Purpose

State law requires "... 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, ... dam failure; slope instability leading to mudslides and landslides, subsidence, liquefaction and other seismic hazards identified pursuant to Chapter 7.8 of the Public Resources Code and other geologic hazards known to the legislative body; flooding; and wild land and urban fires... "

Relationship to Other Elements

Issues related to the storage, handling and transportation of hazardous goods are addressed in Section 4.8: Waste Management and Recycling.

5.1 Seismic and Geologic Hazards

The Hillside Area is located in the foothills of the Diablo Range and consists of a series of parallel hills and valleys oriented generally northwest/southeast. The rounded hills in the western portion of the Hillside Area form a band about one mile wide with a maximum elevation of about 1,270 feet. Spring Valley, in the central portion of the Area, is roughly one-quarter mile wide and two and a half miles long. The central portion of the valley is relatively flat and has an elevation of about 600 feet. Along the eastern boundary of the Hillside Area rise the steep western slopes of Los Buellis Hills, where the elevation ranges from roughly 800 feet to 2,337 feet at Monument Peak in the north.

Background information in this section is extracted from *Geotechnical Hazards Evaluation, City of Milpitas* (1987). The report is based on compilation of published geologic and soils maps, data from unpublished geotechnical reports, and interpretation of stereoscopic aerial photographs. No new field mapping was performed for the study. Figure 5-1 summarizes geotechnical hazards in the Planning Area.

Hillside Area

Most of the Hillside Area is underlain by relatively hard, shallow, fractured bedrock. Softer bedrock underlies the western margin of the Hillside Area. Most of the ridges are mantled by thin residual soil which forms in-place as the bedrock weathers. The slopes and small valleys are blanketed by organic-material rich colluvial soil, which has moved downslope and accumulated on lower slopes and in canyon bottoms.

LANDSLIDES

Many large landslide deposits are present in the foothills. Although the largest landslides are tens of thousands of years old, portions of many of the landslides have reactivated. Large, deep landslides generally involve unstable bedrock as well as soil. These slides can be deeper than 100 feet. Small, shallow landslides generally involve only soil and weathered bedrock. Some of the steep slopes in the hills are susceptible to recurring debris flows, which are shallow, rapid landslides that often travel many hundreds of feet and impact areas well below the unstable hillsides on which they originate.

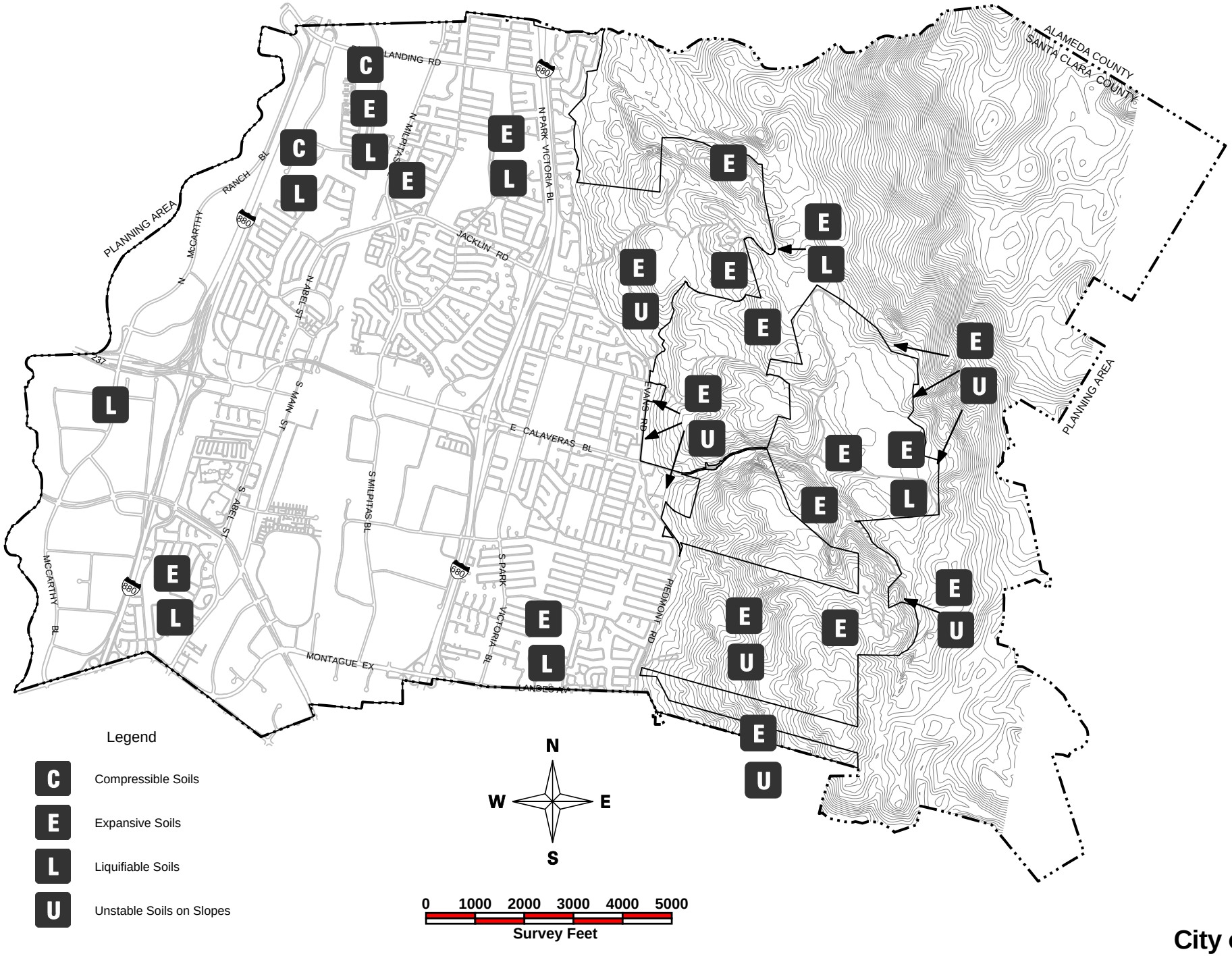
Unstable soils on slopes are mapped in Figure 5-1.

