owners in the event that failure of the structure due to future bluff erosion is deemed imminent by the City.

S24. **Site- or Area-Specific Investigations of Coastal Bluff Retreat Rates.** Evaluations of coastal bluff retreat rates and potential impacts of proposed projects shall be based on a site- or area-specific geologic investigation. These investigations shall determine the projected average rate of coastal bluff retreat (e.g., inches per year) based on an evaluation of historic and projected erosion rates.

a. Past site-specific bluff retreat data derived from historical aerial photo review and other information may be considered when preparing estimates of future site-specific bluff retreat rates.

b. Potential future accelerated rates of erosion and cliff material loss associated with climate change-induced sea level rise as identified in the most recent State projections must be considered. Exact future rates of accelerated coastal bluff retreat are unknown and will vary among location and over time, but are estimated, as of 2008, to average 12 inches per year, potentially accelerating to 1 to 3 feet per year in Santa Barbara if sea level rise progresses (URS 2008).

c. Site-specific estimates of bluff retreat, as well as analysis of potential project effects and measures to address effects, shall be prepared by a Registered Geologist, Engineering Geologist or other similarly qualified individual, and are subject to approval by the City.

S25. **Structural Setback from the Bluff Edge for Slope Stability.** Bluff edge setbacks shall be adequate to address long-term erosion and slope stability issues. The required development setback from the bluff edge shall be determined in accordance with the Coastal Act, the associated California Code of Regulations provisions [such as Regulation § 13577 (h)], (The "Coastal Commission guidelines,") and by an analysis that includes the most recent methodology used by California Coastal

Commission staff. For example, methodologies include the California Coastal Commission memorandum entitled "Establishing Development Setbacks From Coastal Bluffs (2003), provided in Appendix B of the Safety Element Technical Background Report. Factors to be considered include determining bluff edge, slope stability/ factor of safety and long-term bluff retreat. Modifications to the prescribed setback calculation methodology and setbacks may be approved by the City to reflect site-specific geological conditions.

S26. **Bluff Top Drainage.** All new development of bluff top land shall have drainage systems carrying run-off away from the bluff edge and cliff to the nearest public street. In areas where conveyance of runoff landward is constrained by conditions such as engineering feasibility, cost and/or requirements for easements, and where additional fill or grading is inappropriate or cannot accomplish landward drainage, private drainage systems may be permitted if each of the following criteria are met:

a. The drainage system is designed to be minimally visible on the cliff face and shall be maintained to remain minimally visible for the life of the project;

b. The drainage system is designed and constructed to operate properly with only minimal maintenance requirements;

c. The drainage system is designed and maintained to be effective for the life of the project including periodic replacement of the drainage system to adapt to bluff erosion as needed; and

d. The drainage system will not result in accelerated erosion of the bluff.

Possible Implementation Action to be Considered

S26.1 Consider consolidated drainage systems where appropriate and feasible. Consolidated drainage systems could be sized to accommodate run-off from nearby and similarly drained parcels if a consolidated system is found to be most beneficial, efficient, and will not result in environmental damage, and property owners are in agreement regarding the installation and maintenance of a consolidated system.

S27. **Loading.** Development that will result in excessive weight to the top of the bluff (e.g., large structures, swimming pools, artificial fill, non-native vegetation etc.) should be discouraged.

S28. **Improper Vegetation.** Where feasible, existing vegetation that requires large amounts of water should be replaced with native, drought-tolerant vegetation.

S29. **Improvements to Threatened Coastal Properties.** The City recognizes the need for owners of threatened coastal properties to perform maintenance and modest improvements to threatened principal structures (primary living quarters, main commercial buildings, and functionally necessary appurtenances to those structures, such as septic systems and infrastructure) and other facilities. City goals are to minimize exposure of substantial new improvements to hazards of bluff retreat and avoid the need for installation of environmentally harmful coastal protection structures that could be requested to protect such improvements. To meet these goals, the following guidelines apply:

a. Protection for existing structures shall first focus on techniques that avoid use of coastal protection structures including use of non-intrusive techniques such as drainage control, installation of drought tolerant landscaping, construction of cantilevered grade beam foundations, etc.

b. Demolition or relocation of threatened principal structures and facilities further inland on parcels shall be favored over installation of coastal protection structures.

c. Coastal protection structures shall not be allowed for the sole purpose of protecting accessory structures or landscape features (e.g., garages, carports, storage sheds, decks, patios, walkways, landscaping).

d. The siting of new major improvements shall consider accelerated rates of coastal bluff retreat associated with climate change-induced sea level rise as projected by the State of California, and an area- or site-specific geologic investigation that accounts for climate change effects.

e. For proposed new structures that have the potential to be threatened by bluff erosion, coastal development permit conditions shall require demolition by owners in the event failure due to future bluff erosion is deemed imminent by the City.

