City of Santa Paula General Plan
Safety Element

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I. PURPOSE AND AUTHORITY

The City of Santa Paula has prepared this revised Safety Element of the General Plan in compliance with California State law. This document supersedes the Seismic Safety Element prepared for the City in 1974 by the Ventura County Environmental Resources Agency, Planning Division. It complements and is consistent with the goals and policies and other elements that make up the City of Santa Paula General Plan.

The adoption or amendment of a general plan is a legislative act. The Safety Element, and all elements of the General Plan, have equal legal status.

City staff determined that an updated Safety Element was necessary to expand and localize safety issues specifically for Santa Paula. The updated Safety Element should assist the City in planning for hazards and responding to disasters by serving the following functions:

- *Providing an accurate and updated assessment of the natural and human-related hazards in the City, including, but not limited to, earthquakes, landslides, subsidence/settlement, expansive soils, liquefaction, seiche, dam inundation, fire, flood, and release of hazardous materials;*
- *Providing a framework by which safety considerations are introduced into the land use planning process;*
- *Recommending revisions in the development review process, by facilitating the identification and mitigation of hazards;*
- *Providing policies directed at identifying and reducing hazards; and*
- *Strengthening earthquake, inundation, fire, flood, and hazardous materials preparedness specific to Santa Paula.*

The Safety Element became a mandatory part of the general plan in 1975 when the State Legislature adopted SB 271 (Chapter 1104). The initial legislation focused on the adoption of policies relating to fire safety, flooding, and geologic hazards. In 1984 the State revised the Legislation (AB 2038; Chapter 1009) expanding the list of safety element issues and combining the Safety Element and Seismic Safety Element into a single document. The focus of the Safety Element is to adopt policies that will .. "reduce death, injuries, property damage, and the economic and social dislocation resulting from natural hazards." Although the emphasis is on fire, flooding, geologic, and seismic hazards, other relevant safety issues include hazardous materials, aircraft safety, police protection, crude oil operations within the planning area, and critical and lifeline facilities.

Section 65302 (g) of the Government Code Section specifies that:

> *[The general plan shall include a] safety element for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence and other geologic hazards known to the legislative body; flooding; and wild land and urban fires. The safety element shall include mapping of known seismic and other geologic hazards. It shall also address evacuation routes, peakload water supply requirements,*

and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards.

Other pertinent sections of the California code pertaining to geologic and seismic hazards include (Government Code Section 65302.5 and Public Resources Code 2697, 2699 and 4102). Sections pertaining to Fire include Public Resources Code 4125 and 4128.5. Copies of these applicable Code sections are included as an Appendix to this document.

The Safety Element is consistent with the other elements of the General Plan, supporting and complementing the Plan's goals and policies and the related elements. The Land Use Element establishes use and density designations, and controls zoning for all land Citywide. Therefore, the Safety Element considers use and density based upon the degree of hazard that may be present. Similarly, the Housing and Conservation and Open Space Elements address land that may be set aside for certain specific purposes. Decisions regarding the location of multi-family housing, for example, will be better informed when framed within data related to the City's safety hazards and emergency service provision. Open space designations are commonly linked to areas of geologic or flood hazard. The Circulation Element emphasizes transportation issues, which relates to the provision of emergency response in the event of a disaster.

This Safety Element is designed to provide the input necessary to assist the City of Santa Paula in achieving balanced planning decisions. It recognizes the importance of the public safety, and the need to integrate safety concerns with other local issues.

II. EXISTING CONDITIONS AND ISSUES

The City of Santa Paula is situated in the Santa Clara River Valley of central Ventura County. The City boundaries cover about 4.5 square miles. The City's planning area, which includes adjacent unincorporated areas under the City's general planning jurisdiction, covers about 74 square miles. The General Plan, including the Safety Element, applies to this larger planning area which is also known as the City's Area of Interest.

The Santa Clara River Valley lies within the Transverse Range Province which is evidenced by east-west trending mountains bounding the valley on the north and south. The major drainages to the Santa Clara River within the City's planning area include: Adams Canyon; Fagan Canyon; Santa Paula Creek; and Timber Canyon. The developed portions of the City are located primarily on the Santa Clara Valley floor and on slopes of 0-20%, although a great majority of the City is on slopes of 5% or less. Steeper slopes exist in the mountainous terrain to the south toward South Mountain, and to the north toward Sulphur Mountain and Santa Paula Ridge.

Access to the City is primarily via two major arterials. From the east and west, entrance to the City is via State Route 126 (SR 126). Access from the north is via State Route 150/Ojai Road (SR 150). A privately owned airport exists within Santa Paula and can accommodate small single- or double-engine aircraft during the daylight hours.

The City of Santa Paula Police Department provides police protection service to the community within the corporate boundaries. The main police station is located at 214 South Tenth Street. The City of Santa Paula also provides fire protection services within the corporate boundaries. Two fire stations exist within the City: one in the downtown area and one in the west end of the City. The City of Santa Paula Department of Public Works provides water delivery service to the City. The water is piped into storage tanks from groundwater wells penetrating the Santa Paula Groundwater Basin, and then supplied to the public by gravity flow.

The City is served by one area hospital: Santa Paula Memorial Hospital (60 bed facility). There is also an urgent care facility, Rural Health Care, which is an extension of the Santa Paula Memorial Hospital.

Regional Stratigraphy. The Santa Paula planning area lies within the geologic boundaries of the Ventura Basin. The Ventura Basin has a remarkably thick section of mostly marine sedimentary rocks, which totals more than 58,000 feet. These deposits reflect perhaps the thickest accumulation of Pliocene deposits in the world (Norris and Webb, 1990). The lithologic stratigraphy beneath the Santa Paula area includes thick alluvial and unconsolidated sediments accumulated beneath the Santa Clara River Valley, overlying Miocene- and Pliocene-aged bedrock. The Miocene- and Pliocene-aged bedrock outcrops exist on South Mountain, and south of Sulphur Mountain and Santa Paula Ridge. Eocene-aged bedrock outcrops exist on Santa Paula Ridge and north of Sulphur Mountain, north of the Santa Clara River Valley.

With the exception of the Saugus Formation (exposed along the northern boundary of the Santa Clara River in the planning area) and the Sespe Formation (exposed northeast of Santa Paula

Ridge and adjacent to the Santa Clara River Valley on the south), the claystone, shale, and sandstone bedrock exposed in the mountainous regions are sedimentary, relatively soft, and of marine origin. The marine Eocene rocks exposed in the mountains north of the Santa Clara River Valley, and within the planning area, consist of the harder Coldwater Sandstone, Cozy Dell Shale, and Matilija Sandstone. Locally, soil cover and landslides occur on the hillsides. The location of sedimentary and alluvial sequences, and mapped landslide areas, within the planning area, can be found on the geologic maps for the Santa Paula and Santa Paula Peak quadrangles by Dibblee (1990 and 1992). See the Safety Element Appendix for the Dibblee maps showing local faulting.

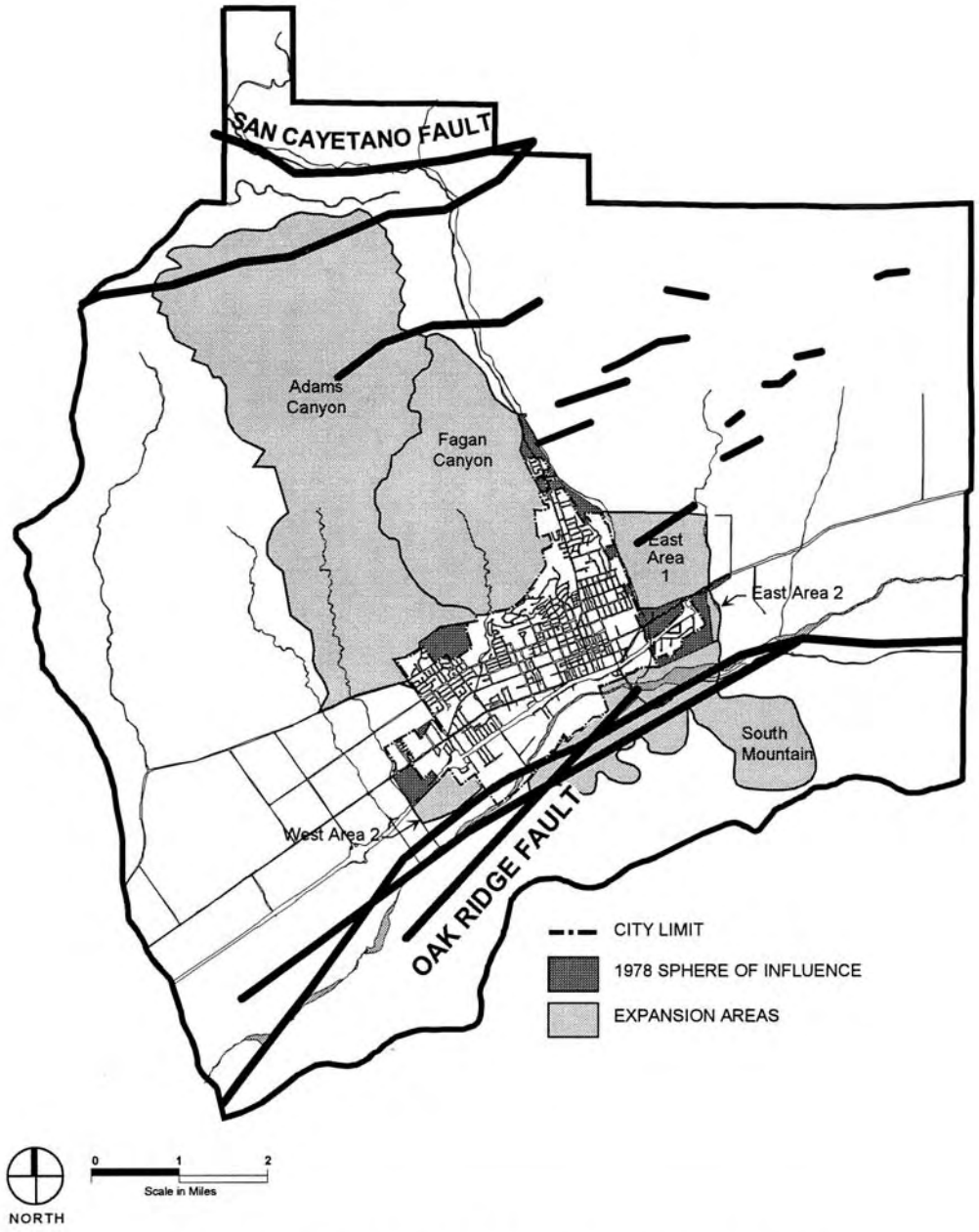
Regional Structural Geology. The City of Santa Paula lies within the western Transverse Ranges geologic province of southern California. This province is characterized by east-west trending folds, faults, and mountain ranges -- which are transverse to the northwest trend of most of the geologic features in California. Structural geology of the region has been described in several reports including Norris and Webb (1990), Yerkes and Lee (1981), Yeats and Huftile (1995), and Weber (1973).

Regional east to west trending folds and faults traverse the western Transverse Ranges, and high rates of deformation have resulted from probable Holocene movement along east-west trending reverse faults in the planning area. The most prominent of these faults is the San Cayetano Fault, located in the northern end of the planning area. The San Cayetano Fault is a north dipping reverse fault, which has thrust older Eocene rocks on top of younger Miocene, Pliocene, and Pleistocene rocks. The maximum amount of displacement observed is about 9,000 meters at Sespe Creek, northeast of the City of Santa Paula and the planning area. The San Cayetano Fault is considered an active fault.

The Oak Ridge Fault lies beneath the Santa Clara River and trends northeast-southwest through the City of Santa Paula Planning Area. The Oak Ridge Fault is a south-dipping, reverse fault which thrusts lower Miocene and upper Eocene strata over upper Pleistocene strata. South of the City of Santa Paula, near the Saticoy area, the displacement of sediments by the Oak Ridge Fault has caused a groundwater barrier. Evidence that the Oak Ridge Fault was active in the Miocene can be seen in the Oakridge oil field, where the fault separates a thin Miocene sequence on the south side from a thick Miocene sequence on the north side. The vertical displacement of the Miocene Saugus Formation near Santa Paula (in the Oakridge oil field) is approximately 2.3 kilometers.

More recently, the Oak Ridge Fault has been called a “continuation” of the Northridge blind thrust fault that caused the Northridge earthquake of January 1994 (Yeats and Huftile, 1995). However, no primary surface rupture seems to have accompanied the Northridge earthquake. Although the Oak Ridge Fault is not considered active based on the Alquist-Priolo Earthquake Fault Zoning Act definitions (no evidence supporting surface displacement in the Holocene - the last 11,000 years), its association with the Northridge blind thrust fault and the Northridge earthquake of 1994 indicates that the fault should be considered as active for land use purposes, particularly in the South Mountain area. In addition, the Fault Activity Map of California and Adjacent Areas compiled by Jennings for the Department of Conservation, California Division of Mines and Geology (CDMG, 1994), indicates that evidence for Holocene activity on the Oak Ridge Fault exists south of Fillmore, east of the City of Santa Paula planning area. Figure S-1 shows the location of the San Cayetano and Oak Ridge Fault zones.

Figure S-1 Select Faults in the Santa Paula Planning Area



Select Faults In the Santa Paula Planning Area Figure S-1

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A. Seismic and Geologic Hazards

Seismic Hazards. The Santa Paula area is in a seismically active region. In the western Transverse Ranges of Southern California, few large earthquakes have occurred historically but geologic and geodetic data indicate high strain rates (CDMG, 1996). No surface-faulting event has been recorded within at least the last 200 years in the Santa Paula planning area. Based on the most recent CDMG study (1995), the average recurrence interval calculated for the Oak Ridge Fault, of about 250 years, suggests that the City of Santa Paula may experience a destructive earthquake along this fault within the next 200 years. Seismic hazards that pose the greatest concern to the City of Santa Paula include seismically-induced ground shaking and fault rupture.

Seismically-Induced Ground Shaking. Table S-1 provides a listing of the closest and most significant regional faults that are modeled herein to predict ground shaking that would be produced within the planning area. Figure S-1 shows the locations of these faults with respect to the current City boundaries.

Table S-1. Estimated Ground Accelerations and Intensities

Fault Name	Maximum Magnitude Earthquake[1]	Distance in Miles from City Boundaries (km)	MaximumMMI[2]
Type A Faults			
San Andreas	7.8	26 (42)	X-XI
Type B Faults			
Oak Ridge	6.9	0-10 (0-16)	X-XI
San Cayetano	6.8	0-10 (0-16)	IX-X
Ventura	6.8	5-10 (8-16)	X-XI
Santa Susana	6.6	10 (16)	IX-X
Northridge Blind Thrust	6.9	30 (48)	VIII-IX

1-CDMG, Probabilistic Seismic Hazard Assessment for the State of California (1996)
2-Krinitzsky and Chang, December (1977)
MMI = Modified Mercalli Intensity

Note: MMIs were calculated for each fault using the relationship between Mmax magnitudes and distance from the epicenter (in this instance the distance from the City of Santa Paula limits and the nearest section of each fault) (Krinitzky and Chang, 1977). MMIs can be influenced by site specific features, such as the thickness of loosely consolidated alluvium and the depth to groundwater. These factors have not been included in the calculation of expected MMIs; thus, the actual intensities that are felt at a site could differ from the levels extrapolated here.

The data by CDMG (1997), indicates that the greatest ground acceleration that the City would be subject to is a peak ground acceleration of 0.83*g*, which would result in a MMI of X-XI. Such an event could be produced from a maximum magnitude earthquake of 6.9 occurring along the Oak Ridge Fault. In areas of loosely consolidated alluvium or areas with a water table within 30 feet from ground surface, MMI levels may be greater. In addition, although lower ground accelerations may occur in the planning area from an earthquake generated on the San Andreas or Ventura Faults, a similar MMI (X-XI) is anticipated.

The most recent modeling efforts of seismic experts (probabilistic modeling) have attempted to evaluate earthquake potential for a given area by factoring all available potential fault sources. The CDMG (1996) have estimated that in the next 50 years, there is about a 10% chance of an earthquake between magnitudes 6.5 and 7.0, and peak ground accelerations of about 0.83*g* (10% in 50 years), within 0 to 5 km from the Santa Paula area. This corresponds to a MMI of VIII or greater. Please refer to the safety Element Appendix for a detailed description of the Probablistics Seismic Hazard Analysis performed for Santa Paula by the California Division of Mines and Geology (CDMG).

Fault Rupture. One potentially active, and one active, fault have been mapped, and identified through the Alquist-Priolo Earthquake Fault Zoning Act, within the City of Santa Paula planning area: the Oak Ridge Fault; and the San Cayetano Fault, respectively. According to the CDMG (Treiman, 1997), the San Cayetano Fault, located in the northern portion of the planning area, is within an Alquist-Priolo Earthquake Fault Zone. The Oak Ridge Fault, though not within an Alquist-Priolo Earthquake Fault Zone in the planning area, has a section zoned under the Alquist-Priolo Act south of Fillmore. The Oak Ridge Fault has not been zoned under the Alquist-Priolo Act within the planning area predominantly because the fault is concealed under the Santa Clara River. According to the CDMG (Treiman, 1997), the Oak Ridge Fault should be considered active, and no important facilities should be located in the vicinity of the fault unless a detailed fault study is performed by a Certified Engineering Geologist.

As geologic studies are performed, there is the possibility that additional active faults may be identified. Santa Paula should follow the guidelines of the Alquist-Priolo Act for proposed new development within the City. A setback from the mapped potentially active Oak Ridge Fault should be considered for critical facilities within the City, including schools, hospitals and essential service buildings. These constraints should be considered prior to land use planning.

Geologic Hazards. Geologic hazards that pose the greatest concern to the City of Santa Paula include liquefaction from seismically-induced ground shaking, slope stability which includes landslides, debris and mud flows, rock falls, and soil related hazards. All of these hazards have affected the Santa Paula area to some extent since the mid-1950s, when rapid development began. An awareness of these potential geohazards is needed with increased population density and encroachment into the hills and mountains.

Liquefaction. Based upon the Seismic Hazard Mapping Act criterion and the geologic maps for the Santa Paula and Santa Paula Peak Quadrangles (Dibblee, 1990 and 1992), areas within the City of Santa Paula and the surrounding planning area which fall into a high hazard category for liquefaction due to seismically-induced ground shaking are shown on Figure S-2.

These areas were designated by the presence of unconsolidated alluvial sediments greater than 10 feet thick. Within this entire zone, it was assumed that depth to groundwater fluctuates but likely rises to within 40 feet of the ground surface (the criteria for high liquefaction potential). The geologic units (Qa and Qg) considered as potentially liquefiable sediments in this evaluation, were mapped in the Santa Paula and Santa Paula Peak areas by Dibblee (1992 and 1990). Please refer to the Safety Element Appendix for the Dibblee reference map.

To more accurately determine the potential for liquefaction, site specific geologic studies are required in accordance with Chapter 6 of CDMG Special Publication 117, *Evaluation and*

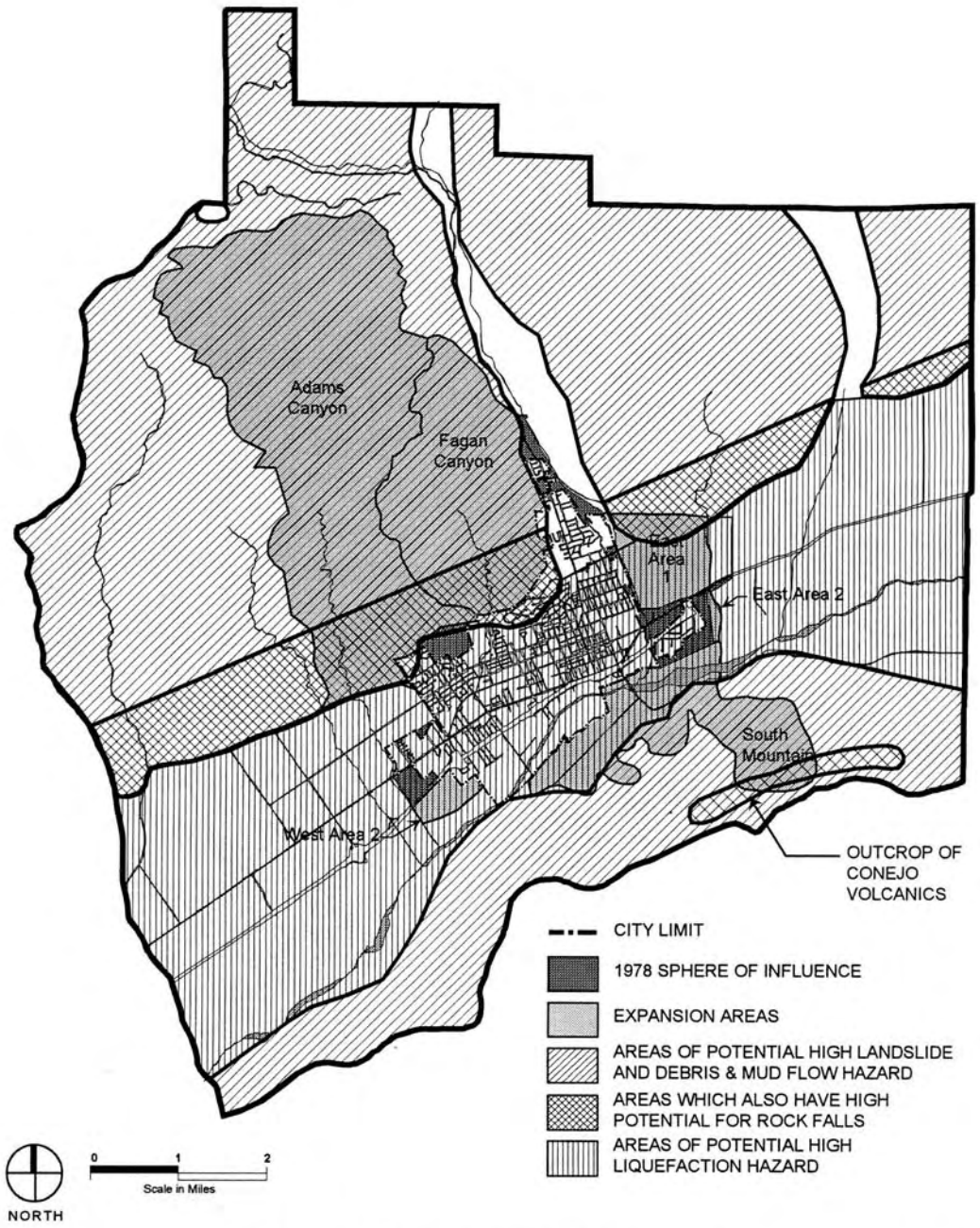
Mitigation of Seismic Hazards in California (1997). These studies should be performed prior to new construction and for the retrofitting of vulnerable structures. The studies should include site-specific depth to groundwater and the Standard Penetration Test, SPT N-blow counts. Areas having liquefiable sediments should be identified, and structures should be properly designed to withstand the conditions.

