Chapter IV.

ENVIRONMENTAL HAZARDS

GEOTECHNICAL ELEMENT

PURPOSE

The Geotechnical Element is intended to provide information about the geological and seismic conditions and hazards that affect the Town of Apple Valley and its Sphere-of-Influence. This element establishes a series of goals, policies, and programs that focus on reducing potential impacts, such as loss of life and property damage, associated with seismic and geologic hazards. These goals, policies, and programs also provide for the protection of the general health and welfare of the community The Element and associated maps and other supporting document will serve as a source of foundational information concerning regional geotechnical hazards and thereby provide for the establishment of future land use policies and decisions.

BACKGROUND

The Geotechnical Element considers the physical characteristics of the planning area and the safety of the community, and is therefore closely related to a number of other elements within the General Plan. These include Land Use, Circulation, Housing, Public Buildings and Facilities, Emergency Preparedness, and Police and Fire Protection. In addition, the Geotechnical Element directly relates to many issues discussed in the Water, Sewer and Utilities Element and the Flooding and Hydrology Element.

California Government Code and Public Resources Code requires that a General Plan include an element that addresses seismic safety issues. To comply with these requirements, as set forth in Government Code Section 65302(g), the General Plan must address the need to protect the community from unreasonable risks that could result from seismically induced hazards, such as surface rupture, groundshaking, ground failure, seiching, dam failure, subsidence, and other known geologic risks. Government Code Section 65303 also allows the General Plan to address other subjects related to the physical development of the community, and the Geotechnical Element contributes towards addressing these issues. The Town and all other jurisdictions located within the most severe seismic shaking zone, designated as Zone 4 (as established in Chapter 2-23, Part 2, Title 24 of the Administrative Code), are required to identify all potentially hazardous or substandard buildings and implement a program for the mitigation of these structures. This requirement is mandated and programmed in Government Code Section 8876.

A technical background study[1] was prepared to assess existing conditions and potential future conditions at build out of the proposed General Plan. This report is referenced herein and is included in its entirety as an appendix to the General Plan EIR.

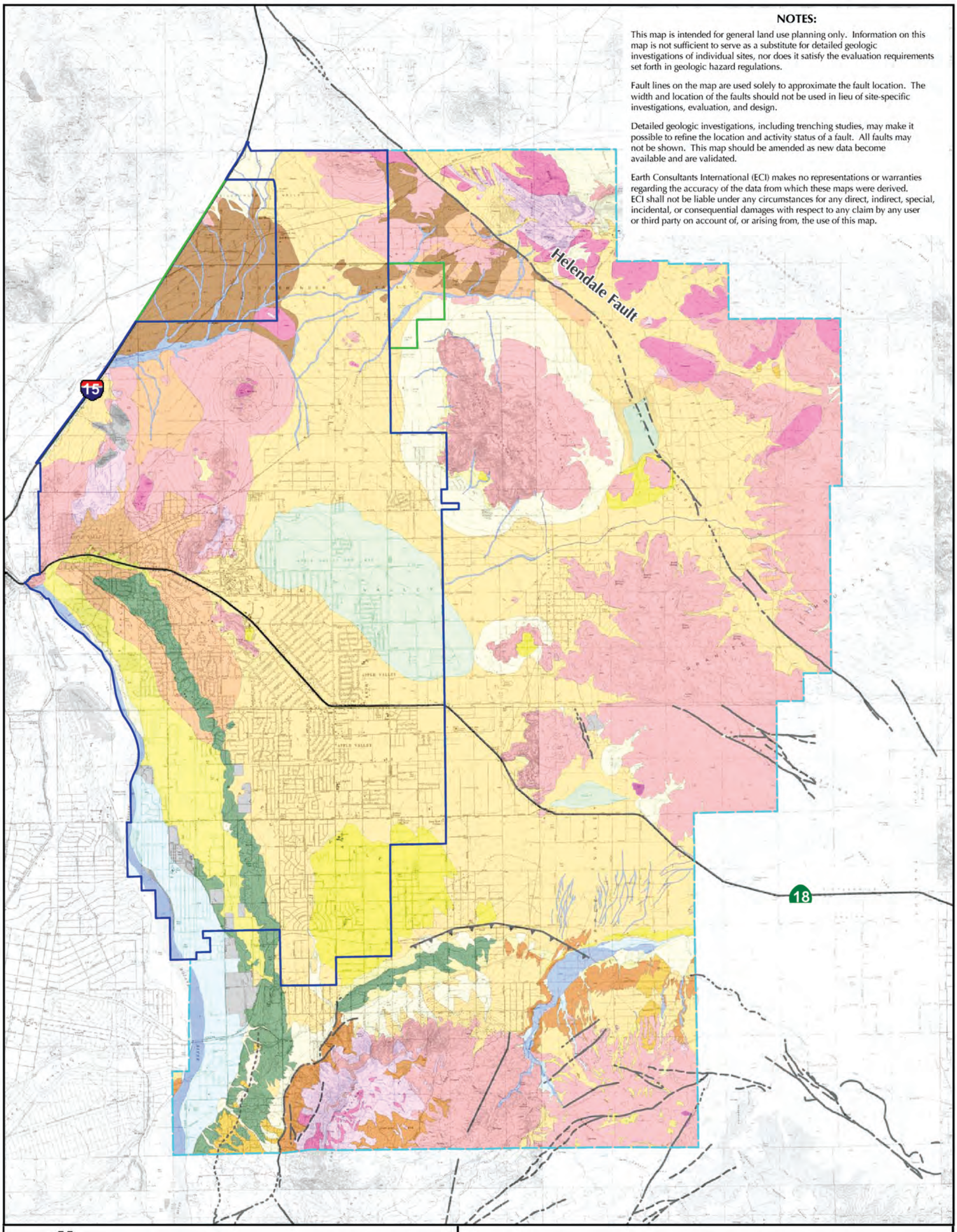
[1] "Technical Background Report to the Safety Element of the Apple Valley General Plan," prepared by Earth Consultants International, October 2007.

GEOLOGIC CONDITIONS IN THE PLANNING AREA

The Town of Apple Valley is generally bounded by the Turtle Mountains on the north, the Fairview Mountains and Granite Mountains on the east and the Ord Mountains on the south. The majority of Apple Valley is situated on gently sloping alluvial fans ranging in elevation from approximately 3,400 feet near the base of the Fairview Mountains to the northeast to 2,700 feet along the Mojave River to the west. Notable geologic formations within the Town include Bell Mountain at 3,897 feet and Catholic Hill at 3,645 feet. One of the most prominent features in the area is the Mojave River, a wide floodplain that generally defines Apple Valley's western boundary.

The geological character of Apple Valley and the surrounding region has been formed by its proximity to large active fault systems, including the Helendale Fault, San Andreas Fault, and the North Frontal Fault. Fault activity in this region continues to result in ground rupture, major groundshaking, subsidence, uplift and mountain building, landform compression and extension. As a result, the mountains are composed of rocks that have been sheared and intensely fractured under the strain of tectonic movement. The valley is formed by many generations of overlapping alluvial fans, the various ages of which coincide with the rise of the local mountains.

The following section describes the general physical and engineering characteristics, from youngest to oldest, of the six types of geologic deposits that underlie the Apple Valley planning area. These consist of: artificial fill, very young or recent alluvium (current or recently active), young alluvial and landslide deposits (0 to 11,000 years old), older alluvial fan deposits (11,000 to 1 million years old), sedimentary rocks (10 to 26 million years old), and crystalline rocks (65 to 225 million years old). Exhibits IV-1 and IV-1A illustrate the soil types in the Apple Valley study area.



NOTES:

This map is intended for general land use planning only. Information on this map is not sufficient to serve as a substitute for detailed geologic investigations of individual sites, nor does it satisfy the evaluation requirements set forth in geologic hazard regulations.

Fault lines on the map are used solely to approximate the fault location. The width and location of the faults should not be used in lieu of site-specific investigations, evaluation, and design.

Detailed geologic investigations, including trenching studies, may make it possible to refine the location and activity status of a fault. All faults may not be shown. This map should be amended as new data become available and are validated.

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Scale: 1:108,000

For Geologic Unit Descriptions See Exhibit IV-1A

Base Map: USGS Topographic Map from Sure!MAPS RASTER, 1997.
Sources: Morton and Miller, 2003; Dibblee, 1960; and CGS, 2007.

