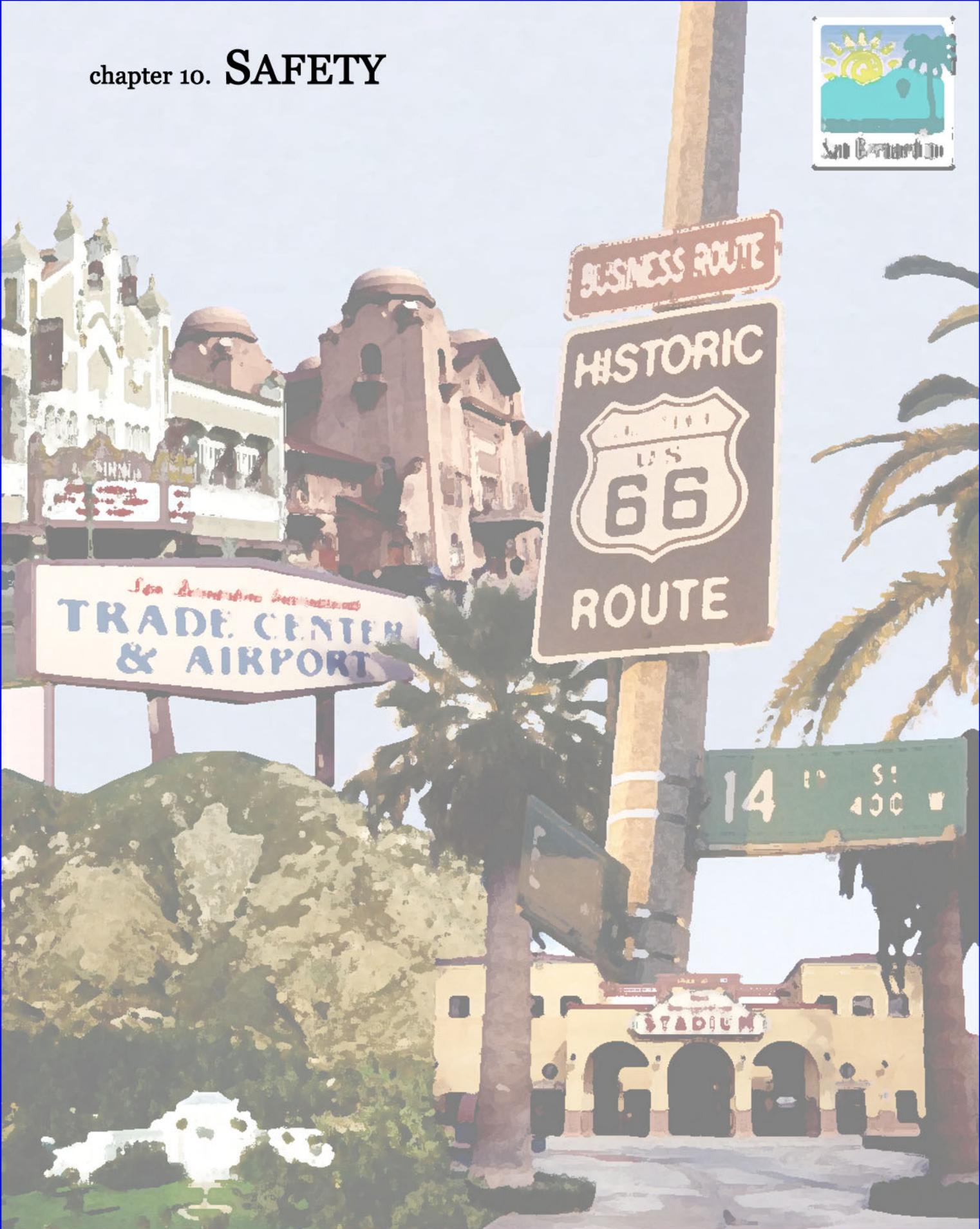


chapter 10. SAFETY



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Chapter 10. Safety

INTRODUCTION

San Bernardino has seen more than its fair share of disaster; from fires, to floods, to earthquakes. Reducing exposure to these threats and protecting the health, safety, and welfare of our community is a fundamental role of City government. It is increasingly important that the City of San Bernardino maintain programs that provide an effective response to public safety concerns. The Safety Element assesses natural and man-made hazards present in the community and includes policies to address those hazards.

Purpose

This element specifically addresses the way in which the City will prepare and respond to fire hazards, geologic, and seismic hazards, and flood hazards. The Safety Element provides background information related to each issue and identifies hazard locations within the City, risk-reduction strategies, and hazard abatement measures that can ultimately be used by decision-makers in their review of projects. Policies also address ways to minimize any economic disruption and accelerate the City's recovery following a disaster.

Relationship to Other Elements

Critical relationships exist between the Safety Element and other General Plan Elements. The types and locations of land uses identified in the Land Use Element are influenced and regulated by the locations of natural hazards, while emergency evacuation routes and locations of critical facilities can be influenced by the goals and policies identified in the Circulation Element. The Public Facilities Element identifies the services available to the City, such as the Police and Fire Departments, to aid in the response to hazards and disasters identified in this Element.



Relationship to Other Documents

Federal, State, and local regulations and policies such as the California Environmental Quality Act (CEQA), the California Government Code, and the San Bernardino Municipal Code regulate and/or influence land use and development in the City. Not only do they help to protect the health, safety, and welfare of our residents, visitors and businesses by ensuring that proper analyses are conducted, sound construction practices are implemented, and uses are appropriately sited within the City, they can also help to minimize the recovery time experienced after the occurrence of a disaster.

ACHIEVING THE VISION

The Safety Element builds upon the City's Vision of "Creating Opportunities for the Future" for its residents. People re-invest in their communities if they believe there are opportunities present to enhance their local environment. As such, a safe community can help to attract new businesses and residents. The Safety Element is responsive to our Vision because it represents our desires to:

- ◆ Establish the appropriate infrastructure and facilities to protect the health, safety, and welfare of the City's businesses, visitors, and residents;
- ◆ Enhance the City's image by providing a safe place to live, work, and play;
- ◆ Effectively respond to natural and man-made hazards and disasters; and
- ◆ Minimize any economic disruption and accelerate the City's recovery following a disaster.

GOALS AND POLICIES

The following presents the goals and policies related to safety in the City of San Bernardino:

Hazardous Materials and Waste

Hazardous materials are any materials that, because of their quantity, concentration, physical or chemical characteristics, pose a significant present or potential hazard to human health and safety or to the environment if released into the environment.

The regulatory responsibility of hazardous waste in the City of San Bernardino belongs primarily to the San Bernardino County Department of Environmental Health. Hazardous waste falls into four general categories of materials that have some distinct characteristics in the types of danger they present. These include materials that are:

- toxic
- explosive
- reactive
- corrosive

The City's goals and policies for hazardous materials and uses are designed to ensure the protection of the public health, safety, and welfare, and environmental resources in the City. Planning practices emphasize waste reduction, recycling, proper management of hazardous materials, siting of facilities, and effective emergency response.

1. Hazardous Waste Management Plan

Hazardous waste and materials are stored, treated, and transported in the City. As a result, the City implements a Hazardous Waste Management Plan to ensure that these materials are handled properly. There are processes in the preparation of the hazardous waste management plan that include the assessment of the risk involved in dealing with hazardous waste, which allows the City to make decisions on the level of risk it is willing to accept.

The most comprehensive State legislation dealing with hazardous waste materials is the Tanner Act (AB2498), adopted in 1986. Because of the Tanner Act, the State Department of Health Services provides regulations and procedures for hazardous waste materials operations and assists



Our Hazardous Materials team in training. Source: City of San Bernardino Website.



counties with guidelines and funding for the preparation and adoption of local hazardous waste management plans. The preparation of local management plans in southern California is coordinated on a regional basis with the Southern California Hazardous Waste Management Authority.

The San Bernardino County Fire Department is responsible for implementing the County Hazardous Waste Management Plan in the City of San Bernardino. Adopted in the early 1990's, this plan established regulations at the local level for the creation, storage, and handling of hazardous waste material. The management plan provides the following components:

- Planning process for waste management
- Permit process for new and expanded facilities
- Appeal process to the State for certain local decisions

The plan pertains to most of San Bernardino County and is included as an element in the County's General Plan.

Various departments in the City review plans for new development, including hazardous waste generators that might use the City sewer system for disposal of waste products. These departments are in a position to identify potential hazardous waste generators and advise them of the permits required prior to operation.

Goal 10.1 **Protect the environment, public health, safety, and welfare from hazardous wastes.**

Policies:

- 10.1.1 Employ effective emergency preparedness and emergency response strategies to minimize the impacts from hazardous materials emergencies, such as spills or contamination.
- 10.1.2 Ensure the protection of surface and groundwater quality, land resources, air quality, and environmentally sensitive areas through safe transportation of waste through the City and comprehensive planning of hazardous materials, wastes, and sites.
- 10.1.3 Execute long-range planning programs to protect resources and the public from the potential impacts that could be created by the use, storage, transport, and disposal of hazardous waste and materials.

- 10.1.4 Continue to support the role that the Fire and the Police Departments play in the on-site identification of hazardous wastes and emergency response to hazardous waste accidents in cooperation with the County Department of Environmental Health Services.

2. Hazardous Waste Operations

The State Department of Health Services requires permits for the use, storage or disposal of hazardous substances. The permit categories range from the use of solvents and flammable material in the ordinary repair of automobiles to the treatment or handling of hazardous wastes in large quantities over prolonged periods of time. Operations that involve the treatment of hazardous wastes or storage over long periods of time require the issuance of a special permit by the State Department of Health Services. As indicated, the County Hazardous Waste Management Plan is refining permit criteria and standards that will vest the permit process to the State.