Slope Stability (Landslides, Debris and Mud Flows, and Rock Falls). Numerous landslides have been mapped within the hillsides of the City of Santa Paula (Dibblee, 1990 and 1992). The hillsides also are prone to debris and mud flows, and to rock falls. Land development near or at the base of canyons, cliffs, or landslides should take these hazards into consideration during the planning, construction and estimated life of the development. Because many factors contribute to the instability of hill slopes (precipitation, soil and rock lithology and induration, seismic ground shaking, steepness of slope, and manmade grading), the Uniform Building Code (UBC, 1997) requires that site specific investigations be performed for development on hill sides. These specific investigations require:

- *Preliminary studies by a Registered Geotechnical Engineer or Certified Engineering Geologist;*
- *Developers to retain both engineering geologists and geotechnical engineers during construction;*
- *Certification as to the stability of the proposed building site, with relationship to adverse effects from rain and earthquakes, prior to the issuance of building permits;*
- *Coordination between the civil engineer and the project engineering geologist/geotechnical engineer during the construction grading;*
- *Mitigation of onsite hazards caused by grading that may affect adjacent properties, including erosion and slope instability; and*
- *Development within areas with a known high potential for landslides, debris flows, mud flows, and rock falls should follow the appropriate criteria (in Chapter 5 of CDMG Special Publication 117, and Chapter A-33 of the 1997 UBC) and site specific studies should be performed prior to development.*

Based on the Seismic Hazard Mapping Act criteria, the geologic maps for the Santa Paula and Santa Paula Peak Quadrangles (Dibblee, 1990, 1992), and the planning area Slope Map (City of Santa Paula, 1995), areas within the City of Santa Paula and the surrounding planning area which fall into a high hazard category for landslides due to seismically-induced ground shaking are shown on Figure S-2. The areas which fall into a high hazard category for mud and debris flows, and rock falls are also shown on Figure S-2.

Figure S-2 – Seismic and Geologic Hazards



Seismic and Geologic Hazards Figure S-2

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Geotechnical Hazards. Geotechnical hazards include expansive soils, settlement, subsidence, and hydrocompaction. This section focuses on areas within the City of Santa Paula that have the potential for such failure.

Expansive Soil. According to the Soil Survey for the Ventura Area (Edwards, et. al., 1970), soil in portions of South Mountain, Orcutt Canyon, Mud Creek Canyon, Timber Canyon, and Adams Canyon, within the planning area, have a high shrink-swell potential. The soils within Santa Clara River Valley, Santa Paula Creek, and the eastern portion of Timber Canyon generally have a low shrink-swell potential. The remainder of the planning area has a moderate shrink-swell potential.

Figure S-3 shows the areas of potential highly expansive soil. The areas mapped generally correspond with "Group D" of the hydrologic soil groups defined in the Soil Survey of Ventura County. However, because of the apparent complexity of factors affecting soil expansiveness, the mapped areas are estimates only. Detailed site specific investigations are required to fully evaluate the shrink-swell characteristics of soils at a given site.

The potential for expansive soils exists in the City of Santa Paula planning area. The shrink-swell characteristics of soils can vary widely within short distances, depending on the relative amount and type of clay. Detailed geologic studies are required prior to development to evaluate the potential for expansive soils. If a site is found to have expansive soils, this can usually be mitigated through proper foundation design.

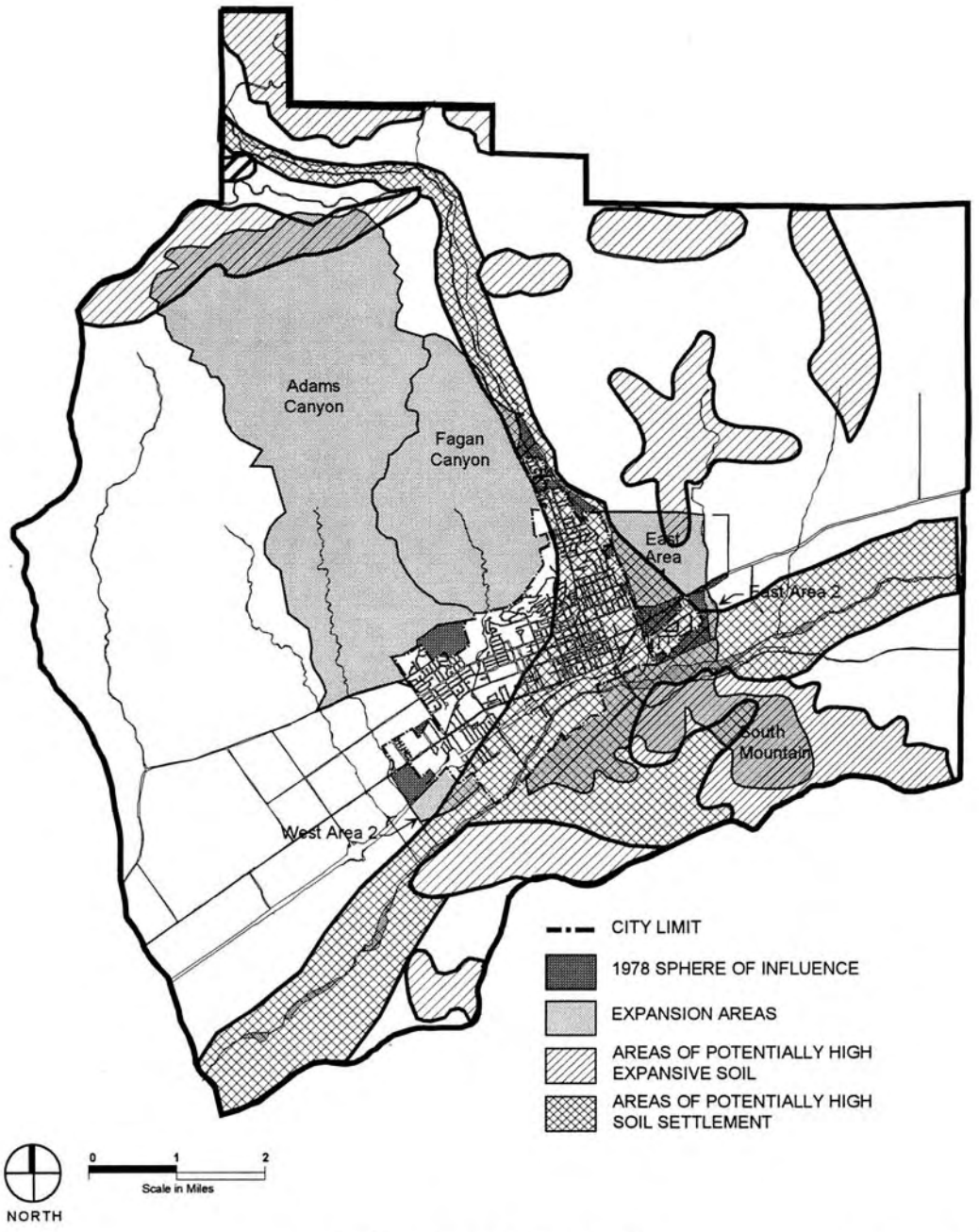
Settlement. Natural soils that are potentially susceptible to settlement can be found in the Santa Clara River Valley, the east side of Timber Canyon, along Santa Paula Creek, and in a portion of the South Mountain area south of the Santa Clara River and across from Santa Paula Creek. The areas with a high potential for settlement are shown on Figure S-3 (Ventura County Soil Survey, 1970).

Large-scale settlement problems should not be an issue in the study area provided that adequate soils and foundation studies are performed prior to construction and that UBC guidelines are followed. Soil with a high potential for settlement exists within the planning area. The potential for settlement should be addressed during geotechnical studies prior to any new construction and appropriately minimized or corrected, as necessary, during construction.

Subsidence. As yet, no recognized subsidence has occurred within the study area due to either groundwater or oil extraction. Accordingly, the potential for subsidence in the study area is considered to be minimal. If present, these hazards would be predominantly manifested in areas of unconsolidated alluvium along the Santa Clara River Valley floor due to extraction of groundwater from the Santa Paula Groundwater Basin during overdraft[1] conditions within the aquifer. Given that groundwater users comply with the Adjudicated Groundwater Basin Agreement, the Santa Paula overdraft conditions would not be expected to occur with the current water demand, nor with future development water demands. Therefore, subsidence

[1] Overdraft is when groundwater is being extracted at a faster rate than it can be replenished from natural supplies, such as rain.

Figure S-3 Geotechnical Hazards



Soil Related Hazards Figure S-3

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due to groundwater extraction in overdraft conditions is not expected to occur currently, or with the proposed expansion of the City of Santa Paula.

Large-scale regional subsidence has not occurred in the study area. Because of the limited amount of groundwater currently being extracted from the basin, and the negligible amount of oil extraction from the Santa Clara River Valley floor, the likelihood of significant subsidence occurring in the study area is considered minimal.

Hydrocompaction. Areas of hydrocompaction have not been identified within the City of Santa Paula. Hydrocompaction could potentially occur in areas of unconsolidated soils, particularly along the Santa Clara River Valley floor. If, during the preparation of a foundation study, soils susceptible to hydrocompaction are encountered, the condition should be mitigated prior to development. Mitigation measures should be designed by a civil or geotechnical engineer.

B. Flood Hazards

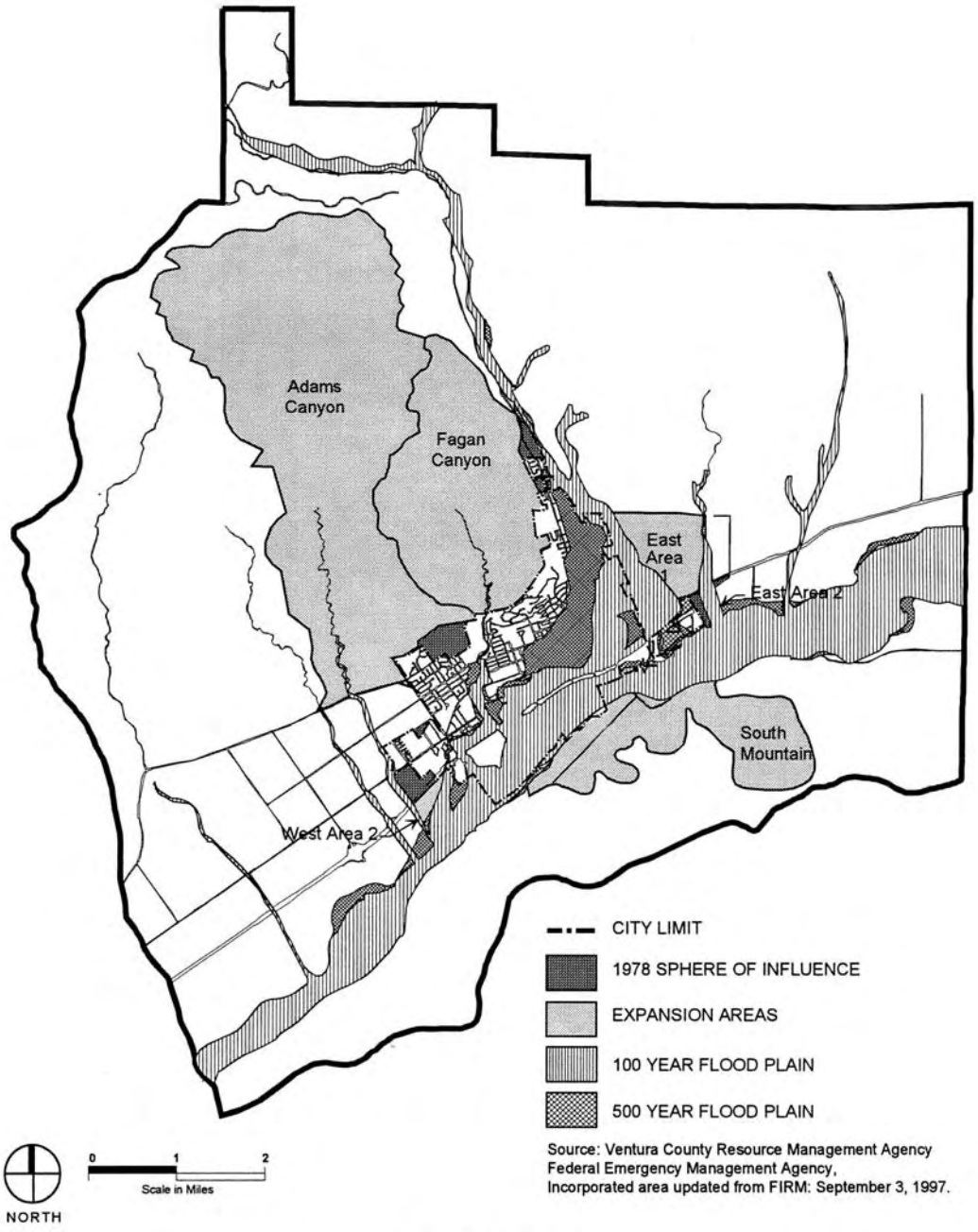
Development within the City of Santa Paula is primarily on the Santa Clara River Valley floor and on slopes less than 10% (Fugro West, Inc., 1994). The watershed is defined by the Topa Topa Mountains to the north (which include Sulphur Mountain and Santa Paula Peak) and South Mountain to the south. The Santa Clara River is the major drainage feature through the City. This watercourse drains from the eastern limit of the planning area, westerly through the Oxnard Plain and into the Pacific Ocean. Major tributaries of the Santa Clara River within the planning area include Santa Paula Creek, Adams Barranca, Fagan Barranca, and Timber Canyon.

Flood Hazards. Flood hazard areas of the City of Santa Paula are subject to periodic inundation which can result in destruction of property, loss of life, health and safety hazards, and disruption of commerce and governmental services. Encroachment onto floodplains, such as artificial fills and structures, reduces the capacity of the floodplain and increases the height of flood water upstream of the obstructions. Floodplain management involves the balancing of economic gain associated with land development within the floodplain against the increased flood hazard.

The Federal Emergency Management Agency (FEMA) establishes base flood heights for 100-year and 500-year flood zones. The 100-year flood zone is defined as the area that could be inundated by the flood which has a one percent probability of occurring in any given year. The 500-year flood is defined as the flood which has a 0.2 percent probability of occurring in any given year.

Figure S-4 illustrates areas of the City that could be inundated by the 100- and 500-year flood (FEMA, 1997). The little watersheds, including Santa Paula Creek, are most affected by short, high-intensity storms, while the larger watersheds, including the Santa Clara River, are affected by longer, lower-intensity events (City of Santa Paula, 1994).

Figure S-4 Flood Hazards



Flood Hazards Figure S-4

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The largest flood area is caused by Santa Paula Creek. Major development on the east bank of the creek should not be considered without resolution of the flood problems. Future development on the west side of Santa Paula Creek is regulated by a City ordinance which requires that building structures be constructed at elevations above the anticipated flood level. In 1994, the Corps of Engineers completed a study of Santa Paula Creek. The Corps of Engineers has since authorized a project that will eliminate 100-year flooding from Santa Paula Creek. The project will be completed in 1999.

The City of Santa Paula does not have a Master Plan of Storm Drains. According to the City, problematic areas include: Santa Paula Creek; Fagan Barranca, Adams Barranca; Harvard Boulevard at Warren Avenue; Twelfth Street above the railroad tracks; and Todd Lane (City of Santa Paula, 1994). Future land development will affect drainage needs on Todd Lane, in Adams and Fagan Barrancas, and in Santa Paula Creek.

Flood hazards associated with the Santa Clara River cannot be mitigated through drainage design. In designating land uses south of SR 126, the flood hazard potential of that area should be considered.

Potential Inundation Due to Dam Failure. At least four dams northeast of the Santa Paula area have the hypothetical potential to result in dam inundation to the City or surrounding environs: Lake Pyramid Dam, Lake Castaic Dam, Bouquet Canyon Dam, and Santa Felicia Dam (Lake Piru). General information for each of these dams is summarized in Table S-2 below. The boundary of potential dam inundation within the planning area is depicted on Figure S-4.

Table S-2. Dams in the Santa Paula Area

Name	Year Completed	Type of Dam	Storage Capacity (A-Ft)	Height (feet)
Lake Pyramid Dam	1973	Earth-Rock Embankment	180,000	444
Lake Castaic Dam	1973	Earth Embankment	323,700	360
Bouquet Canyon Dam	1934 Upgraded 1981	Earth Fill	36,505	190
Santa Felicia Dam (Lake Piru)	1955	Earth Embankment	100,000	236.3

*Source: Department of Water Resources, Division of Safety of Dams, Bulletin 17-*93 Dams Within the Jurisdiction of the State of California.

Failure of any of the above referenced dams during a catastrophic event, such as an earthquake, is considered possible but unlikely. According to the California Department of Water Resources, Division of Safety of Dams (Mihyar, 1997), Lake Pyramid Dam, Lake Castaic Dam, Bouquet Canyon Dam, and Santa Felicia Dam are large structures which should have been designed to withstand at least a magnitude 6.0 earthquake. However, the exact seismic design for each dam was not researched.

The Saint Francis Dam was located in San Francisquito Canyon, east of both Lake Piru and Lake Castaic. The catastrophic failure of the Saint Francis Dam in 1928 caused the largest historic flood on the Santa Clara River to date. The flood waters inundated the City of Santa Paula north to East Santa Paula Street, by the high school. Some of the dams currently upstream from Santa Paula are larger than the Saint Francis Dam. If one of the large dams should fail suddenly, there could be significant damage to property and structure, and loss of life.

Failure of any of the upstream dams could have significant and/or disastrous inundation impact on the City of Santa Paula. Probably the best criteria for evaluating dam/reservoir safety and inundation risk is compliance with State standards. Annual safety inspections are conducted by the California Division of Safety of Dams. Operational and maintenance recommendations must be adhered to by the dam owner in order to remain in compliance with State safety standards. Emergency response actions associated with a dam failure and/or flooding should be specified in an operations plan developed by the City of Santa Paula.

Although the dams in question have been certified for safety (Mihyar, 1997), the location of critical and high risk facilities in potential inundation areas may pose an unacceptable risk, regardless of the likelihood for dam failure.

C. Fire Hazards

Fire Prevention and Suppression. Fire prevention and suppression services are provided by the City of Santa Paula Fire Department (SPFD). The SPFD was organized by local businessmen in 1903. In 1989 the fire chief became a full time appointed City employee. Currently there are eight full time employees: fire chief; assistant fire chief/fire prevention officer; three captains; and three engineers. In addition, there are 27 part time, paid/call firefighters. The SPFD is responsible for enforcing the following:

- *All aspects of the 1994 Uniform Fire Code (or the most current edition of the Uniform Fire Code as adopted);*
- *Any City of Santa Paula ordinances and/or amendments pertaining to fire prevention and suppression;*
- *California Health and Safety Code, Division 12, Part 2.7 (Fire District Law) and Part 5 (Abatement of Hazardous Weeds and Rubbish); and*
- *California Health and Safety Code, Sections 25501 through 25510 as they pertain to the administration of Hazardous Materials Business Plans.*

Peakload Water Requirements. Peak load water supply standards ensure that sufficient water flow is available to fight fires. The minimum fire flow required is determined by the type of building construction, proximity to other structures, fire walls, and fire protection devices as specified by the 1994 Uniform Fire Code, Appendix III-A and adopted Amendments. The required water supply for new developments is a fire flow of 1,000 gallons per minute (gpm) for buildings less than 3,600 square feet, and of between 1,500 gpm and 8,000 gpm, and a duration capability of from 2 to 4 hours, for buildings over 3,600 square feet (City of Santa Paula, 1994). Applicants for new development projects in the City must verify that the water purveyor can provide the required volume at the project.

According to the Ventura County Department of Water Resources (Panaro, 1997) and the Santa Paula Department of Public Works (Wilkinson, 1997), the Santa Paula Groundwater Basin has a storage capacity and safe yield large enough to supply water, during peakload water requirements, for the current population and new development. However, the Santa Paula Groundwater Basin was recently adjudicated in 1996 in a near full condition. A seven year study program is required to monitor the groundwater levels before pumping levels can be increased or decreased. The current adjudication allows for the pumping of 30,500 acre-feet from the basin.

The majority of the wells currently used for groundwater supply are located in the Santa Clara River Valley floor, or on Santa Paula Creek. In addition, the groundwater from these wells is pumped to water-supply pipelines and reservoir tanks utilizing electrically-operated pumps. In the event of an emergency, the groundwater supply would not be an issue, but the amount of water available in reservoir tanks, the condition of the main water lines leading to and from the reservoir tanks, and the electrical supply available to pump the groundwater to the reservoir tanks and/or booster pump stations would be critical. Currently, there is a lack of pipelines to convey groundwater to many sections within the Santa Paula planning area. Only municipal-supply wells are connected to pipelines to service communities within Santa Paula. Additional back-up electrical-supply generators, additional pipelines, additional upgradient water reservoirs and booster pump stations, and installation of additional groundwater wells, must be considered prior to implementation of new development in the Santa Paula planning area.

Prior to construction of new developments, applicants must submit plans to the SPFD for the approval of the location of fire hydrants. The SPFD should be contacted in advance of submitting these plans to evaluate hydrant locations and required fire flow for the specific development. If a proposed structure is greater than 5,000 square feet in area, the structure must be fitted with an automatic fire sprinkler system in accordance with Santa Paula City Municipal Code Amendments to the 1994 Uniform Fire Code.

Minimum Road Widths and Clearances Around Structures. Per City of Santa Paula Municipal Code requirements, Public Improvements Section, roads shall be installed or improved to the standards specified in the City of Santa Paula Municipal Code and construction specifications in effect at the time of construction. The improvement shall not begin until the City Engineer has approved the improvement plans or the proposed construction. Currently the minimum street width in a residential area is 40 feet from curb to curb. In hillside areas, the width of the road depends on whether the road is a collector or an arterial road. The minimum width for a hillside road that is not a collector ranges from 30 to 32 feet from curb to curb.