S30. **Development on the Cliff Face.** With the exception of drainage systems identified in Policy S26, no development shall be permitted on the cliff face except for engineered staircases or access ways to provide public beach access and pipelines for scientific research or coastal dependent industry. To the maximum extent feasible, these structures shall be designed to minimize alteration of the bluff and beach.

S31. **Trash Disposal.** The disposal of any material onto the face of the cliff, including brush clippings from landscape vegetation, shall be prohibited.

S32. **Improper Access.** Improper, improvised, and unmaintained access routes on public or private land have the potential to cause serious erosion and/or public safety problems. To minimize impacts to coastal bluffs, programs to control or prohibit improper access should be implemented. This may include pursuing enforcement actions on existing or new unauthorized paths on coastal bluffs.

Possible Implementation Actions to be Considered

S32.1 Informational Signs. Consider posting informational signs at the top of the bluff near the improper access route. The signs should describe the adverse effects that improper access can cause and where the nearest maintained public access routes are located.

S32.2 Additional Access. Consider providing additional parking and improved facilities at existing public beach access points.

S32.3 Publicize. Develop a program to increase public awareness and publicize the locations of existing public beach access points.

Fire Hazards

S33. **Fire Hazard Programs.** The City shall continue to implement programs that reduce the risk of wildland and structure fires, and that minimize the short- and long-term effects of fires.

a. Wildfire Risk Reduction. Continue to implement risk reduction measures identified by the Wildland Fire Plan, such as vegetation fuels management and vegetation chipping.

b. Limit Residential Development in High Fire Hazard Areas. Land use map designations limit residential density in High Fire Hazard Areas.

c. Wildland Fire Suppression Assessment District. Continue to implement wildfire risk reduction programs facilitated by the Wildland Fire Suppression Assessment District, such as vegetation management and homeowner education and assistance programs.

d. Coordination. Continue to coordinate fire risk prevention, management, response, recovery, and public education programs with the County of Santa Barbara, Montecito Fire Protection

District, U.S. Forest Service, California Emergency Management Agency, CAL FIRE, Federal Emergency Management Agency and other agencies.

Possible Implementation Actions to be Considered

S33.1. Offer incentives and/or an option for property owners to transfer development rights from the High Fire Hazard Area to the High Density residential land use designations.

S34. **Evacuation Routes.** Development projects located in the Extreme Foothill and Foothill High Fire Hazard Zones shall be evaluated to determine if the project would have the potential to substantially affect emergency evacuation. A project would result in a substantial effect on evacuation if it would result in either of the following conditions:

a. Physically interfere with evacuation capabilities. A project could physically interfere with evacuation capabilities if it would reduce evacuation capacity by substantially decreasing the width of road or other access way, or result in the closure of a road or access way.

b. Add substantial additional evacuees to routes with limited capacity. A project could substantially reduce evacuation capacity if it would add a considerable amount of traffic to probable evacuation routes that do not meet current Fire Department roadway or access standards; or add a considerable amount of traffic to probable evacuation routes in relation to roadway capacity and evacuation traffic volumes reasonably expected to be generated by existing development in the project area.

S35. **Evacuation Route Evaluation.** The Fire Department shall periodically evaluate the effectiveness of existing and proposed fire emergency evacuation routes, and develop standards or conditions that can be applied to projects to assure that adequate evacuation capacity is provided and maintained.

S36. **Fire Department Tactical Areas.** To increase fire fighter safety during wildfire emergencies, new development and major redevelopment proposals located in designated high fire hazard areas shall be reviewed to assess the potential for the project to provide on-site fire suppression tactical areas, such as staging areas, operational safety zones, and escape routes. Fire suppression tactical areas should be provided consistent with criteria provided by the Fire Department.

S37. **Fire Hazard Reduction Design Requirements.** Project designs shall adequately address fire hazard, providing for appropriate site layout; building design and materials; fire detection and suppression equipment; landscaping and maintenance; road access and fire vehicle turnaround; road capacity for evacuation; and water supply.

S38. **Fire Education and Training.** The Fire Department shall continue working with the Planning Commission, Design Review Boards, development review staff and the public to enhance understanding and appropriate application of measures to reduce fire hazard.

S39. **Defensible Space.** Require that defensible space be provided around existing and proposed development projects located in high fire hazard areas in accordance with the Wildland Fire Plan, or as recommended by the Fire Department.

S40. **Vegetation Management.** Vegetation management programs to reduce fire fuel loads, as well as project-related landscape and maintenance plans, shall protect and preserve environmentally sensitive habitat areas (ESHAs) and balance fire risk reduction benefits with possible aesthetic, habitat, and erosion impacts. Potential effects resulting from fuel management activities shall be avoided or reduced as feasible.