There are several approved hazardous waste management companies offering managing services to other companies in the City of San Bernardino for the treatment, disposal or storage of hazardous material. These companies have either received a permit or have been granted interim status by the State of California pending review of the facilities for compliance with federal and State regulations.

Goal 10.2 Promote proper operations of hazardous waste facilities and ensure regulations applicable to these facilities are enforced.

Policies:

- 10.2.1 Require the proper handling, treatment, movement, and disposal of hazardous materials and hazardous waste.
- 10.2.2 Encourage businesses to utilize practices and technologies that will reduce the generation of hazardous wastes at the source.
- 10.2.3 Implement federal, state, and local regulations for the disposal, handling, and storage of hazardous materials.
- 10.2.4 Work with the Department of Environmental Health Services to promote waste minimization, recycling, and use of best available technology in City businesses.



- 10.2.5 Participate in the process of selecting routes that are the most acceptable for the safe transportation of hazardous waste material within the City limits. Streets with high concentrations of people, such as the downtown, or with sensitive facilities, such as schools and parks, should be avoided to the maximum extent possible.

3. Household Hazardous Waste

Hazardous materials are even in our homes. Many people don't realize it, but there are several common household items that are considered hazardous including medications, paint, motor oil, antifreeze, auto batteries, lawn care products, pest control products, drain cleaners, pool care products such as chlorine and acids, and household cleaners. These materials need to be used, stored, and disposed of in a safe and proper manner. When used properly, hazardous materials are normally not a problem. When used improperly, the results can be devastating. For example, some household cleaners may be harmful separately or when combined, such as ammonia and bleach. Flames caused by mixed household hazardous wastes improperly disposed of in curbside trash bins have injured City workers.

City residents can take household hazardous waste to the San Bernardino International Airport and Trade Center (2824 East W Street, Bldg. 302) to properly dispose of household hazardous materials.

Goal 10.3 Minimize risk of injuries or damages caused by household hazardous wastes.

- 10.3.1 Conduct educational programs to educate the public about the proper handling and disposal of household hazardous wastes.
- 10.3.2 Enforce the proper disposal of Household Hazardous Wastes.

Surface and Subsurface Groundwater Contamination

There are numerous sites in the City that have historically been subject to the disposal of hazardous waste and have likely contaminated the underlying groundwater. These sites may present an imminent danger to surrounding areas. They are polluting the groundwater and in many specific instances, they are polluting wells within the City. The pollution of the City's water system and the systems of other jurisdictions is a potentially serious health problem that warrants special attention and treatment.

Related to the issue of groundwater protection is the issue of minimizing the effects of storm water and urban runoff pollution (SWURP). Not only does storm water runoff affect local groundwater, it has the potential to impact neighboring jurisdictions and the region. Unlike sewage, which goes to treatment plants, urban runoff flows untreated through the storm drain system. Anything thrown, swept or poured into the street, gutter or a catch basin (the curbside openings that lead into the storm drain system) can flow directly into our waterways. The problem is particularly acute during heavy rains, but can be a problem at any time due to the improper disposal of products associated with home, garden, and automotive maintenance.

Water pollution is of national importance and the federal Clean Water Act established the National Pollution Discharge Elimination System (NPDES) permit program to address the problem. The Clean Water Act requires that cities "effectively prohibit non-stormwater discharges into the storm sewers" and "require controls to reduce the discharge of pollutants to the maximum extent practicable." Cities are now required to obtain NPDES permits to discharge their storm water into the storm drains and implement Best Management Practices (BMPs) on new construction in order to prevent illegal discharges to storm drains and runoff from construction sites, restaurants, outdoor storage sites, and industrial areas. Also see additional related discussion and policies in Chapter 9, Utilities.



Goal 10.4 Minimize the threat of surface and subsurface water contamination and promote restoration of healthful groundwater resources.

Policies:

- 10.4.1 Promote integrated inter-agency review and participation in water resource evaluation and mitigation programs.
- 10.4.2 Protect surface water and groundwater from contamination.
- 10.4.3 Eliminate or remediate old sources of water contamination generated by hazardous materials and uses.
- 10.4.4 Develop programs and incentives for prevention of groundwater contamination and clean up of known contaminated sites.

Goal 10.5 Reduce urban run-off from new and existing development.

Policies:

- 10.5.1 Ensure compliance with the Federal Clean Water Act requirements for National Pollutant Discharge Elimination System (NPDES) permits, including developing and requiring the development of Water Quality Management Plans for all new development and significant redevelopment in the City. (LU-1)
- 10.5.2 Continue to implement an urban runoff reduction program consistent with regional and federal requirements, which includes requiring and encouraging the following:
- Increase permeable areas to allow more percolation of runoff into the ground;
 - Use natural drainage, detention ponds or infiltration pits to collect runoff;
 - Divert and catch runoff using swales, berms, green strip filters, gravel beds and French drains;
 - Install rain gutters and orient them towards permeable surfaces;
 - Construct property grades to divert flow to permeable areas;

- Use subsurface areas for storm runoff either for reuse or to enable release of runoff at predetermined times or rates to minimize peak discharge into storm drains;
 - Use porous materials, wherever possible, for construction of driveways, walkways and parking lots; and
 - Divert runoff away from material and waste storage areas and pollution-laden surfaces such as parking lots. (LU-1)
- 10.5.3 Cooperate with surrounding jurisdictions and the County to provide adequate storm drainage facilities.
- 10.5.4 Require new development and significant redevelopment to utilize site preparation, grading and foundation designs that provide erosion control to prevent sedimentation and contamination of waterways. (LU-1)
- 10.5.5 Ensure compliance with the requirements for Storm Water Pollution Prevention Plans or Water Quality Management Plans for all new development or construction activities.
- 10.5.6 Coordinate with appropriate federal, state, and local resource agencies on development projects and construction activities affecting waterways and drainages.

Flooding and Dam Inundation

Flooding

Flooding represents a potential hazard in San Bernardino, especially at the base of the mountains and foothills. This section addresses the risks of flooding due to the natural topography, rainfall, and runoff of the City.

The 100-year floodplain within the City, as currently defined by the Federal Emergency Management Agency Flood Insurance Rate maps, is depicted on Figure S-1. FEMA periodically updates these maps so please contact the Development Services Department for the most recent information. The 100-year floodplain is confined to storm channels, debris basins, and between levees with a few minor exceptions. A few areas, including the Base Line Street and Sterling Avenue area, Mountain View Avenue and Electric Avenue area, and south of Redlands Boulevard, east of Hunts Lane, are identified as low areas within the 100-year floodplain.

100-Year Floodplain:

Land that is subject to flooding by the 100-year flood or lands within the floodable elevation that has a one percent chance of being equaled or exceeded each year.

500-Year Floodplain:

Land that has the potential to be flooded in a storm that has a 0.2 percent chance of occurring every year.



Storm drains and flood control facilities within the City include: channels, storm drains, street waterways, natural drainage courses, dams, basins, and levees. Some streets in the City of San Bernardino are specifically designed to accommodate storm flow. Flows carried within the street right-of-way may cause localized flooding during storms, possibly making some roads impassable during the storm event.

Storms are not the only cause of flooding within our City. Basements and underground utility vaults may also experience flooding in areas between the Santa Ana River and downtown due to the City’s existing high groundwater table.

Dam Inundation

Dam Inundation:

The release of flood waters to downstream areas caused by dam failure.

Flood inundation resulting from the failure of the Seven Oaks Dam is a potential hazard for the City of San Bernardino. General limits of flood hazards to San Bernardino due to the dam failure of Seven Oaks Dam are shown on Figure S-2, Seven Oaks Dam Inundation Map.

The Seven Oaks Dam is located in unincorporated San Bernardino County northeast of the City of Highland. The Seven Oaks Dam is a feature of the Santa Ana River Mainstream Project. A study showed that storage of dam floodwater would provide a minimum average of about 10,000 acre-feet of water per year. The dam was designed to resist an earthquake measuring 8.0 on the Richter scale, with any point able to sustain a displacement of four feet without causing any overall structural damage.



*Seven Oaks Dam
Source: Army Corps of
Engineers Website*

Goal 10.6 **Protect the lives and properties of residents and visitors of the City from flood hazards.**

Policies:

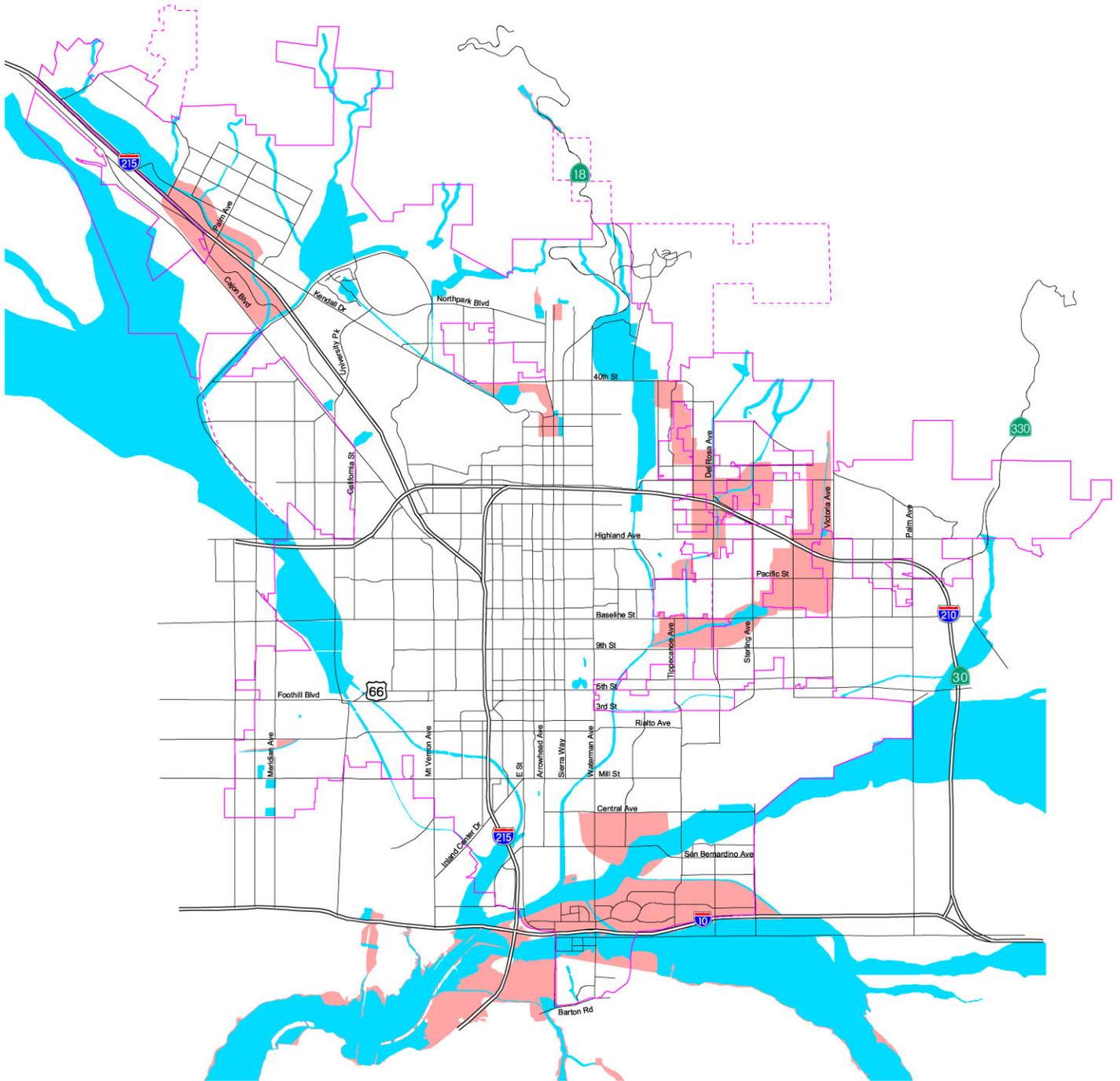
- 10.6.1 Maintain flood control systems and restrict development to minimize hazards due to flooding.
- 10.6.2 Use natural watercourses as the City’s primary flood control channels whenever feasible.
- 10.6.3 Keep natural drainage courses free of obstructions.
- 10.6.4 Evaluate all development proposals located in areas that are subject to flooding to minimize the exposure of life and property to potential flood risks.

- 10.6.5 Prohibit land use development and/or the construction of any structure intended for human occupancy within the 100-year flood plain as mapped by the Federal Emergency Management Agency (FEMA) unless adequate mitigation is provided against flood hazards.
- 10.6.6 Encourage new development to utilize and enhance existing natural streams, as feasible.
- 10.6.7 Utilize flood control methods that are consistent with Regional Water Quality Control Board Policies and Best Management Practices (BMPs).
- 10.6.8 Review development proposals for projects within the City's Sphere of Influence and encourage the County to disapprove any project that cannot be protected with an adequate storm drain system.
- 10.6.9 Ensure major drains in developed areas have a pipeline capacity to comply with the Flood Control District's Comprehensive Storm Drain Plans for development of the City's storm drain system.
- 10.6.10 Design local drains in foothill areas to convey 25-year storm flows where downstream systems are lacking and street systems are not present.
- 10.6.11 Design major drains in foothill to convey 100-year flows within a pipe or channel areas where downstream systems are lacking and street systems are not present.
- 10.6.12 Develop a process to study flooding issues and create appropriate regulations. This could include the creation of "alluvial districts," local quasi-government entities designed to inform homeowners of flood risks as well as advise the floodplain land use decisions of the City.



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100-Year Flood Plain



Source: Federal Emergency Management Agency
Flood Insurance Rate Maps. Date: 1990

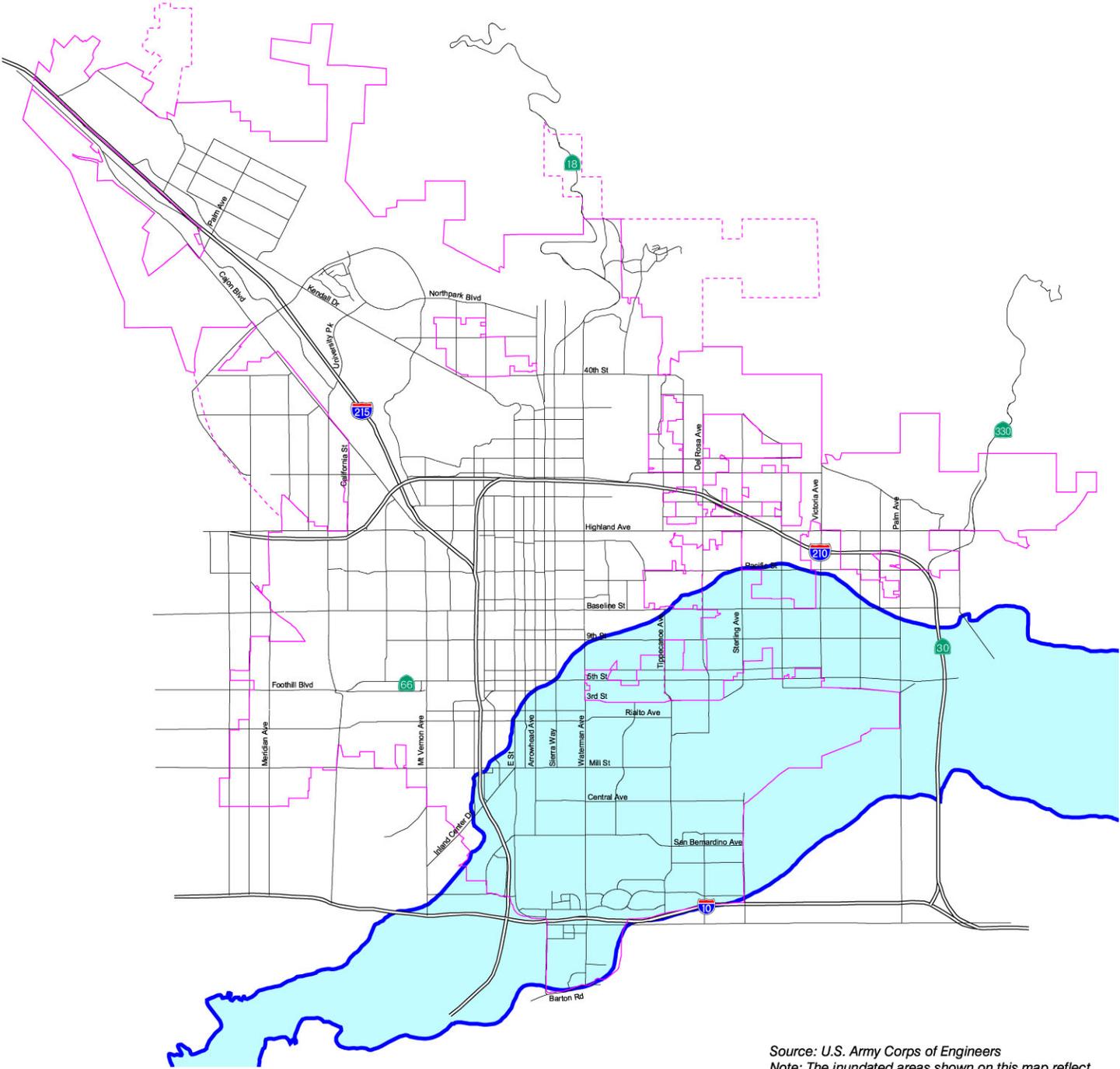
- 100-Year Flood Zone
- 500-Year Flood Zone
- City Boundary
- Sphere of Influence Boundary





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Seven Oaks Dam Inundation



Source: U.S. Army Corps of Engineers
 Note: The inundated areas shown on this map reflect events of an extremely remote nature. These results are not in any way intended to reflect upon the integrity of the Seven Oaks Dam. Flooded areas shown are based on dam failure at full pool elevation 2,580 feet, NGVD.

- Limit of Flooded Area with Dam Failure
- City Boundary
- Sphere of Influence Boundary





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Seismic Hazards

San Bernardino is surrounded by earthquake faults. Two of the most notorious faults, the San Andreas and San Jacinto Faults, run through our City. Consequently, the potential for fault rupture, strong ground shaking, landslides, and liquefaction is high. These geologic and seismic hazards can affect the structural integrity of buildings and utilities, and, in turn, cause severe property damage and potential loss of life.

The City's policies and programs for geologic/seismic hazards are intended to reduce death, injuries, damage to property, and economic and social dislocation due to seismic events, as well as to enhance our preparedness to survive, respond to, and recover from a major earthquake or geologic disaster.

Effective implementation of seismic policies requires a continuing awareness of the seismic hazards affecting our City; strong, enforceable seismic standards for the siting, design, and review of proposed development; and progressive City-wide programs for disaster preparedness and recovery planning.

1. Fault Zones

San Bernardino is criss-crossed by numerous earthquake faults, as shown on Figures S-3 and S-4.

San Bernardino is located between several active fault zones including: the San Andreas Fault, the San Jacinto Fault, the Glen Helen Fault, and the Loma Linda Fault. Each of these faults is classified as Alquist Priolo Special Study Zones under the Alquist-Priolo Earthquake Fault Zoning Act, as shown on Figure S-3. The CDMG has designated certain faults within the planning area as part of the State of California Alquist-Priolo Special Study Zones. These zones extend parallel to and extend from approximately 200 to 500 feet from designated faults.