The SPFD has established some standards pertaining to road widths and clearances for development projects which include fire access roads and number and type of turnaround areas and means of ingress and egress. The SPFD standards identified are as follows:

- *Access roads shall be unobstructed and at a minimum width of 20 feet, with an unobstructed vertical clearance of 13 1/2 feet.*
- *Turnarounds will be at a width calculated to accommodate the turning radius of the largest fire engine in the City.*

The SPFD should be consulted prior to new development, particularly in hillside areas where access is critical to retarding and/or eliminating a wildland brush fire.

Wildland Brush Fires. Many homes in the Santa Paula area, predominantly those along SR 150, are located along the urban/wildland interface. Figure S-5 presents the fire hazard areas. The level of hazard is based largely on the type of ground cover, the slope of the ground, and the ability of fire crews and engines to access the area.

D. Hazardous Materials and Emergency Preparedness

Emergency Operations Plan. The City of Santa Paula Police Department oversees emergency operations within the City. The SPFD follows the Personnel Training and Emergency Response Plan outlined in the California Code of Regulations Title 26, Divisions 19 and 19.1.

Evacuation Routes. The SPFD is ultimately responsible for coordinating evacuation necessitated by an emergency. If delayed during a large disaster, the SPFD Chief is responsible for coordinating evacuation efforts on an interim basis. Figure S-6 shows the routes and streets to be used in the event of a disaster requiring evacuation.

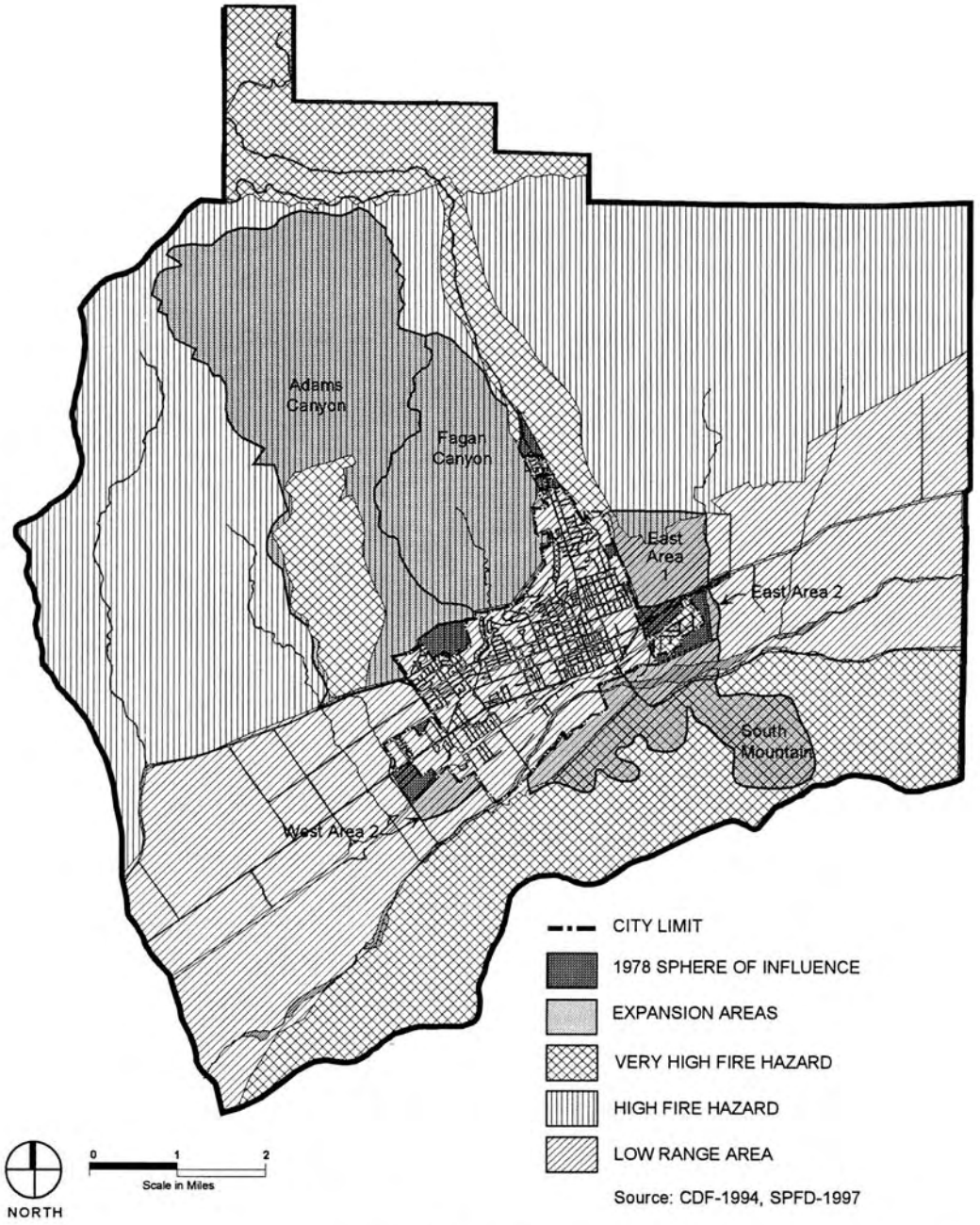
Evacuation Centers. The American Red Cross is the lead agency involved in providing disaster relief during peacetime disasters. Authority is mandated by Federal Law 36-USC-3 and reaffirmed in Public Law 930288 (Federal Disaster Relief Act of 1974). The Red Cross acts cooperatively with State and local governments, including the California Office of Emergency Services and the California Department of Social Services, and private relief organizations to provide relief services.

Evacuation centers to be used in the event of disaster vary depending on the location and nature of the disaster. The facilities most likely to be used are the local high schools (Rink, 1997). These facilities are ideal because they are public facilities and can accommodate lodging, feeding and showering. Other options include junior and elementary schools, churches, community centers, and even commercial lodging facilities.

Hazardous Materials Spills. The seriousness of a hazardous material incident is dependent on a number of factors including the type and quantity of material involved, the proximity to populated areas, the time of day, weather conditions and physical state of material (i.e., solid, liquid, vapor or gas). The greater the number of people exposed to the hazardous material, the greater the potential for significant impact. Because of their dispersion characteristics, vapors and gases tend to involve greater hazards. Under a worst case scenario, an incident could result in mass fatalities and injuries, destruction of private and public improvements, and contamination of the environment.

Although a hazardous materials release could occur anywhere within the City of Santa Paula, certain areas are at greater risk. These include the following:

Figure S-5 Fire Hazard Zones



Fire Hazard Zones Figure S-5

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Figure S-6 Evacuation Routes

Evacuation Routes Figure S-6

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SR 126 and SR 150 are major transportation corridors through the Santa Paula area. A hazardous material spill involving transportation would most likely occur along one of these highways.

- *Because of the high number of businesses that use or store hazardous materials on Main Street or Harvard Boulevard, these major arterials and adjacent neighborhoods are probably at greater risk than other arterials within the City.*
- *One facility with acutely hazardous materials is located on Quail Court, and poses a higher risk than other facilities within the City.*

E. Aircraft Hazards

The Santa Paula Airport is located within the south-central portion of the City of Santa Paula, and is bounded by SR 126 on the north, Palm Avenue on the west, Ojai Street on the east, and the Santa Clara River on the south (Figure S-7). The airport is a public-use airport which is privately owned and operated by the Santa Paula Airport Association. The airport encompasses a total of 38 acres and provides a single asphalt runway (Runway 4/22) which is 2,650 feet long by 40 feet wide[2].

The runway is used by piston and propeller, single and twin, engine planes. No commercial aircraft utilize this airport. The airport operates under visual flight rule (VFR) conditions only, indicating that approaches to the runway are only made in weather conditions where the cloud cover is greater than 1,000 feet in height and visibility is greater than 3 miles[3]. The airport is currently not licensed to operate at night.

Safety Zones. The State of California has defined air safety zones in the Airport Land Use Planning Handbook. Santa Paula Airport has adopted the State of California air safety zones which include: the Inner Safety Zone; the Outer Safety Zone; and the Traffic Pattern Zone. A fourth air safety zone, the Extended Runway Centerline Zone, was not applied by the Ventura County CLUP to the Santa Paula Airport due to the lack of a relationship with historical aircraft accident data in Ventura County, and the lack of instrument approaches at the airport.

The *Inner Safety Zone* is also referred to as the Runway Protection Zone and is that area below the portion of the approach surface from the end of the primary surface to the point where the approach surface is 50 feet above the runway end elevation. The *Outer Safety Zone* underlies a portion of the approach surface which extends beyond the Inner Safety Zone. The total length of the Inner and Outer Safety Zones reflect the type of aircraft currently using, or projected to use, the airport as follows:

- *Single engine general aviation aircraft: 2,000 feet*
- *Twin engine general aviation aircraft: 3,500 feet*

The *Traffic Pattern Zone* is the area beneath the outer edge of the aircraft flight paths. Air Safety and Height Restriction Zones for the Santa Paula Airport are shown on Figure S-7.

[2] VCTC, 1991
[3] Caltrans, 1993

Figure S-7 Air Safety Zones

Air Safety and Height Restriction Zones Figure S-7

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Table S-3 presents land use guidelines for the three Safety Zones established by the Ventura County Airport Land Use Commission (ALUC) in their Comprehensive Land Use Plan (CLUP).

Table S-3. Land Use Guidelines for Airport Safety Compatibility

Land Use	Inner Safety Zone	Outer Safety Zone	Traffic Pattern Zone
Single Family	Unacceptable	Unacceptable	Conditional (a)
Multi-Family	Unacceptable	Unacceptable	Conditional (a)
Mobile Home Parks	Unacceptable	Unacceptable	Conditional (a)
Hospital/Convalescent Homes	Unacceptable	Unacceptable	Unacceptable
Schools	Unacceptable	Unacceptable	Unacceptable
Churches/Synagogues	Unacceptable	Unacceptable	Unacceptable
Auditoriums/Theaters	Unacceptable	Unacceptable	Unacceptable
Transportation Terminals	Unacceptable	Unacceptable	Unacceptable
Communication/Utilities	Conditional (b)	Acceptable	Acceptable
Automobile Parking	Conditional (b)	Acceptable	Acceptable
Hotels and Motels	Unacceptable	Unacceptable	Conditional (c)
Offices and Businesses/Professional Services	Unacceptable	Conditional (a)	Conditional (c)
Wholesale	Unacceptable	Conditional (a)	Conditional (c)
Retail	Unacceptable	Conditional (a)	Conditional (c)
Manufacturing-General/Heavy	Unacceptable	Conditional (a)	Conditional (c)
Light Industrial	Unacceptable	Conditional (a)	Conditional (c)
Research and Development	Unacceptable	Conditional (a)	Conditional (c)
Business Parks/Corporate Offices	Unacceptable	Conditional (a)	Conditional (c)
Outdoor Sports Arenas	Unacceptable	Unacceptable	Unacceptable
Outdoor Amphitheaters	Unacceptable	Unacceptable	Unacceptable
Parks	Unacceptable	Conditional (a)	Acceptable
Outdoor Amusement	Unacceptable	Conditional (a)	Acceptable
Resorts and Camps	Unacceptable	Conditional (a)	Acceptable
Golf Courses and Water Recreation	Conditional (d)	Acceptable	Acceptable
Agriculture	Acceptable	Acceptable	Acceptable

Source: Airport CLUP Update for Ventura County, November 1991

(a) = Maximum structural coverage must be no more than 25 percent. "Structural coverage" is defined as the percent of building footprint area to total land area, including streets and greenbelts.

(b) = The placing of structures or buildings in the Inner Safety Zone is unacceptable. Above ground utility lines and parking are allowed only if approved by the FAA as not constituting a hazard to air navigation.

(c) = Maximum structural coverage must not exceed 50 percent. "Structural coverage" is defined as the percent of building footprint area to total land area, including streets and greenbelts. Where development is proposed immediately adjacent to the airport property, it is suggested that structures be located as far as practical from the runway.

(d) = Clubhouse is unacceptable in this zone.

According to the Ventura County CLUP, the Santa Paula General Plan land use designations are consistent with the recommended air safety criteria at the Airport, with the exception of light manufacturing land uses proposed in the Inner Safety Zones at both ends of the runway. The Ventura County CLUP recommends that the planned light manufacturing land uses in the

Inner Safety Zones at both ends of the runway be changed to agricultural or other conforming land uses. In addition, proposed legislation, which would allow funding by the State for purchase of the property in the Inner Safety Zone, should be passed and the property acquired by the City of Santa Paula or other designated public entity.

F. Police Protection

History of Law Enforcement in Santa Paula. Prior to 1923, law enforcement was provided in Santa Paula by a Constable who was appointed, and later a Town Marshal who was elected. In 1923, the Santa Paula Police Department was formed and the first Police Chief, Lee Sheppard, took office. By 1964, the department had 24 sworn officers and 5 civilian employees. A police reserve unit was authorized in 1961 to augment the strength of the regular police department. The reserve officers allowed the department to field two-officer units on some shifts (City of Santa Paula, 1993).

Crime Rate versus Police Department Capabilities. From 1988 to 1992, the rate of serious crime in Santa Paula increased by 43 percent. The department also experienced a 49 percent increase in the number of emergency calls for service in the same period. However, the number of sworn police officers, reserve officers, and full-time civilian staff for the police department either did not change during this five year period, or was slightly reduced (City of Santa Paula, 1993).

According to the Santa Paula Police Department (Adair, 1997), overall crime rates in Santa Paula decreased in 1995 compared to previous years, and the Part One (homicide, rape, robbery, assault, burglary, theft, auto theft, and arson) crime rates in 1996 decreased by 1.8 percent compared to 1995. In addition, the number of Reserve Officers has been increased to 20, the number of full-time civilian staff has been increased to nine, a Citizens Patrol Unit comprised of 25 volunteer members has been formed, and the department now has six full-time dispatchers. The Citizens Patrol Unit performs various duties including evening patrols and reporting (they do not perform any police action, only reporting of possible crimes), traffic control during major events such as parades, and disaster aid. The current number of full-time and part-time civilians and sworn law enforcement officers employed is:

- *Sworn Officers* *29*
- *Reserve Officers* *20*
- *Full-Time Civilian* *9*
- *Part-Time Civilian* *11*

Economic Base and Housing Density. The economic base and housing density within the City of Santa Paula largely affects the crime rate and the City's ability to pay for police services. According to the Santa Paula Police Department (City of Santa Paula, 1993), Santa Paula pays less than average for their police department when compared with other cities that have their own department. In Ventura County, Santa Paula has the second highest crime rate (60.2 crimes per 1,000 residents) but a lower than average number of employees and officers per 1,000 residents.

Much of the housing in Santa Paula was built before Proposition 13, and tends to be lower-middle income and subsidized housing. High density housing uses more City services,

particularly police services, than low density housing. The infilling of vacant properties within the City has created a number of low to moderate income dwelling units in the City. The majority of the population within Santa Paula has a low income level, a high unemployment rate, and a low educational level (City of Santa Paula, 1993). These demographic facts have resulted in a City with a high crime rate, relative to other cities within Ventura County, and an economic base unable to support sufficient police services to respond to the crime issues.

G. Other Public Safety Hazards

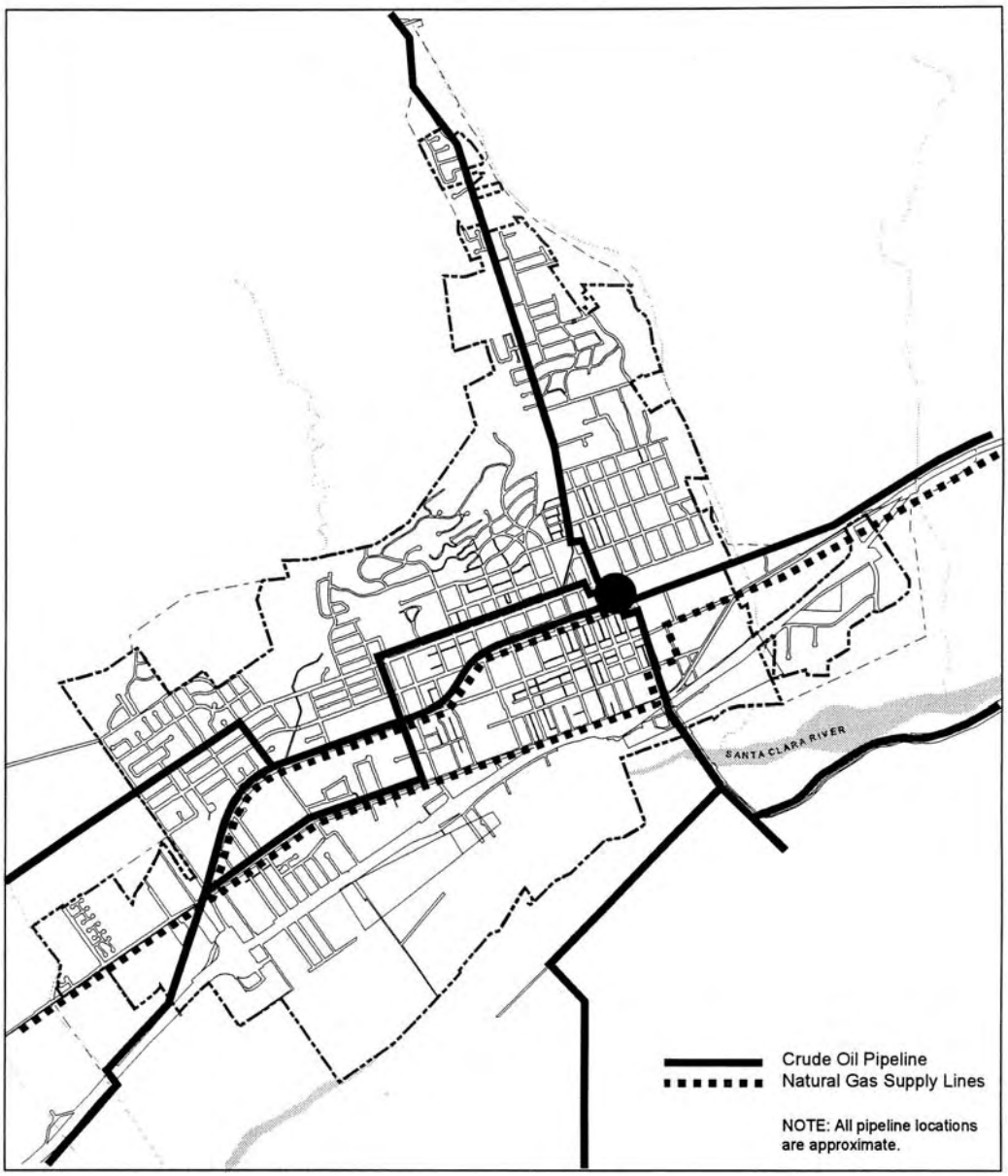
Oil Wells and Oil Sumps. Oil production was one of the founding industries of Santa Paula. Originally an oil "tunnel" was completed in 1866 on Sulphur Mountain, north of the Santa Paula planning area. The tunnel was 80 feet long, and oil flowed by gravity to the tunnel's entrance. Tunnels were dug later that were as long as 1,600 feet and produced up to 60 barrels of oil a day. Oil seeps are still active in the South Mountain area (Norris and Webb, 1990) and many have been documented by the State of California Division of Oil and Gas (CDOG) in their Publication No. TR26, "Onshore Oil & Gas Seeps in California", dated 1987.

Four active oil fields exist within the City of Santa Paula planning area: the Saticoy Field; the Santa Paula Field; the South Mountain Field; and the West Mountain Field. Union Oil has numerous active, inactive, and abandoned oil wells, as well as oil collecting and staging facilities, in the Santa Paula, South Mountain and West Mountain Field areas. The South Mountain and West Mountain Fields lie south of the Santa Clara River in the South Mountains. The Santa Paula Field lies in the Sulphur Mountain area, west of SR 150 and south of Ojai, in the northern portion of the planning area. Sage-California and/or Whiting Petroleum Corporation, has numerous active, inactive, and abandoned oil wells in the Saticoy Field. The Saticoy Field lies essentially south of SR 126, extending from approximately Todd Lane to the eastern boundary of the City of San Buenaventura. The location of the oil fields, the active, inactive and abandoned oil wells, and oil facilities are shown on the State of California Division of Oil, Gas and Geothermal Resources Maps for Saticoy (Map No. 205), Santa Paula (Map No. 203), and West Mountain and South Mountain (Map No. 206).

The State Fire Marshal are responsible for pipeline safety in the City of Santa Paula. Mr. Charles L. MacDonald, Pipeline Safety Engineer for the State of California, Office of the State Fire Marshall, provided the approximate locations of all crude oil and natural gas pipelines and oil and gas facilities which traverse the City of Santa Paula planning area. The pipelines are shown on Figure S-8.

Radon. The California Department of Health Services participated in the United States Environmental Protection Agency's (EPA) State Radon Survey in 1990. Out of the 2,858 homes surveyed, the results for 1,885 homes were utilized for the survey. The EPA recommended action level for radon is 4 pico curies per liter of air (pCi/l). For Santa Barbara and Ventura Counties, referred to as Region 8 in the EPA survey, the results indicated that the arithmetic mean for homes surveyed was 1.3 pCi/l, the median was 0.9 pCi/l, and the 90th percentile was 2.8 pCi/l. The results also indicated that 5.2 percent of the homes surveyed

Figure S-8 Oil and Natural Gas Pipelines



Crude Oil and Natural Gas Pipelines and Facilities

Figure S-8

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in Region 8 had radon levels exceeding 4 pCi/L per liter (California Department of Health Services, 1990).

Recent radon mapping performed by Churchill (1997) indicates that in general, Santa Paula is within an area noted as having low potential for indoor radon exposure (less than 4 pCi/L per liter). However, the mountainous areas both north and south of the City exhibit a high radon exposure potential. South Mountain is classified as having a high potential for indoor exposures greater than 4 pCi/L per liter. The mountains north of the City exhibit a moderate potential for such exposure. The uppermost portion of Adams Canyon is within the moderate exposure zone. Fagan canyon is just outside this area, within the low exposure zone.

According to the survey and the EPA, "no survey will be able to predict what the radon exposure level measurement in an individual house might be. This is because radon concentration, in homes and buildings, has been found to depend on many factors, including which floor of the building the measurement was taken, the specific types of construction and building materials used in the design and construction of the building, and whether windows and doors in the building were opened or closed during the testing period. For these reasons, the only way to determine the amount of radon present in a particular home or building is to test that home or building for radon using a radon detector." For a list of companies selling radon detectors and information on radon, contact the State of California Department of Health Services at (800) 745-7236.

Critical Facilities. Critical facilities are generally defined as those structures whose ongoing performance during an emergency is required or whose failure could threaten many lives. Type of structures vary but may include hospitals, urgent care, and private ambulance companies; fire stations; police and emergency services facilities; schools; utility facilities; and communication facilities. A map of select critical facilities in the Santa Paula planning area is included as Figure S-9.