GEOLOGY AND SOILS

All of the bedrock formations produce colluvial soil, which may be as thick as 15 feet in valley bottoms. Sandstone and shale of Cretaceous age underlies the west-central portion of the Hillside Area west of Spring Valley. Much of the shale is highly susceptible to landsliding. Residual soils are generally silty and sandy clay, less than 2 feet thick, and highly expansive.

Source: Geotechnical Hazards Evaluation, City of Milpitas, 1987

Geotechnical Hazards
Figure 5-1



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The Monterey Shale of Miocene age underlies the central portion of the foothills west of Spring Valley. Unweathered bedrock may be difficult to excavate. Residual soils are generally clayey, less than two feet thick, and highly expansive.

The Briones Sandstone of upper Miocene age underlies the eastern portion of the foothills west of Spring Valley. The formation includes siltstone as well as sandstone and is locally fossiliferous. Fossiliferous beds may also be difficult to excavate. Residual soils are generally clayey, less than two feet thick, and expansive.

The Orinda Formation of Pliocene age underlies the foothills around Spring Valley and includes conglomerate, sandstone, siltstone, and claystone. The Orinda Formation, especially the claystone, is highly susceptible to landsliding. The conglomerates may be difficult to excavate. The residual soils are generally silty clay, four to six feet thick, and highly expansive.

The Santa Clara Formation of Plio-Pleistocene age underlies the western margin of the foothills. It consists of soft conglomerate sandstone, siltstone, and claystone that weather rapidly and are highly erodible and highly susceptible to landsliding. Residual soils are generally clayey, five to six feet thick, and highly expansive.

Valley Floor

The relatively flat, urbanized Valley Floor is underlain by alluvial soil of Quaternary age. This soil consists of interlayered, poorly sorted gravel, sand, silt, and clay deposited by water. The thickness of the alluvial soil increases westward from zero at the base of the hills to 1,000 feet or more at the western edge of the City.

The alluvial soil in Milpitas was deposited in and adjacent to stream channels, in low-lying basins between streams, and on the floor of the Bay when the shoreline was east of its present position. The composition and consistency of alluvial soils varies laterally and vertically over small distances and depths.

Most of the alluvial soil in Milpitas is expansive and susceptible to liquefaction, and alluvial areas along creeks may be susceptible to lateral spreading. Local areas have compressible soils, poorly drained soils, shallow ground water, or are susceptible to lateral spreading. Because soil composition varies vertically as well as laterally, several soil types may underlie a particular site.