Site-specific geologic reports are required for development within these Zones to determine the precise location of and any required setbacks from any active faults. Human occupancy structures are prohibited within 50 feet of either side of an active fault.

In addition, active faults may also exist outside of the Alquist Priolo Zones, as shown on Figure S-4. Although they are not zoned as Alquist-Priolo faults, it is recommended that critical developments proposed in

California Seismic Hazards Mapping Act

The goal of the Seismic Hazards Mapping Act of 1990 is to minimize loss of life and property by identifying and mitigating seismic hazards.

The Act addresses non-surface fault rupture earthquake hazards, including strong ground shaking, liquefaction, and seismically induced landslides. The State agency charged with implementation of the Act is the California Geological Survey (CGS). The CGS prepares and provides local governments with seismic hazard zone maps that identify areas susceptible to amplified shaking, liquefaction, earthquake-induced landslides, and other ground failures. The seismic hazard zones delineated by the CGS are referred to as "zones of required investigation" because site-specific geological investigations are required for construction projects located within these areas.

As of the writing of this General Plan, the CGS had not completed the seismic hazard zone map for the City. Upon completion, the City should, if necessary, revise the General Plan accordingly.



**Alquist-Priolo
Earthquake Fault Zoning
Act**

The main purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The Act focuses on the hazards associated with surface fault rupture and does not address other earthquake hazards.

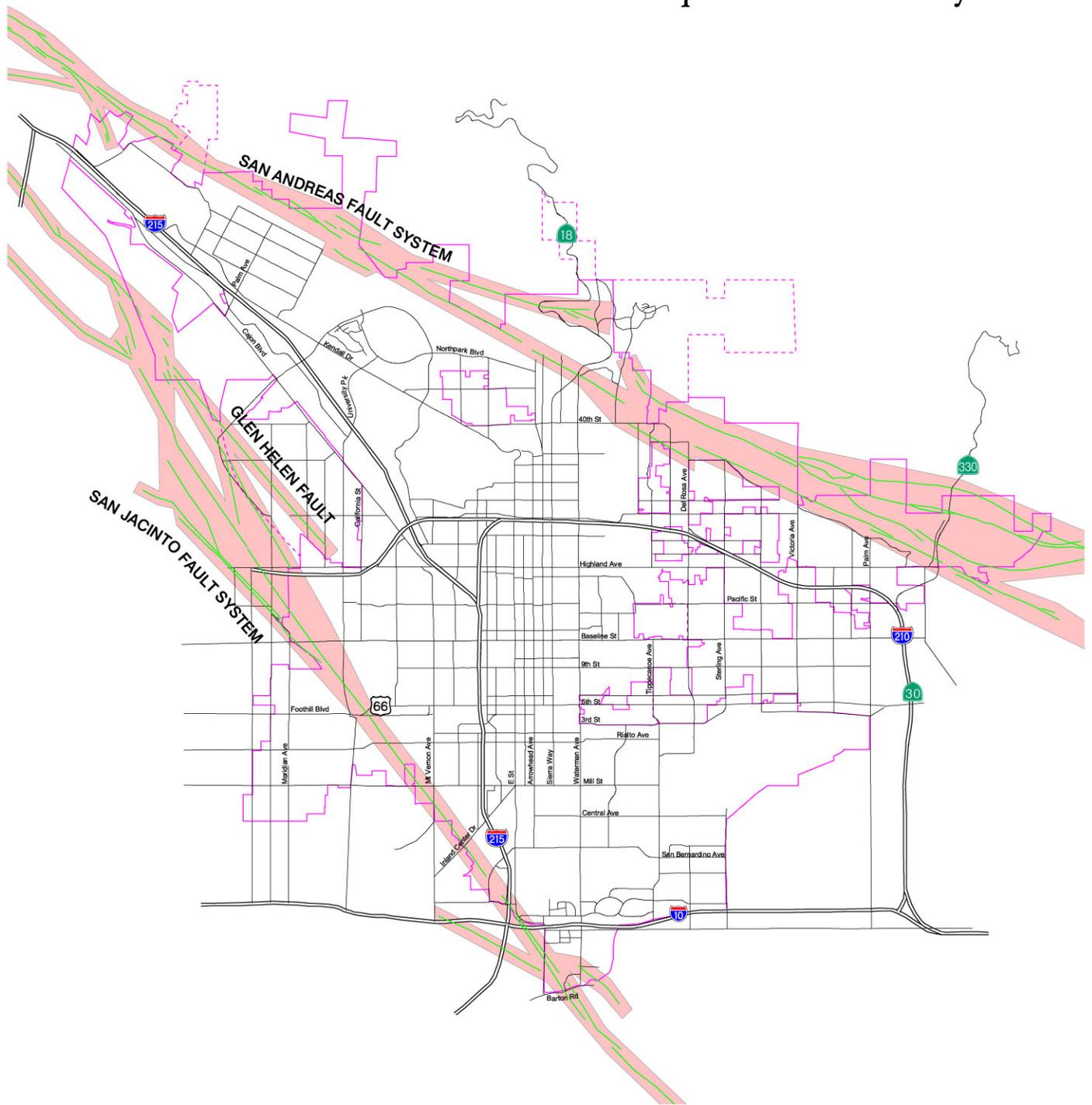
these areas be subject to more detailed, on-site analysis to make a more definite determination as to the activity levels and locations of any faults.

2. Liquefaction

Liquefaction is a process whereby strong earthquake shaking causes sediment layers that are saturated with groundwater to lose strength and behave as a fluid. This subsurface process can lead to ground failure that, in turn, can result in property damage and structural failure.

Groundwater saturation of sediments is required in order for earthquake-induced liquefaction to occur. Groundwater depth shallower than ten feet to the surface is considered to have the highest liquefaction susceptibility. Groundwater ten to 30 feet below the surface is considered to have a moderately high to moderate susceptibility. Groundwater 30 to 50 feet deep can create a moderate to low susceptibility to liquefaction.

Alquist-Priolo Study Zones



-  Approximate Fault Location
-  Approximate location of Alquist Priolo Special Study Zones
-  City Boundary
-  Sphere Boundary





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Regional Faults

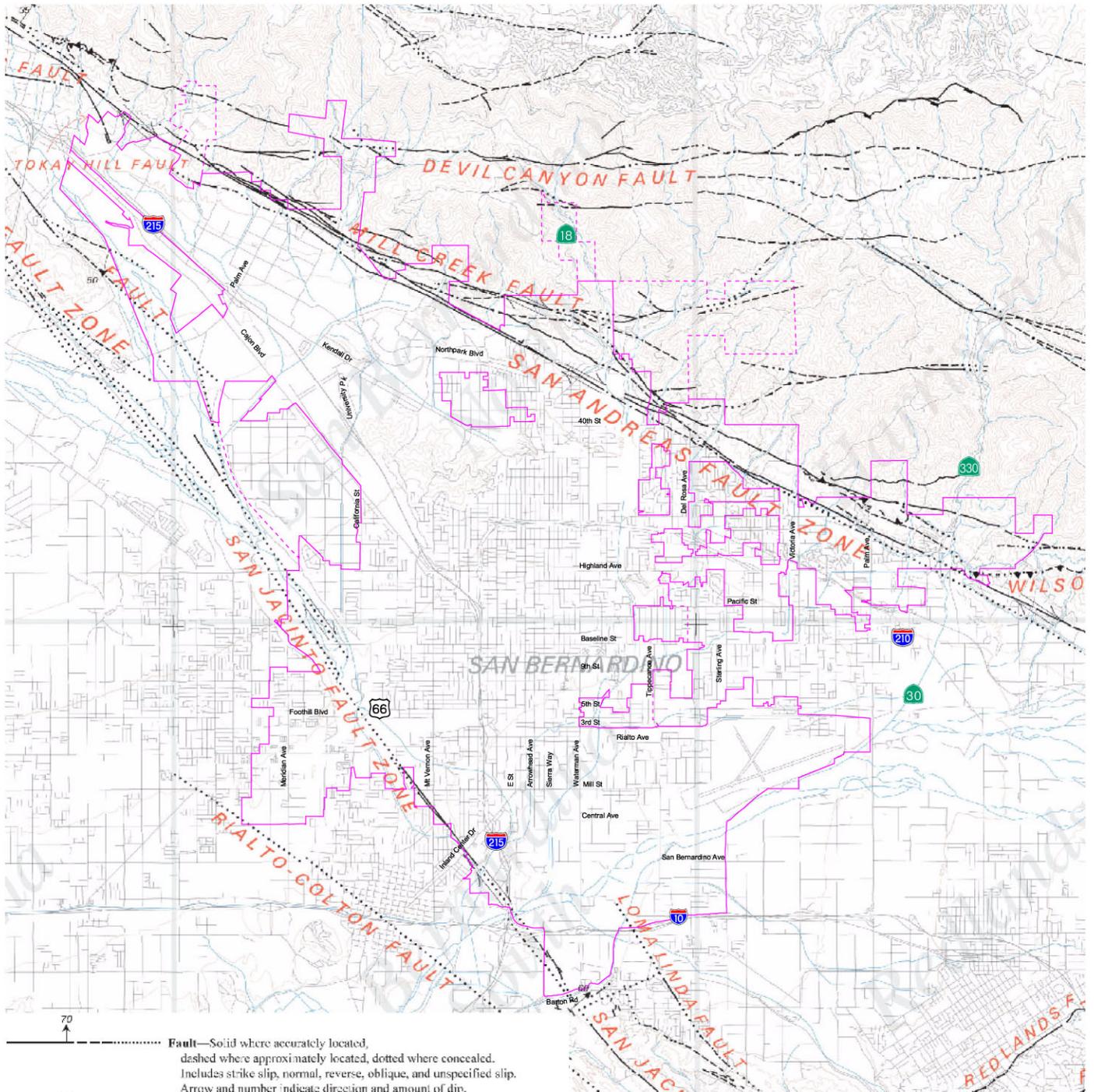


Figure S-4



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Figure S-5 summarizes the general liquefaction susceptibilities for maximum credible earthquakes occurring on the San Andreas, San Jacinto, or Loma Linda/Glen Helen Faults. Two general zones, “high” and “moderately-high to moderate” are depicted, and encompass almost the entire south end of the City. High zones are concentrated adjacent to the San Andreas Fault zone north and northeast of the City and in the old artesian area between the San Andreas and San Jacinto Faults in the central and southern parts of the City. In general, the old artesian area will continue to experience the greatest groundwater fluctuations.