Based on information provided in previous sections of this report, there are a number of potential hazards that could affect existing critical structures in the City of Santa Paula. These include flood and dam inundation, seismic and geohazards and fire hazards. The following provides a summary of existing critical facilities located in potentially hazardous areas. No specific reference is made to geologic hazards because all of the facilities may be affected by such hazards - especially ground shaking caused by a large regional earthquake. Measures that can be taken to reduce these hazards are addressed in previous sections of this document.

Hospitals and Emergency Care Facilities. The City of Santa Paula is served by one hospital, Santa Paula Memorial Hospital, a 60 bed facility, and one urgent care facility, Rural Health Care, an extension of Santa Paula Memorial Hospital. Santa Paula Memorial Hospital and Rural Health Care are located just outside of the dam inundation hazard area. In the event of a dam failure, major access roads to this hospital (10th Street/Ojai Road, East Santa Paula Street, East Main Street, and Harvard Boulevard) could be impacted. In addition, the hospital is located in an area of potentially high landslide, debris and mud flow, rock fall, and soil settlement hazards.

Schools. Existing schools are potentially susceptible to a number of hazards including:

- *Thelma Bedell School, Webster School, McKevett School, Grace Thille School, Isbell School, and Glen City School are located within or adjacent to the 100-year flood zone. It should be noted that with the completion of the Army Corps of Engineers flood control project in Santa Paula Creek, much of the City would be removed from the 100-year floodplain.*
- *All of the schools except Mupu School are located within the dam inundation hazard area that would be caused by a failure of Lake Castaic Dam, Lake Pyramid Dam or Santa Felicia Dam.*
- *Thelma Bedell School and Mupu School are located in areas of high fire hazard.*
- *Thelma Bedell School and Mupu School are located in areas of high landslide potential.*
- *All of the schools except Thelma Bedell and Mupu Schools are located in areas of high liquefaction potential in the event of an earthquake.*
- *Thelma Bedell School, Webster School, McKevett School, Grace Thille School, Mupu School, and Santa Clara School are all located in areas of high soil settlement potential.*

The State of California has the responsibility for ensuring that public school buildings are adequately constructed to meet seismic design standards established in the Garrison Act of 1969.

Fire Stations and Police Station. Santa Paula has two fire stations and one police station. The location of these facilities is shown on Figure S-9. Some of these facilities are potentially susceptible to various hazards including:

- *As discussed in the technical report in the appendix of this document, Fire Station 1 was constructed in 1935, was seismically upgraded in 1987, and is currently being remodeled.*
- *Fire Station No. 1 is located within the 100-year flood zone, and Fire Station No. 2 is located adjacent to the 100-year flood zone.*
- *Fire Stations No. 1 and 2 are located within the boundary of dam inundation should a dam failure occur on Lake Castaic Dam, Lake Pyramid Dam, or Santa Felicia Dam.*
- *Fire Stations Nos. 1 and 2 are located in an area of high liquefaction potential in the event of an earthquake.*
- *Fire Station No. 1 is located in an area of high soil settlement potential.*

Other Facilities. Various other critical facilities are potentially susceptible to hazards including the following:

- *City Hall is located within the 100-year flood zone, and a City Yard and the Wastewater Treatment Plant are located adjacent to the 100-year flood zone.*
- *City Hall, a City Yard, and the Wastewater Treatment Plant are all located within the boundaries of dam inundation, within an area of high liquefaction potential in the event of an earthquake, and within an area of high soil settlement potential.*

Figure S-9 Critical Facilities

Critical Facilities Figure S-9

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Lifeline Facilities. Lifeline facilities are utility corridors and associated facilities that may be damaged by catastrophic events such as earthquakes. These include: major gas lines, major power lines, crude oil pipelines, major water lines, and water tanks. Figure S-8 shows the oil and gas pipelines in the Santa Paula planning area. Figure S-10 shows other lifeline facilities, such as water lines (City of Santa Paula), electrical lines (Southern California Edison), and gas lines (Southern California Gas) in the Santa Paula planning area.

Buried Southern California Edison (SCE) electrical transmission lines may be susceptible to liquefaction in the event of a ground failure triggered by an earthquake. Many of the transmission lines are located in areas of older unconsolidated alluvium and may be susceptible to liquefaction and other soil-related hazards. However, most, if not all, of SCE's transmission lines are overhead lines, not buried lines within the City of Santa Paula.

All of the Southern California Gas main distribution lines, except the one that is beneath Santa Barbara Street, are within the 100-year floodplain area. All of the main distribution lines are within the boundaries of dam inundation, and are in an area of high liquefaction potential in the event of an earthquake. Damage to these lines during an earthquake could result in an interruption of service or, in a worst case scenario, fires or explosions. Leaks would be expected to occur mostly at piping connections and valves.

In general, the crude oil pipelines which lie in the Sulphur Mountain, Santa Paula Peak, South Mountain, and West Mountain areas are located in high potential landslide, and debris and mud flow zones. Those crude oil pipelines which lie beneath the Santa Clara River Valley floor are located in a high potential liquefaction zone in the event of an earthquake, a high soil settlement zone, and within the 100-year flood and dam inundation zones.

Water supply lines south of East Santa Paula Street are potentially susceptible to liquefaction. Water Supply lines along SR 150 southward to the Santa Clara River, and within approximately 4,000 feet to the north and south of the Santa Clara River, are potentially susceptible to a 100-year flood. All water supply lines located along SR 150 are also in areas of high landslide, debris and mud flow, and fire hazards.

Figure S-10 Lifeline Facilities (SCE, gas, water lines)

Lifeline Facilities Figure S-10

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III. GOALS, OBJECTIVES, AND POLICIES

In this element, GOALS are statements that provide direction and state the desired end condition. The OBJECTIVES state a specific step toward goal achievement. POLICIES are specific statements that guide decision-making. They indicate a clear commitment by the City and generally serve as mandatory criteria. The IMPLEMENTATION MEASURES outlined in the following section of this element support the goals, objectives, and policies by providing specific programs and standards to carry out the Safety Element.

The goals, objectives, and policies that follow are organized according to topics. These topics were selected based on the City of Santa Paula's specific goals and objectives outlined for the Safety Element.

SEISMIC SAFETY

Goals

1.1 Development should mitigate undue risks from earthquakes.

1.2 Existing risks from earthquakes should be reduced.

1.3 When technically feasible, a system for timely public warnings of earthquakes should be provided.

Objectives

1(a) The fault displacement maps for Santa Paula and Ventura County should be updated.

1(b) The City should review and analyze the studies conducted on fault displacement in Santa Paula and Ventura County.

1(c) Information should be reviewed on high intensity ground shaking areas in Santa Paula.

1(d) The City should review and document natural and manmade areas that are subject to damage due to ground shaking.

1(e) Potential landslide locations should be reviewed and documented.

1(f) The City should review and map development on hillsides subject to landslides.

1(g) The map of potential liquefaction areas in Santa Paula should be updated.

1(h) Soil conditions should be reviewed to determine if subsidence is a threat.

1(i) Expansive soil maps of Santa Paula should be updated.

1(j) Building Code Standards for expansive soil requirements should be reviewed.

1(k) Procedures and requirements for soil investigations should be reviewed.

1(l) Flood inundation maps for Santa Paula should be updated.

1(m) New building regulations for structural lateral forces should be considered.

1(n) The City should review the mitigation methods, including financing of potentially hazardous buildings.

1(o) The City should adopt mandatory requirements such as "Uniform Code for Building Conservation" for seismic upgrade of unreinforced buildings.

1(p) Regulations for the seismic upgrade of residential housing (costs to the residences) should be considered (i.e. bolting the house to the foundations, room additions, etc.).

1(q) Mitigation measures for concrete tilt up and steel frame buildings for seismic upgrade should be adopted.

1(r) The City should review evacuation plans for Santa Paula.

1(s) The City should review emergency plans for assessment of structural damage.

1(t) A comprehensive Emergency Operations Plan should be developed.

1(u) The City should monitor bridges, over and underpasses, and walls in the public right-of-way to ensure safety.

Policies

1.a.a. The City shall require, prior to approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard. If the City finds that no undue hazard of this kind exists, based on information resulting from studies conducted on sites in the immediate vicinity of the project and of similar soil composition to the project site, the geotechnical report may be waived. After the report has been approved or a waiver granted, subsequent geotechnical reports shall not be required, provided that new geological datum, or data, warranting further investigation is not recorded. The City shall submit one copy of each approved geotechnical report, including mitigation measures, if any, that are to be taken, to the State Geologist with 30 days of its approval of the report. (State of California, Public Resources Code Section 2697). (IM 2, 26)

1.b.b. The City, in preparing the safety element to its general plan pursuant to subdivision (g) of Section 65302 of the Government Code, and in adopting or revising land use planning and permitting ordinances, shall take into account the information provided in available

seismic hazard maps. (State of California, Public Resources Code Section 2699) (IM 2, 3, 20, 26)

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1.c.c. Establish and update parameters for new construction in identified seismic hazard zones in Title 15 (Buildings and Construction) of the City of Santa Paula Municipal Ordinance. (IM 2, 3, 5)

1.d.d. Develop standards and restrictions within Alquist-Priolo Earthquake Fault Zones including limits on allowable development, development intensity, and setbacks from the fault trace. (IM 3-6)

1.e.e. Require a geotechnical evaluation, prior to site development, of the potential for displacement along identified active and potentially active faults. (IM 5, 6, 7, 26)

1.f.f. Remove or rehabilitate structures which may be expected to collapse in the event of an earthquake including, but not limited to, unreinforced masonry buildings pursuant to Government Code Section 8875 et seq., bridges, and critical facilities. (IM 9-15)

1.g.g. Require a geotechnical evaluation, prior to site development, of the potential for seismically-induced landslide or liquefaction in areas where such hazards have been identified. (IM 2, 16, 26)

1.h.h. Develop standards and restrictions such as the limits on the types of allowable development, development intensity/density standards, and subdivision design policies for sites subject to seismically-induced landslides or liquefaction, or potential fault rupture areas for identified active and potentially active faults. (IM 12-26)

1.i.i. The City should encourage the seismic upgrade of unreinforced masonry buildings as required by the State of California, Uniform Code for Building Conservation, Appendix Chapter One. The City should strive to accomplish a seismic design standard for a peak acceleration based on the most current study available for upgrade of reinforced masonry buildings, but the ultimate design requirement for individual structures shall be evaluated on a case by case basis by a licensed structural engineer with final approval by the City's building official. (IM 12-13)

1.j.j. If evidence of faulting is observed during any subsurface geologic or geotechnical investigation at a site, a special fault investigation shall be initiated following the guidelines in the Alquist-Priolo Earthquake Fault Zoning Act. (IM 12, 13, 26a)

1.k.k. Sites confirmed to be in an area prone to seismically-induced liquefaction shall have foundations designed by a structural engineer. (IM 12, 13, 26b)

1.l.l. Sites confirmed to be in an area prone to seismically-induced landslides shall be graded to increase the factor of safety, or the landslide will be mitigated prior to construction at the site, as determined by a civil or geotechnical engineer. (IM 12-13)

GEOLOGY

Goals

2.1 Development should mitigate undue risks from mudslides, landslides, subsidence, radon gas infiltration and other geologic hazards.

2.2 Existing risks from mudslides, landslides, subsidence, radon gas infiltration and other geologic hazards should be reduced.

Objectives

2(a) Development should not take place without proper geologic studies and engineering improvements that will mitigate, if not eliminate, the risk of future loss from mudslides, landslides, subsidence, radon gas infiltration and other geologic hazards.

2(b) Corrective measures should be taken to mitigate or eliminate the risk of loss of life or to existing structures due to geologic hazards.

Policies

2.a.a. Require a geotechnical evaluation, prior to site development, of the potential for landslides, mud or debris flows, rock falls, soil settlement or soil expansion in identified hazard areas. (IM 16-18, 26, 26c, 26k)

2.b.b. Develop standards and restrictions such as density/intensity standards for slopes, subdivision design policies, and generalized performance standards for sites subject to landslides, mud or debris flows, rock falls, soil settlement or soil expansion. (IM 16-18, 26d, 26l)

2.c.c. Require a geotechnical evaluation, prior to development, of subsidence potential in areas of known risk. (IM 5, 6, 7, 26, 26n)

2.d.d. Develop standards and restrictions, such as limits on density and restrictions on water wells in areas subject to subsidence. (IM 6-10, 19, 26o)

2.e.e. Require setbacks and subdivision design within areas subject to other known geologic hazards such as crude oil production and activity. (IM 6-10)

2.f.f. The stability of a proposed hillside building site should be certified by a civil or geotechnical engineer prior to the issuance of building permits. (IM 6-10, 26e, 26f, 26g)

2.g.g. The civil engineer and project engineering geologist/geotechnical engineer should coordinate efforts during construction grading at a project site. (IM 5-10, 26i)

2.h.h. Hazards caused by project grading which may affect adjacent properties, such as erosion and slope instability, shall be mitigated before final approval of the project is given by the City. (IM 5-10, 26j)

2.i.i. Areas identified to be in high expansive soil, or zones of soil settlement, and confirmed through site geotechnical investigations, shall have foundations designed by a structural engineer to withstand the existing conditions, or the site shall be graded under the supervision of a civil engineer. (IM 5-10, 26m)

2.j.j. Project sites located at the base of, or near the base of, hillside areas should be evaluated for potential exposure to landslides, mud or debris flows, or rock falls. (IM 26h)

2.k.k. If soil subsidence is observed in a portion of the Santa Clara River Valley within the Santa Paula planning area, the Santa Paula Department of Public Works should initiate an investigation to evaluate the cause for the subsidence, and to develop a program to halt or retard the subsidence.

FLOOD PROTECTION

Goals

3.1 Development should mitigate undue risks from floods.

3.2 Existing risks from floods should be reduced.

3.3 Development should be compatible with existing flood hazards if such hazards cannot be reduced.

3.4 Waterways should be protected from pollutants, soil erosion and other environmental hazards.

3.5 A system for timely public warning of predicted flood events should be provided.

Objectives

3(a) Santa Paula should support flood control projects on the Santa Clara River and Santa Paula Creek, and on other waterways, to eliminate or reduce flood hazard zones.

3(b) New construction and substantial improvements to existing construction should comply with the City's floodplain management ordinance.

3(c) Santa Paula should continue to actively participate in the Ventura Countywide Stormwater Quality Management Program and to implement the measures recommended by that program.

3(d) Santa Paula should continue to participate in the Ventura County Flood Control District's flood warning system.

3(e) New development projects and new and replacement flood control projects should be constructed in accordance with appropriate hydrologic and hydraulic design standards.

3(f) An emergency flood evacuation plan should be prepared and publicly distributed or announced.

Policies

3.a.a. Develop standards and restrictions within identified floodplains or areas subject to inundation by a 100-year flood. These might include subdivision design, setback requirements, and development intensity/density standards. (IM 27, 27a, 27b)

3.b.b. Develop policies, standards, and requirements which reduce the risk of flood hazards relative to evacuation routes and minimum road widths. (IM 27, 28)

3.c.c. Develop policies to complete flood improvements on Santa Paula Creek, Adams Canyon, and Fagan Canyon prior to issuance of any new building permits, or in conjunction with new development design. (IM 27-32)

3.d.d. Develop standards and restrictions such as subdivision design policies and building setbacks within areas subject to inundations as a result of dam failure. (IM 27-32)

3.e.e. Develop standards and restrictions to minimize potential risk within areas that would be inundated as a result of dam failure. (IM 28)

3.f.f. Develop a Master Plan of Storm Drains for the City. (IM 29)

3.g.g. Develop policies and restrictions for development of land south of State Route 126. (IM 27-29)

3.h.h. Establish projected completion dates to upgrade drainage deficiencies identified within the City limits and for the Todd Lane drainage which is under the County's jurisdiction. (IM 32a)

3.i.i. The City should develop a long-range plan for improvements such as a Capital Improvements Plan. The plan should identify improvements, funding needs, and funding sources over a 7 year period for capital improvement projects, such as storm drain system upgrades, required to accommodate new development. (IM 32b)

3.j.j. Require new development in Fagan Canyon, East Area 1, and East Area 2 to be designed such than peak water discharge into the Santa Clara River does not exceed existing conditions. (IM 32c)

FIRE PROTECTION

Goals

4.1 Development should mitigate undue risks from fires.

4.2 Existing risks from fires should be reduced.

4.3 Development should incorporate designs, systems and practices for fire safety, prevention and suppression.

Objectives

4(a) The Fire Department should be staffed with best available equipment, firefighters, supervisors, civilian personnel and administrators.

4(b) Emergency Dispatch should be adequately staffed and equipped to handle the call load and monitor all police and fire operations.

4(c) A program to require the installation of fire sprinklers in new and existing structures should be considered.

4(d) An equitable cost recovery program should be designed and implemented to reimburse the City for emergency response and investigation.

4(e) A fire safety and equipment access standard should be appropriately designed and implemented.

4(f) A fire safety plan should be required of all businesses and multi-family occupancies.

4(g) A program for fire safety plans and training should be designed and implemented.

4(h) New development in the urban/wildland interface and other high fire risk areas should have enforceable plans or standards for fire resistive construction and landscaping and landscape maintenance.

4(i) New development in urban/wildland interface areas should have supplemental stored, dedicated firefighting water supplies and outside fire sprinkler systems.

4(j) Adequate water availability should be provided in all new development.

Policies

4.a.a. Develop new and/or maintain existing policies, and upgrade these policies, standards, and restrictions which reduce the risk of urban and wildland fires to a reasonable level, including: design, reservation, and requirements regarding evacuation routes; peakload water supply requirements and performance standards for urban, suburban, and rural development; minimum road widths; clearances around structures; fire equipment response time; land use intensity/density standards; subdivision design for fire safety; and fire safe building materials. (IM 33-42)

4.b.b. Require that all fire safety standards conform with those established by the State Board of Forestry for state responsibility areas (State of California, Public Resources Code Section 4290) including: road standards for fire equipment access; standards for signs identifying streets, roads, and buildings; minimum private water supply reserves for emergency fire use; fuel breaks and greenbelts; land use policies and safety standards

that take into account the recurrent nature of wildland fires; design standards establishing minimum road widths and clearances around structures; and emergency preparedness protocol and procedures. (IM 33-42)

4.c.c. The City should consider a future fire station location(s) closer to the urban/wildland interface currently existing along State Route 150, or in canyon areas proposed to be developed, and outside of the 100-year flood zone, dam inundation, and seismically-induced liquefaction hazard areas. (IM 42)

4.d.d. The City should continue to enforce the 1994 Uniform Fire Code; the City of Santa Paula ordinances pertaining to fire prevention and suppression; the California Health and Safety Code Division 12, parts 2.7 and 5; and the California Health and Safety Code Sections 25501 through 25510. (IM 37)

HAZARDOUS MATERIALS (Natural Resource Preservation)

Goals

5.1 Hazards to natural resources should be controlled or eliminated, including but not limited to pollution.

5.2 Public environmental awareness, sound environmental practices and a healthy environment should be promoted.

Objectives

5(a) Aquifer recharge areas should be protected and enhanced.

5(b) The improvement and protection of air quality should be encouraged and supported.

5(c) The improvement of water quality for drinking, cleaning, and other uses, should be encouraged and supported.

5(d) Environmental decisions, mitigations and practices should be based on documented information about the local and specific environment.

5(e) Public education about local problems and concerns should be incorporated into the environmental review process.

Policies

5.a.a. The City should maintain and upgrade policies concerning the use, storage, and transportation of hazardous materials within the City planning area. (IM 43-57)

5.b.b. City policies concerning the use, storage and transportation of hazardous materials, and regarding underground or above ground storage tanks, should reflect the County of Ventura Environmental Health Division and the State Regional Water Quality Control Board policies and requirements. (IM 43-52)

AIRCRAFT SAFETY

Goals

6.1 Existing risks from aviation should be reduced.

6.2 Development should be compatible with existing risks from aviation.

Objectives

6(a) Development of properties adjoining or near the airport should be compatible with airport operations and the airport land use plan.

6(b) The mapped clear zones should be purchased as soon as individual parcels and funds become available.

6(c) Runway overruns should be extended when land becomes available.

Policies

6.a.a. The City should work in conjunction with the privately-owned Santa Paula Airport to follow the land use guidelines for safety compatibility outlined in the Ventura County Airports Comprehensive Land Use Plan Update. (IM 61)

6.b.b. The City should propose legislation to allow for the City to acquire the property in the Inner Safety Zones of the Airport. (IM 62)

POLICE PROTECTION

Goals

7.1 The community should be free of crime and violence and should be a safe environment in which to live, work and raise a family.

Objectives

7(a) The Police Department should be staffed with the best available police officers, supervisors, civilian personnel, administrators, and equipment.

7(b) The number of sworn officers on the Police Department should be adequate to provide a full range of services to the community. A ratio of 1.25 officers per 1,000 population is considered desirable.

7(c) Emergency Dispatch and police communications systems should be staffed and equipped at a level which meets both public safety requirements and contemporary industry standards.

7(d) A traffic bureau should be instituted as part of the patrol division to focus on traffic enforcement, accident investigation, adequate protection for school crossings, and related issues.

7(e) Additions to the police facility to increase space for investigations and patrol personnel should be considered.

7(f) Community based police programs should be developed and implemented. COPPS should address family crimes, and domestic violence.

7(g) High visibility police patrol in high crime areas should be provided.

7(h) The City should encourage continued use of volunteers such as Police reserves, Citizens Patrol and others.

7(i) A program should be developed to enhance the image of law enforcement.

7(j) The City should develop a victim advocate program and improve techniques to prevent domestic violence, neighborhood problems, and quality of life issues such as drug dealing, abandoned and junk cars, and safe sidewalks.

Policies

7.a.a. The City should develop a policy to utilize volunteers in the community for a citizens patrol, for assisting the police department, and for aiding the police department in emergency disaster situations. (IM 67-70)

7.b.b. The City should develop a policy to utilize and support a retired senior-citizen volunteer program to aid the police department with various civilian-type duties. (IM 69)

OTHER PUBLIC SAFETY HAZARDS

Goals

8.1 Hazards related to current oil production activities in the northern and southern portions of the planning area should be controlled to reduce the potential for pollution and/or a public safety problem.

Objectives

8(a) Aquifer recharge areas should be protected and enhanced.

8(b) Public safety, particular children's safety, should be protected.