Faulting and Seismicity

The Hayward fault trends northwestward through the western portion of the Milpitas foothills (see Figure 5-2). The Calaveras fault trends northwestward through Calaveras Reservoir, approximately 1-1/2 miles northeast of the eastern edge of the City. The San Andreas fault trends northwestward through the Santa Cruz Mountains approximately 13 miles southwest of Milpitas. All of these faults are active and have produced damaging earthquakes in the historic past. Other active and potentially active faults are present in the Bay Area and may produce earthquakes of significance to Milpitas.

Earthquake hazards consist of hazards produced by surface fault rupture, and hazards produced by ground shaking. Only the Hayward fault zone is located within Milpitas and capable of producing surface fault rupture in the City. Large earthquakes on the Hayward, Calaveras, and San Andreas faults could produce ground shaking sufficient to cause extensive damage in Milpitas. Large earthquakes on other faults may also produce significant ground shaking in the City. Table 5-1 lists each of the three major active faults, its closest approach to the City of Milpitas, and the Richter magnitude of the maximum credible earthquake it might generate.

Table 5-1

Distance to Major Active Faults

Fault	Distance To Nearest Part Of Milpitas (Miles)	Maximum Credible Earthquake (Richter Magnitude)
Hayward	runs through Milpitas	7.7
Calaveras	1-1/2	7.7
San Andreas	13	8.3

Source: *Geotechnical Hazards Evaluation*, City of Milpitas, 1987

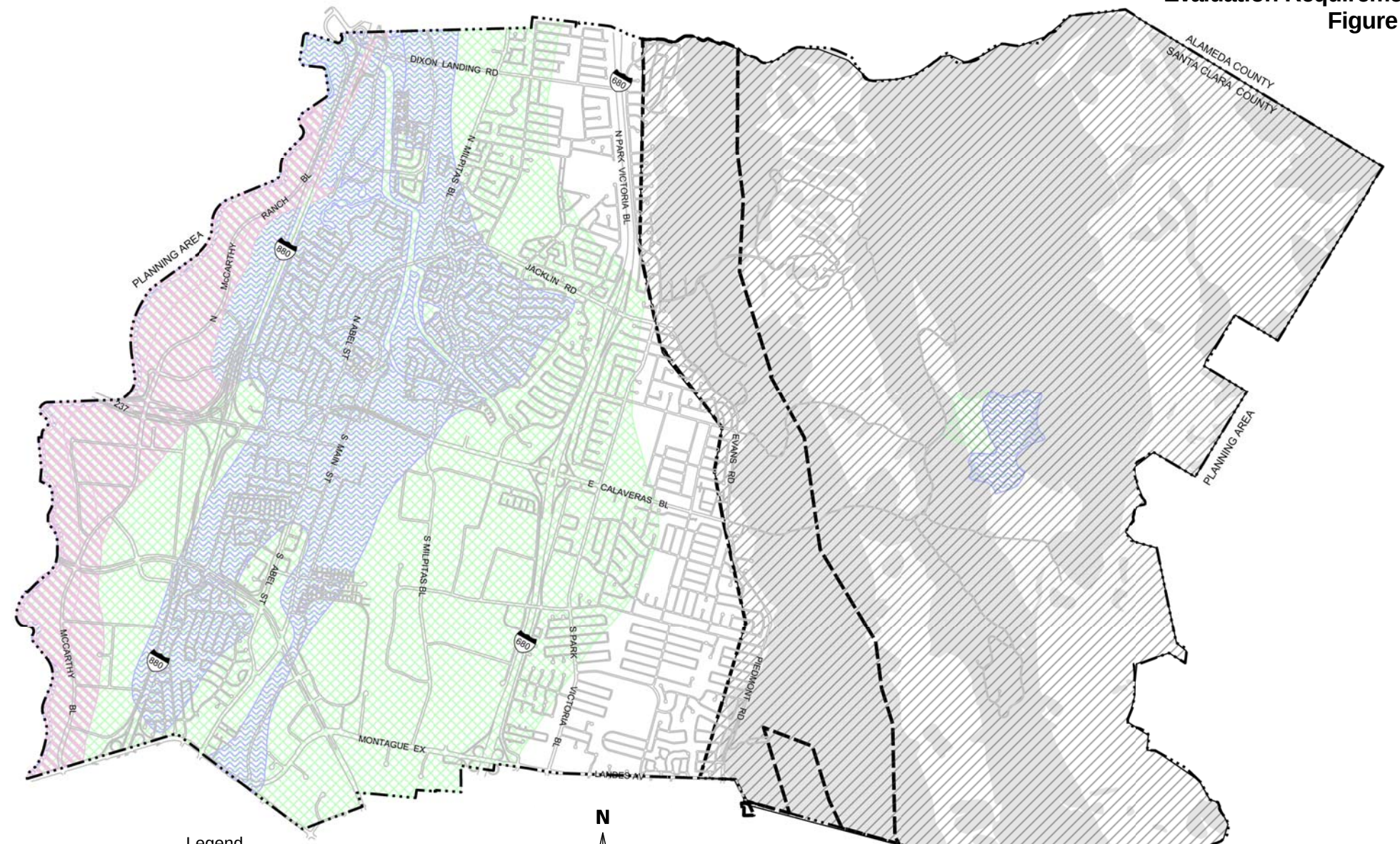
Surface Fault Rupture. As previously stated, the Hayward fault zone passes through the western part of the Milpitas Hillside Area. The fault zone extends from San Pablo Bay to San Jose. In 1836 and 1868 the Hayward fault produced earthquakes with estimated Richter magnitudes of 7.0 and 6.9. The surface rupture of the 1868 earthquake extended from San Leandro to the Warm Springs district of Fremont, a distance of about 29 miles. Portions of the Hayward fault exhibit slow, relatively continuous surface fault creep not associated with earthquakes. The Hayward fault is not known to be creeping in Milpitas.