These zones delineate regional susceptibility and can vary greatly due to groundwater level changes. Site-specific geotechnical reports are necessary to determine site-specific liquefaction potential and possible design mitigation.

Goal 10.7 **Protect life, essential lifelines, and property from damage resulting from seismic activity.**

Policies:

- 10.7.1 Minimize the risk to life and property through the identification of potentially hazardous areas, establishment of proper construction design criteria, and provision of public information.
- 10.7.2 Require geologic and geotechnical investigations for new development in areas adjacent to known fault locations and approximate fault locations (Figure S-3) as part of the environmental and/or development review process and enforce structural setbacks from faults identified through those investigations. (LU-1)
- 10.7.3 Enforce the requirements of the California Seismic Hazards Mapping and Alquist-Priolo Earthquake Fault Zoning Acts when siting, evaluating, and constructing new projects within the City. (LU-1)
- 10.7.4 Determine the liquefaction potential at a site prior to development, and require that specific measures be taken, as necessary, to prevent or reduce damage in an earthquake.
- 10.7.5 Evaluate and reduce the potential impacts of liquefaction on new and existing lifelines.

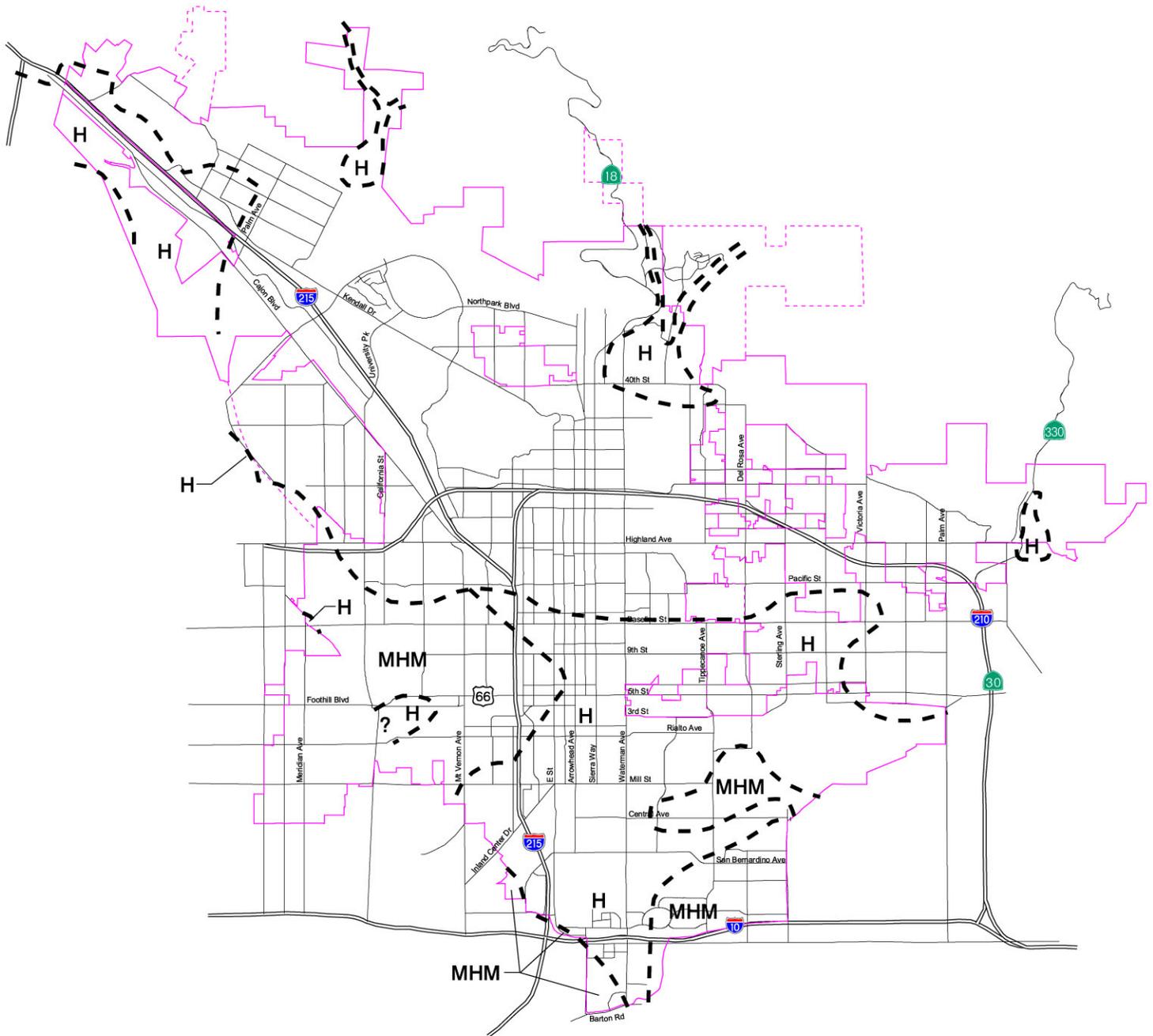
Lifelines

Water, sewer, electrical, gas facilities, and communication and transportation facilities that are needed in the event of an earthquake, flood, or other natural disaster.



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Liquefaction Susceptibility



-  Approximate Location of Areas of High Liquefaction Susceptibility
-  Approximate Location of Areas of Moderately High to Moderate Liquefaction Susceptibility
-  City Boundary
-  Sphere of Influence Boundary

Note: Not to be used as a substitute for site-specific geotechnical liquefaction induced ground failures should be addressed. Boundaries between susceptibility zones will shift if ground water conditions raise or lower over time. Zonations based on sub-surface geology, ground water levels, and maximum credible earthquakes on the San Andreas Fault System, the San Jacinto Fault System and the Cucamonga Fault. (After Matti and Carson, 1986)





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3. Hazardous Buildings

Ground shaking, fault rupture, or liquefaction pose threats to the community during an earthquake. Buildings that house people or buildings providing essential functions and services can be damaged, imposing significant impacts to the City. Continuing advances in engineering design and building code standards over the past decade have greatly reduced the potential for collapse in an earthquake of most of our new buildings. However, many of the City's buildings were built before some of the earthquake design standards were incorporated into the building code, and as such, the City is home to numerous unreinforced masonry buildings, pre-cast concrete buildings, soft-story structures, and non-ductile concrete frame buildings in need of seismic mitigation.

The California Building Code (CBC), Unreinforced Masonry Law (SB 547), Alquist-Priolo Earthquake Fault Zoning Act, and the State of California Seismic Hazards Mapping Act govern development in potentially seismically active areas.

The CBC contains provisions to safeguard against major structural failures or loss of life caused by earthquakes or other geologic hazards. According to the CBC, the City of San Bernardino is located in Seismic Zone 4, one of five zones (0-4) mapped in the CBC to identify areas subject to varying degrees of potential impact and frequency of large earthquakes. Seismic Zone 4 is potentially subject to the highest accelerations, or changes in speed or velocity due to seismic shaking, and has the greatest frequency of large earthquakes.

The Unreinforced Masonry Law requires all cities and counties in Seismic Zone 4 (CBC, 1998) to identify hazardous unreinforced masonry buildings in their jurisdictions. Owners of such buildings must be notified of the potential earthquake hazard, and mitigation must be performed. The mitigation method, which may include retrofitting or demolition, is left to the local jurisdiction.

Goal 10.8 Prevent the loss of life, serious injuries, and major disruption caused by the collapse of or severe damage to vulnerable buildings in an earthquake.

Policies:

10.8.1 Enforce the requirements of the California Seismic Hazards Mapping and Alquist-Priolo Earthquake Fault Zoning Acts

Unreinforced Masonry Law:

The Unreinforced Masonry Law requires cities and counties within Seismic Zone 4 to identify hazardous unreinforced masonry buildings and consider local regulations to abate potentially dangerous buildings through retrofitting or demolition as outlined in the State Office of Planning and Research Guidelines.



when siting, evaluating, and constructing new projects within the City. (LU-1)

- 10.8.2 Require that lifelines crossing a fault be designed to resist the occurrence of fault rupture.
- 10.8.3 Adopt a program for the orderly and effective upgrading of seismically hazardous buildings in the City for the protection of health and safety. Compliance with the Unreinforced Masonry Law shall include the enactment of an effective program for seismic upgrading of unreinforced masonry buildings within the City.

Geology and Soils

Site-specific investigation of geologic and soils conditions are the City's primary means of hazard evaluation and an important basis for developing effective mitigation of individual development projects through the planning and design. Standardized reporting procedures are necessary to assure consistency of hazard evaluation in the planning area.

Data collected for an individual development site does not necessarily provide a complete picture of the regional geologic hazards affecting the site. A broader data base of geologic and soils information, derived from a variety of research, development, and excavation projects, would provide a broader perspective and significant insights on potential development hazards, that can be utilized on a regional scale for land use planning.