Policies

8.a.a. Oil production facilities should be enclosed and locked in a manner to prevent vandalism and/or theft. (IM 75, 75a)

8.b.b. Where feasible, oil production facilities should be moved out of the current City boundaries, and particularly away from public schools. (IM 75, 75a)

8.c.c. Abandoned oil or gas lines should be removed by the responsible oil company, and environmental monitoring and/or sampling performed in the soil surrounding the pipeline. (IM 44, 75a)

8.d.d. Pipeline conditions should be checked periodically by the City Fire Department in conjunction with the State Fire Marshal, to ensure that no leaks or spills, or fire hazards have occurred or currently exist. (IM 74, 75)

8.e.e. The State of California Division of Oil, Gas, and Geothermal Resources (CDOG) and the applicable oil company should be contacted when new development is proposed in an area of historical or existing oil operations. The City should follow the CDOG's requirements for setbacks from active oil wells, abandoned oil wells, and oil production facilities. (IM 75)

8.f.f. State or Federal electric or magnetic exposure levels and setback, if established, are to be followed. (M 76)

IV. IMPLEMENTATION MEASURES

This section of the Safety Element indicates the actions and programs that shall be carried out by the City of Santa Paula to implement the Safety Element goals, objectives, and policies. These implementation measures, together with the policies, establish and guide the City's annual budget process and day-to-day decision-making so there is continuing process toward attainment of the goals. Some policies and implementing measures may need to be re-examined and revised during the plan's time frame (2020). The implementation measures presented below are categorized by the same topics as the goals, objectives, and policies in the preceding section, where appropriate. Implementation measures with a letter following the measure number (i.e., 22a) have been added during revision, update, or amendment processes. This number/letter system is intended so that the numbering system is not affected by any subsequent additions or revisions to implementation measures.

SEISMIC SAFETY AND GEOLOGY AND CRITICAL FACILITIES

1. The building and zoning codes shall be amended to incorporate specific standards for siting, seismic design and review of Critical, Sensitive, and High-Occupancy Facilities.

2. Detailed site specific studies for ground shaking characteristics, liquefaction potential (in areas defined as being susceptible to liquefaction only), landslide potential (in areas defined as being susceptible to landslides), and fault rupture potential shall be required as background to the development approval process for Critical, Sensitive, and High-Occupancy Facilities.

3. Zoning regulations shall be amended to prevent Critical Facilities from being located in the Alquist-Priolo Earthquake Fault Zone of an active fault.

4. No single-family residences, or other inhabitable structures, shall be constructed within fifty feet of either side of an active fault.

5. Within the Alquist-Priolo Earthquake Fault Zone, Sensitive and High-Occupancy Facilities shall require the discretionary approval of the Planning Commission, and the sites shall be designed to minimize the consequences of possible fault rupture. Sensitive and High-Occupancy Facilities shall not be allowed within 100 feet of either side of an active or potentially active fault.

6. Alquist-Priolo Earthquake Fault Zone Reports shall be in a standardized format through consultation with the City Geologist and relevant City Departments. An agreed upon design earthquake shall be formulated for the San Andreas, San Cayetano, Oak Ridge, and Ventura faults and utilized in the reports to determine ground shaking. Reports shall be reviewed for adequacy by the City Geologist.

7. All construction excavations and trenches relative to human occupancy and public works infrastructure of five feet or deeper in mapped fault zones shall be inspected by the City Geologist for any evidence of faulting.

8. Public participation shall be sought in the development of hazard mitigation and disaster recovery programs.

9. Existing Critical, Sensitive, and High-Occupancy facilities shall be reviewed for any significant siting, design or construction problems that would make them vulnerable in an earthquake. The findings shall be incorporated into emergency operations plans as well as addressed in longer-term programs of facilities upgrading or relocation. A special committee comprised of the City Engineer, and the Directors of Planning, Public Works, Building and Safety, and Emergency Services can formulate such plans.

10. Essential facilities within the City shall be surveyed for seismic hazards and programs shall be developed as appropriate for correction of any significant problems that could jeopardize public health and safety or inhibit effective emergency response. A special committee comprised of the City Engineer, and the Directors of Planning, Public Works, Building and Safety, and Emergency Services can formulate such plans.

11. Data on the current inventory of unreinforced masonry buildings shall be maintained and updated.

12. A strong, enforceable ordinance for upgrading of unreinforced masonry buildings shall be utilized, and tailored to the local conditions in the City. The ordinance shall include:

    a. Requirements for upgrading unreinforced masonry buildings.
    b. Incorporation of concepts and provisions of the State Code for historic buildings, to provide additional flexibility for preservation of historic buildings while protecting them from significant earthquake damage.
    c. A time schedule for enforcement with all upgrading completed during that time.
    d. Signs shall be posted and maintained on unreinforced masonry buildings to warn residents of the potential hazard.

13. The following information shall be developed in preparation for the ordinance, to provide a substantial basis for policy evaluations.

    - *A disaster impact analysis of the City's unreinforced masonry buildings, including an assessment of potential casualties, damages, and economic and social impacts in the event of an earthquake. The disaster impact analysis could be addressed through a CEQA document, such as an environmental impact report.*

14. Strategies and program options shall be developed for preservation or replacement of the low- and moderate-income housing currently located in unreinforced masonry buildings. Possible strategies include, among others: community redevelopment programs; low-interest loans for seismic rehabilitation of residential buildings; preservation of nonconforming zoning rights for in-kind replacement of residential buildings; and relocation assistance for any displaced occupants.

15. Appropriate means of economic relief for commercial buildings that are constructed of unreinforced masonry, shall also be considered, such as: preservation of non-conforming zoning rights for in-kind replacement of commercial buildings, and community redevelopment programs for the coordinated upgrading of seismic, economic, and general design characteristics of affected commercial areas.

16. A liquefaction or landslide report shall be required for proposed projects located in areas susceptible to either liquefaction or landslides. The reports shall be in a standardized format and utilize a design earthquake on the San Andreas, San Cayetano, Oak Ridge, and Ventura faults. Liquefaction and landslide reports will be submitted prior to issuance of construction permits. These reports will be utilized to help assure that adequate liquefaction or landslide mitigation is possible.

17. Special review criteria shall be established for Critical and Sensitive Facilities proposed in or near potential liquefaction or landslide areas. The criteria should include such concerns as: blockage of road access and interruption of essential utility service as a result of liquefaction or landslides in the area.

18. Technical reviews of groundwater, liquefaction susceptibility, and fault zone data shall be conducted every three to five years at a minimum, for potential revisions in liquefaction susceptibility and fault zone designations and related land-use and construction policies.

19. High groundwater problems related to any old, improperly-abandoned water wells shall be mitigated wherever possible, by proper sealing and abandonment procedures.

20. Any State-adopted seismic revisions to the current Building Code shall be reviewed for early adoption and implementation. These standards, as recommended by the Structural Engineers Association of California, should be adopted on an interim basis for the design of large buildings.

21. Future revisions to the seismic building code shall also receive early review and incorporation, as appropriate, into the City Building Code.

22. The current development review procedures for concrete tilt-up and composite pre-stressed concrete construction shall be reviewed for consistency with effective principles of seismic design, and revised as appropriate to maintain the seismic integrity of new construction.

22a. The City should adopt an ordinance that establishes and requires retrofit foundation standards and retrofit concrete tilt-up building standards.

23. The highest and most current professional standards for seismic design shall be used in the design of Critical, Sensitive and High-Occupancy Facilities, so that the seismic design of the facilities will not become substandard within a few years.

24. All components of the seismic design for Critical, Sensitive, and High-Occupancy Facilities shall be subject to independent, third-party structural engineer review by qualified professional standards for seismic design of those types of facilities, based on the development of appropriate criteria and procedures, if required by the Building Official.

25. Effective review of seismic design for proposed buildings of four stories or more in height, or 6,000 square feet or more in ground level floor space shall be conducted by on-staff structural engineers or through third-party review by qualified engineers responsible to the City, if required by the Building Official.

26. A central repository shall be established in the City, for the collection and compilation of geologic and soils engineering information related to faults and fault zone studies, groundwater levels, soils characteristics, susceptibility to landslides and liquefaction, and other data as appropriate. The range of opportunities for collection of new liquefaction and fault-related data shall be identified, and a long-term program development for geologic inspection of all significant excavations in the fault zones. The cooperation of other agencies should be sought, to help identify additional opportunities for data collection. This information shall be used to increase the knowledge and insights of City reviewers and applicants alike, in support of hazard mitigation.

26a. A fault investigation ordinance shall be prepared which states that if evidence of faulting is observed during any subsurface geologic or geotechnical investigation at a site, or if a site is located in an area of known active or potentially active faults, a special fault investigation should be initiated in accordance with the State Alquist-Priolo Earthquake Fault Zoning Act Guidelines, in an attempt to determine and/or confirm that the fault is active or potentially active. The special fault investigation shall be performed prior to the implementation of new construction, and the information obtained from the investigation should be utilized for future planning purposes.

26b. The City shall establish an ordinance which requires that projects located in areas identified as having a high potential for seismically-induced liquefaction shall have foundations designed by a structural engineer.

26c. Development within areas with a known high potential for landslides, debris flows, mud flows, or rock falls should follow the appropriate Building Code criteria and site specific studies should be performed prior to development.

26d. The City shall create an ordinance restricting the density/intensity of land use for slopes/hillsides in the planning area. The City shall also establish generalized performance standards for sites subject to landslides, mud or debris flows, rock falls, soil settlement, or soil expansion based on the most current acceptable County or State standards/criteria.

26e. The City shall require certification as to the stability of any proposed hillside building site, with relationship to adverse effects from rain and earthquakes, prior to the issuance of building permits.

26f. Sites confirmed to be in a landslide area, or an area prone to seismically-induced landslides, shall be graded to increase the factor of safety, or the landslide will be mitigated prior to construction at the site, as determined by a civil or geotechnical engineer. If the landslide cannot be mitigated through current engineering techniques, and if a factor of safety of 1.5 or greater cannot be achieved through mitigation measures, the site will be deemed unfit for development.

26g. The City shall require the design and construction of mud and debris flow diversion basins and/or walls for sites subject to mud or debris flows, or rock falls.

26h. The City should require a setback from the base of slopes known to be prone to landslides, mud or debris flows, or rock falls.

26i. The City shall establish an ordinance requiring the filing of a grading plan and a final grading report for hillside projects and critical facilities prior to final approval of the project, and prior to construction of any building structures.

26j. The City's Civil Engineer or equivalent will inspect a project after the final grading report has been filed. The project will not be approved for construction by the City Engineer or equivalent until all hazards caused by project grading which may affect adjacent properties, such as erosion and slope instability, are mitigated to the City's specifications.

26k. Development within areas with a known high potential for expansive soil or soil settlement should follow the appropriate Building Code criteria and site specific studies should be performed prior to development.

26l. The City shall create an ordinance restricting the density/intensity of land use for sites subject to soil settlement or soil expansion based on the most current acceptable County or State standards/criteria or provide specific design standards to mitigate against these hazards.

26m. The City shall establish an ordinance requiring that a structural engineer be obtained to design foundations for building structures which are to be constructed on project sites confirmed to be in highly expansive soil or in soil prone to settlement; or the project site will be graded to mitigate the existing soil conditions under the supervision of a civil engineer and with final approval by the City Engineer.

26n. Development within areas with a known potential for soil subsidence should follow the appropriate Building Code criteria and site specific studies should be performed prior to development.

26o. The City shall continue implementing its ordinance controlling groundwater pumping for municipal and industrial uses.

26p. The City shall form a committee to gather information on soil subsidence in the planning area, and to develop a program to halt or retard any subsidence which is confirmed through field observations or testing.

FLOOD PROTECTION

27. Development proposals for projects within the 100-year flood plain shall be reviewed for consistency with Federal Emergency Management Agency requirements as adopted by the Santa Paula Municipal Code. Projects not consistent with the Municipal Code may require modification to be consistent.

27a. New development shall comply with the City's Floodplain Management Ordinance.

27b. An Emergency Flood Evacuation Plan shall be prepared and publicly distributed or announced.

28. A site specific flood protection study which meets the standards of the City of Santa Paula and the Ventura County Flood Control District shall be prepared by a qualified civil engineer as a prerequisite to the approval of major projects. The study shall be reviewed by the City Engineer. Staff recommendations regarding the facilities necessary to mitigate flooding hazards resulting from project implementation and/or impacts to flood facilities shall become conditions of project approval. Mitigation against flooding hazards must be provided prior to the issuance of certificates of occupancy.

29. A Master Plan of storm drains should be prepared by the City, for use by the City and the County Flood Control District.

30. If not already developed, Storm Drainage and Flood Control Programs should be developed and implemented.

31. Flood improvements should be expedited and completed along Santa Paula Creek to reduce the 100- and 500-year flood zones north of State Route 126. Improvements should be completed prior to development in East Area 1. The necessity for new or relocated critical facilities would be lessened if the flood zone area was reduced through improvements to Santa Paula Creek.

32. Flood improvements to all canyon areas should be performed prior to grading and development of those areas.

32a. New development in localized flood-prone areas should not be allowed within the City limits or Todd Lane drainage area prior to upgrading drainage needs.

32b. Develop a Capital Improvement Plan to identify drainage needs required to accommodate new projects.

32c. Review development proposals in Fagan Canyon, East Area 1, and East Area 2 for incorporation of flood control technology to ensure that peak water discharge into the Santa Clara River does not exceed existing conditions.

FIRE PROTECTION

33. Incorporate the provisions of the Ventura County and City of Santa Paula Fire Hazard Reduction Program providing for the siting of structures, site access, availability of water supply, use of fire retardant vegetation, maintenance of landscape, incorporation of setbacks from natural vegetation, erosion control, and other measures to reduce fire hazards.

34. The City of Santa Paula Fire Department's measures for wildland fuel management, erosion control, street signage/identification, roadside and building vegetation clearance, and water supply requirements shall be implemented.

35. Continue and expand, as appropriate, the City's Building Code requirements for the design of structures to minimize fire hazard designated risk areas. These shall include, but not be limited to, the following: fire resistant construction; non-combustible roofing, fencing, and decking; fire walls; adequate placement of vents; and safety window glass.

36. At least once each three years, the City shall review its Building Code to evaluate its effectiveness in mitigating fire hazards and reflection of current technologies and construction methods. As appropriate, the Code shall be revised to account for any deficiencies.

37. Proposed development projects in the High and Very High Fire Hazard Areas shall be reviewed for their conformance to the policies contained in this Plan and standards and requirements of the Uniform Fire Code and Building Code.

38. Installation of new water reservoirs, pipelines, and booster pump stations will need to be addressed by the City Department of Public Works and the Santa Paula Fire Department prior to development in the High and Very High Fire Hazard Areas.

39. The City shall ensure that incidents resulting from fire conditions are addressed in the City's Emergency Preparedness Plan.

40. The City shall conduct a study to determine the means of establishing a buffer separating residential development in the foothills from chaparral and other native vegetation. This may include property easements and setbacks in new subdivisions, acquisition of lands adjacent to existing development, establishment of a "fire break" or National Forest lands, or other techniques. Methods to fund acquisition and maintenance of the "buffer" shall be identified.

41. Pursue enforcement of the City's code requirements for weed abatement, site maintenance, and other fire hazard mitigations.

42. The City should pursue development of a Fire Station along State Route 150/Ojai Road, north of Mill Park, out of the 100-year flood, dam inundation, and liquefaction hazard zones. Additional fire stations should be considered in canyon areas prior to implementation of development (e.g. Adams Canyon).

HAZARDOUS MATERIALS AND EMERGENCY PREPAREDNESS

43. Assist the County Department of Environmental Health Services (DEHS) in preparing and updating the County Hazardous Waste Management Plan (CHWMP).

44. Adopt and enforce the CHWMP through General Plan or ordinance adoption.

45. Participate with the County DEHS in all task force, study and review groups formed to implement and update the CHWMP.

46. Establish procedures for processing projects which involve the use, storage, transport, handling and/or disposal of hazardous materials/wastes. These procedures shall include provisions for the involvement of DEHS (permits, site plan review, etc.), submittal of additional information (such as a Business Plan, Waste Minimization Plan, risk assessment, etc.) and processing timeframes.

47. Amend project applications to include requirements for submittal of information involving the proposed use, storage, handling, transport and/or disposal of hazardous materials/wastes and any previous use, storage, handling and/or disposal of hazardous materials/wastes.

48. Develop a listing of land uses which typically use, store or generate hazardous materials/wastes, to be used by the Planning Department to determine project processing procedures.

49. Investigate and establish a procedure to identify existing, expanded and new businesses in the City which handle hazardous materials and/or generate hazardous waste. These procedures shall include an agreement with the County DEHS for both jurisdictions to share compiled information.

50. Establish procedures for processing projects proposed on identified contaminated sites. These procedures shall include provisions for pre-application conferences and discretionary review.

51. Evaluate the structural stability of hazardous waste facilities.

52. Require permits for the use, storage, handling, transport or disposal of hazardous materials/waste substances in accordance with applicable federal, state and county laws/regulations.

53. Appropriate disaster response and earthquake response plans shall be maintained and updated on a regular basis.

54. Disaster response plans shall include adequate capabilities for heavy search and rescue, major medical response, interim morgue, emergency shelter, traffic and utility impacts, and debris removal and disposal. Plans shall address hazardous materials response for any chemicals stored or used in or adjacent to the hazardous buildings, and hazardous material spills along highways and the railroad.

55. Disaster response plans shall also include procedures for access, traffic control, emergency evacuations, and security of damaged areas.

56. The City shall maintain effective mutual aid agreements for fire, police, medical response, public works, building inspection, mass care, and heavy rescue.

57. Emergency preparedness exercises shall be conducted at least once a year. Exercises shall be designed to test and upgrade various disaster response plans. Disaster planning scenarios and emergency response plans shall include contingencies for:

- *Possible ruptures on multiple faults, either separately or simultaneously;*
- *Collapse of 50 buildings or more, including some high-rise and/or mid-rise structures, some essential facilities, and numerous unreinforced masonry buildings;*
- *Sporadic ground failure due to liquefaction or landslides, with major disruption of streets and utilities in some areas, and serious damage to homes and businesses;*
- *Many aftershocks, continuing for several weeks or months.*

Emergency preparedness exercises shall not be limited to earthquake response, but shall include other potential disasters such as fire and flooding.

58. Earthquake prediction response plans should be developed, including procedures for protecting occupants of hazardous buildings, appropriate warning announcements and public education procedures, and other short-term preparations.

59. A program of public education and preparedness shall be a major, continuing component of the emergency preparedness program. It should include, at a minimum:

- *The existence and approximate locations of local faults and landslides, and liquefaction susceptibility areas;*
- *The potential for strong ground shaking in the area, and means of strengthening buildings and protecting furnishing, equipment and other building contents from damage;*
- *The need for businesses and residents to be self-sufficient for several days following an earthquake, including food, water, medical assistance, and limited fire-fighting;*
- *Specific information describing what an individual should do during and immediately following an earthquake, whether at home, in a car, at work, or in an unfamiliar building.*

60. The cooperation of the business community shall be enlisted for public education and mutual assistance. Businesses should develop their own disaster response plans and have provisions for food, water, first aid and shelter of employees who may not be able to return home for several days following a major earthquake.

AIRCRAFT SAFETY

61. The City of Santa Paula should change the land use designations in the Inner Safety Zones at both ends of the City of Santa Paula Airport runway to agricultural or other conforming land uses.

62. The City should pass legislation which would allow funding by the State for purchase of the property in the Inner Safety Zone.

POLICE PROTECTION

63. The City shall maintain a police force capable of providing adequate protection and criminal prevention services to the citizens of Santa Paula and their property.

64. The City shall conduct an annual assessment of Police Department services that shall evaluate: infrastructure conditions in all existing facilities and equipment; personnel staffing conditions; and facilities, equipment and personnel needs for the coming fiscal year, based on anticipated population growth, level of service, and the crime rate.

65. Establish a program that will monitor crime prevention programs and identify funding sources for law enforcement on the Federal, State, and local level.

66. The City shall continue and periodically review its cooperation agreements with the County of Ventura and adjacent jurisdictions for mutual assistance.

67. The City, through the Police Department, shall enact an ongoing Outreach Program to existing Neighborhood Watch groups to provide support and assistance in self-help programs, and identify residential areas without neighborhood watch programs and assist them to initiate and continue watch programs. A structure for similar program for commercial areas in the City shall be established that may be effectuated by the Chamber of Commerce and other similar organizations.

68. The City, through the Police Department, shall establish an ordinance to allow for utilizing volunteers in the community for citizens patrol, assisting the Police Department, and aiding the Police Department in emergency disaster situations.

69. The City, through the Police Department, shall establish an ordinance, to establish and support a retired senior-citizen volunteer program.

70. The City, with the assistance of the Police Department, shall assist the Santa Paula Unified School District and other educational agencies in establishing an early intervention program that will include, but not be limited to, sports, arts and crafts activities, job training and counseling for high school, junior high and elementary students who are having identified academic and social problems.

71. The City shall enact amendments to the Building Code and incorporate in the City's design review process for development projects requirements for defensible space design in all new projects that ensure maximum visibility and security for entrances, pathways and corridors, open space (both private and public), and parking lots/structures.

72. The City shall maintain an adequate complement of building code compliance inspectors who will work with the police department in order to eradicate building conditions which enhance criminal activity.

73. The City should pursue development of an additional police station along Ojai Road, out of the 100-year flood, dam inundation, and liquefaction hazard zones. Development of additional police stations should be considered as the City's expansion areas are designed and developed.

OTHER PUBLIC SAFETY HAZARDS

74. Special emergency preparedness plans shall be formulated for dealing with the possible effects of the severance of the City's major lifelines in the event of a major earthquake. For example:

- *Rupture of the petroleum product pipelines within the City limits, or to the north and south of the City, could result in uncontrollable fires.*
- *Rupture of the main natural gas lines could cause extensive fires and loss of natural gas services to the City for extended periods of time.*
- *Major or minor damage to the major Southern California Edison substations located in the City.*
- *Disruption of the water supply caused by breakage of the main water lines, damage or destruction of water reservoir tanks, or by non-functional pump stations.*
- *Disruption or termination of operations at wastewater treatment facilities.*
- *Disruption or termination of telephone and telecommunications systems for at least three days.*
- *Closure of major surface transportation routes, including railways, for several weeks to several months.*
- *Ground failure and damage to the runway at the Santa Paula Airport.*

75. The City shall enact amendments to its Oil Code and Building Code pertaining to development in historic or existing oil fields including, but not limited to, setbacks from active and abandoned oil wells, and setbacks and land use restrictions adjacent to oil production facilities.