Source: Earth Consultants International, December 2008

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Apple Valley General Plan
Geological Units in Apple Valley Area
Apple Valley, California

Exhibit
IV-1

Symbols

Fault; solid where location known, dashed where approximate, dotted where concealed. (For more information on faults refer to Exhibit IV-1)

Geologic Contact

Apple Valley City Boundary

Apple Valley Sphere of Influence

Apple Valley Annexed Areas

Geologic Unit Descriptions

Very Young Deposits

Qaf Artificial Fill/ Disturbed Ground- Mainly larger fills and graded areas or mining operations. Many smaller areas, inluding both engineered and non-engineered fills, are present, but not shown.

Qw Very Young Wash Deposits- Unconsolidated sand, gravel, cobbles, and boulders in the Mojave River and active washes. Late Holocene.

Qf Very Young Alluvial Fan Deposits- Unconsolidated silt, sand, and gravel on active and recently active fans. Late Holocene.

Qc Very Young Colluvium- Unconsolidated silt, sand, and gravel in drainage swales and along the toes of natural slopes. Late Holocene.

Qe Very Young to Young Eolian Deposits- Fine-grained sand and silt. Holocene to late Pleistocene.

Qp Very Young to Young Playa/ Dry Lake Deposits- Sand, silty to sandy clay, and clayey silt. Holocene to late Pleistocene.

Young Deposits

Qyw Young Wash Deposits- Unconsolidated to slightly consolidated silt, sand, and gravel along the margins of the Mojave River and within Arrastre Canyon. Holocene to late Pleistocene.

Qyf Young Alluvial Fan Deposits- Unconsolidated to moderately consolidated silt and sand; locally with gravel. Holocene to late Pleistocene.

Qya Young Alluvial Valley Deposits- Slightly to moderately consolidated silt, sand, and gravel. Holocene to late Pleistocene.

Qyls Landslide Deposits- Young landslides consisting of displaced bedrock blocks and/ or rubble. Holocene and late Pleistocene.

Older Deposits

Qof Old Alluvial Fan Deposits- Moderately well consolidated silt, sand, and gravel. May contain boulders near the base of the mountains. Late to middle Pleistocene.

Qoa Old Alluvial Valley Deposits- Weakly consolidated silt, sand, and gravel. Pleistocene.

Qvof Very Old Alluvial Fan Deposits- Moderately to well consolidated silt, sand, and gravel. Middle to early Pleistocene.

Qvoa Very Old Alluvial Valley Deposits- Moderately consolidated sand and gravel. Early Pleistocene to late Miocene (?).

Sedimentary Rocks

Tcr Crowder Formation- Sandstone, pebbly sandstone, and siltstone. Pliocene to Miocene.

Crystalline Rocks

Mzp Plutonic Rocks- Predominately monzonite, quartz monzonite, monzogranite, and syenogranite. Mesozoic.

Mzv Volcanic Rocks- Predominately rhyolite and dacite. Mesozoic.

Mzm Metasedimentary Rocks- Marble, schist, quartzite, and gneiss. Mesozoic.

Pzw Wood Canyon Formation- Highly deformed schist and quartzite. Paleozoic.

Source: Earth Consultants International, December 2008

Artificial Fill/Disturbed Ground
The planning area includes numerous deposits of man-made fills. Fills are related to roadway, bridge, and railway embankments, levees, and graded developments. Some of these deposits cover a substantial area, however the size, age and composition vary widely.

Very Young or Recent Alluvium (Map Symbols Qw, Qf, Qc, Qe, and Qp)
Within Apple Valley, very young wash deposits (Qw and Qf) are found in several settings. These include unconsolidated sediments that line active drainage courses, such as sand and gravel in the Mojave River; mixed sand, gravel, and boulders found in Arrastre Canyon in the southern Sphere of Influence, Desert Knolls Wash, Bell Mountain Wash; and within the many unnamed washes and silt, sand and gravel in the numerous unnamed gullies and washes that cross alluvial fans. Surface soils on these deposits are undeveloped, and are therefore subject to being re-worked by flooding or buried by new sediment during storms. In the upper reaches of the drainages, large boulders may be deposited during flooding; this condition is most likely to be found near the mountains.

Similar in character to Qf deposits, modern colluvium (Qc) may be found in hillside areas lining drainage deposits. In hillside areas, colluvium generally accumulates in the linings of drainage depressions and along the natural toes of slopes, resulting from slope wash and weathering of underlying soil units. Colluvial deposits are characteristically very large, unconsolidated, and may contain organic material.

Fine- to medium-grained sand and silt (Qe) wind-deposited soils are found throughout Apple Valley. Typically these deposits are thin and unconsolidated. The youngest deposits tend to form patches in the sheltered side of desert vegetation. North of the Ord Mountains is a somewhat older and relatively large deposit, containing a poorly developed drainage network controlled by understated dunes.

There are several dry lake areas in the planning area and vicinity, including the Apple Valley Dry Lake in Apple Valley, as well as a small playa south of the Granite Mountains, and Reeves Lake in Fairview Valley, and Apple Valley Dry Lake. These areas contain Playa deposits (Qp) that are primarily comprised of very fine-grained sediments such as silt and clay, but also include some fine- to medium-grained sand. These areas are flat-floored basins with no ouflow, and are therefore subject to future flooding and sediment deposition.

Young Alluvial and Landslide Deposits (Map Symbols Qyf, Qyw, Qya and Qyls)
Young alluvial fan deposits (Qyf) are those ranging from a few years old up to about 15,000 years in age, blanketing most of the valley with unconsolidated to moderately consolidated silt and sand with scattered gravel. Cobbles and boulders may be present in deposits in and near the mountains, and more deeply incised drainage channels may also occur.

Young wash deposits (Qyw), which typically have an age within the last 10,000 years, occur in the planning area and vicinity as unconsolidated sand and gravel along a slightly elevated terrace adjacent to the Mojave River and within Arrastre Canyon. In the latter, undeveloped area these soils tend to be more vegetated than within the very young deposits. Along the Mojave River,

where substantial development has occurred, this unit represents an older river floodplain. Along the river the lowest areas are somewhat protected by sand levees; nonetheless, localized flooding could occur during severe storm events, or in the event of catastrophic failure of one of the upstream dams.

Young alluvial valley fill (Qya) soils are within 15,000 years in age and are comprised of pale brown, slightly to moderately consolidated silt, sand, and gravel which has been incised by shallow to moderately deep drainages. In the planning area these soils form an elevated terrace above the Mojave River floodplain, as well as the relatively steep bluffs north of Yucca Loma Road.

Landslide deposits (Qyls) normally consist of blocks of intact bedrock and/or rubble. The graben area (upper part of the slide) is typically comprised of a mix of soil and bedrock fragments. There are two mapped landslide deposits, which are located in the western part of the Granite Mountains, in and near the far eastern portion of the Sphere of Influence.

Older Alluvial Fan Deposits (Map Symbols Qof, Qoa, Qvof and Qvoa)
There are older alluvial deposits (Qof and Qoa) in the planning area that occur as scattered remnants of erosion along the flanks of the Ord Mountains to the south, and in the Desert Knolls area. In the Black Mountain area, to the northeast, these deposits occur as isolated patches and they are generally elevated above younger fan deposits. This unit is weakly stratified and has moderate surficial soil development. These deposits range from about 11,000 to 500,000 years old, and are comprised of moderately well consolidated silt, sand and gravel, with boulders possible near the base of mountains.

Very old alluvial deposits (Qvof and Qvoa) consist primarily of silt, gravel, and medium- to coarse-grained sand. These soils are mid to early Pleistocene in age (about 500,000 to 1 million years old), and are moderately to well consolidated with a deeply dissected surface. Characteristically, such deposits may be roughly arranged in beds (layers of varying thickness and character), although these beds may give way to chaotic debris flows near the mountains. Mature soils are developed on the surface and may exhibit a reddish colored on the upper part of the deposit. In the planning area vicinity, there are very old alluvial deposits in a large area north of Bell Mountain Wash, as well as within isolated patches southwest of the Black Mountains and within the Ord Mountains (Juniper Flats and the lower mountainsides.).

In general, older alluvium may provide better structural support because it is more consolidated than young alluvium. Where clayey soils develop on the fan surface, however, they may be expansive. Stream erosion can over-steepen slopes, leading to slope instability.

Sedimentary Rocks (Map Symbol: Tcr)
Sedimentary rocks occur in narrow, exposed bands along the base of the Ord Mountains, and along the eastern side of the Mojave River. They include sandstone, pebbly sandstone, and conglomerate of the Miocene-age (10 to 26 million years old) Crowder Formation. This unit is pinkish-tan, pale gray, and pale brown in color. Because of their permeability, the presence of massive to planar bedding and cross-bedding, and the absence of well-developed potential slip planes, sedimentary rocks generally contribute to gross slope stability. However, they are highly

vulnerable to erosion and surface failure on natural slopes as well as on graded slopes comprised of granular materials.