1. Subsidence

Subsidence can be caused by natural geologic processes or by human activity such as subsurface mining or pumping of groundwater or oil. Historic and potential ground subsidence areas within the San Bernardino planning area are depicted in Figure S-6. The City's historic subsidence area was located within the thick, poorly consolidated alluvial and marsh deposits of the old artesian area north of Loma Linda. Potential subsidence within this area may be as great as five to eight feet if unreplenished groundwater is depleted from the Bunker Hill-San Timoteo Basin. Since 1972, the San Bernardino Municipal Water District has maintained groundwater levels from recharge to percolation basins that, in turn, filter back into the alluvial deposits. Problems with ground subsidence have not been identified since the groundwater recharge program began.

2. Landslides

General slope stability is determined by a number of factors including slope, vegetative cover, wildfire, bedrock, soil, precipitation, and human alteration. Slopes may be in temporary equilibrium until one of the above factors is modified resulting in an unstable condition and potential failure.

Slope stability studies of the San Bernardino planning area were conducted by Morton (1974) and Miller (1979) and include general descriptions of slope areas along with accompanying maps. Generalized slopes are subdivided into areas of low relief, areas of moderate relief, and areas of high relief. Generalized landslide susceptibility in the City is considered low to moderate. A combination of the generalized slope categories and the generalized landslide susceptibility areas results in two potentially hazardous zones. These zones are mapped in Figure S-7 and include:

- ◆ Areas of low relief with low to moderate susceptibility that may contain small-scale surficial soil slips, debris flow, and mudflows on steep slopes.
- ◆ Areas of moderate and high relief with low to moderate susceptibility that may contain small to large rotational slides, debris slide, and combinations of surficial slides and flows. These areas contain individual landslides that have been included on the regional slope stability and landslides map.

Potential slope failures in the above areas could be hazardous to buildings, reservoirs, roads, and utilities. Seismic shaking may also include slope failure.

Goal 10.9 Minimize exposure to and risks from geologic activities.

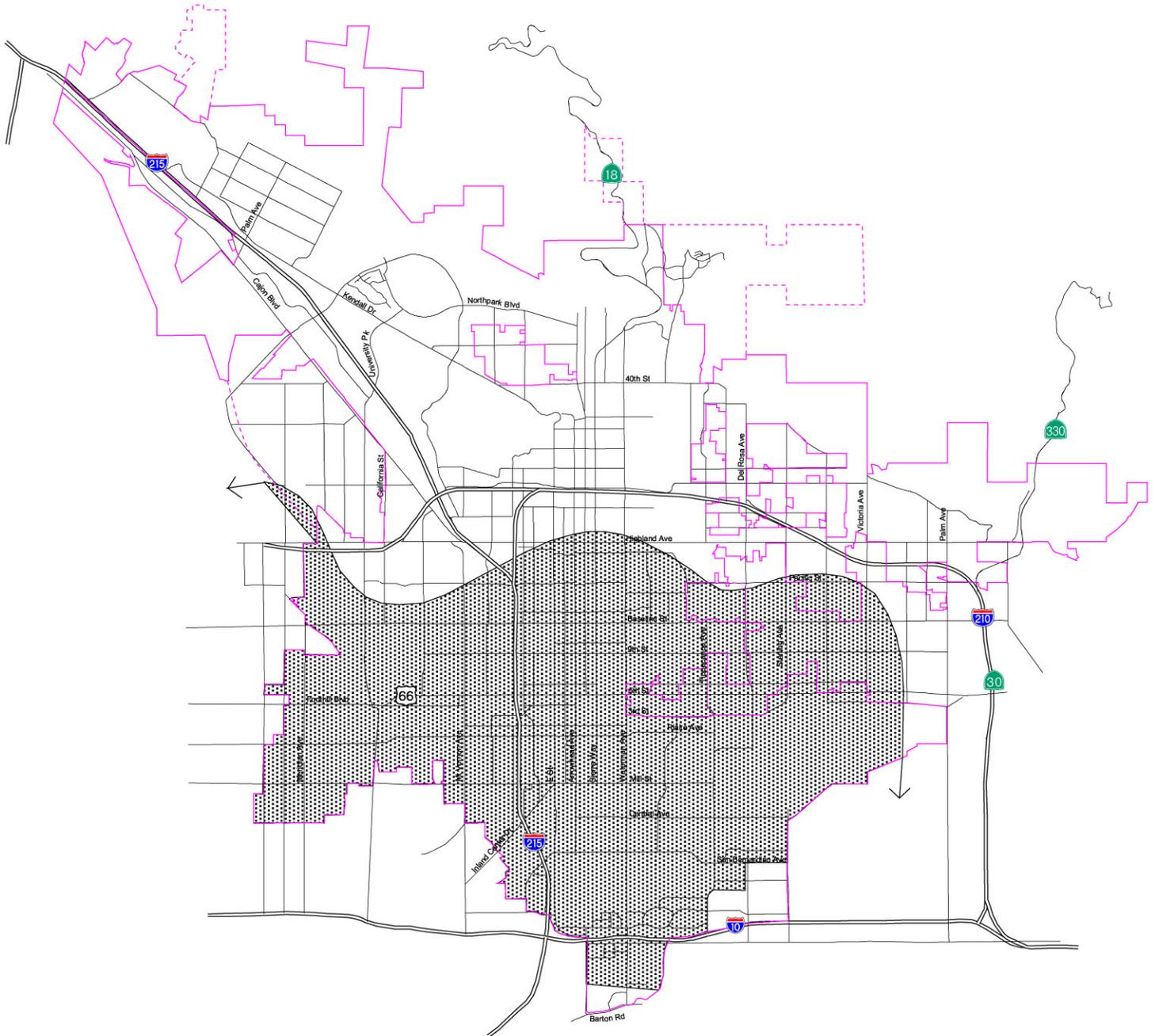
Policies:

- 10.9.1 Minimize risk to life and property by properly identifying hazardous areas, establishing proper construction design criteria, and distribution of public information.
- 10.9.2 Require geologic and geotechnical investigations in areas of potential geologic hazards as part of environmental and/or development review process for all new structures. (LU-1)



- 10.9.3 Require that new construction and significant alterations to structures located within potential landslide areas (Figure S-7) be evaluated for site stability, including potential impact to other properties during project design and review. (LU-1)

Potential Subsidence Areas



Note: Degree of subsidence dependent on groundwater levels.
 Historic subsidence may have occurred in above area.
 (After Fife and others, 1976)

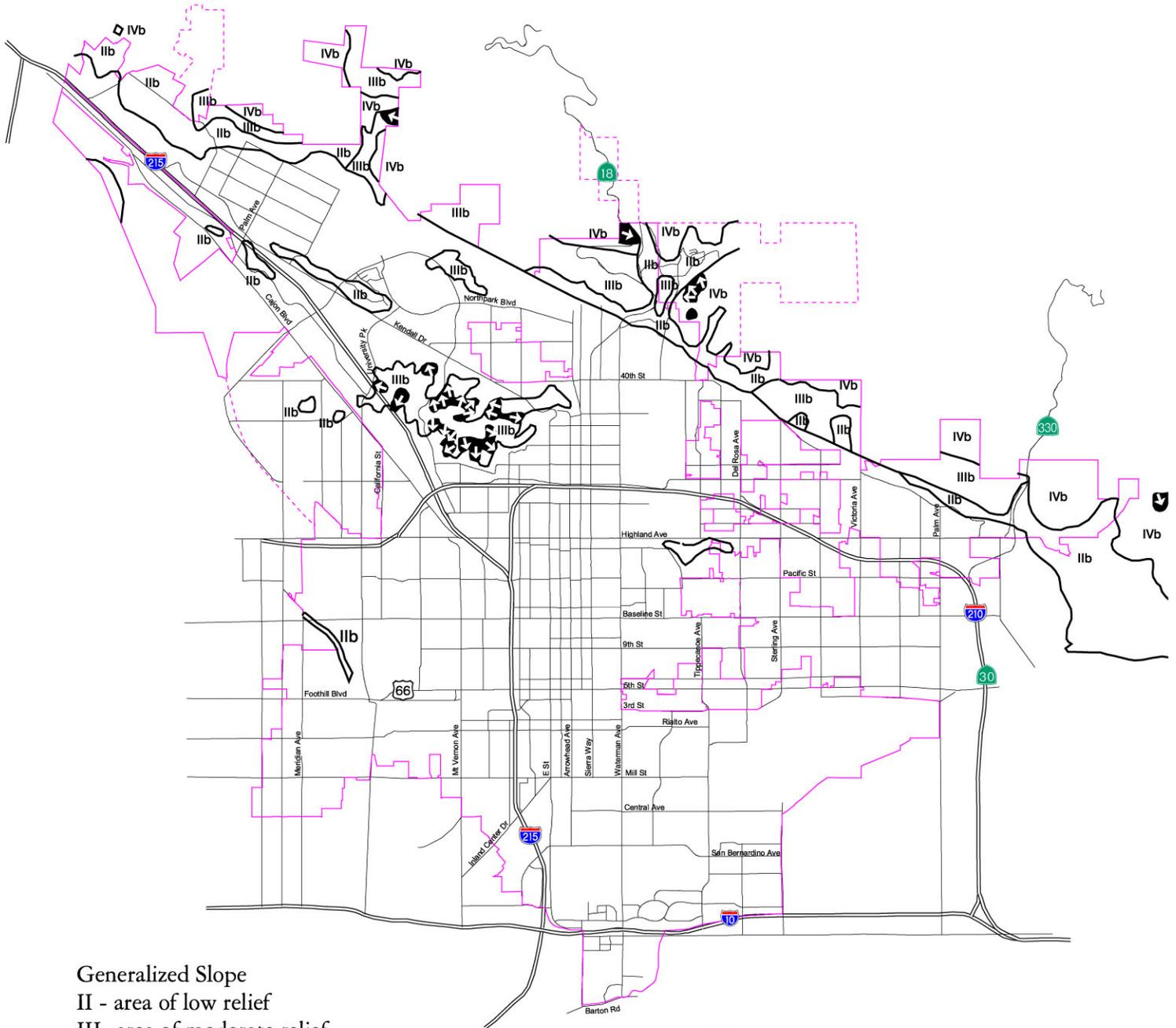
-  Areas of Potential Ground Subsidence
-  City Boundary
-  Sphere of Influence Boundary





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Slope Stability and Major Landslides



Generalized Slope
 II - area of low relief
 III- area of moderate relief
 IV- area of high relief

Generalized Landslide Susceptibility
 b - low to moderate

Note:
 -Areas IIb may contain small scale surficial soil slips, debris flows and mudflows on steep local slopes.
 -Areas IIIb and IVb may contain small to large rotational slides, debris slides and combinations of surficial slides and flows.