Ground Shaking. The intensely of ground shaking depends on factors such as earthquake magnitude, distance to the causative fault, depth to bedrock, physical characteristics of underlying soil and bedrock, and local topography. Maximum bedrock accelerations for the Milpitas area are expected to exceed 0.5g, half the acceleration of gravity. Maximum earthquake intensities expected in the City for large earthquakes on the Hayward fault range from "very violent" to "very strong". Earthquake hazards produced by ground shaking include damage to structures, and secondary ground failures.

Ground shaking that accompanied the 1868 earthquake on the Hayward fault and the 1906 earthquake on the San Andreas fault caused ground failures along Coyote Creek in Milpitas. Modes of ground failure included ground settlement, lateral spreading, and failures of stream banks. Large historic earthquakes have also produced landslides on hillsides in the region.

Source: California Geological Survey, 2005 and Santa Clara County Planning Department

Seismic and Geotechnical Evaluation Requirements
Figure 5-2



Legend

- Geotechnical Studies required prior to project approval
- Liquefaction - Very Highly Prone
- Liquefaction - Highly Prone
- Liquefaction - Prone
- Alquist Priolo Zone
- Landslide Hazard

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Alquist-Priolo Special Studies Zone. The Alquist-Priolo Special Studies Zone Act went into effect in 1973 and has been amended several times since. The purpose of the Act is to prohibit the location of most structures for human occupancy across the traces of active faults and to thereby mitigate the hazard of fault rupture. Under the Act, the state Division of Mines and Geology is required to delineate Special Studies Zones along active faults in California, and jurisdictions containing these zones must then regulate certain types of development within the zones.

Figure 5-2 shows the state-defined Special Studies Zone for Milpitas and requirements for undertaking studies prior to development.

5.2 Drainage, Flooding and Dam Inundation

Drainage

The Planning Area extends northeastward from Coyote Creek near the Bay into the Diablo Range. The base of the foothills of the Range trends northwestward and marks the northeastern edge of the urbanized part of the Planning Area. Near the eastern City limit, the rolling foothills are interrupted by a broad, northwest tending intermontane valley known as Spring Valley. Elevations in the Planning Area range from sea level near Coyote Creek to approximately 2,400 feet in the northeastern corner, near Monument Peak. Natural slope gradients range from nearly level near the Bay to approximately 1.5:1 (horizontal to vertical) on the steeper hillsides.

Drainage in Milpitas is generally westward. Six intermittent streams (Scott, Calera, Tularcitos, Piedmont, and Berryessa creeks, and Arroyo de los Coches) flow out of the foothills and across the flatlands. In the western part of the City, Lower Penetencia and Coyote creeks carry water from these streams northward into the Bay. The perennial Coyote Creek originates approximately 30 miles southeast of Milpitas. Most of the intermittent streams have been channelized through the Valley Floor.