S41. **Fire Prevention and Creek Restoration.** Coordinate fire prevention and vegetation management activities with creek and riparian resource protection by developing and implementing Best Management Practices for vegetation/fuel management operations conducted within and adjacent to creek corridors.

Possible Implementation Actions to be Considered

S41.1 Vegetation Management Practices. Develop guidelines for conducting fuel management activities in creek areas. The guidelines should include the following parameters:

a. Describe conditions that may warrant vegetation management activities within or adjacent to creek banks.

b. Establish requirements to prepare site-specific vegetation management evaluations. Avoid fuel management operations within or adjacent to sensitive habitat areas.

c. Delineate requirements regarding when a Streambed Alteration Agreement (Fish and Game Code 1601) from the California Department of Fish and Wildlife and a Coastal Development Permit are required prior to the implementation of the vegetation management work.

d. Identify standard approaches and measures to be implemented to protect biological and water resources if planned vegetation management operations have the potential to result in substantial direct or indirect effects to sensitive habitat, species, erosion, or water quality.

Avoid impacts to nests of migratory birds and special-status species. Develop standards for when vegetation management operations may be conducted to minimize the potential for impacts to nesting birds and sensitive species.

If, after careful consideration of need and environmental effects including biological, erosion, and water quality impacts, clearing may be necessary in or near creeks and habitats, hand clearing shall be utilized to the greatest extent feasible.

S42. **Post Fire Recovery.** Rebuilding that occurs in designated high fire hazard areas shall incorporate all applicable design measures that reduce the risk of future fire-related impacts. Expedited project review and permitting shall occur as determined by the Community Development Director.

S43. **Building Code Updates.** Periodically adopt amendments or updated provisions of the California Building Code to implement new building design measures that reduce fire risks.

S44. **Public Water System Improvements for Fire Fighting.** Continue to periodically evaluate the potential for additional water system improvements to assist in emergency preparedness and incorporate feasible measures into the City Capital Improvement Plan.

S45. **Private Water Supplies for Fire Fighting.** Encourage and assist homeowners in High Fire Hazard Areas to install their own emergency water supplies to support fire fighting operations.

Possible Implementation Action to be Considered

S45.1 Consider implementing an expedited permit review process for emergency water supply installations.

Flood Hazards

S46. **Development in Flood Hazard Areas.** The potential for flood-related impacts to health, safety, and property may be reduced by limiting development in flood-prone areas. New development or redevelopment located within a designated 100-year floodplain shall be required to implement appropriate site and structure designs consistent with regulatory requirements that minimize the potential for flood-related damage, and shall not result in a substantial increase in downstream flooding hazards.

S47. **Localized Drainage Impacts.** New public and private development or substantial redevelopment or reuse projects located in areas outside a designated 100-year floodplain, but in areas known to have experienced repeated property damage to due to poor storm water drainage, shall not contribute to existing drainage impacts by substantially increasing runoff volume or flow rates, or displacing runoff onto adjacent properties. Vegetation removal projects shall not contribute to existing drainage impacts by substantially increasing runoff volume or flow rates.

S48. **Floodplain Mapping Update.** Coordinate with FEMA to update the Flood Insurance Rate Map (FIRM) floodplain boundaries for Special Flood Hazard Areas such as the Mission and Sycamore creek drainages and Area A near the Estero.

S49. **Dam Inundation.** Potential dam inundation hazards to new development located downstream of the Lauro Reservoir shall be considered during the development review process.

Coastal Flooding and Inundation

S50. **Sea Level Rise.** Monitor, assess, and adapt to changes in stream and coastal flooding characteristics that may occur due to a global climate change induced rise in sea level.

S51. **Monitoring, Data Collection, and Analysis of Sea Level Rise.** Develop the following data and analysis to support future sea level rise risk assessment, vulnerability analysis, and adaptation planning.

a. Tide gauge. Protect ongoing functioning of the NOAA tide gauge at the Santa Barbara breakwater to establish a long-term monitoring record of sea level changes.

b. Coastal bluff monitoring. Establish a coastal bluff monitoring program with surveyed transects that can be regularly monitored to document and track rates of cliff retreat.

c. Beach profiles. Establish a set of beach profiles (spaced at about 500 feet) from Leadbetter Beach to the Clark Estate, and a set of winter and summer profiles from Cabrillo Boulevard to the shoreline, for annual surveys to track seasonal and long-term changes.

d. Flooding and inundation. Obtain detailed topographic mapping of low-lying areas of the City and the Airport (accurate to at least 12 inches, such as from State LiDAR satellite survey), and develop projected future flooding and inundation area maps to assist future adaptation planning.