Crystalline Rocks (Map Symbols: Mzp, Mzv, Mzm, Pzw)
Rocks that have crystallized from the igneous, or molten state, and rocks of sedimentary origin that have crystallized under extreme conditions deep below the earth's surface (metasedimentary), are included in this group. Where not highly weathered, these rocks are very hard, forming steep, rugged slopes and deep canyons. However, they are generally fractured, since they are brittle and have been subjected to millions of years of tectonic activity, and therefore are typically very fractured. As a result, they may be sheared near fault zones, a condition, which, along with jointing that is inherent in intrusive rocks, creates planes of weakness along which slope instability can occur. As noted above, however, there are only two small landslides mapped in the planning area vicinity, at the western edge of the Granite Mountains in the eastern Sphere of Influence.

Plutonic rocks (Mzp) are those that have solidified deep within the earth's crust. They are characterized by fine to coarse grains that are easily discernible by the human eye. These rocks tend to weather into rounded outcrops containing boulders. In the planning area and vicinity, including the Ord Mountains, Granite Mountains, Bell Mountain, and Catholic Hill, there are small patches of darker-colored rocks (horneblende diorite and gabbro).

Rocks that are solidified on the ground surface, such as from a lava flow, are volcanic (Mzv). These rocks cooled quickly and thus are very fined-grained. Volcanic rocks, classified as rhyolite or dacite, occur as small isolated patches forming jagged, blocky outcrops on Bell Mountain and Catholic Hill. Volcanic rocks occur in the Sidewinder and Black Mountains, northeast of the Helendale fault.

Metasedimentary rocks (Mzm) are pale gray to tan marble, schist, quartzite and gneiss. Rocks of Mesozoic-age (251 million years ago to 65 million years ago) occur in the western part of the Ord Mountains and as small patches in the hills north of the Desert Knolls area. The north and east sides of Catholic Hill are comprised of the oldest rocks in Apple Valley, and occur on the north and east sides of Catholic Hill. These formations consist of highly deformed schist and quartzite approximately 250 to 500 million years in age, including the Wood Canyon Formation (Pzw).

Geologic Hazards

Landslide and Slope Instability
Much of the terrain within Apple Valley is hillside land, which is generally undeveloped except for local mining operations. The presence of scattered homes along the base of steep mountain slopes in the planning area represents a hazard due to slope instability. While slope failures tend to result in localized affects, in contrast to earthquakes or major floods, and are generally short-term, they can result in significant monetary losses. Such hazards may not be covered under homeowner's insurance policies, and may therefore result in additional distress to affected property owners.

The mountains and hills of Apple Valley are underlain by bedrock, which is not typically susceptible to landslides. However, canyon walls and other areas of sharp topographic relief, are potentially affected by rockfalls and rockslides, especially due to strong seismic shaking, and to mudflows and soil erosion during or after intense storm events. Exhibit IV-2, Seismic Related Hazards, shows areas of potential risk for rockfall and landslides in the planning area.

NOTES:

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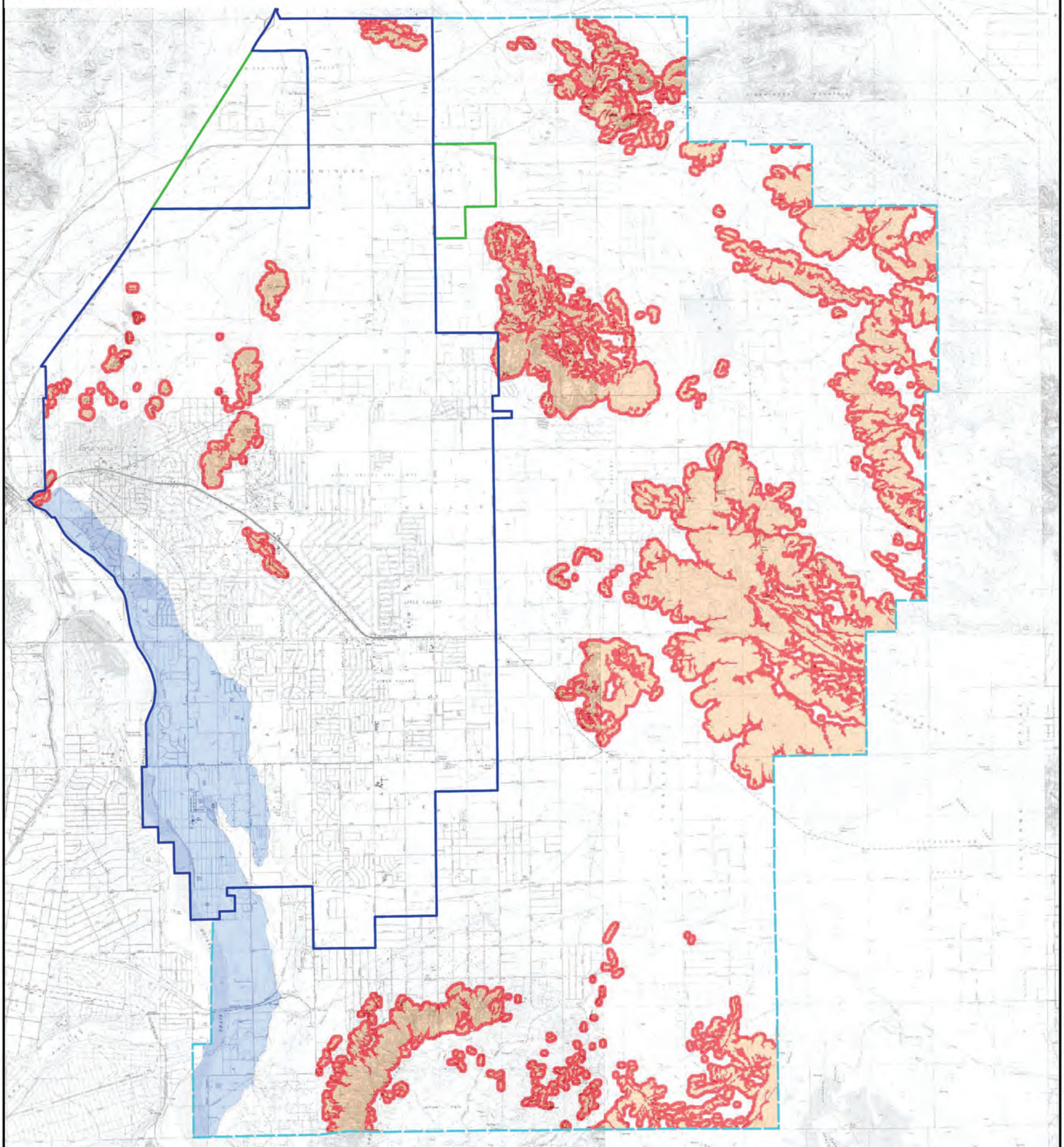

Base Map: USGS Topographic Map from Sure!MAPS RASTER, 1997.
Sources: Derivative map based on an analysis of geology as mapped by Morton and Miller (2003), and groundwater data from Sneed et al. (2003), and Schlumberger Water Services, 2004; slope analysis made from USGS 10m Digital Elevation Model.

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Scale: 1:108,000

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Explanation

- Areas where local geological and groundwater conditions suggest a potential for liquefaction.
- Hillside and mountainous areas where numerous rockfalls and landslides are expected to occur during an earthquake.
- Areas where local topographic and geological conditions suggest the potential for earthquake-induced landslides.
- Town of Apple Valley Boundary
- Apple Valley Sphere of Influence
- Apple Valley Annexed Areas

Source: Earth Consultants International, December 2008

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Apple Valley General Plan
Seismic Related Hazards
Apple Valley, California

Exhibit
IV-2

Compressible Soils

Soil units that could compress under the weight of proposed fill embankments and structures are known as "compressible soils". While such soils usually involve geologically young (Holocene age) unconsolidated sediments with low density, they can also occur in conditions such as the upper weathered part of older alluvium, colluvium/slope wash that collects near the base of natural slopes, and slope failure debris. In some cases, they may be present in very weathered bedrock. Factors that determine the settlement potential and the rate of settlement in these sediments include texture and grain size, natural moisture and density, thickness of the compressible layer(s), drainage, proposed load weight, and the rate at which the load is applied.