In the Valley Floor, water seeps into unlined streambeds and recharges the ground water supply. In some parts of the flatlands, the ground water table is near the ground surface during the rainy season.

Storm Water Collection and Disposal. The City collects and disposes its storm water via a storm drainage network consisting of catch basins, conveyance piping, pump stations, and outfalls to creeks. The City has 123 miles of storm pipe, 3,000 catch basins, approximately 4 miles of drainage ditches and creeks, and storm water pump stations. Storm water collection efforts are guided by the Floodplain Management Plan, which is a compilation of different management sources, and is designed to be a flexible and growing instrument.

Flooding

Milpitas is located within the East Zone of the Flood Control benefit Assessment District, the proceeds of which go to the Santa Clara Valley Water District to provide maintenance and an increased level of flood protection by accelerating construction projects throughout the County, some of which are in Milpitas.

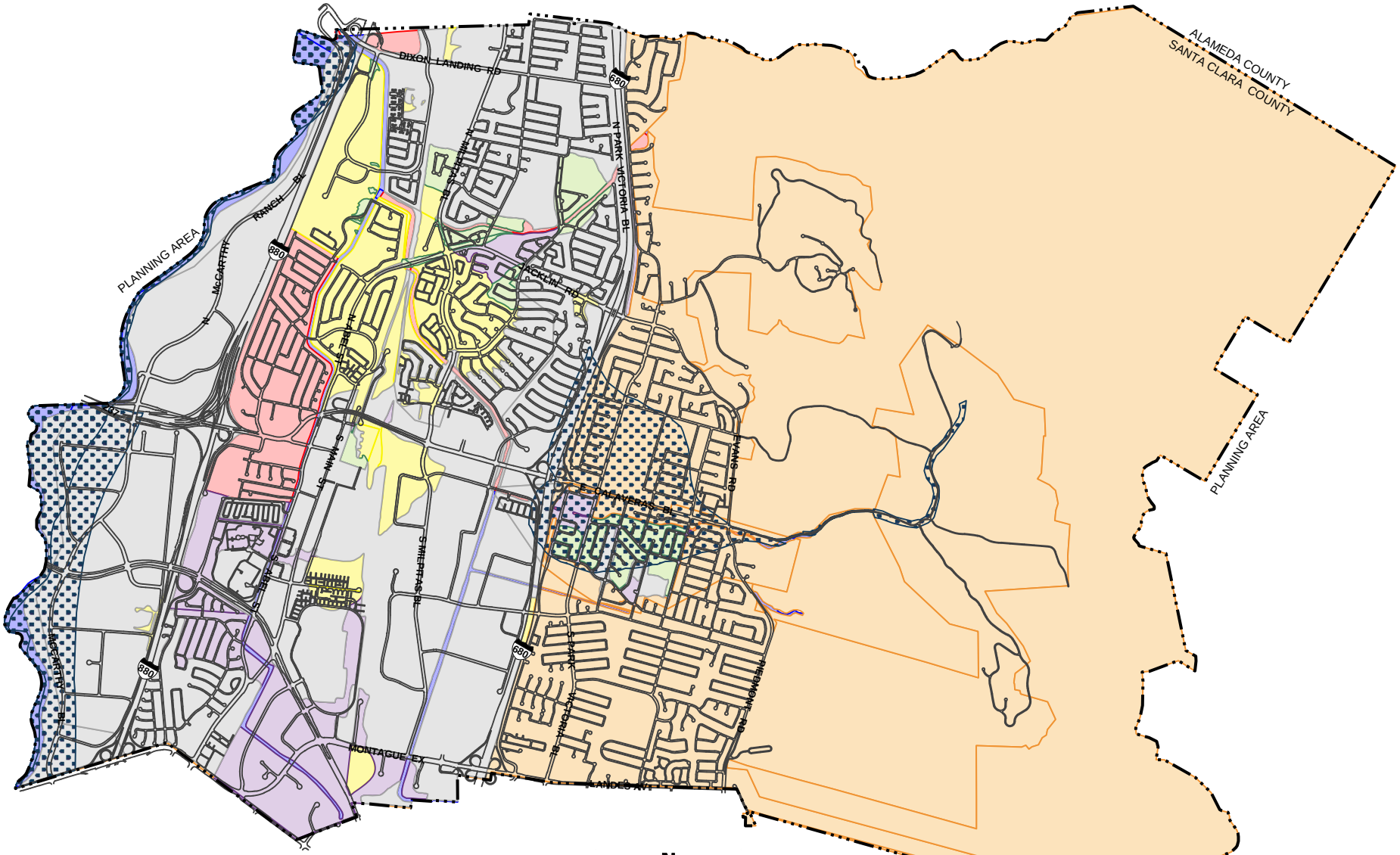
About half of the Planning Area Valley Floor lies within one of the Special Flood Hazard Areas (see Figure 5-3). Almost all land west of the Southern Pacific Railroad lies within the 100-year Flood Zone and all land west of Highway 680 is part of the 500-year Flood Zone.