75a. The City shall amend its Oil Code to include ordinances requiring the following:

- *All oil extraction facilities/structures including, but not limited to, oil derricks, oil wells, and oil reservoirs, shall be enclosed and locked.*
- *Oil companies shall be restricted from placing large oil facilities or oil storage facilities within the city limits, or adjacent to areas identified in the land use plan for proposed residences or public schools.*
- *Abandoned oil pipelines shall be removed from the subsurface, when deemed feasible by the city, by the responsible oil company. Subsurface monitoring and testing, in compliance with state laws, shall be performed.*

76. The City shall adopt an ordinance requiring that State or Federal electric or magnetic exposure levels, if established, are to be followed. In the absence of these exposure standards, no residential structures or residential yards, schools, active parks, or recreational facilities are to be built within the utility corridor right-of-way. In addition, the following setback guidelines adopted by the California Department of Health

Services shall be adhered to: 100 feet from 100-110 kV lines; 150 feet from 220-230 kV lines; and 250 feet from 345 kV lines.

V. TECHNICAL APPENDICES

EXISTING CONDITIONS AND ISSUES

Regional Stratigraphy. The stratigraphic and lithologic features of the major rock sequences within the Santa Paula planning area (Norris and Webb, 1990 and Dibblee, 1990 and 1992) are described by age group as follows:

Middle to Late Eocene, Matilija Sandstone (Tma, Tmaw, Tmasl, Tmash). Predominantly north-dipping (including overturned beds) sequence of resistant marine, thick-bedded, tan arkosic sandstone with thin partings of gray micaceous shale, and hard white sandstone and thin shale interbeds in the Santa Paula Peak area. This bedrock crops out in the northeast portion of the planning area.

Late Eocene, Cozy Dell Shale (Tcd, Tcdss). Predominantly north-dipping, marine, dark gray shale and light gray to tan arkosic sandstone. Outcrops exist at the northern tip of the planning area, adjacent to Santa Paula Creek.

Late Eocene, Coldwater Sandstone (Tcw, Tcwsh). Predominantly north-dipping and overturned beds of marine hard and tan sandstone, and greenish-gray and fossiliferous siltstone and shale. This bedrock crops out in the northern portion of the planning area, adjacent to Santa Paula Creek.

Oligocene, Sespe Formation (Tsp). Non-marine sandstone and conglomerate with outcrops restricted to south of the City of Santa Paula and the Santa Clara River.

Middle Miocene, Conejo Volcanics (Tcva). Volcanic rocks consisting of andesitic basalt. These rocks crop out in a thin strip near the peak of South Mountain, in the southern portion of the planning area.

Middle Miocene, Topanga Formation (Tts). Southern-dipping, marine, semi-friable sandstone that is time equivalent to the Conejo Volcanics. Crops out in a small area in the southwestern portion of the planning area.

Middle and Late Miocene, Monterey Formation (Tm). Described previously as the Modelo Formation (Weber, 1984), this unit is described as marine, biogenic, thinly-bedded to finely-laminated siliceous shales. This unit crops out in the northwestern portion of the planning area adjacent to Santa Paula Creek, and in the southwest portion of the planning area adjacent to Santa Clara River.

Pliocene and Pleistocene, Pico Formation (QTpm, Tp). Predominantly southern-dipping, marine, soft claystone or mudstone with some lenses or interbeds of semi-friable sandstone. A thick, coherent white tuff bed exists in the South Mountain area. This unit crops out over most of the planning area north of Santa Clara River, and in the southwest portion of the planning area adjacent to the river valley.

Late Pliocene and Early Pleistocene, Las Posas Sand (QTlp, QTlc). Southern-dipping, marine strata consisting of friable sandstone and sandy siltstone with some lenses of pebble-cobble conglomerate. This unit crops out in a thin zone adjacent to the west of Santa Paula Creek, in the northern section of the planning area.

Pleistocene, Saugus Formation (Qts). Southern-dipping, nonmarine, weakly-consolidated alluvial cobble-boulder conglomerate. This unit crops out along the northern border of the Santa Clara River Valley, in the central portion of the planning area.

Older Surficial Sediments (Qoa, Qog, Qof) . Dissected remnants of weakly-consolidated alluvial gravel, sand and silt. These sediments crop out primarily between Santa Paula Creek and Timber Canyon, north of the City of Santa Paula.

Surficial Sediments (Qg, Qf, Qa). Unconsolidated and generally undissected stream channel and alluvial deposits. These deposits lie within the boundaries of Santa Paula Creek, Timber Canyon, and in the Santa Clara River Valley floor.

Regional Seismicity and Earthquake History. Earthquakes occur along active faults. One of the tools used in the evaluation of seismic risk is the historical earthquake record. These records list when an earthquake occurred, its epicenter and depth below ground surface, and strength (Modified Mercalli Intensity or Magnitude). Seismic records in southern California date back about 200 years -- to the time of Spanish colonization. Earthquake recurrence along an individual fault can be on the order of thousands of years, so the historical record alone is not sufficient to fully determine the seismic risk that an area may experience. Despite these limitations, a review of historical seismicity has value in evaluating the seismicity that an area may undergo. The accuracy of the database increases with time; events before about 1940 are based on colloquial data and are not instrumentally recorded. These events, therefore, may not accurately locate the recorded event.

Historical Seismicity of the Santa Paula Area. The lower Santa Clara Valley has not had a large, damaging earthquake in 200 years of record keeping. According to the State of California, Department of Conservation, Earthquake Epicenter Map of California (1978), no earthquake epicenters, for earthquakes with a magnitude of 4.0 or greater, have been located within the City of Santa Paula planning area between 1900 through 1974. In addition, no large earthquakes are known to have occurred in the western Transverse Ranges during the historical record of the past 200 years (CDMG, 1996).

Several historical earthquakes with epicenters outside of the Santa Paula area have affected the Santa Clara Valley and the County of Ventura. An earthquake which occurred offshore, possibly on a continuation of the Oak Ridge Fault, in December 21, 1812 created tsunami-like waves along the Ventura coastline (Yeats, 1988). The great Fort Tejon earthquake of January 9, 1857, with its epicenter on the San Andreas Fault close to the northeast corner of Ventura County, caused significant damage in the southern portion of the County and cracks in the river bed six miles from the mouth of the Santa Clara River (City of Santa Paula, 1974). Two earthquake "shocks" occurred on June 6, 1925 and June 30, 1941, of magnitudes 6.3 and 5.9, respectively, which caused some damage in Ventura. The February 9, 1971 San Fernando (magnitude 6.5) earthquake caused severe damage to older buildings in Santa Susana, and

small displacement along the Santa Susana Fault (the eastern extension of the Oak Ridge and possibly San Cayetano Fault zones).

The 1994 Northridge (magnitude 6.7) earthquake resulted in a maximum displacement of 3.5 meters along a south-dipping blind thrust fault. As stated above, the Northridge blind thrust fault is thought to be a continuation of the Oak Ridge Fault. The Oak Ridge Fault also continues offshore. More than 400 earthquakes between magnitude 0.5 to 4.0 occurred on this offshore segment of the Oak Ridge Fault in April of 1984 (CDMG, 1995).

Probable Future Seismicity for the Santa Paula Area. The slip rate on the Oak Ridge Fault at South Mountain is estimated at 4.9 ± 1.0 millimeters per year (mm/yr) since the late Pliocene/early Pleistocene time. A slip rate of 4.5 ± 1.5 mm/yr was determined for the San Cayetano Fault based on stratigraphic evidence from the oldest alluvial fans at Timber Canyon, fluvial terrace deposits, and alluvial fan surfaces at Sisar Creek, Bear Canyon, and Mud Creek (CDMG, 1995). Yeats (1988) assumed that the slip rates calculated for the San Cayetano Fault are in the same general range as those for the Oak Ridge Fault, and that average recurrence intervals for earthquakes on these faults are in the same range. However, the CDMG determined in their study of the 1994 Northridge earthquake (CDMG, 1995) that the slip rate on the San Cayetano Fault was greater than 10 mm/yr, and the slip rate on the Oak Ridge Fault was between 1 and greater than 5 mm/yr. The average recurrence interval documented for the Oak Ridge Fault (250 to 500 years), and surmised for the San Cayetano Fault, suggests that a damaging earthquake may strike the lower Santa Clara Valley in the near future (Yeats, 1988).

SEISMIC HAZARDS

Seismic Setting. The regular occurrence of earthquakes in the southern California area serves as ongoing evidence that the area is seismically active. Although nothing can be done to prevent the occurrence of earthquakes, through proper construction design and planning, their destructive effects can be reduced. Within the last several decades, there has been a recognition that structures should not be built over active fault traces. Ongoing earthquake research has resulted in improved construction standards for buildings, roadways, and other structures. Another approach to increasing awareness of seismic hazards has been the State requirement that local governments address seismic safety issues in their General Plans [Government Code Section 65302(g)]. This Safety Element meets the requirement to consider the goals, programs, and policies that are to be followed to reduce the danger of earthquakes.

Earthquake hazards are manifested in many ways, including ground rupture, ground shaking, landslides, tsunamis, liquefaction, and seiches. Secondary hazards that can be caused by earthquakes include flooding due to dam failure, urban fires, and toxic chemical releases.

Previous Work. A Seismic Hazard Analysis of Santa Paula was performed by Earth Technology Corporation of Long Beach, California, in February of 1985. Earth Technology Corporation concluded that the recurrence interval for the Western Transverse Ranges province (which includes the City of Santa Paula) for peak ground accelerations of 0.10 g, 0.14 g, 0.19 g, 0.24 g, and 0.28 g, was 50 years, 100 years, 200 years, 400 years, and 600 years, respectively. The recurrence intervals for peak ground accelerations expected to be generated from an earthquake along the San Andreas Fault were considered separately in Earth Technology's report. The recurrence interval along the San Andreas Fault, based on surface geomorphology, ranges from

140 to 300 years. The median peak ground acceleration in the City, based on a magnitude 8.25 event on the San Andreas Fault at a distance of 53 kilometers from the City, was calculated to be 0.15 g. Earth Technology recommended that a seismic design criteria of 0.2 g should be utilized in the analysis and redesign of unreinforced masonry buildings in the City.

Seismically-Induced Ground Shaking. Earthquake-generated ground shaking is the greatest cause of widespread damage in an earthquake. The California Seismic Safety Commission (1993, 1994) estimates that ground shaking causes 99% of the earthquake damage to residences and other structures in California. Local conditions can greatly influence the intensity of ground shaking. Types of soil, depth to bedrock, depth to groundwater, and orientation of the fault movement all influence the intensity of ground shaking.

Ground shaking is the shock wave produced when there is a sudden movement created by an earthquake rupture. As the shock wave travels away from the hypocenter (the point of rupture), energy is lost and the intensity of the wave diminishes. In general, ground shaking diminishes as the distance from the earthquake epicenter increases. This attenuation relationship has been studied by numerous scientists, resulting in several attenuation models. Distance from the hypocenter also affects the form of the ground shaking. For sites near (within about 10 miles) the hypocenter, one may feel a sharp, high-frequency shock wave. This type of shock wave tends to affect short (one to two story) structures. At greater distances, the high-frequency shock wave is attenuated and one feels a rolling motion. This rolling motion tends to affect higher structures (multi-story structures, towers, large tanks).

A common scale used to measure the magnitude of an earthquake is the Richter scale. Richter magnitude is a logarithmic measurement of the maximum motion of the earthquake event as recorded on a seismograph. Richter magnitude is defined as the logarithm of the maximum amplitude on a seismogram written by an instrument of a specified standard type calculated to be at a distance of 62 miles (100 km) from the epicenter. By definition, Richter magnitude is fixed to an event and does not vary with distance. Seismically-induced ground shaking can also be measured quantitatively as ground surface acceleration (acceleration with respect to the force of gravity-[g]), and qualitatively by the modified Mercalli scale (see Table S-A1). Because of the attenuation of ground shaking with distance, modified Mercalli intensities (MMIs) vary depending on distance from the earthquake, soil type, resonance of the underlying sediments, and other site specific phenomena.

Ground shaking caused by the magnitude 6.7 Northridge Earthquake of January 17, 1994 resulted in the single most costly natural disaster in U.S. History. Over 33 fatalities and 7,000 injuries were attributed to the earthquake. Damages were widespread and included six sections of collapsed highway structures, thousands of damaged or destroyed residential and commercial structures, widespread disruption of utilities and other lifeline facilities, and numerous landslides and soil embankment failures. In all, over 14,000 structures in 28 cities were damaged by the earthquake. In the City of Santa Paula, located about 35 miles from the epicenter, 22 buildings were damaged, but none were severely damaged (Earthquake Engineering Research Center, 1994).

TABLE S-A1 MODIFIED MERCALLI INTENSITY SCALE (ABRIDGED)[1]	
INTENSITY	**DESCRIPTION**
I	Not felt except by a very few under especially favorable circumstances.
II	Felt by only a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibration like passing of truck. Duration estimated.
IV	During the day, felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably.
V	Felt by nearly everyone, many awakened. Some dishes, windows, and so on broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	Felt by all; many are frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster and damaged chimneys. Damage slight.
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motorcars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Chimneys, factory stacks, columns, monuments, walls fall. Heavy furniture overturned. Disturbs persons driving motorcars.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed along with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Waves seen on ground surface. Lines of sight and level distorted. Objects thrown into the air.

Source: United States Geological Survey, 1985

As stated previously, ground shaking attenuates with distance, thus, active faults near the City of Santa Paula have the potential to produce the greatest ground accelerations. The 1994 Northridge earthquake resulted in accelerations (through bedrock and soil) of up to about 0.5 g near the epicenter and accelerations were extrapolated to be less than 0.2 g near the City of Santa Paula (Earthquake Engineering Research Center, 1994).

Proper design of new structures and strengthening of existing structures can reduce or prevent damage associated with ground shaking. Conformance with the Building Code in the building of new structures helps reduce the likelihood of damage. In residences, most of the damage caused by groundshaking is the result of:

- *Unbraced water heaters,*
- *Houses not adequately anchored to their foundations, and*
- *Houses that have weak cripple walls, or are on pier-and-post foundation.*

Much of the life-threatening earthquake damage to commercial property is caused by:

- *Walls that are poorly anchored to the roof or floors,*
- *Unreinforced masonry walls,*
- *Poorly reinforced concrete walls or columns.*

The majority of buildings in the City of Santa Paula area were constructed in the 1920s, 1950s and 1960s. A large portion of the downtown area is considered "historic". These historic buildings, and many of the other residential and commercial structures within the City, were constructed prior to the implementation of building codes. Many of the historic masonry buildings are unreinforced.

The California Seismic Safety Commission (1993, 1994) has published guidebooks that assist property owners with identifying structural weaknesses and provide recommendations for mitigating these problems. These guidebooks can be ordered directly through the Seismic Safety Commission (Sacramento) and are entitled:

- *The Homeowners Guide to Earthquake Safety*
- *The Commercial Property Owner's Guide to Earthquake Safety*

Fault Rupture. Ground rupture occurs when displacement along a fault reaches the ground surface. Ground rupture capable of causing several inches or greater displacement could have a catastrophic effect on the integrity of a structure. Thus, setbacks from active fault traces are incorporated into determining areas that are suitable to develop. A difficulty in determining the fault rupture hazard is predicting where future ground rupture will occur. Fault displacement often is within a fault zone and not necessarily along exact traces of previous breaks. Also, movement typically is along more than one fault break.

One way in which geologists classify faults is on their movement history. As defined by the California State Mining and Geology Board (Hart, 1994), faults that have had surface displacement within the last 11,000 years (Holocene age) are considered ***active*** faults. Faults are considered ***potentially active*** if they show evidence of surface displacement during Quaternary time (within the last 1.6 million years).

California's Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Section 2621 et. seq.) regulates the development and construction of structures in the state. The act assures that public buildings, and all other structures for human occupancy, are not built on active faults. This act is designed to reduce earthquake hazards to life and property. Active and potentially active faults are to be considered during construction within the state. Cities and counties affected by the zones must regulate certain development within the zones. For proposed development within one of the fault zones, a geologic study must be performed to demonstrate that the sites are not threatened by ground rupture from future faulting.

When designing a structure, it is important to consider the likely earthquake that a fault can produce. A ***maximum probable earthquake*** is the largest earthquake that is expected to be produced within a 100-200 year time frame. Because the life of most structures is on the order of this range, maximum probable earthquakes are commonly used as design criteria for a structure. A ***maximum credible earthquake*** is the largest event that can be produced by a particular fault, regardless of time span. For critical structures, such as dams, emergency operation centers, fire stations, nuclear power plants, and other similar buildings, the maximum credible earthquake is often used as the seismic design criteria.

The following is a brief description of the faults which may affect the Santa Paula planning area.

San Cayetano Fault. The San Cayetano Fault is an east-west trending **active** fault that traverses the Sulphur Mountain ranges in the north end of the Santa Paula planning area and extends eastward to the San Fernando Valley. The San Cayetano is a north-dipping reverse fault on the north side of the Ventura Basin. A slip rate of approximately 4.5 mm/yr has been adopted for the San Cayetano Fault based on displacement of fluvial terrace deposits and alluvial fan surfaces at Sisar Creek, Bear Canyon, and Timber Canyon. There has been no surface faulting event on this fault in at least the past 200 years (SCEC, 1995).

The San Cayetano Fault is modeled as having the potential to produce a MCE of magnitude 6.8 (CDMG, 1996). Such an event could produce ground shaking accelerations ranging from 0.26 g to 0.63 g and a MMI of IX-X in the Santa Paula area.

Santa Susana Fault. The Santa Susana Fault is an east-west trending **active** fault with dip-slip and strike-slip components. About 2,000 meters of vertical offset (the north side up) and 3,200 meters of left-lateral strike slip have been observed along the fault (Yerkes and Lee, 1981). In some places the fault cuts late Pleistocene fan deposits, and surface rupture occurred along the northeast portion of the fault during the 1971 San Fernando earthquake.

The Santa Susana Fault is modeled as having the potential to produce a MCE of magnitude 6.6 CDMG, 1996). Such an event could produce a ground shaking acceleration of 0.26 g and a MMI of IX-X in the Santa Paula area.

Blind Thrust Faults. Low-angle thrust faults, known as ***blind thrust faults***, have recently been recognized as a seismic risk in southern California. Blind thrust faults are low angle features that do not reach the ground surface but do have surface expressions in the form of overlying folds that grow during large earthquakes. The seismic hazard from blind thrust faults has been demonstrated by the Northridge (1994) and the Whittier Narrows (1987) earthquakes. The magnitude 6.7 Northridge earthquake was produced by a south dipping blind thrust fault extending northward from beneath the San Fernando Valley to the Santa Susana Mountains (Jackson, et. al., 1995). The blind thrust fault which caused the Northridge earthquake is believed to be an eastward extension of the Oak Ridge Fault Zone which lies in the southern portion of the Santa Paula planning area. The magnitude of an earthquake that a blind thrust can produce is dependent on the fault's area and characteristic displacement. Earthquakes ranging in size from magnitude 6.4 to magnitude 7.5 can be expected on individual blind thrust segments.

The Northridge Blind Thrust Fault is modeled as having the potential to produce a MCE of magnitude 6.9 (CDMG, 1996). Such an event could produce a ground shaking acceleration of 0.085 g and a MMI of VIII-IX in the Santa Paula area.

Ventura Fault. The Ventura Fault is an east-west trending **active** fault which extends from the east end of the City of Ventura near the Santa Clara River, into the Santa Barbara Channel to the west. The Ventura Fault is a north-dipping reverse fault which appears to cut Holocene strata (Yerkes and Lee, 1981).

The Ventura Fault is modeled as having the potential to produce a MCE of magnitude 6.8 (CDMG, 1996). Such an event could produce ground shaking accelerations ranging from 0.25 g to 0.38 g and a MMI of X-XI in the Santa Paula area.

San Andreas Fault. The San Andreas Fault is mapped by Jennings (1994) as a northwest-southeast trending **active** fault with a length of over 600 miles. This fault is a right-lateral strike-slip fault which forms the plate tectonic boundary between the Pacific plate to the west and the North American plate to the east. The San Andreas Fault has an estimated slip rate of 16-38 mm per year and a recurrence interval of 132 years for large earthquakes (Peterson and Wesnousky, 1994). Numerous earthquakes have been recorded along the San Andreas Fault. Of the faults discussed here, the San Andreas Fault has the highest possibility of future rupture. Because this fault is located about 70 miles east of Santa Paula, ground shaking from a San Andreas Fault event would be somewhat attenuated by the time it reached the City.

The San Andreas Fault is rated as being able to produce a MCE of magnitude 7.8. Such an earthquake could produce a peak ground acceleration of 0.18 g, or a MMI between X-XI in the Santa Paula planning area. Because of the distance between the City and the fault, the nature of ground shaking is expected to be a long period rolling movement.

Oak Ridge Fault. The Oak Ridge Fault is an east-west trending **potentially active** fault that traverses much of the Santa Clara River Valley, extending from the Santa Paula area to the San Fernando Valley. This fault is a steeply south-dipping reverse fault that has an onshore length of about 25 miles (SCEC, 1995). As described by Yeats and Huftile (1995), the 1994 Northridge earthquake may have occurred on a continuation of the Oak Ridge fault system. Because slip rates along the Oak Ridge fault (5 millimeters per year) are nearly three times greater than the Northridge blind thrust fault (the actual fault responsible for the Northridge earthquake), they speculate that there is a potential for a Northridge-size earthquake in the Ventura Basin area. The recurrence interval of this fault is estimated at 250 to 500 years (Yeats, 1988). The Oak Ridge Fault is located in the southern portion of the Santa Paula planning area.

The Oak Ridge Fault is modeled as having the potential to produce a MCE of magnitude 6.9 (CDMG, 1996). Such an event could produce ground shaking accelerations ranging from 0.26 g to 0.64 g and a MMI of X-XI in the Santa Paula area. The nature of the ground shaking would be a sharp, high-frequency wave if the earthquake occurs near Santa Paula, or a longer period, rolling wave if the rupture takes place away from the City.

Design Response Spectra,
Per State Department of Conservation, Division of Mines and Geology

Please refer to the following 7 pages of text and graphics.

GEOLOGIC HAZARDS

Liquefaction. Liquefaction is a phenomenon that occurs when loosely consolidated soils lose their load bearing capabilities during shaking and flow in a fluid-like manner. Liquefaction typically occurs in water-saturated, loosely compacted, fine- to medium-grained sand where the groundwater table is within about 40 feet below grade. When these materials are shaken, such as during an earthquake, pore pressure of the sediments increases, causing the sediment to behave as a liquid. Where the liquefied layer occurs near the ground surface, structures built on such a layer could sink into the ground. Other effects of liquefaction include lateral spread, flow failures, ground oscillations, and loss of bearing strength (Tinsley et. al., 1985). Because liquefaction occurs in sediments, areas of bedrock are not considered liquefiable.