Compressible soils are most likely to occur in the planning area where Holocene-age deposits are present, as well as active and recently active stream channels. In hills it is most likely that compressible soils will be found in canyon bottoms, swales, and at the base of natural slopes. Landslide deposits often result in compression, especially at the head or along the depression created by the slide, as well as along the margins. At depths of greater than 60 feet, deep fill embankments can also compress under their own weight. Potential hazards associated with compressible soils are preventable through the use of sound engineering practices, including a thorough geotechnical soils analysis.

Collapsible Soils

Substantial and rapid settlement can occur under relatively light loads when soil units are saturated, leading to a rearrangement of their grains and a loss of cohesion or cementation. Most susceptible soils are generally those associated with recently deposited, Holocene-age soils that have accumulated in an arid or semi-arid environment, as well sand and silts deposited by wind. Flash flooding often deposits debris flow settlements, creating alluvial fans comprised of soils that are susceptible to collapse. Surface water infiltration is increased during irrigation, or a rise in the groundwater table. When combined with the weight of a building or structure, these conditions can cause rapid settlement, causing foundations and walls to crack. Heavily irrigated landscaping in close proximity to a structure's foundation is often associated with differential settlement of structures.

Given the granular nature of the soils, the fact that upper soils are generally dry, and the rapid deposition in the alluvial fan environment, the young and very young alluvial sediments in the planning area may be locally susceptible to this hazard.

Expansive Soils

Soils with significant amount of clay minerals the ability to give up water (shrink) or absorb water (swell). These are considered expansive soils, which have potential to substantially change in volume in response to changes in moisture content. Structures and other surface improvements are subject to damage from upward pressures induced by the swelling of expansive soils.

Alluvial sediments underlying the valley and canyon areas are primarily comprised of granular materials, such as silty sand and sand. These soils typically have a low expansion potential, although pockets of fine-grained expansive soils are not uncommon within these units. There are very fine-grained silts and clays within Apple Valley Dry Lake, which are likely to be expansive.

Clay deposits accumulated in subsurface soils have developed on older fan deposits; this is due to weathering and soil development. Where such soils are rich in clay they may be expected to have moderately expansive qualities.

Ground Subsidence

The gradual settling or sinking of the ground surface with little or no horizontal movement is known as ground subsidence. This movement is due to extraction of oil, gas or groundwater in sediment-filled valleys and floodplains, and may be evidenced by earth fissures, sinkholes or depressions, and disruption of surface drainage. Damage associated with ground subsidence may include harmful effects to canals, levees, underground pipelines, wells, buildings, roads, railroads and other structures and improvements. Subsidence has been mitigated in affected areas through management of water resources, including reduction in pumping from local wells, importation of water, and artificial groundwater recharge.

Apple Valley overlies the southern part of the Mojave River Groundwater Basin; the Basin covers approximately1,400 square miles and has an estimated storage capacity of nearly five million acre-feet. It is one of the largest groundwater reservoirs in southern California. The Mojave River accounts for over 80% of the natural recharge, with the remainder coming from runoff that flows from upper reaches of tributary washes. The basin is in a state of overdraft that has developed as water extraction has exceeded natural recharge over many decades. Groundwater levels in the basin have dropped more than 100 feet between the 1950s and 1990s, and approximately 30 feet in the last 20 years alone. These issues are further discussed in the Water Resources Element.

Subsidence studies conducted by the U.S. Geological Survey (USGS) and the Mojave Water Agency (MWA) show that the closest subsidence area to Apple Valley is located approximately seven miles northwest. No subsidence has not been detected to date within Apple Valley. The MWA continues to implement groundwater conservation and recharge activities in the Apple Valley area and these activities contribute to the management of ground subsidence. Monitoring groundwater and basin conditions and increasing the use of reclaimed water, storm water or imported water are preventative measures.

Erosion

The planning area is located in an area of extreme topographic relief between the valley and the surrounding mountains and is therefore subject to erosion, runoff, and sedimentation. Key factors affecting these processes include climate, topography, soil and rock types. Natural erosion may be accelerated by human activities such as agricultural or land development, as well as grading that may involve altering natural drainage patterns. Grading and construction activities such as soil compaction, and cut and fill slopes also increase the potential for erosion, and sedimentation. The increase in impermeable surfaces associated with development may impact conditions downstream of development, increasing the potential for flooding and sedimentation.

Wind Erosion

Wind erosion is a common phenomenon occurring mostly in flat, bare areas where dry, sandy soils are present, or anywhere the topsoil is loose, dry, and finely granulated. Recognized as a serious environmental problem, wind erosion causes damage to land and natural vegetation through the air or water-borne relocation of soil from one place to another. Soil loss, dryness and deterioration of the soil structure, loss of nutrients and productivity, air pollution, as well as sediment transport and deposition are all problems created by erosion.

Apple Valley is affected by strong winds associated with the Cajon Pass, as well as climatic differences between the high desert, the mountains, and the inland valleys south of the pass. The wind, combined with sandy surface soils that are common in Apple Valley, poses an environmental hazard that may be destructive. The presence of dust particles in the air poses a health risk associated with respiratory discomfort and airborne pathogens that cause eye infections and skin disorders. Dust storms also reduce highway and air traffic visibility. Wind erosion can be managed through the use of wind barriers, watering construction sites, and vegetative ground cover.

Seismic Assessment

Much of southern California is located along the boundary between the North American and Pacific tectonic plate. This boundary, also known as the San Andreas Fault Zone, could generate strong seismic activities. The Pacific Plate is moving in a northwesterly direction, approximately 50 millimeters per year in relationship to the North American Plate. In southern California, the San Andreas Fault consists of three segments: the Mojave Desert segment, the San Bernardino Mountains segment, and the Coachella Valley segment.

The planning area is located near this boundary, and there are several active faults in the region. These include the Helendale fault, the San Andreas fault, the North Frontal fault, the Cleghorn fault, the Cucamonga fault, and the San Jacinto fault. Of these, the North Frontal fault has the potential to generate the strongest seismic shaking in Apple Valley.

Measuring Seismic Events

Classification of seismic events is based on their magnitude and intensity. The intensity of ground shaking is determined by several factors, such as the earthquake's magnitude, the distance from the epicenter, and the geologic composition of local soils and rocks. Seismic intensity is most commonly measured by the Modified Mercalli Intensity (MMI) scale, which includes twelve levels of damage. The MMI is derived from actual observations of damage to structures and human reactions to earthquakes. Based on this scale, an earthquake tremor at Level I earthquake tremor is generally not felt and is considered unlikely to result in damage, whereas a Level XII earthquake results in total destruction. Earthquake intensities may result in damage such as partial or complete collapse of masonry structures, severe damage to complete destruction of underground pipelines, rock and land slides, and massive damage or destruction of bridges, overpasses and other improvements.

Earthquake magnitude is measured by the Richter Scale on a continuum of one to nine, with each level-of-magnitude increase representing a tenfold increase in the amplitude of the waves on a

seismogram. The most notable historic earthquake in the Apple Valley region was the Landers earthquake of 1992, which had a magnitude of 7.3 on the Richter Scale. The Landers earthquake, so named for its epicenter near the small desert community of Landers, also ruptured five other separate faults.

The largest earthquake likely to occur on a fault or fault segment within a specified period of time is considered the Maximum Probable Earthquake (MPE). The MPE is useful during emergency and engineering planning. It provides a means to assess the potential seismic risk within a region, is referenced to establish safe construction and design parameters, and facilitates the preparation of policies and programs that are responsive to the potential impacts of an earthquake.

Defined as the largest earthquake a fault is estimated to be capable of generating, the Maximum Credible Earthquake (MCE) also provides a useful gauge for emergency and engineering planning efforts. In the Apple Valley area, the North Frontal fault (West) is expected to generate a magnitude 7.2 earthquake with a Peak Ground Acceleration (PGA) ranging from 1.13g to 0.38g, which is equivalent to a Level XI to X on the Modified Mercalli Intensity Scale (MMI). Table IV-1 shows a list of faults that could generate significant impacts within Apple Valley and the surrounding area.