Flood control in the Planning Area is provided by a variety of federal, state, and local agencies. The general purposes of these agencies are to identify potential flood issues and

Source: FEMA 2009 and Santa Clara County Planning Department

Flooding and Dam Inundation

Figure 5-3



Legend

- Dam Inundation
- Zone X (Other Flood Area) - 0.2% annual chance of flooding
- Zone X (Other Areas) - 0.2 annual chance of flooding.
- Zone D - Not analyzed for flooding hazards. Possible but undetermined.
- Zone AO - Shallow flooding; 1-3 ft usually as sheet flow from a stream flood.
- Zone AH - Shallow flooding; 1-3 ft. usually as ponding areas.
- Zone AE - Areas which base flood elevations have been determined.
- Zone A - Areas for which no base flood elevation has been determined.

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hazard areas, and devise preventative programs, policies, or structures to avoid or minimize flood destruction. Agencies besides the City that are responsible for flood control include:

U.S. Army Corps of Engineers (ACOE). The ACOE identifies the need for, and constructs major flood control facilities. The ACOE also develops flood and dam inundation maps and reports.

Federal Emergency Management Agency (FEMA). FEMA manages the National Flood Insurance Program, providing insurance to the public in communities which participate in the program. FEMA is the main federal government agency contact during natural disasters and is a regulating agency for water quality control. FEMA publishes the Federal Insurance Rating Maps (FIRM), which identifies the extent of flood potential in flood prone communities. FIRMs are based on a 100-year flood (or base flood) event.

Federal Insurance Administration. The Federal Insurance Administration is the primary agency which delineates potential flood hazard areas and floodways through the FIRMs and the Flood Boundary and Floodway Map.

Dam Inundation

State law requires local governments to assess the potential impacts that dam failures may have on their jurisdiction. According to the state Office of Emergency Services for Santa Clara County, parts of the City along the Calaveras Road area east of I-680 could be inundated by failure of the 38-foot high Sandy Wool Lake Dam, located in Ed Levine Park (see Figure 5-3). The area could be inundated in as soon as 15 minutes from the time of dam failure, affecting a population of about 4,900. The Office of Emergency Services maintains an evacuation plan in the unlikely event that a failure of the dam were to occur.

5.3 Fire Safety

Milpitas Fire Department

The Milpitas Fire Department (MFD) provides fire protection services for the 13.2 square-mile incorporated portion of the Planning Area. The City maintains mutual aid agreements with the area municipal and County fire departments through the Santa Clara County Local Mutual Aid Plan, and also with the California Department of Forestry and Fire Protection. The City is also party to the statewide mutual aid agreement.

The average response time to code 3 emergencies in the City was about 4.2 minutes during 2010/2011. The City's Insurance Services Office (ISO) rating is 3 on a scale of 1 to 10 (with 1 being the best).

Stations. The City staffs and operates four stations: on Curtis Avenue, Yosemite Drive, Midwick Drive, and Barber Lane. While expansion of facilities and seismic upgrading at some stations is being planned, there are no plans to add new stations[1].

Wildland Fires

During summer, and in prolonged periods without rainfall, grasses, trees and other vegetation in the Planning Area become extremely dry and act as potential fuel for fires. The grasses on the hillsides are light fuel vegetation, which in the event of a fire burn quickly. Fire protection for the hillsides is primarily provided by the California Department of Forestry and the Spring Valley voluntary Fire Department. The City provides assistance for the hillside as needed on the basis of a mutual agreement.

Weed Abatement Program. The MFD maintains a weed abatement program. Each year, between May and August, department personnel survey non-developed properties in the City and notify owners of the need to remove vegetation and trash.