Because of a tendency for young sediments to be poorly consolidated, recently deposited material, such as river and flood plain deposits, are more susceptible to liquefaction than other types of sedimentary deposits. The distribution of sediment grain size also influence the susceptibility of liquefaction. Silty sand deposits have the greatest potential for liquefaction. Gravelly sand or deposits containing less than 15 percent clay are less likely to liquefy, and bouldery and cobbly gravels or deposits containing more than 15 percent clay are not known to liquefy (Tinsley et. al., 1985).

Depth to groundwater influences the susceptibility for liquefaction. Where groundwater is within 10 feet from ground surface, the susceptibility is very high. For groundwater between 10 and 40 feet, the susceptibility is high. For groundwater at 40 to 50 feet below grade, the susceptibility is low, and for groundwater deeper than 50 feet, the susceptibility is very low.

The magnitude and duration of ground shaking also has an influence on the susceptibility of liquefaction. The larger the magnitude of an earthquake, the greater the distance at which liquefaction is observed. Similarly, the longer the duration of shaking, the greater the distance at which liquefaction is observed.

The Seismic Hazard Mapping Act was established in 1990 by the CDMG, following the devastating 1989 Loma Prieta earthquake. The purpose of the Seismic Hazard Mapping Act is to encourage land-use management policies and regulations that will reduce and mitigate earthquake hazards, and assist cities and counties in preparing their general plans. The Act calls for the delineation of seismic hazard zones that identify areas of high potential for ground failures such as amplified ground shaking and liquefaction. The purpose of the seismic hazard zones is to show local officials where geotechnical investigations should be required prior to the issuance of a construction permit. The liquefaction zone criteria, based on the Seismic Hazard Mapping Act, is shown in Table S-A2 (CDMG, 1995).

Table S-A2. Liquefaction Zone Criteria

Geologic Unit	Depth to Groundwater	
	Greater than 40 feet	Less than 40 feet
Qa, Qg	low	high
all other	low	low

Source: State of California, Department of Conservation, Division of Mines and Geology
Special Publication 116, The Northridge, California, Earthquake of 17 January 1994, 1995

Lateral spread is the movement of blocks of ground as a result of liquefaction in a subsurface layer. During liquefaction of a subsurface layer of sediment into a fluid mass, gravity can cause the mass to flow down slope. Examples of this include movement into a cut slope such as a river channel, irrigation channel, or a storm drain. Lateral spread typically occurs on gentle slopes ranging from 0.3^{o} to 3^{o}. Ground movement of several feet to tens of feet are possible. Lateral spread is particularly destructive for pipelines, utilities, bridge piers, and other structures having shallow foundations.

Ground oscillation may take place where liquefaction occurs at depth and where the ground slope is too gentle for lateral spreading. When deeper zones liquefy, overlying sediments that are not liquefied can decouple and differentially move. Manifestations of ground oscillation include a ground wave, ground settlement, and opening and closing of fissures.

Flow failure occurs when blocks of ground are decoupled from underlying sediment and move downslope. Flow failures occur on slopes greater than 3^{o}. These blocks can be quite large, from tens of feet to several miles in length and width. Underwater flow failures can also generate tsunamis. Flow failures constitute the greatest hazard produced by liquefaction.

Loss of bearing strength can occur under a structure when the underlying soil liquefies. Large movement in the soil column is possible, allowing for structures to settle, tip, or float upwards.

The City of Santa Paula lies within the Santa Clara River Valley, and extends northward up Santa Paula Creek. The surficial sediments beneath the Santa Clara River Valley and Santa Paula Creek are recent valley and floodplain deposits consisting of silt, sand, and gravel. The Santa Paula planning area extends northward into the Sulphur Mountain and Santa Paula Peak areas, and southward into South Mountain, which are underlain by bedrock. The areas underlain by bedrock are not susceptible to liquefaction. However, the area of the City underlain by unconsolidated alluvial sediments within the Santa Clara River Valley may be susceptible to liquefaction.

According to the United Water Conservation District (Dal Pozzo, 1997), the depth to groundwater in two locations within the boundaries of the City of Santa Paula, and in the Santa Clara River Valley, is less than 40 feet below ground surface (bgs). The depth to groundwater in the two wells monitored by the United Water Conservation District, Well #-03N21W16H08S and Well #03N21W15G05S, was last measured on January 23, 1997 as 31.59 feet bgs and 23.87 feet bgs, respectively. According to the City of Santa Paula Department of Public Works (Wilkinson, 1997), groundwater levels in the Santa Clara River Valley within the planning area are generally less than 40 feet below ground surface. Based on the depth to groundwater beneath the Santa Clara River Valley within the planning area, and on the Seismic Hazard

Mapping Act criteria, the entire alluvial basin may be susceptible to liquefaction. In areas where the subsurface sediments have a high clay content (greater than 15%) or are very coarse grained (containing cobbles or boulders), the susceptibility to liquefaction would be decreased.

Slope Stability Hazards (Landslides, Mud and Debris Flows, and Rock Falls). Landslides, debris and mud flows, and rock falls all occur within the planning area. All are manifestations of gravity driven flows of earth materials due to slope instability. Hill slopes naturally have a tendency to fail. Unless engineered properly, development in hillside areas tends to increase the potential for slope failures. Slope modification by grading, changes in the infiltration of surface water, and undercutting slopes can create unstable hill slopes, resulting in landslides or debris flows.

Much of the City of Santa Paula is comprised of topographically pronounced areas. These hill slopes and mountains predominantly consist of sedimentary rock outcrops that are locally covered with soil. Slope instability is of greatest concern in these topographically pronounced areas. The majority of landslide and slope wash problems in the Santa Paula area occur in geologic terraces involving folded sequences of claystone, siltstone, and sandstone. Within the planning area, the majority of the mapped landslides (Dibblee, 1990 and 1992) occur in the Pico and Sespe Formations, and the Topanga Sandstone. Landslides and potentially unstable slopes are especially common in hillside areas underlain by sedimentary bedrock of the Pico Formation. This formation is generally soft and crumbly and contains abundant clay and silt strata (City of Santa Paula, 1974).

Landslides. Naturally-occurring landslides are associated with steep slopes which have been undercut by erosion or on slopes where the bedding planes of the bedrock are inclined down the slope. The presence of subsurface water also contributes to slope instability. Ground shaking, due to an earthquake, can trigger movement in terrain already prone to landslides.

Several landslides in the area are depicted on geologic quadrangle maps for Santa Paula and Santa Paula Peak (Dibblee, 1990 and 1992). The largest landslides mapped in the planning area are prominent along the major fault zones: San Cayetano and Oak Ridge Faults. According to the CDMG (Open File Report No. 95-07, 1995), the largest, most extensive, landslides in the planning area are ancient composite rotational failures along anti-dip slopes on the north side of South Mountain and Oak Ridge. On the north slope of South Mountain, large composite landslides have occurred in interbedded sandstone and claystone of the Sespe and Vaqueros Formations, below a ridge top formed by a volcanic andesite sill and silicified sandstone. Smaller dip slope landslides/earth flows are present in the south-dipping Pico siltstone and coarser-grained Saugus Formation in the hillsides north of the City.

The Seismic Hazard Mapping Act discussed above also calls for the delineation of seismic hazard zones that identify areas of high potential for ground failures such as earthquake-induced landslides. The landslide hazard zone criteria, based on the Seismic Hazard Mapping Act criteria, is shown in Table S-A3 (CDMG, 1995).

Table S-A3. Landslide Zone Criteria

Strength Category*	Slope Category			
	0 to 25% (0 - 4:1)	25% to 50% (4:1 - 2:1)	50% to 67% (2:1 - 1.5:1)	> 67% (> 1.5:1)
A (strong)	low	low	low	high
B (moderate)	low	low	high	high
C (weak)	low	high	high	high

Source: State of California, Department of Conservation, Division of Mines and Geology, Special Publication 116, The Northridge, California, Earthquake of 17 January 1994, 1995.
**The Strength Category is based on the lithology, past performance, and structural features of geologic units identified on source maps.*

The Seismic Hazard Maps for the Santa Paula or the Santa Paula Peak Quadrangles have not yet been published by the CDMG as of the date of this report, but should be acquired by the City of Santa Paula upon publication and incorporated by reference, herein. A breakdown of the hillside areas, within a portion of the Santa Paula planning area, into landslide susceptibility categories can be found in the CDMG Open File Report No. 95-07 (1995).

Debris and Mud Flows. Debris and mud flows often occur after periods of precipitation. Water soaked soil and rock are destabilized by the weight of the water. Often compounding the added weight is erosion of the base of a hill slope. Once this slope becomes destabilized, the water, soil, and mud mass is driven downhill by gravity. Numerous mud and debris flows occurred during the very heavy rains of January 1969, especially north of the Santa Clara River Valley, between Santa Paula and Piru Creeks (Weber, 1973). Inhabited building structures at the bases of slopes are especially prone to destruction due to mud flows.

Debris flows most frequently occur during intense rainstorms of the wet season, on steep slopes underlain by poorly indurated sand and silty units of granular soils, and on moderate slopes where loose debris has accumulated in swales and gullies. Debris flows are abundant on steep slopes underlain by the Pico Formation in the planning area (CDMG, 1995). Most of the hillside terrain within the planning area has been identified by the CDMG as being the most susceptible to debris flows because:

- *The evidence of previous debris flows is common;*
- *Source hollows and swales were observed;*
- *The slopes are steeply inclined; and*
- *The appropriate source material is widespread.*

In general, the areas most susceptible to debris and mud flows correspond to the areas with a high potential for earthquake-induced landslides.

Rock Falls. Rock falls occur in virtually all types of rocks and especially on slopes steeper than 40^0. Areas of primary risk from rock falls are those located at the base of steep, high slopes where rock outcrops (usually Saugus Formation, Conejo Volcanics, or Sespe Formation) are susceptible to dislodgment of large cobbles or boulders. These conditions are locally present along the northern and southern margins of the Santa Clara River Valley within

the planning area. Rock falls are usually triggered by seismically-induced ground shaking or by erosional destabilization of a hill slope.

SOIL HAZARDS

Expansive Soils. Expansive soils are those that are characterized as having a high shrink-swell potential (Edwards, et. al., 1970). The shrink-swell potential of a soil refers to the change in volume resulting from a change in moisture content. Soils with high shrink-swell potential generally have a high clay content and shrink when dry and swell when wet. Expansive soils can cause considerable damage to building foundations, roads, and other structures. Soils with low shrink-swell potential are generally suitable for building sites if other geologic factors are also favorable.

Soils with a high clay content, and a moderate to high shrink-swell potential, can be derived from weathering and erosion of many different rock types. The chemical breakdown of certain minerals through the weathering process can produce a clay soil in an area underlain with bedrock. In the planning area zones of soil with a high shrink-swell potential, as described in the Soil Survey of Ventura County (Edwards, et. al., 1970), generally correspond with mapped outcrops of claystone, siltstone, and shale as mapped by Dibblee (1990 and 1992).

Settlement. Settlement is the downward movement of a soil or of the structure which it supports, resulting from a reduction in the voids in the underlying strata. Settlement can result from natural consequences such as accumulation of sediments (addition of weight) over porous alluvial soils within a river valley. Settlement can also result from human activities which include: improperly placed artificial fill, and structures built on two different soil and/or bedrock materials with different settlement rates. In addition, settlement can result from seismic ground shaking and/or liquefaction in naturally-occurring soils. Liquefaction is discussed in its own section in this report.

Inadequately emplaced fill material, if not compacted properly, can subside when a structure is built on the fill. It is important that fills be engineered so that the density and moisture of the material can be controlled. Controlling the density, moisture, and compaction of the fill material will reduce the possibility that the material will settle after development on the fill. Structures which are constructed partially on a cut pad (into bedrock) and partially on a fill pad may result in settlement problems and should be addressed during engineering design.

Settlement hazards can occur in areas with permeable alluvial deposits, where fill is improperly placed, and in areas where construction occurs across a cut/fill boundary. Areas of poorly consolidated sediments should be engineered to support the weight of a structure that is to be built on the site. In areas of fill, the fill should be compacted to adequately support the proposed development, and structures should not be placed partially on cut and partially on fill unless specifically designed by civil and structural engineers.

Subsidence. Subsidence is the decrease in volume of a material as the result of an increase in the density of a material. It is generally related to the withdrawal of fluids such as water, oil, and gas from the subsurface. When fluids are removed from the subsurface, the overburden weight, which the water had previously helped support through buoyant forces, is transferred to the soil structure. Subsidence typically occurs over a long period of time and

results in a number of structural impacts. Facilities most impacted by subsidence are long, surface infrastructure facilities such as canals, sewers and pipelines.

The extraction of groundwater from an aquifer beneath an alluvial valley can result in subsidence, or settlement, of the alluvial soils. The factors which influence the potential occurrence and severity of alluvial soil settlement due to groundwater withdrawal include: degrees of groundwater confinement; thickness of aquifer systems; individual and total thickness of fine-grained beds; compressibility of the fine-grained layers; probable future depth of wells; and probable future decline in groundwater levels (City of Santa Paula, 1974).

According to the Ventura County Department of Water Resources (Panaro, 1997), groundwater is withdrawn from the Santa Paula Groundwater Basin from an unconfined aquifer within Quaternary alluvial sediments and the San Pedro Formation. The Santa Paula Groundwater Basin services approximately 13,504 acres, and the groundwater is utilized for irrigation, municipal and domestic supply. The aquifer within the Santa Paula Groundwater Basin is approximately 2,000 feet thick based on oil well logs, can potentially hold up to 4,915,000 acre-feet of water, and currently has an agreed upon initial allocation yield of 30,500 acre-feet (Brommenschenkel, 1997). The water demand for the City of Santa Paula, and its general service area, for 1990 was 6,500 acre-feet. Based on the conservative safe yield made by Dr. Mann in 1959, Santa Paula has a water supply large enough to support its current population and future development.

Oil extraction sometimes also results in overlying soil settlement or differential subsidence. The Santa Paula area has not had significant subsidence problems despite historical oil drilling in the area. According to the State of California Division of Oil and Gas (Fields, 1997), State regulations require subsidence studies in coastal areas where sea water intrusion due to oil extraction is an issue. Subsidence studies are generally not performed in inland areas.

Hydrocompaction. Hydrocompaction occurs in relatively loose, open textured soils above the groundwater table. Once water is introduced, whether by heavy irrigation or a rise in the water table, the soil loses strength and consolidates under its own weight. Hydroconsolidation typically occurs in desert environments and has been noted in some semi-arid regions of southern California.

FLOOD HAZARDS

Historic Flooding. Table S-A4 provides a listing of major flood events that have occurred in Ventura County over the previous 25 years.

Heavy water flows occurred on Santa Paula Creek in 1938, 1943, 1969, 1973, 1978 and 1980. The 1938 and 1943 floods caused Congress to authorize a flood protection project on Santa Paula Creek in 1948. Work on the flood protection project began in 1974, but was halted due to a court order stating that an insufficient environmental study was performed. The Corps of Engineers began work on the flood protection project again in 1994 (City of Santa Paula, 1994).

Table S-A4. Major Flood Events in Ventura County

Date	Comments
1973	State declared disaster
Feb. 9-10, 1978	Presidentially declared disaster
February 16, 1980	Presidentially declared disaster; 4-day storm event
March 1, 1983	Presidentially declared disaster; peak flow on record in Zone III
February 10-12, 1992	Presidentially declared disaster; 50-year flood event
January 10, 1995 and March 10, 1995	Presidentially declared disaster; 10-13 million dollars in damage from the combined storms

Source: County of Ventura, Flood Control Department

The 1969 and 1978 floods presented major threats to the City, as rock and debris completely filled in the channel of Santa Paula Creek. Five inches of rain fell on the City of Santa Paula within six hours in 1980. Fagan Barranca escaped its banks and flooded about 80 homes and covered 11 miles of street with mud (City of Santa Paula, 1994).

Flood Control and Prevention. Flood hazards may be alleviated through a variety of measures, some corrective and some preventive. Corrective measures include warning and relief programs, flood-proofing of existing structures, and the construction of flood control works. Preventive measures include public acquisition of flood plain lands, public information programs, development policies and regulations.

Flood control prevention is the responsibility of the Ventura County Flood Control District. The Flood Control District has the authority to maintain and construct flood control facilities on all major channels, including Santa Clara River, Santa Paula Creek, Adams Barranca, Fagan Barranca, Todd Lane, and Peck Road. The network of tributary storm drain trunks and laterals that collect and convey surface water from the urban areas to the major channels is the responsibility of the City of Santa Paula Public Works Department (City of Santa Paula, 1994).

On the Federal level, the regulations of the National Flood Insurance Program (NFIP), which is administered by the Federal Insurance Administration (a component of the Federal Emergency Management Agency), require that communities adopt land use restrictions for the 100-year flood plain in order to qualify for Federally-subsidized flood insurance. The program requires that residential structures be elevated above the level of the 100-year flood and that other types of structures be floodproofed. The NFIP was established by Congress with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures.

To provide for early flood warning, the Ventura County Flood Control District has been operating an automated flood warning system since 1979. The system is known as "ALERT" (Automated Local Evaluation in Real Time) and was developed by the National Weather Service in Sacramento, California. The system is comprised of self reporting rain gages and stream gages that collect data and transmit signals to a flood warning center computer system located in the County Government Center Administration Building in Ventura. Operators of the system compare rainfall forecasts with the runoff forecasts from the hydrologic models and notify proper authorities in threatened areas to initiate evacuation warnings as appropriate. In the Santa Paula area, self reporting stations are located at Santa Paula Creek near Steckel Park

(stream level and precipitation) and at Fagan Canyon near Main Street (stream level and precipitation) (Kane, 1997).

Potential Inundation Due to Dam Failure. The State of California has been responsible for supervising dams since August 14, 1929 for the purpose of safeguarding life and protecting property (California Department of Resources, 1995). The legislation was enacted following the failure of St. Francis Dam in March 1928. St. Francis Dam was located in San Francisquito Creek, a tributary to the Santa Clara River, located east of the City of Santa Paula and north of the City of Santa Clarita. In 1965, legislation was revised to include off stream storage reservoirs as a result of the failure of Baldwin Hills Reservoir in December of 1963. In March 1973, Senate Bill 896 was adopted by the State of California amending the Government Code. This law required dam owners, under the direction of the Office of Emergency Services, to show the possible inundation below their dam in the event of a failure.

FIRE HAZARDS

Causes and Origins of Wildland Brush Fires. The vegetation found within the City of Santa Paula boundaries include agricultural and riparian vegetation. In the hillside areas of the Santa Paula planning area, vegetation includes riparian, grassland, chaparral, oak woodland, and coastal sage shrub. The hillside vegetation, primarily the chaparral and coastal sage shrub, provides a major source of fire fuel. These vegetative associations contain many species of plants considered pyrophytic, plants which need the heat of the fire to germinate their seeds for reproduction. When these vegetation systems are burned over by a brush fire, the existing ground cover is destroyed, but in many cases the plant association survives and is actually improved by this means of natural selection.

The climate of the region is one of the critical factors influencing the occurrence and severity of brush fires. The hot dry summers leave the area hillsides susceptible to a major fire. During the early fall, periods of "Santa Ana" winds occur, caused by a local weather phenomenon of a low pressure system developing off the coast while a high pressure system settles over the inland desert areas. The result is the hot dry winds which pour over the mountain areas into the Santa Clara River Valley aggravating the potential fire threat in the high brush areas already dried out by the summer heat. Nearly 90 percent of the large Southern California fires documented over the last 73 years have occurred between September and December, during the Santa Ana season (Crosby, 1992).

Brush fires are often caused by man, either intentionally or unintentionally. Continued urbanization of the flat lands within the valleys has put increasing pressure on the development of hazardous brush covered hillsides. The longer a brush area goes without burning, the older dry, dead materials and the new plant growth constitute potentially a more volatile fuel source. These fuel sources are usually then ignited by man, either directly through arson or careless action, or indirectly through accidents such as sparks from engine exhaust, falling power lines, etc. Natural causes are now relatively minor causes of brush fires. Man is the primary agent in this natural cycle of fire.

Santa Paula Fire Department Response. The SPFD responded to 1,456 incidents in the City of Santa Paula in 1996. Emergency medical aid responses were 978, comprising 67% of the total incidents. Fire services consisted of that specified in Table S-A5.

Table S-A5. Fire Incident Activity Summary - 1996, Santa Paula

Fires/Incidents	Number of Incidents	Dollar Loss
Structures	19	$127,125
Vehicles	38	86,000
Smoke Checks	49	0
Vegetation	28	200
Refuse	28	1,150
Public Service	82	0
False Alarms	106	0
Hazmat/Spills	27	2,000
Aircraft	2	0
TOTAL FIRES	379	3,668
Emergency Medical	978	0
Vehicle Accidents	36	0
Other Calls	63	0
TOTAL INCIDENTS	1,456	$217,400

Source: Santa Paula Fire Department, April 14, 1997

Some cities within Ventura County have chosen to contract with the Ventura County Fire Protection District for fire protection services. The Ventura County Fire Department's Battalion 51 has two fire stations located in the Santa Paula area:

- *Summit Fire Station, 12727 Santa Paula-Ojai Road, Santa Paula, California 93060; and*
- *Saticoy Fire Station, 12391 West Telegraph Road, Santa Paula, California 93060.*

The SPFD has a number of mutual aid agreements with other fire departments and services agencies within Ventura County. If the resources of these departments/agencies are depleted, assistance can also be obtained through various state agencies including Office of Emergency Services, the Department of Forestry and Fire Protection, the State Fire Marshall, and the Department of Fish and Game; and various Federal agencies including the U.S. Forest Service, the National Park Service and Bureau of Land Management, and the Department of Defense. Urban fire hazard abatement is discussed in this section and Wildland fire hazard abatement is discussed in the following section.

Existing Fire Stations. The SPFD currently operates two fire stations. The SPFD maintains a 5-minute response goal for any incident within the City. Table S-A6 provides a summary of the local fire station's capabilities (personnel and equipment).