Table IV-1
Estimated Horizontal Peak Ground Accelerations and Seismic Intensities in the Apple Valley Area

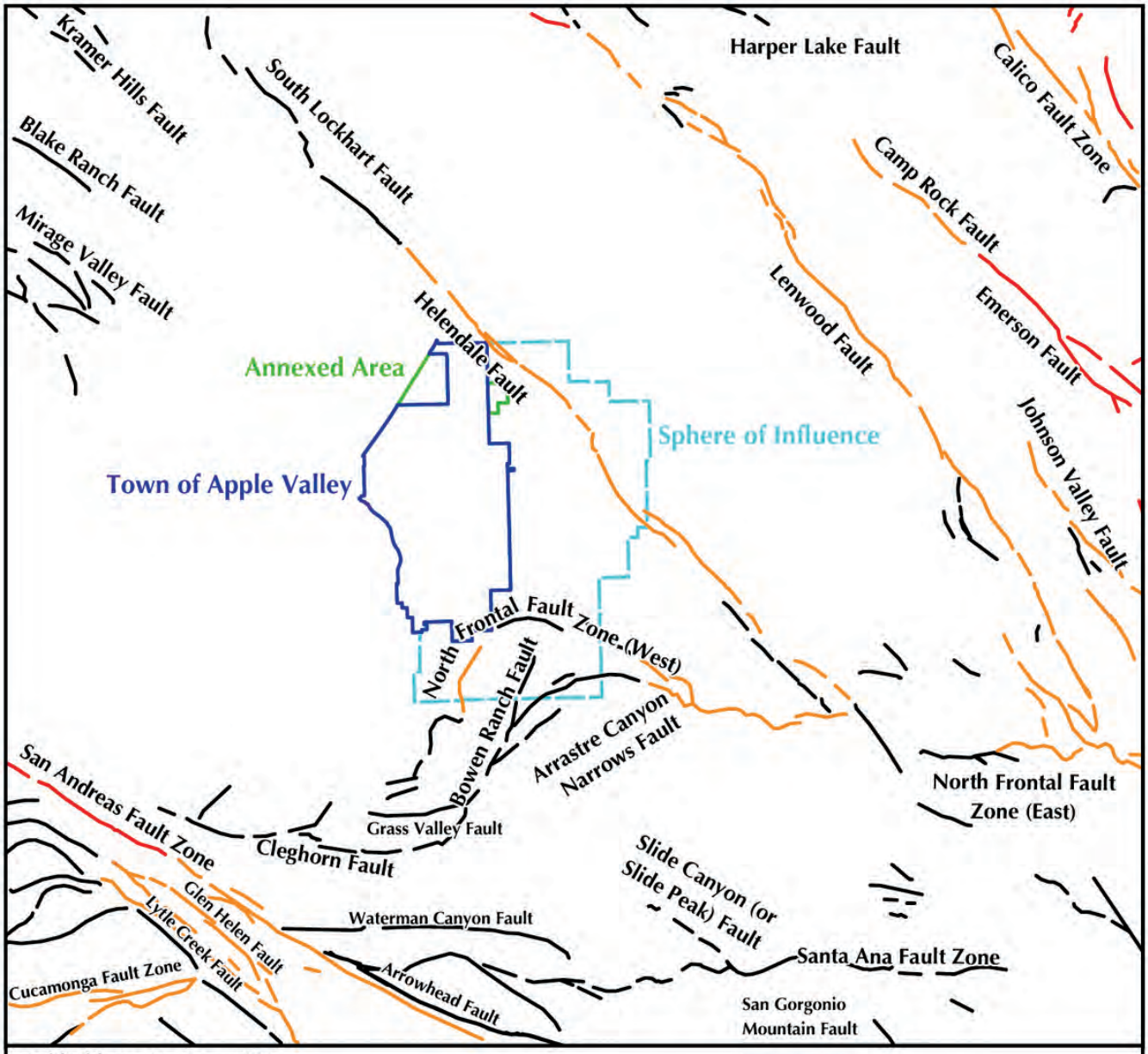
Fault Name	Distance to Apple Valley (km)	Distance to Apple Valley (mi)	Magnitude of M_{max} *	PGA (g) from M_{max}	MMI from M_{max}
North Frontal Fault (West)	<0.5 – 16.2	0.5 – 26.1	7.2	1.13 – 0.38	XI - X
Helendale – South Lockhart	<0.5 – 13.9	0.5 – 22.4	7.3	0.75 – 0.33	XI - IX
San Andreas (Whole Southern)	14.4 – 31.4	23.1 – 50.6	8.0	0.48 – 0.25	X - IX
Lenwood – Lockhart – Old Woman Springs	12.1 – 28.7	19.4 – 46.2	7.5	0.42 – 0.19	IX - VIII
San Andreas (San Bernardino – Coachella)	14.4 – 31.4	23.1 – 50.6	7.7	0.41 – 0.20	X - VIII
San Andreas (1857 Rupture or Cholame – Mojave)	16.9 – 33.2	27.2 – 53.5	7.8	0.38 – 0.20	IX - VIII
San Andreas (San Bernardino)	14.4 – 31.4	23.1 – 50.6	7.5	0.36 – 0.17	IX – VIII
Cleghorn	8.1 – 24.4	13.1 – 39.2	6.5	0.33 – 0.11	IX - VII
San Andreas (Mojave)	16.9 – 32.2	27.2 – 53.5	7.4	0.30 – 0.15	IX - VIII
Cucamonga	18 – 34.4	29 – 55.3	6.9	0.28 – 0.15	IX - VIII
Landers	17.3 – 34.5	27.9 – 55.6	7.3	0.27 – 0.14	IX - VIII
North Frontal (East)	17.3 – 32.2	27.9 – 51.9	6.7	0.26 – 0.14	IX – VIII
Sierra Madre	29.6 – 45.1	47.7 – 72.6	7.2	0.21 – 0.14	VIII
Gravel Hills – Harper Lake	20.8 – 37.5	33.5 – 60.3	7.1	0.20 – 0.11	VIII - VII
Calico – Hidalgo	29.1 – 43.6	43.1 – 70.2	7.3	0.18 – 0.11	VIII - VII
San Jacinto (San Bernardino)	18.6 – 35.7	29.9 – 57.4	6.7	0.17 – 0.09	VIII - VII
Johnson Valley (Northern)	19.9 – 32.4	32 – 52.1	6.7	0.16 – 0.10	VIII – VII
Puente Hills Blind Thrust	42.7 – 58.9	68.7 – 94.8	7.1	0.14 – 0.10	VIII - VII
Blackwater	30 – 45.2	46.8 – 72.8	7.1	0.14 – 0.09	VIII - VII
San Jacinto (San Jacinto Valley)	26.2 – 42.8	42.2 – 68.8	6.9	0.14 – 0.09	VIII - VII
Pinto Mountain	31.5 – 48.8	50.7 – 78.5	7.2	0.14- 0.09	VIII - VII
Pisgah – Bullion Mtn. – Mesquite Lake	35.5 – 51.4	57.1 – 82.7	7.3	0.13 – 0.09	VIII - VII
Emerson South – Copper Mtn.	29 – 40.6	46.7 – 65.3	7.0	0.13 – 0.09	VIII - VII

Abbreviations: mi – miles; km – kilometer; M_{max} – maximum magnitude earthquake; PGA – peak ground acceleration as a percentage of "g", which is the acceleration of gravity; MMI – Modified Mercalli Intensity.
Source: Technical Background Report to the Safety Element for the Town of Apple Valley, prepared by Earth Consultants International, 2007.

Major Faults Affecting Apple Valley

Potential adverse effects from earthquakes may be substantial and range from property damage, to the loss of public services and facilities, to loss of life. Apple Valley and the surrounding area are most susceptible to severe impacts associated with strong ground shaking. Strong ground shaking can cause other geologic hazards, including landslides, ground lurching, structural damage or destruction, and liquefaction, which can further disrupt affected areas through fire, the interruption of essential services or damage to facilities and infrastructure, such as water, sewer, gas, electric, transportation, communications, drainage, as well as release of hazardous materials. Dam or water tank failure brought about by seismic activity can result in flood inundation.

There are no faults mapped by the State of California within the Town's corporate limits or within either of the proposed annexation areas, however two faults occur within portions of the Town's Sphere of Influence. The following discussion describes the faults in the region that are most likely to impact Apple Valley. Faults within the Apple Valley study area are illustrated in Exhibit IV-3, Faults in Apple Valley Area.



Modified from: Jennings, 1994;
www.scecd.scec.org/faults/mojfault.html
Refer to text for descriptions of these faults.

Explanation

Fault Showing Evidence of Historic Rupture (Active).

Fault Showing Evidence of Holocene Rupture (Active).

Fault Showing Evidence of Quaternary and Late Quaternary Rupture (Potentially Active).

N

Source: Earth Consultants International, December 2008

TERRA NOVA®
Planning & Research, Inc.