5.4 Emergency Management

See also section 5.2 for emergencies related to dam inundation.

The City maintains an emergency plan to deal with natural or man-made disasters. The objectives of the Plan are to prepare for and facilitate coordinated and effective responses to emergencies within the City and to provide assistance to other jurisdictions as needed. The Plan specifies actions for the coordination of operations, management and resources, and responsibilities of the different departments and governmental agencies during emergency events. Evacuation routes are to be determined as appropriate depending on the nature of the emergency.

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[1] Milpitas Fire Department, September 1993.

The City Manger serves as the Director of Emergency Services; a state of emergency can be declared by the Director or the City Council. The City Emergency Operating Center is located in the City Police Station, 1275 North Milpitas Boulevard.

The California Mutual Aid Agreement calls for a shared response to an emergency from adjacent or area jurisdictions when an affected jurisdiction cannot provide service by itself. Disaster assistance from federal agencies is also available when needed to supplement, but not substitute, local civil operations.

Hazardous Materials Spill. In the event of a hazardous materials emergency several agencies are responsible for timely response, depending on the extent, and type of the incident. The Santa Clara County Hazardous Materials Response Team composed of representatives of the Santa Clara County Fire Department, California Department of Forestry, and member cities responds to large scale, emergency hazardous material incidents within the Planning Area. The Milpitas Fire Department is responsible for non-emergency hazardous materials reports within the City. If and when these non-emergency incidents become a threat to groundwater supplies, the Regional Water Quality Control Board takes control of the case. The Fire Department also monitors above ground and underground storage tanks and combustible and flammable liquids for leaks and spills.

5.5 Seismic/Safety Principles and Policies

a. Seismic and Geologic Hazards

Guiding Principle

5.a-G-1 Minimize threat to life and property from seismic and geologic hazards.

Implementing Policies

5.a-I-1 Require all projects within the Alquist-Priolo Special Studies Zone to have geologic investigations performed to determine the locations of active fault traces before structures for human occupancy are built.

5.a-I-2 Require applications of all projects in the Hillside Area and the Special Studies Zone to be accompanied by geotechnical reports ensuring safety from seismic and geologic hazards.

5.a-I-3 Require projects to comply with the guidelines prescribed in the City's *Geotechnical Hazards Evaluation* manual.

b. Drainage and Flooding

Guiding Principle

5.b-G-1 Minimize threat to life and property from flooding and dam inundation.

Implementing Policies

5.b-I-1 Ensure that new construction or substantial improvements to any existing structure result in adequate protection from flood hazards. This includes ensuring that:

- New residential development within the 100-year Flood Zone locate the lowest floor, including basement, above the base flood elevation; and
- New non-residential development locate the lowest floor, including basement, above the base flood elevation or incorporate flood-proofing and structural requirements as spelled out in the Municipal Code.

Criteria for protection from the 100-year flood hazard is spelled out in Title XI Chapter 15 of the Municipal Code.

5.b-I-2 Require all structures located within the 100-year Flood Zone to provide proof of flood insurance at the time of sale or transfer of title.

5.b-I-3 Ensure that encroachment into designated floodways does not result in any increase in flooding hazards.

5.b-I-4 Continue working with the Office of Emergency Services to update and maintain the Sandy Wool Lake Dam failure evacuation plan.

5.b-I-5 Seek construction of flood control channels to withstand 100-year floods along Coyote, Penitencia, Berryessa, Scott, Calera, and Los Coches creeks.

c. Fire Safety

Guiding Principle

5.c-G-1 Provide high quality, effective and efficient fire protection services for the Milpitas area residents.

Implementing Policies

5.c-I-1 Maintain a response time of four minutes or less for all urban service areas.

5.c-I-2 Maintain mutual aid agreements with other agencies in the County.

5.c-I-3 Require automatic fire sprinklers for all new development in the Hillside Area that is not within 1.5 miles of an existing or planned fire station, and fire-resistive construction and compliance with California high-rise building requirement for buildings over three stories in height.

d. Emergency Management

Guiding Principle

5.d-G-1 Use the City's Emergency Management Plan as the guide for emergency management in the Planning Area.

Implementing Policies

5.d-I-1 Maintain and upgrade the Emergency Management Plan as necessary.

5.d-I-2 Design critical public facilities to remain operational during emergencies.