(Source: Morton, 1974 and Miller, 1979)

 Approximate location and size of individual landslides. Arrows illustrate predominate direction of landslide movement.

 City Boundary
 Sphere of Influence Boundary





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Wind

The City is subject to extremely high winds, which have resulted in significant property damage. For example, portions of roofs and block walls have been broken and blown away and public utility structures such as power lines and traffic signals have been damaged.

The most significant wind problems occur at the canyon mouths and valleys extending downslope from the San Bernardino Mountains. The highest velocities are associated with downslope canyon and Santa Ana winds (90-100 mph).

The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds and usually occur on a region-wide basis during late summer and early fall. Santa Ana's are dry, warm winds that flow from the higher desert elevations in the north through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Consequently, peak velocities are highest at the mouths of the canyons and dissipate as they spread across the valley floor.

High winds exacerbate brush fire conditions. Of the major fires in the San Bernardino Mountains, all have occurred during periods of high winds. New development in the foothill areas and valleys will expose buildings and population to significant wind hazards.

The high wind velocity and property damage potential have resulted in the northern half of the City adjacent to the mountains being classified by the City as a "High Wind Area" (Figure S-8). In this area of the City, stringent conditions for the construction of buildings and public facilities are applied. Due to various topographic conditions, wind velocities vary throughout the City; however, building standards remain constant. A detailed study may reveal localized wind patterns that merit different structural standards.

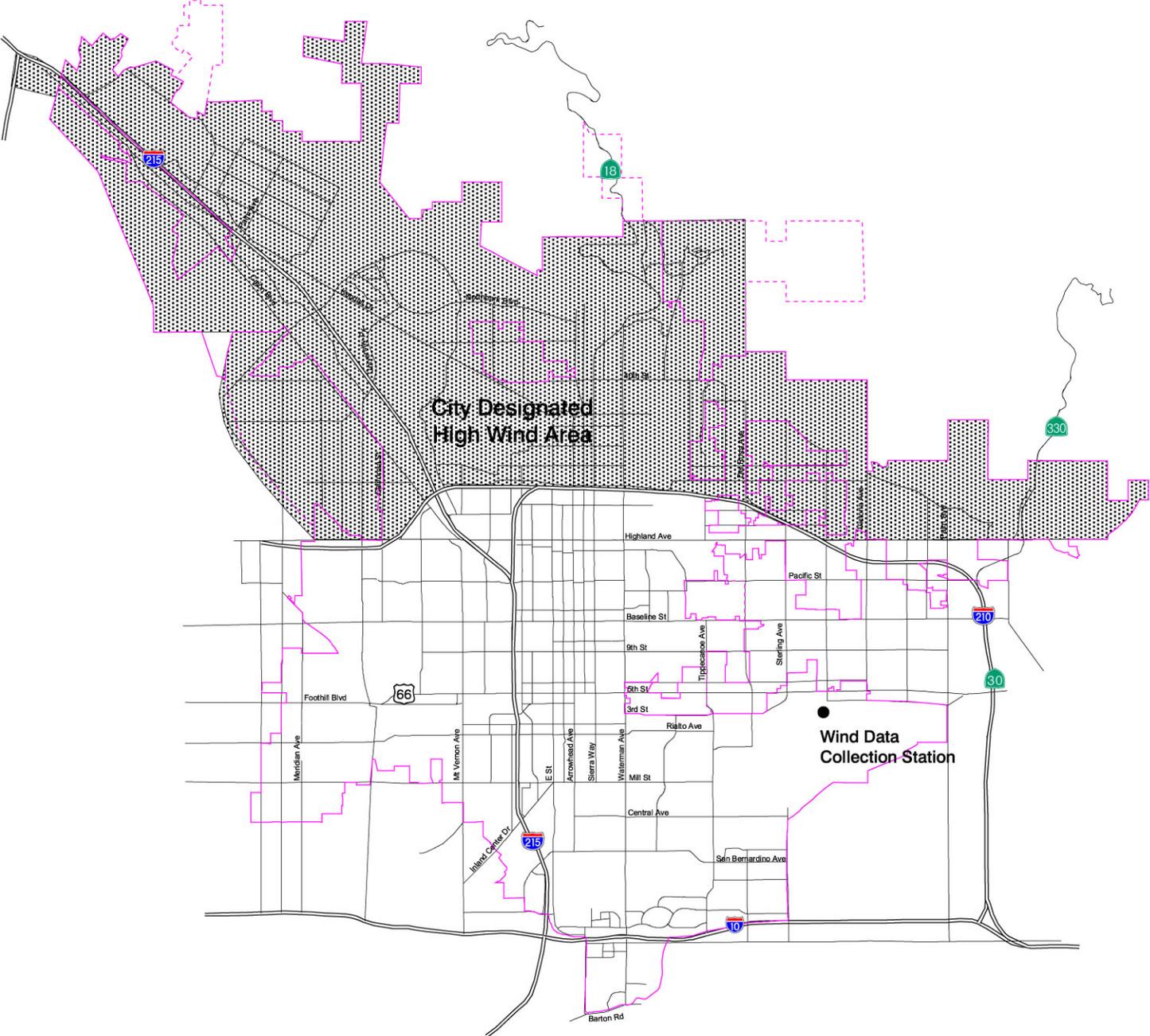
Goal 10.10 Protect people and property from the adverse impacts of winds.

Policies:

- 10.10.1 Ensure that buildings are constructed and sited to withstand wind hazards. (LU-1)



- 10.10.2 Require that development in the High Wind Hazard Area, as designated on Figure S-8, be designed and constructed to withstand extreme wind velocities. (LU-1)
- 10.10.3 Periodically review the structural design requirements for wind in the Building Code to reflect wind conditions and property damage experienced as well as advances to current construction technology.
- 10.10.4 Require that structures be sited to prevent adverse funneling of wind on-site and on adjacent properties.
- 10.10.5 Require that multi-story residential, commercial, and industrial buildings be designed to prevent wind tunnel affects around their base and in passageways. (LU-1)
- 10.10.6 Construct public infrastructure (lighting poles, street lights, bridges, etc.) to withstand extreme wind velocities in High Wind Hazard areas.
- 10.10.7 Maintain police, fire, medical, and other pertinent programs to respond to wind-caused emergencies.
- 10.10.8 Initiate a review of the wind hazard potential as it applies to various parts of the City and, if merited, tailor the design standards accordingly.



-  City Designated High Wind Area
-  City Boundary
-  Sphere of Influence Boundary





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Urban and Wildland Fires

Fires in undeveloped areas result from the ignition of accumulated brush and woody materials, and are appropriately termed “wildland fires”. Such fires can burn large areas and cause a great deal of damage to both structures and valuable open space land. Urban fires usually result from sources within the structures themselves. Fire hazards of this type are related to specific sites and structures, and availability of fire fighting services is essential to minimize losses.

In urban areas, the effectiveness of fire protection efforts is based upon several factors, including the age of structures, efficiency of circulation routes that ultimately affect response times, and availability of water resources to combat fires. In wildland areas, taking the proper precautions, such as the use of fire resistant building materials, can protect developed lands from fires and, therefore, reduce the potential loss of life and property.

The City of San Bernardino is susceptible to wildland fires due to the steep terrain and highly flammable chaparral vegetation of the foothills of the San Bernardino Mountains and high winds that correspond with seasonal dry periods. The characteristics of the San Bernardino Mountains and winds in the area indicate that large uncontrollable fires on a recurring basis are inevitable. Major fires have endangered the City of numerous occasions and in several instances, have spread into the City causing extensive damage, most recently in 2003.



Foothill Fire Zone Overlay

The San Bernardino Development Code and this General Plan contain the Foothill Fire Zone Overlay District. The purpose of this overlay is to mitigate the spread of fire, to help minimize property damage, and reduce the risk to the public health and safety.

The Foothill Fire Zone Overlay ranks areas of fire danger (extreme, high, and moderate) and dictates standards that must be met when developing within the overlay. Standards address the access, vegetation, water supply, erosion control, identification, and design of all new development.

This Overlay is depicted on both the General Plan and Zoning Maps.



The danger from wildland fires in foothill locations is increased by the number of structures and encroachment of new development in the hillside areas. Specific concerns include the density of development, spacing of structures, brush clearance, building materials, access to buildings by fire equipment, adequacy of evacuation routes, property maintenance, and water availability. The capacity of the water systems to provide sufficient water to fight fires is also a significant issue.

The U.S. Department of Forestry has records of wildland fires dating back to the beginning of the 20th century. The data indicates that fires occur on a regular basis almost every year and that very large fires occur approximately every ten years. According to the Department of Forestry, the large fires correspond to the age of the vegetation which, if not burned regularly, begins to accumulate dead material that is more easily ignited and spreads fire faster than newer growth.