Apple Valley General Plan
Faults in Apple Valley Area
Apple Valley, California

Exhibit
IV-3

North Frontal Fault

As previously noted, the North Frontal fault is closest to and therefore has the potential to generate the strongest seismic shaking in the planning area. The North Frontal fault is a partially blind reverse fault zone comprised of several fault splays; it trends south along the eastern flank of the San Bernardino Mountains, and has a combined total length of approximately 40 miles. Several of the fault splays interact with other faults that traverse the region. The most significant fault with which the North Frontal relates is the Helendale fault, which offsets and divides the North Frontal into two main segments, referred to as the East and West segments. The West segment is approximately 22 miles long, and is less than 0.5 miles from Apple Valley at the closest point.

The North Frontal fault is considered an active fault, based on its having moved within the last 10,000 years. However, it has not been studied in detail, and while it is has been attributed a slip rate of approximately 0.5 mm per year, the parameters of this fault are not well understood.. It is thought that movement on this fault causes an average uplift rate of the San Bernardino Mountains of about 1 mm per year. The West segment of the North Frontal fault zone is considered capable of generating a maximum magnitude 7.2 earthquake, based on its length. Such an earthquake on this fault would generate peak ground accelerations in the planning area of between about 1.1g and 0.4g, which converts to Modified Mercalli intensities as high as XI. Based on rupture of the East segment of the North Frontal fault zone in a 6.7 earthquake, ground shaking of about 0.26g to 0.14g would be felt in the planning area. This converts to Modified Mercalli intensities in the IX to VIII range.

Helendale Fault

There are several right-lateral strike-slip faults within what is known as the Eastern California Shear Zone, of which the Helendale fault is the westernmost. Approximately 9 to 23% of the total movement along the North American/Pacific plate boundary motion occurs along this zone. The Helendale fault itself is 56 miles long, but it also seems to form a continuous fault with the South Lockhart fault to the north. The southern end of the Helendale fault apparently offsets the North Frontal fault, as discussed above, forming the East and West segments. The Helendale fault extends to the northeast of the planning area, outside of Apple Valley's northeastern corporate limits and within the Sphere of Influence.

The Helendale fault has an annual slip rate calculated at 0.8 mm/year; it has a recurrence interval for large surface-rupturing events of 3,000 to 5,000 years. Based on currently available data, the California Geological Survey estimates that a maximum earthquake of magnitude 7.3 along the combined Helendale-South Lockhart faults would generate horizontal peak ground accelerations in Apple Valley of between 0.75g and 0.3g, with Modified Mercalli Intensities of between XI and IX.

San Andreas Fault

The San Andreas Fault zone is located approximately 23 miles southwest of Apple Valley. The longest fault in the State of California, it extends approximately 750 miles from Cape Mendocino in northern California to the Salton Sea in southern California. The San Andreas, a right-lateral transform fault, is regarded as a "Master Fault" that controls the seismic hazard for central and

southern California. The magnitude 8.0 Fort Tejon earthquake, which occurred in 1857, is the last major earthquake to have occurred on the southern San Andreas. As previously discussed, at least one other fault occurs closer to Apple Valley and has the potential to cause stronger ground shaking, and therefore more damage, than the San Andreas Fault. Nonetheless, the San Andreas Fault is considered to have a high probability of causing an earthquake in the near future and should therefore be considered in all seismic hazard assessment studies in southern California given its.

The Fort Tejon earthquake in 1857 ruptured the Cholame, Carrizo, and Mojave segments of the San Andreas fault, and displacements occurred along of as much as 27 feet of the rupture zone. It is estimated that peak ground accelerations in Apple Valley as a result of the 1857 earthquake may have been as high as 0.38g. Another similar earthquake that ruptured the entire southern San Andreas Fault, with its epicenter along the section of fault closest to Apple Valley, could generate even higher peak ground accelerations in Apple Valley, estimated at between 0.48g and 0.25g.

Lenwood – Lockhart – Old Woman Springs Faults

Another of the Eastern California Shear Zone faults is the Lenwood fault, a right-lateral strike slip fault approximately 47 miles long. It has a slip rate of about 0.8 mm/year. Based on trenching studies, this fault has ruptured at least three times and these ruptures have occurred as recently as approximately 200 to 400 years ago. Other ruptures are estimated as occurring between 5,000 and 6,000 years ago, and 8,300 years ago. Therefore a recurrence between major surface ruptures is estimated at between 4,000 to 5,000 years. Prior to the 1992 Landers earthquake the yearly slip rate on this fault had been recorded but not verified.

The Lockhart fault is approximately 44 miles long and is north of the Lenwood fault. The North Lockhart fault, a segment that evidences no activity within the last 11,000 years, is approximately 6 miles. The Lockhart fault is estimated to have an interval of between 3,000 and 5,000 years for major surface-rupture.

The Old Woman Springs segment is about 6 miles long and is the main trace in a complex fault system where the Eastern segment of the North Frontal Fault Zone and the Lenwood fault intersect. It is considered an active fault.

The Lenwood and Lockhart faults essentially form a continuous, 90-miles long system. While there is no evidence that both of these faults have ruptured together in the past, such an event may be possible, as evidenced by rupture of five separate fault segments during the Landers earthquake. The technical background study assumes a scenario wherein the Lenwood and Lockhart faults, together with the Old Woman Springs fault, rupture together in a magnitude 7.5 maximum earthquake. Such an event would generate peak ground accelerations in Apple Valley of about 0.42g to 0.19g, with Modified Mercalli Intensities in the IX to VIII range. A smaller magnitude event involving rupture along only one of these faults ruptures would cause lesser ground motions in Apple Valley than those reported above.

Cleghorn Fault

The Cleghorn fault, also known as the Silverwood Lake fault due to its extension across the lake, is approximately 19-miles long. Studies suggest that the fault zone has had about 650 feet of motion in the last 50,000 to 100,000 years, which results in a slip rate of 2 to 4 mm/year. A magnitude 6.5 earthquake on this fault is considered capable of generating horizontal peak ground accelerations in the Apple Valley area of between about 0.33g and 0.11g, with Modified Mercalli Intensities in the IX to VII range.

Cucamonga Fault

The Cucamonga fault zone is approximately 16-miles long. As one element of the Transverse Ranges family of thrust faults, it runs along the southern front of the San Gabriel Mountains from San Antonio Canyon eastward to the Lytle Creek area. It has a slip rate of between approximately 5.0 and 2.0 mm/year with an estimated average recurrence interval of 625 years. The Cucamonga fault is thought capable of generating a maximum magnitude 6.9 earthquake, based on length, and such a scenario would result in peak horizontal ground acceleration in the Apple Valley area of between about 0.28g and 0.15g, with Modified Mercalli intensities in the IX to VIII range.

Landers (or Kickapoo) Fault

The group of faults that ruptured during the 1992 Landers earthquake, including the Homestead Valley, Kickapoo, and Johnson Valley faults, and segments of the Burnt Mountain and Eureka Peak faults, are known as the Landers fault. The Landers fault now refers to the Kickapoo fault. These faults are part of the Eastern Mojave Shear Zone and were discovered after they ruptured the surface during the 1992 Landers earthquake. It is estimated that intervals between major ruptures is in the thousands of years, The 1992 earthquake resulted in substantial lateral displacement along some of these faults, for instance nearly 9.5 feet in the case of the Kickapoo fault. Individually, these faults could rupture in smaller earthquakes. Their combined lengths allowed for the magnitude 7.3 earthquake that shook southern California on June 28, 1992. Ground shaking in the Apple Valley area due to a Landers-type earthquake on these faults would cause horizontal ground accelerations of between 0.27g and 0.14g, with Modified Mercalli intensities in the IX to VIII range.

Sierra Madre Fault

The Sierra Madre fault zone or complex is approximately 47 miles long and extends along the base of the San Gabriel Mountains from the San Fernando Valley to San Antonio Canyon; from there it continues southeastward as the Cucamonga fault. The estimated slip rate of the Sierra Madre fault is estimated to be approximately 0.6 mm/year with a recurrence interval of about 8,000 years. Recent studies suggest that the last rupture event on the eastern segments of the fault occurred about 8,000 years ago, therefore, the Sierra Madre fault may be near the end of its cycle, and therefore has potential generate an earthquake in the not too distant future. The Sierra Madre fault is estimated to be capable of producing a magnitude 7.2 earthquake, resulting in peak horizontal ground accelerations in Apple Valley of between about 0.21g and 0.14g.