The Santa Paula Fire Department is a combination full time/part time department providing fire suppression and emergency medical services as well as fire prevention and business hazardous materials regulation functions within the City. There are eight full time personnel, consisting of a Fire Chief, Assistant Chief, three Captains and three Engineers, and 27 part time

Table S-A6. Santa Paula Fire Department Station Capabilities

Station No.	Year Built	Location	Personnel	Equipment
1	1935	114 South 10th Street	1 Captain* 1 Engineer* 1 part-time firefighter 20 part-time, paid/ call personnel	Engine #1 (1954 Mack Pumper) Engine #6 (1988 Ford Pierce Pumper) Truck (1986 Ford Pierce Pumper with 50 ft aerial ladder) One Utility Pick Up Truck
2	1988	536 West Main Street	7 part-time, paid/ call personnel	Engine #3 (1970 Ward LaFrance Pumper) One sedan car

Source: City of Santa Paula Fire Department, April 1997
** Three each full time, work on a 24-hour rotating shift system*

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paid/call personnel, consisting of four Captains, four Engineers, and 19 firefighters. There are two volunteer Chaplains. Administration and Prevention offices are at the Community Development Building. Routine fire, medical and other calls are handled by the on-duty engine company, which consists of a Captain and an Engineer on a rotating 24-hour shift system. They are supplemented by the Chief and Assistant Chief during weekday business hours and during the evenings and weekends by a third crew member scheduled from among the part time personnel. All available part time personnel are dispatched to emergencies that require more than the duty engine company. According to the Fire Chief, the average number of part time, paid/call personnel responding to typical daytime fire emergencies in 1993 was between 14 to 20.

In 1995 six full-time firefighting positions were created and Fire Station 1 is now staffed 24-hours a day with one Captain, one Engineer, and (in the evenings, weekends and holidays) a part-time firefighter. This alleviated most of the problems related to part time, paid/call personnel response time to fire emergencies. It has also been suggested by the SPFD that another fire station be opened on Ojai Road above Mill Park to take advantage of the closer availability of firefighters who live in that area. In addition, funding and staffing a one 3- or 4-man engine company on a 24-hour basis using a combination of full time and part time personnel at Station 2 has been recommended (Skeels, 1997), particularly in the event of annexation and development of the Adams Canyon area. It may also be appropriate to locate and staff a fire station within Adams Canyon.

Station 1, referenced in Table S-A6, was constructed prior to the enactment of strict seismic structural codes and is of masonry construction. However, according to the SPFD (Skeels, 1997), the engine room of Station 1 was seismically upgraded in 1987, and has recently been remodeled to include upgraded office space and living quarters for firefighters. Fire stations are considered critical facilities that must be functional in the event of an earthquake or other disaster to minimize loss of life and property damage.

Historic Brush Fires. Table S-A7 provides a summary of brush fires which have occurred in the Santa Paula planning area since 1936. The 1985 Ferndale fire, and the 1993

Steckel fire, burned through all of Adams Canyon. Large uncontrolled fires occur on a regular basis in the South Mountain area (City of Santa Paula, 1994).

Effects of Brush Fires. The principal effects of brush fires include loss of vegetative ground cover, increased erosion, loss of building structures, loss of utilities, and loss of life. Loss of the vegetative ground cover results in damage to valuable recreational and open space area. Many of the plant and animal associations in the natural communities have adapted themselves to a fire-climax cycle, and will naturally generate themselves through fire. Hence, they themselves may not be permanently impacted.

Loss of vegetative cover results in secondary erosional impacts, especially in steeply sloped hillside areas. When a slope is burned over by a fire of intense heat, a chemical reaction in the soil takes place which makes it less porous. As the rains of winter come, rain water runs off and causes mudslides and mudflows. Properties not affected directly by the fire may be damaged or destroyed by the effects of increased runoff due to brush fire.

Table S-A7. Historic Brush Fires Near Santa Paula (1936-1993)

Name	Origin (Quadrangle)	Date Started	Acres Burned
Boosey	Santa Paula Peak	1/26/36	900
La Questa	Santa Paula Peak	11/23/38	1,682
Edwards	Santa Paula Peak	11/22/39	4,450
Mud Creek	Santa Paula Peak	12/10/51	500
Culbert	Santa Paula	12/4/62	5,525
Santa Paula Canyon	Santa Paula Peak	12/4/62	1,941
Sespe Ranch	Santa Paula	10/15/67	17,431
Timber Canyon	Santa Paula Peak	10/16/67	11,450
Sespe Ranch	Santa Paula	12/16/71	2,925
Sespe Ranch	Santa Paula	9/26/73	1,008
South Mountain	Santa Paula	11/13/75	6,500
South Mountain	Santa Paula	10/29/80	3,600
Loma	Santa Paula	6/15/81	1,331
Mupu	Santa Paula Peak	7/4/85	28
Ferndale	Santa Paula Peak	10/14/85	47,064
Ferndale	Santa Paula	10/21/85	45,710
Lloyd Butler RX Burn	Santa Paula	9/30/86	600
Bradley	Santa Paula	11/10/86	9,027
South Mountain	Santa Paula	10/8/90	714
Steckel	Santa Paula	10/27/93	26,500

Source: Ventura County Fire Department

The loss of man-made improvements in the brush covered areas constitute most of the dollar loss from fires. Losses along this line include homes, barns and sheds, utility lines and facilities. The loss of valuable watershed area combined with the actual suppression costs also are major determinants of the total dollar costs of any fire. The potential for loss of life is the most

dangerous aspect of brush fires. Occasionally, trapped residents are injured or killed when there is no warning of the impending disaster, or when they simply refuse to evacuate their homes in the face of the fire. Unfortunately, the largest loss of life occurs to the professional fire fighters who are killed while fighting brush fires, which have a highly unpredictable nature, or in other accidents during the support operations necessary to suppress the fire. Fortunately, there have been no serious injuries or deaths in the brush fires that have come into Santa Paula.

As the population of California cities continue to grow, more and more people are encroaching on what firefighters call the urban/wildland interface, the perimeter of urban areas adjacent to wildlands. According to California Department of Forestry and Fire Protection (CDF) statistics, since 1980 more than 5,000 structures have been damaged in wildland fires, triple the amount of damage that occurred in the previous 15 year period. Some of the more recent devastating examples of this phenomenon include:

Santa Barbara: Painted Cave Fire of June 1990 which swept across almost 5,000 acres of coastal hillsides, destroying more than 600 houses.

Oakland/Berkeley: 1991 fire covering over 1,600 acres, decimated entire neighborhoods, killing 25 people, destroying 2,900 homes, and leaving more than $1.5 billion in property damage.

Malibu to Laguna Beach: a series of fires in the fall of 1993 which killed three people and destroyed over 1,000 homes.

Fire Hazard Reduction. Experienced firefighters believe they can no longer protect homes and lives as well as they did in the past with fuel loading causing such catastrophic fires (Gilmer, 1994). It is up to the homeowners living on the urban/wildland interface to establish defensible space. Defensible space describes a band of managed vegetation around a home which stops the movement of fire by denying fuel. The Fire Department does not recommend indiscriminate clearing of native chaparral and other vegetation. Natural vegetation plays an important role in erosion control. The goal is to obtain a balance between fire hazard reduction and erosion control. Defensible space also provides a place where fire fighters can do their jobs without unnecessary risk to themselves. According to the CDF, as many as 80 percent of the homes lost to wildfires in the past could have been saved if the owners had followed a few simple fire safe practices. Some of these fire safe practices include the following:

- *Use fire resistant landscaping. Fire resistant plants are those with low growth habit (generally less than 18 inches in height), low fuel volume, and high moisture content. Such plants offer far less fuel than upright woody shrubs.*

- *Irrigate and maintain landscaping. A fire resistant plant will lose this quality if allowed to dry out. Maintenance insures the effectiveness of the fire resistant landscape by retaining proper spacing between plants and removing dead/dry vegetation.*

- *Have a fire-retardant roof. Untreated wood shake roofs provide fuel for an advancing fire. Class A roofs provide the most protection. These include: clay tile, concrete tile, fibrous cement shake, metal tile, and fiberglass composition shingles.*

The County Fire Protection District has developed a Fire Hazard Reduction Program with the goal of preventing the loss of life and property due to uncontrolled wildfire in the urban/wildland interface through the cooperation of the property owners of Ventura County (Ventura County Fire Protection District). The stated objectives of the Fire Hazard Reduction Program are to:

1. *Reduce significantly the incidence of destructive fires in the urban/wildland interface areas, and the resulting loss of life and property.*
2. *Provide a defensive perimeter around urbanized areas of the Fire District.*
3. *Provide for the protection of structures in the urban/wildland interface by establishing and maintaining a 100 foot defensible perimeter around each structure.*
4. *Provide for the removal of annual fuels within the defensive perimeter.*
5. *Provide any fire suppression resource from any agency the opportunity to successfully protect structures and other valuable properties during a wildfire threat.*
6. *Protect the watershed fire areas from exposure to structure fires in the urban/wildland interface areas.*

The Fire Hazard Reduction Program strives to establish defensive barriers in the urban/wildland interface in preparation for the annual onslaught of wildfire. Hazardous vegetation is at its peak growth in the spring and fall seasons. An inspection program has been developed that targets hazard reduction in the spring and fall months. Within the 100 foot defensible perimeter, all brush, flammable vegetation, or combustible growth identified as a fire hazard by an inspecting officer is required to be mowed or cut to a stubble height not to exceed 3 inches. All cuttings are required to be removed from the property. Single specimens of trees, ornamental shrubbery or ground covers are permissible provided that they do not form a means of rapidly transmitting fire from the native growth to any structure. Other specific clearance requirements pertain to roof surfaces, chimneys, propane tanks, access roads, and vacant parcels and are specified within the Fire Hazard Reduction Program guidelines.

The Santa Paula Fire Department has its own Fire Hazard Reduction Program, and has required that the weed abatement and vegetation management programs be followed for new developments in high fire risk areas. However, some questions regarding the effectiveness of these programs, for new developments in canyons and on hillsides, in minimizing the risk of loss of life or property from wildland fires still need to be addressed. The Santa Paula Fire Department should be consulted when new development plans are being considered for canyon and hillside areas within the Santa Paula planning area.

The best defense against disastrous fires affecting the urban/wildland interface is a working partnership between developers, property owners, their neighbors, the Ventura County Fire Department, and the Santa Paula Fire Department. More detailed information pertaining to defensible space strategies and other fire hazard reduction approaches can be obtained from the Santa Paula Fire Department.

HAZARDOUS MATERIALS

More than 60,000 chemicals are produced in the United States. Over 11,000 of these chemicals are used for commercial purposes. Within the County of Ventura, over 5,000 manufacturing and service industries use or store hazardous materials, including pesticides, acids, caustics,

solvents, and heavy metals (County of Ventura, 1989). Because of the widespread use of hazardous materials in our communities, minor and major hazardous materials spills and incidents occur. Most of these incidents are related to the increasing transport of chemicals over roadways or through industrial accidents. SR 126 and SR 150 are major transportation corridors through Santa Paula.

In an effort to reduce impacts associated with a hazardous material incident, Ventura County has developed a Hazardous Materials Emergency Response Plan. The goal of the plan is to protect life, property, and the environment from the effects of a hazardous material release to air, land or water or a hazardous material fire. Procedures to be used in the event of an incident and specific agency responsibilities are identified within the plan. The Plan is activated by the designated Incident Commander at the scene. Depending on the nature of the incident, this could be either the appropriate law enforcement authority (City of Santa Paula Police Department, Ventura County Sheriff's Department or California Highway Patrol) or the SPFD.

The County Hazardous Materials Emergency Response Plan is supplemented by individual Business Plans for businesses/facilities that store or handle hazardous materials and wastes. Under Chapter 6.95, section 25503 of the California Health and Safety Code, Business Plans are required from California businesses that handle a hazardous material in quantities equal to or greater than the following:

- *55 gallons of a liquid;*
- *500 pounds of a solid;*
- *200 cubic feet of a compressed gas; or*
- *Extremely hazardous substances above Federal threshold reporting quantities*

As part of the Business Plan, emergency response plans and procedures must be developed and training sessions must be provided to employees. Businesses are periodically inspected by local administering agencies (Santa Paula Fire Prevention Bureau) to ensure that handling, storage, and waste disposal practices conform with appropriate laws and regulations.

According to the Santa Paula Fire Department (Araiza, 1997), 100 businesses use or store hazardous materials in the City of Santa Paula (Table S-A8). These businesses include gasoline stations, automotive repair facilities, dry cleaners, agricultural facilities, crude oil pipelines and facilities, and miscellaneous commercial and industrial facilities. Industrial use of hazardous materials is centered in the downtown Santa Paula area. Many of the commercial businesses that store or use hazardous materials are located on Main Street or Harvard Boulevard. Specific information regarding the location of businesses and types and quantities of hazardous substances used or stored can be obtained through the Santa Paula Fire Department.

Table S-A8. Number of Businesses and Facilities that Use/Store Hazardous Materials by Street Name

Street Name	Number of Businesses
10th Street	7
Corporation Street	7
Harvard Boulevard	20
Main Street	23
Quail Court	7
Santa Maria Street	6
Santa Paula Street	5
Streets with Five or Fewer Businesses	32
Total	107

Source: Santa Paula Fire Prevention Bureau, personal communication, Assistant Chief Rick Araiza, 1997

Only one facility uses or stores acutely hazardous materials within the City of Santa Paula: Baker Performance Chemicals located at 265 Quail Court. Extremely hazardous wastes (or materials) are defined by California HWCL as any hazardous waste or mixture of hazardous wastes which, if human exposure should occur, may likely result in death, disabling personal injury or serious injury because of its quantity, concentration, or chemical characteristics.

In addition to traffic related incidents, hazardous materials spills could be caused by ground shaking associated with a large earthquake or other soil related hazards (landslide, debris flow, liquefaction, etc.). As discussed in Section IIA, peak horizontal ground accelerations of 0.64 g and Modified Mercalli Intensities of VIII-IX could cause major structural damage to facilities using hazardous materials. Hazardous material containers not properly secured could be felled and/or ruptured. Improperly segregated materials could result in toxic or explosive reactions.

AIRCRAFT HAZARDS

Based upon the Airports Comprehensive Land Use Plan Update for Ventura County (VCTC, 1991), the Ventura County Transportation Commission is also the Airport Land Use Commission (ALUC) for the County, including Santa Paula Airport. The purpose of the ALUC is to "formulate a comprehensive plan that will provide for the orderly growth of each public airport and the area surrounding the airport within the jurisdiction of the commission" (Public Utilities Code Section 21675). The ALUC comprehensive plan includes protecting public health, safety, and welfare. The ALUC prepared an updated Airports Comprehensive Land Use Plan (CLUP) for the four airports in Ventura County, including Santa Paula Airport.

The California Department of Transportation (Caltrans) Division of Aeronautics maintains an Airport Land Use Planning Handbook that addresses airport land use compatibility issues such as aircraft accident characteristics and safety compatibility. Caltrans provides suggestions to the ALUC in forming local policies. The ALUP designated Airport Safety Areas, for Santa Paula Airport, extending from the runway as a basis for determining land use compatibility. The Airport currently serves private passenger aircraft.

OIL WELLS AND OIL SUMPS

Existing Operations. The source for local oil regulations is the City of Santa Paula Municipal Code No. 5.40, *Santa Paula Oil Code*. The following is a brief overview of the procedures required to drill and abandon oil wells.

Permits. A permit from the County of Ventura must be obtained for drilling a new well or re-entering a well previously abandoned, prior to commencing said operation within the planning area.

Well Spacing. No well shall be located within 1090 feet of any building used for human occupancy, nor shall any such building be erected within 100 feet of any well not abandoned, except buildings incidental to the operation of the well. According to the City of Santa Paula Municipal Code Section 5.40.070, well location shall be in accordance with the requirements of the state and the zoning ordinance of the City.

Storage Tanks. Tanks shall be constructed and maintained so as to prevent leakage. Diversion walls or drains safely directing any escape of fluids to catchment basins, to impounding basins formed by impervious dikes around tanks or groups of tanks, or combinations thereof, shall be constructed. The net capacity of a catchment basin or dike impounding basin, shall be equal to the capacity of the largest tank, plus six inches of freeboard.

Any new crude petroleum storage facilities, incidental to a producing well, shall not exceed a storage capacity of 2,000 barrels per well. The minimum distances between aboveground tanks for storing flammable liquids other than crude petroleum, and for storing crude petroleum, to the line of adjoining property which may be built upon are specified in the City of Santa Paula Municipal Code Section 5.40.130.

Fire Prevention. The Uniform Fire Code and the City of Santa Paula Fire Code applies to all aspects of oil well operations. This includes, but is not limited to, no smoking within 50 feet of any well, tank, or area where hydrocarbons are present. The City of Santa Paula Fire Department should be notified when an oil drilling permit has been filed. The code requires that a minimum of two fire extinguishers be maintained at all oil well locations where drilling, servicing, or repair work is being conducted.

Abandonment Procedures. Abandonment of oil wells shall include the following procedures:

1. *A copy of the Division of Oil and Gas "Notice of Intention to Abandon" furnished by the Division of Oil and Gas is mailed to the City;*
2. *The well has been abandoned in accordance with the requirements of the Division of Oil and Gas;*
3. *The site has been cleared of all drilling or producing equipment and left in a clean condition, which shall include draining and backfilling of any sump used in connection with the well and removal of concrete, pipe and other foreign materials from the surface of the ground, and the surface of the land, insofar as practicable, left in a neat and orderly condition; and*

4. *The City shall have inspected and certified in writing that such well has been properly abandoned in accordance with the provisions of the Santa Paula Municipal Code, Chapter 5, Section 5.40.080.*

Hazardous Conditions. In the event that the City of Santa Paula and/or the State Supervisor of Oil, Gas and Geothermal Resources determines at any time that any well heretofore or hereafter drilled, or other operations covered by the ordinances, is endangering any fresh water body or strata, or that any oil field construction, improvement, or operation constitutes a safety hazard, or a substantial nuisance to the public, the City of Santa Paula and/or the State Supervisor of Oil, Gas and Geothermal Resources shall have the right to compel the operator to make such modifications as may be required to correct such condition.

Equipment and appurtenances hazardous to life or limb shall either be attended 24 hours a day, or enclosed, in all inhabited, urban, or common places of public use areas where there is a reasonable likelihood of potential danger to persons. Perimeter enclosures shall conform to the fencing requirements satisfactory to the City of Santa Paula. There shall be at least one gate which is of sufficient width to give access to fire vehicles. The gate shall be locked at all times when the property is unattended and a key or combination shall be made available to the City of Santa Paula.

Sumps. Most oil wells had associated oil sump areas where waste fluids and oil were deposited. In the past, these oil sumps were buried and not removed. Placement of structures over these areas could force the oil and waste fluids to the surface and will also contaminate the soil. As part of the discretionary review process, the City should require a Phase I Environmental Site Assessment for all properties that have the potential to contain an oil sump as defined as follows:

- *All sites that contain an existing or abandoned oil well;*
- *All sites within the area of known oil drilling operations as shown on the State of California Division of Oil, Gas and Geothermal Resources Maps.*

However, if a clearance letter from the State of California Division of Oil, Gas and Geothermal Resources and/or the State Regional Water Quality Control Board is provided, a Phase I Environmental Site Assessment should not be necessary unless further evidence of soil contamination is discovered.

The Phase I Environmental Site Assessment shall contain, at minimum, a description of the study area, a past and present land use analysis, and the general field observations of the site to determine the level of contamination on the site. If the Phase I Environmental Site Assessment indicates a presence of soil contamination or oil sumps, detailed soil testing should be conducted and a report should be prepared that identifies the extent of the contamination and the appropriate remediation techniques. The soils report shall be submitted prior to acceptance of applications as complete applications.
The City should require that all oil sumps or contaminated soil that is discovered be remediated in accordance with State and County procedures. The State Regional Water Quality Control Board has the primary responsibility for overseeing the remediation process.

Previous Operations. Prior to the enactment of the City of Santa Paula Municipal Code Section 5.40.080 in 1981, oil wells and associated facilities and sumps may not have been abandoned in accordance with current regulations. Improperly abandoned wells, improperly abandoned facilities, and improperly abandoned oil sumps all are potential sources of safety hazards.

CRITICAL FACILITIES

New hospitals are required to undergo stringent design and construction standards in conformance with the Hospital Act of 1972. This legislation was enacted following the 1971 San Fernando Earthquake of Southern California in which several hospitals in the vicinity of the epicenter were seriously damaged and unable to continue functioning during a critical period. These newer standards are considerably more stringent than standards in place prior to 1972.

LIFELINE FACILITIES

Electrical. The City of Santa Paula is supplied electrical power by Southern California Edison. Substations are the most vulnerable component of the electrical power delivery system. Transformers, switches, circuit breakers, control equipment, and high-voltage porcelain insulators are especially susceptible to high-frequency ground motions which can be generated in earthquakes. A substation can be disabled by seismic intensities as low as VII (Toppozada, 1988).

If damaged during an earthquake, sections of the City may be without power. Critical facilities such as hospitals, the Police Station and Fire Stations can function on backup generators. If only limited electrical service can be restored following a disaster, these facilities should be given priority.

Lack of electrical power can also impair designated evacuation centers, communication facilities, and water distribution systems. Evacuation centers that will most likely be used during a disaster and emergency communication facilities should be equipped with backup power systems. Much of the water supplied to the City of Santa Paula and to fire hydrants is pumped electrically from groundwater wells. A backup power source for groundwater pumps, or gravity-fed water distribution systems, should be incorporated into City-wide, fire suppression emergency programs.

Natural Gas and Oil. Natural gas is supplied to the City by Southern California Gas Company through major distribution lines (6" to 12"). Numerous crude oil pipelines traverse the Santa Paula planning area and within the City limits. The pipelines in the northern planning area are operated by Unocal, those within the City limits are operated by Unocal, Shell, Texaco, and Four Corners Pipe Line Company, and those in the southern portion of the planning area are operated by Unocal, Shell, and Texaco. Crude oil pipelines are typically buried within the upper 5 feet and are equipped with emergency shut off valves. These pipelines could potentially be damaged in an earthquake, resulting in disruption of service and contamination of surface waterways, soil, and underlying groundwater.

Water. The City of Santa Paula supplies water to the City through the pumping of groundwater from the Santa Paula Groundwater Basin. The groundwater is pumped

electrically to water tanks and fed by gravity to the City for municipal supply. There are also private groundwater wells utilized for agriculture and domestic supply.

Water distribution lines could be damaged in an earthquake as a result of liquefaction. Breaks in water distribution pipelines could result in disruption of service, loss of pressure, and localized flooding and associated impacts (erosion, sinkholes, etc.). A lack of adequate water pressure could result in inadequate flow for fire suppression. In addition, if electrical service was terminated due to an earthquake, the electrically-operated pumps in the groundwater wells would not operate. The issue of an electrical outage is discussed in the electricity section above. Additional information pertaining to fire suppression is provided in the technical background in the appendix of this document.

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