Consequently, a decade can pass with few fires followed by a decade with several large fires. The occurrence of the largest fires also corresponds to periods of extremely high wind conditions. This was seen in 2003 Old Waterman Canyon fire, the largest fire in recent history, which destroyed approximately 330 residential properties, and the Panorama fire in 1980, which destroyed 345 structures and killed four people. Many of the areas burned during the Panorama fire were again burned in 2003.

The large fires that are spread by winds periodically approaching and exceeding 90 to 100 miles per hour are considered uncontrollable by the California Department of Forestry and U.S. Forest Service. Other areas in southern California are being burned off periodically by way of controlled burns to remove older vegetation. The controlled burn process is used very carefully in the San Bernardino Mountains because of the unpredictability and force of the winds in the area that could make controlled burns a potential hazard.

Goal 10.11 Protect people and property from urban and wildland fire hazards.

Policies:

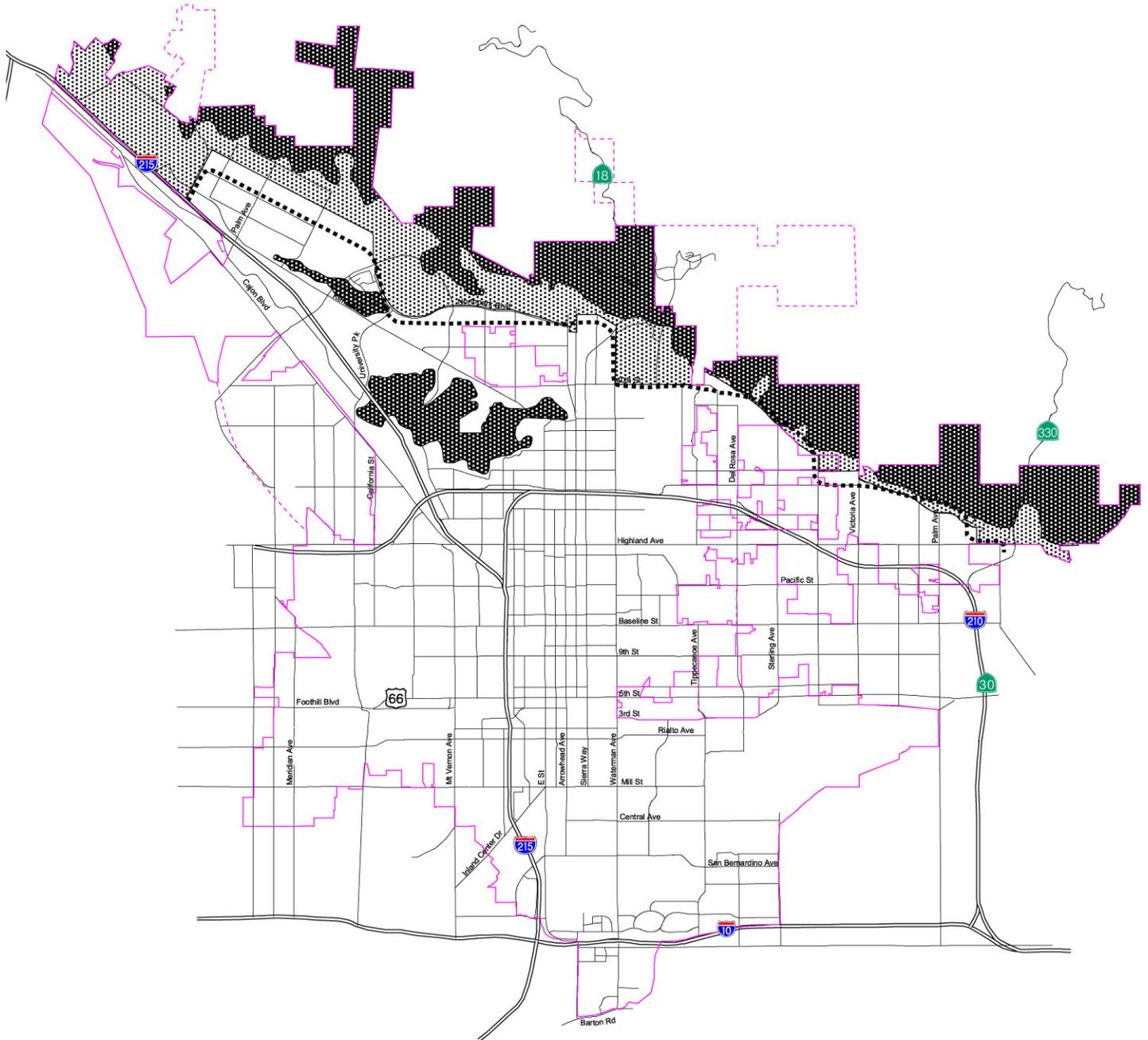
- 10.11.1 Continue to conduct long-range fire safety planning efforts to minimize urban and wildland fires, including enforcement of stringent building, fire, subdivision and other Municipal Code standards, improved infrastructure, and mutual aid agreements with other public agencies and the private sector. (S-2)

- 10.11.2 Work with the U.S. Forest Service and private landowners to ensure that buildings are constructed, sites are developed, and vegetation and natural areas are managed to minimize wildfire risks in the foothill areas of the City. (S-3)
- 10.11.3 Require that development in the High Fire Hazard Area, as designated on the Fire Hazards Areas Map (Figure S-9) be subject to the provisions of the Hillside Management Overlay District (HMOD) and the Foothill Fire Zones Overlay. (LU-1)
- 10.11.4 Study the potential acquisition of private lands for establishment of greenbelt buffers adjacent to existing development, where such buffers cannot be created by new subdivision.
- 10.11.5 Continue to require that all new construction and the replacement of 50% and greater of the roofs of existing structures use fire retardant materials. (LU-1 and S-3)



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Fire Hazard Areas



-  Extreme Fire Hazard Area
-  Moderate Fire Hazard Area
-  City High Fire Hazard Line
-  City Boundary
-  Sphere of Influence Boundary

(Source: City of San Bernardino)





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Emergency Preparedness and Response

Advance preparation for potential disasters can prevent severe loss of life and property from catastrophic events. The proper preparations improve the City's ability to respond to emergency situations created by these occurrences.

Preparation, however, is only the first step in the management of hazards and disasters. Once a disaster has occurred, the capability of the City to respond to the situation at hand affects how quickly the City can recover from impacts.

1. Emergency Management Plan

The City of San Bernardino Emergency Plan details the functional responsibilities and interactions of the federal, state, and local governmental agencies as well as private organizations in the event of natural and/or human-related disasters. Included within the natural disaster category are earthquakes, geologic hazards, floods, and fires. Potential human-related disasters include hazardous materials incident, nuclear attack, and transportation-related accidents.

Within the Emergency Management Plan, potential hazards are described, the possible effects delineated, and recommended mitigations are discussed where applicable. Post-disaster aid, reconstruction, and financial assistance are also discussed.

2. Hazard Mitigation Plan

The Disaster Mitigation Act of 2000 (DMA 2000), Section 322 (a-d), requires that local governments, as a condition of receiving federal disaster mitigation funds, adopt a mitigation plan that describes the process for identifying hazards, risks, and vulnerabilities, identifies and prioritizes mitigation actions, encourages the development of local mitigation, and provides technical support for those efforts. In response to this and the requirements of the State of California Office of Emergency Services and the San Bernardino County Office of Emergency Services, we have prepared the San Bernardino Hazard Mitigation Plan. While we cannot prevent natural disasters from occurring, we can reduce/eliminate their effects through the well organized public education and awareness effort, preparedness, and mitigation set forth in the Hazard Mitigation Plan.



3. Hazardous Materials Emergency Response Planning

The San Bernardino City Fire Department has a Hazardous Materials Response Team specially trained and equipped to handle hazardous materials releases that have adverse effects on lives, the environment, and property within the City of San Bernardino. A release is any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment, unless permitted or authorized by a regulatory agency.

If the fire and police departments determine that an incident requires special expertise and equipment, they may request assistance from the Countywide Haz Mat Team of the County Environmental Health Department. The Haz Mat Team includes a minimum of two fire specialists and two environmental health specialists who perform hazard identification, risk assessment, and actual control measures. Haz Mat is a cooperative organization structure that is intended to bring the maximum available equipment and special expertise to any given emergency situation.

Goal 10.12 Ensure the availability and effective response of emergency services in the event of a disaster.

Policies:

- 10.12.1 Maintain a functional City emergency response plan that addresses all hazards.
- 10.12.2 Implement the City of San Bernardino Hazard Mitigation Plan.
- 10.12.3 Foster and participate in ongoing emergency preparedness and response training programs.
- 10.12.4 Enhance emergency preparedness through the implementation of community education and self-help programs. (S-4)
- 10.12.5 Prevent serious damage and injuries through effective hazard mitigation.
- 10.12.6 Maintain mutual aid agreements with neighboring cities and the County of San Bernardino and develop partnerships to respond to disaster with other emergency relief organizations.

- 10.12.7 Ensure that sensitive uses, such as the University and other public uses that accommodate many occupants, have adequate access to allow emergency personnel to access the site in the event of an emergency.

Goal 10.13 Prepare the City for effective response to facilitate rapid and effective recovery following disasters.

Policies:

- 10.13.1 Establish and maintain a rapid damage assessment capability through the formation of damage assessment strategies that are applied by the appropriate City Staff or inspection personnel.
- 10.13.2 Develop programs, options, and procedures to promote the rapid reconstruction of the City following a disaster, and to facilitate a specific upgrading of the community environment.
- 10.13.3 Identify alternative sources of financing of damage and reconstruction that can be utilized in the event of a disaster.
- 10.13.4 Encourage public awareness of emergency response planning and emergency evacuation routes. (S-1)



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