Gravel Hills – Harper Lake Fault

This fault zone is between 31 and 44 miles long, depending on how many fault segments are included and is considered active. The estimated annual slip rate on this fault zone is 0.9

mm/year; the recurrence interval between earthquakes is about 3,500 years. The combined fault segments are estimated to be capable of generating 7.1 magnitude earthquake, which would generate peak horizontal ground accelerations in the Apple Valley area of between 0.20g and 0.11g, with Modified Mercalli intensities in the VIII to VII range.

Seismically Induced Geotechnical Hazards

Ground Shaking

The most significant potential geotechnical hazard facing the planning area is seismically induced ground shaking. As previously noted, the effects of ground motion on structures are difficult to predict, depending as they do on a variety of factors. These include the intensity of the quake, the distance from the epicenter to the site, the composition of soils and bedrock, building design, and other physical criteria. Given the variability of these factors, ground shaking may cause no, little, or major structural damage or destruction. Generally, with increasing distance from the causative fault, peak ground accelerations and seismic intensity values decrease. The effects of seismic waves may be amplified by local conditions, such as soft soils, shallow ground water, and the presence of ridge tops, which may result in localized accelerations. Local agencies utilize the Uniform Building Code, California Building Code, and Unreinforced Masonry Law as their primary tools to ensure seismic safety in structures. Goals, policies and programs are set forth below to ensure that development in the planning area complies with the requirements established within these codes.

Liquefaction

Where loose, saturated, sandy sediments are subjected to ground vibrations greater than 0.2 g, liquefaction may occur. causing the total or substantial loss of shear strength in the affected sediments. During this process, wherein soils behave like a liquid or semi-viscous substance, structural distress or failure due to ground settlement can occur. These conditions may cause foundation soils to lose load-bearing capacity in foundation soils and the buoyant rise of buried structures.

Liquefaction is induced by three general conditions: 1) strong ground shaking over a relatively long period; 2) the presence of unconsolidated granular sediments; and 3) the occurrence of water-saturated sediments within 50 feet of the ground surface. These general conditions appear to occur in the planning area, thereby allowing the potential for liquefaction. There are a number of active faults in the region that could potentially generate earthquake characterized by strong ground shaking of long durations. Along major drainages in the planning area and vicinity, granular loose sediments occur. The alluvium underlying Apple Valley is coarsely granular and percolates well; the water table is below 50 feet of the ground surface throughout most of the area, with the exception of locally within the Mojave River floodplain, where water-saturated sediments occur within about 50 feet of the surface. These areas are likely vulnerable to liquefaction during an earthquake.

Seismically Induced Settlement

Strong ground shaking can, under certain circumstances, cause soils to densify and thereby result in local or regional settlement of the ground surface and associated ground failure, which occurs when loose granular, cohesionless soil grains become tightly packed due to the collapse of voids

and pore spaces. These risks increase where there are recently deposited alluvial sediments and when artificial fills are not properly compacted, potentially resulting in damage to buildings and water, sewer, and other subsurface pipelines. Areas in the planning area that are underlain by young, unconsolidated alluvial deposits and artificial fill may be susceptible to seismically induced settlement.

Seismically Induced Rockfalls and Landslides

Landslides, rock slides and rock falls can occur as a result of strong ground motion, particularly where saturated ground conditions exist. This potential increases in the planning area where there is a high seismic potential, as well as areas where rapid uplift and erosion have resulted in steep slopes and deeply incised canyons, rock with inherently weak components such as silt or clay layers, and highly fractured and folded rock. Slope orientation relative to the direction of the seismic wave also contributes to the occurrence of landslides in the planning area.

Although most of the Town of Apple Valley is characterized by relatively level to gently sloping terrain, there are several natural slopes in the Sphere of Influence area that could be vulnerable to seismically induced slope failure. In addition, there are many areas in the San Bernardino Mountains to the south of Apple Valley that could fail during an earthquake. This has the potential to significantly impede traffic through the area immediately and for several days after an earthquake, which could indirectly impact Apple Valley's residents and visitors, in addition to restricting access to and from the area by emergency response teams.

Deformation of Sidehill Fills

The deformation of sidehill fills, which may also result from strong seismic ground shaking, can cause minor to severe property damage. Sidehill fills, which are artificial fill wedges typically constructed on natural slopes to create roadways or level building pads, may crack at the cut/fill contact area. Further, strong ground shaking may result in differential settlement in the fill wedge, and the development of bulging on the slope face. This condition is most common in relatively thin fills of 27 feet or less placed near the tops of narrow ridges. It is not expected to occur in Apple Valley, with the exception of the approaches to the two bridges in Apple Valley that extend across the Mojave River, where minor settlement of the bridge embankment could result in a step up of a few inches to the actual bridge.

Ridgetop Fissure and Shattering

Ridgetop fissuring and shattering can result from intense amplification or focusing of seismic energy due to local topographic features. During the 1989 Loma Prieta and 1994 Northridge earthquakes, linear fault-like fissures and shattering of surface soils on the crests of steep, narrow ridgelines occurred, making surfaces affected by ridgetop shattering appear as if they had been plowed. Severe structural damage may occur, especially where it occurs on relatively high (greater than 100 feet), narrow (typically less than 300 feet wide) ridges flanked by slopes steeper than about 2.5:1 (horizontal:vertical). Ridgetop shattering may occur locally in the unincorporated area of Apple Valley, in the Granite Mountains, Fairview Mountains, and Ord Mountains, and just outside the study area, at the top of the Black Mountains, Sidewinder Mountains and Turtle Mountains.

Seiches and Seismically Induced Inundation

Seismically-induced oscillation or sloshing of water contained in enclosed bodies of water including lakes, ponds, reservoirs, and swimming pools are called seiches. Factors that determine the risk of seiche in an area include the frequency of seismic waves, distance and direction from the epicenter, and site-specific design criteria of the enclosed body of water. Seiches due to seismic shaking could occur in Silverwood Lake, to the southwest of Apple Valley, and in the shallow lakes present throughout the study area if water is present at the time of the earthquake. Minor sloshing of water out of the lakes and onto the immediately adjacent surrounding areas may occur. In similar fashion, water in swimming pools is known to slosh during earthquakes; for the most part, however, such sloshing does not lead to significant damage.

Fire-suppression efforts may be affected if damage to water storage tanks and systems substantially limits water supplies after a major earthquake. Water tanks are required to include baffles and other design elements to reduce the potential for seiches in tanks, open reservoirs, and ponds where overflow or structural failure may cause damage to nearby properties. The American Water Works Association (AWWA) Standards for Design of Steel Water Tanks provides criteria for seismic design of water tanks.

Mitigation Of Earthquake Hazards

Building and structure collapses cause the majority of injuries and loss of life related to earthquakes. The occurrence of an earthquake cannot be prevented, however, it is possible to minimize such an event's destructive effects through comprehensive hazard mitigation measures. Such measures include the identification and mapping of potential hazards, sensible planning, strict implementation of building codes, and the retrofitting and rehabilitation of weak structures.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was signed into California law in 1972, and was intended to mitigate the hazards of fault rupture by prohibiting the location of structures for human occupancy across active fault traces. As required by the Act, the State Geologist is required to delineate active (showing evidence of Holocene surface displacement along one or more of their segments) "earthquake fault zones", and are clearly detectable by a trained geologist as a physical feature at or just below the ground surface. An earthquake fault zone boundary is generally about 500 feet from major active faults, and 200 to 300 feet from well-defined minor faults. Counties and cities are also required to condition development permit approval for sites within earthquake fault zones to perform geologic investigation that demonstrate that the sites are safe from surface displacement associated with future faulting. Of the types of development that are regulated are defined by State law, however, local regulations may prove even more restrictive.

Currently (2008) there are no Alquist-Priolo Earthquake Fault Zones mapped within the Apple Valley corporate limits or the annexation areas. However, there are two zones extending across portions of the town's Sphere of Influence, and a third Alquist-Priolo zone approaches the Sphere of Influence from the east-southeast. It should be noted that the State Geologist periodically revises the Alquist-Priolo Earthquake Fault Zones based upon new scientific

research or fault studies' data. Local agencies, either at the county or local level, can designate additional fault hazard study zone.

Seismic Hazards Mapping Act

The Alquist-Priolo Earthquake Fault Zoning Act addresses hazards associated with surface fault rupture. In addition, the State enacted the Seismic Hazards Mapping Act in 1990. This Act addresses non-surface rupture earthquake hazards such as strong ground shaking, liquefaction, and seismically induced landslides. It is intended to identify and mitigate seismic hazards and thereby lessen loss of life and property. The Act is implemented by the California Geological Survey (CGS), which provides local governments with seismic hazard zone maps delineating areas susceptible to seismic hazards and other ground failure hazards. When development projects are proposed within these areas, termed "zones of required investigations," site-specific geological hazard investigations are required. Although CGS has not mapped seismic hazards for San Bernardino County, or the Town of Apple Valley the technical background study conducted for the proposed Apple Valley General Plan and referenced herein has analyzed and mapped this hazard.