S52. **Sea Level Rise Risk Assessment and Vulnerability Analysis.** Conduct periodic sea level rise studies that provide risk analysis indicating probability and magnitude of future impacts to Santa Barbara due to sea level rise to support future adaptation planning. Consider effects associated with storm flooding, beach and cliff erosion, and permanent inundation. Consider short-term effects (from storms), intermediate-term effects (to 2050), and long-term effects (to 2100).

S53. **Sea Level Rise Adaptation.** Identify policy options, costs, and consequences for addressing sea level rise issues, including:

a. Techniques to minimize wave energy and damage from storm surges, while minimizing disruption of coastal activities, natural processes and habitats.

b. Review of City public improvements and utilities for potential consequences from sea level rise, and consider means of adaptation such as measures to protect in place, raising facilities above projected flood heights, and managed retreat or relocation of facilities.

c. Coordination with private property owners along the waterfront on techniques for structural adaptation and new design.

S54. **Shoreline Management Plan.** Develop a comprehensive Shoreline Management Plan to identify, manage and to the extent feasible, mitigate or reduce climate change-induced sea level rise impacts upon public facilities, natural areas and private property along the City Shoreline. The City should continue coordination with local and regional entities such as the Beach Erosion Authority for Clean Oceans and Nourishment (BEACON), the County, other South Coast cities, and UCSB to manage coastal issues including:

a. Protection/restoration of natural sand transport and sand supply replenishment projects;

b. Natural bluff restoration, stabilization and erosion control measures;

c. Non-intrusive methods to slow sand transport and retain sand along the beaches that front the City's bluffs; and

d. Funding mechanisms to implement beach replenishment and methods to reduce bluff retreat.

e. Relocation of potentially threatened structures inland.

S55. **Future Inundation.** Consider the following options in the development of adaptation plans for future permanent inundation effects:

a. Establishing mandatory rolling setbacks that move landward over time for future development or significant redevelopment in areas likely to be affected by sea level rise inundation within the expected lives of the structure.

b. Restricting rebuilding when structures are substantially damaged by sea level rise inundation and coastal storms.

c. Developing policies and identifying funding or tax incentives to relocate away from areas subject to future sea level rise inundation.

d. Evaluating the costs, impacts, and estimated lifespan of a seawall along Cabrillo Boulevard and Shoreline Drive.

Hazardous Materials

S56. **Hazardous Materials Exposure**. Continue to provide adequate hazardous material collection facilities and to minimize the potential for exposure to hazardous materials and to provide for their safe disposal.

a. Continue to coordinate with other South Coast jurisdictions and the waste management industry to develop additional household hazardous waste collection facility capacity on the South Coast.

b. Continue to coordinate with other South Coast jurisdictions and the waste management industry to develop additional opportunities for residents to properly dispose of pharmaceutical waste.

S57. **Contaminated Sites.** The City shall continue to identify ways to facilitate hazardous waste site remediation, protect public health, and minimize environmental impacts resulting from the presence of waste material and from remediation activities.

S58. **Integrated Pest Management.** The City shall encourage new and existing development projects to implement integrated pest management strategies that reduce the use of pesticides.

S59. **Prioritize Remediation.** The City shall continue to prioritize remediation of contaminated soils and groundwater on City-owned land adjacent to creeks, wetlands and the coastlines that may be subject to climate change induced coastal erosion and seawater intrusion.

S60. **Polluted Runoff**. The City shall reduce health hazards associated with polluted runoff, including runoff which contains harmful bacteria and or viruses.

S61. **Sewer Line Erosion**. The City shall support relocation of sewer lines which may be threatened by erosion.

S62. **Development on Sites with Contaminated Soils and High Groundwater.** New development in areas of high groundwater and high potential for contaminated soils or contaminated groundwater shall incorporate appropriate vapor control measures into the design of buildings. Control measures may include measures such as vapor barriers, passive air ventilation systems, sealing of ducts and cracks, and depressurizing soil below the foundation. New development shall comply with all County, State and Federal regulations regarding contaminated soils.

Public Safety

S61. **Electromagnetic Field Development Setbacks.** Continue application of prudent avoidance policy in siting development near transmission lines with adequate setbacks.

a. Monitor Electromagnetic Field Study. Continue to monitor scientific study of electromagnetic fields and update development polices as necessary.

S62. **Natural Gas Transmission and Distribution Pipelines.** New development shall provide adequate setbacks from natural gas transmission and distribution pipelines to facilitate pipeline maintenance activities and provide for public safety.

S63. **Airport Safety.** New development at the Airport shall continue to be evaluated for compliance with the safety requirements of FAA regulations, the Santa Barbara County Airport Land Use Plan, and the City of Santa Barbara Airport Master Plan.

S64. **Hazardous Substance Transportation**. Potential health and safety impacts that could occur as a result of a hazardous substance release shall be evaluated during the environmental review of projects located adjacent to U.S. Highway 101 and the Union Pacific railroad tracks.