Real Estate Disclosure Requirements

The Natural Hazards Disclosure Act, effective June 1, 1998, requires that sellers of real estate properties and their agents provide prospective buyers with a "Natural Hazard Disclosure Statement" if the property being sold occurs within one or more State-mapped hazard areas. The law further requires the seller of a house built pre-1960 to provide the buyer a completed earthquake hazards disclosure report and a booklet entitled "The Homeowner's Guide to Earthquake Safety," which was written and adopted by the California Seismic Safety Commission. The Alquist-Priolo Earthquake Fault Zoning Act and Seismic Hazards Mapping Act mandates that real estate agents, or sellers of real estate acting without an agent, must disclose to potential buyers that the property is located in an Earthquake Fault Zone and/Seismic Hazard Zone.

There are currently no official Alquist-Priolo or Seismic Hazard maps for Apple Valley. However, as noted above, Alquist-Priolo Earthquake Fault Zones are mapped across Apple Valley's Sphere of Influence. Where regions of the study area have potential to be impacted by natural hazards, as described in this document, those hazards should be disclosed to prospective buyers, following the provisions of the Natural Hazards Disclosure Act.

California Environmental Quality Act

The California Environmental Quality Act of 1970 (CEQA) was intended to ensure that local governmental agencies consider and review the environmental impacts of proposed projects within their jurisdictions. CEQA regulations require the preparation of an Environmental Impact Report (EIR) for projects with potential to result in significant impacts to the environment. As part of its analysis, an EIR must identify geologic and seismic hazards and include potential mitigation measures to reduce potential impacts.

Uniform Building Code and California Building Code

One of the important tools used by local agencies to ensure seismic safety in structures is the Uniform Building Code (UBC). It defines a variety of factors, including minimum lateral forces

needed to resist seismic shaking, purpose of the building, seismic zone, type of structural system, building configuration and height, and soil profile types that result in various degrees of shaking. The last version of the UBC was issued in 1997.

California Building Code (CBC), also known as Title 24 of the California Code of Regulations, provides building regulations customized for California earthquake conditions. State law requires that every local agency, town, city, and county enforcing building regulations adopt the CBC within 180 days of its publication. A local jurisdiction may, in addition to CBC regulations, adopt more stringent amendments provided that they are based upon local geographic, topographic or climatic conditions.

Building Codes are minimum requirements, and therefore, they may, in some cases, be inadequate to protect health and safety. Therefore, it is essential for geotechnical consultants, engineers, the Town and reviewers of their work to keep up to date with current research.

Seismic Retrofitting

Seismic zones are zones near historically active faults. The entire Apple Valley area lies within Seismic Zone 4. The Unreinforced Masonry Law of 1986 requires all towns, cities, and counties in Seismic Zone 4 to identify potentially hazardous unreinforced masonry (URM) buildings in their jurisdictions, establish a URM loss reduction program, and report their progress to the State by 1990. To comply with the law, the Town of Apple Valley has conducted an inventory of its URM buildings and has notified building owners about the hazards of URM construction. In 2006, the Seismic Safety Commission reported that the Town has 14 non-historic URM buildings. These building owners have been notified of the hazards associated with this type of construction; retrofitting of the structures will be required at such time as a property owner applies to do any alterations or additions to their building. As of 2006, none of the URM buildings in Apple Valley had been retrofitted, and no warning placards had been placed in any of the buildings.

Past earthquakes have demonstrated that many types of structures, in addition to URMs, are potentially hazardous. These include pre-cast tilt-up concrete buildings (including pre-1971 structures), soft story structures, unreinforced concrete buildings, and pre-1952 single-family structures. Other structures that are considered at risk include irregular-shaped buildings and mobile homes. It is recommended that the Town consider developing and adopting a program that inventories and provides mitigation of these structures.

FUTURE DIRECTIONS

Local seismic and geotechnical conditions pose on-going challenges that the Town must continue to manage by means of those regulations and guidelines already in place. Implementation and enforcement of the requirements set forth in the Alquist-Priolo Earthquake Fault Zoning Act, CEQA Statutes and Guidelines, Uniform/International Building Code, zoning ordinance, and other applicable legislation are necessary to deal with risks addressed in this Element. The Town must also sustain or initiate close coordination with state, regional, and county agencies in order to establish or maintain an updated information database of geotechnical and seismic conditions in the region. As part of its development review process, the

Town must continue to assure that all-inclusive and thorough evaluations of geotechnical and seismic safety are provided for all development proposals. Such evaluations must include the preparation and review of all necessary special studies are conducted and reviewed, and the implementation of comprehensive mitigation measures.

GOAL, POLICIES, AND PROGRAMS

Goal

The protection and safety of human life, land, and property from the effects of seismic and geotechnical hazards shall be increased.

Policy 1.A
The Town shall begin and maintain an information database including maps and other information that describe and illustrate seismic and other geotechnical hazards that occur within and in proximity to the Town boundaries.

Program 1.A.1
The Town shall implement a program to ensure the establishment and routine improvement and updating of the database by conferring and coordinating with surrounding communities, the California Division of Mines and Geology, San Bernardino County, other applicable state and federal agencies, and professional engineering geologists.
Responsible Agency: Planning Division, California Division of Mines and Geology, San Bernardino County, Consulting Geologists.
Schedule: 2009-2010, ongoing.

Policy 1.B
In areas identified as being susceptible to slope instability, development shall be avoided unless adequately engineered to eliminate geotechnical hazards.

Program 1.B.1
The Town shall make copies of the General Plan Slope Instability Susceptibility Map available and shall either discourage development within areas so designated, or require that detailed geotechnical analysis be conducted and mitigation measures implemented to reduce potential hazards to insignificant levels.
Responsible Agency: Planning Division, Town Engineer, Consulting Engineering Geologist**.**
Schedule: 2009-2010, ongoing.

Policy 1.C
The Town shall required that future development avoid disturbing unique rock outcroppings within the Town boundary and Sphere of Influence.

Program 1.C.1
The Town shall consider unique rock outcroppings as being biologically sensitive and shall discourage disturbance of them.
Responsible Agency: Planning Division.
Schedule: 2009-2010, ongoing.

Policy 1.D
The Town shall actively support and participate in local and regional efforts at groundwater conservation and recharge, in order to minimize the potential impacts of subsidence due to extraction of groundwater.

Program 1.D.1
The Town shall consult and coordinate with local water providers, U.S. Geological Survey, and other appropriate agencies to routinely monitor groundwater levels and surface elevations in the Town.
Responsible Agency: Public Works Division, local water purveyors, U.S. Geological Survey.
Schedule: Ongoing.

Policy 1.E
In areas identified as being susceptible to rockfall, landslide, liquefaction and/or other associated hazards as depicted in the General Plan EIR, development shall be required to prepare detailed technical analysis, which shall include mitigation measures intended to reduce potential hazards below levels of significance.

Program 1.E.1
The Town shall contract with a state-certified geologist and/or geological engineer to review and determine the adequacy of geotechnical studies for proposed projects.
Responsible Agency: Planning Division, Building and Safety Division, Town Engineer/Consulting Engineering Geologist.
Schedule: Ongoing.

Policy 1.F
Development in areas susceptible to collapsible or expansive soils as shown in soils mapping in the General Plan EIR shall be required to conduct soil sampling and laboratory testing and to implement mitigation measures that reduce potential hazards below levels of significance.

Program 1.F.1
The Town Building and Safety Division shall review soils studies conducted for proposed projects, determine their adequacy, and enforce the implementation of mitigation measures.
Responsible Agency: Building and Safety Division, Town Engineer, Consulting Engineering Geologist.
Schedule: Ongoing.

Policy 1.G
The Town shall coordinate and cooperate with public and quasi-public agencies to ensure that major utility systems and roadways have continued functionality in the event of a major earthquake.

Program 1.G.1
The Town shall maintain working relationships and coordinate strategies between the Public Works Division, utilities, and other appropriate agencies to strengthen or relocate utility facilities, and take other appropriate measures to ensure the protection of major utility distribution systems.
Responsible Agency: Planning Division, Public Works Division, Town Engineer, Public and Quasi-Public Utilities.
Schedule: 2009-2010, ongoing.

Policy 1.H
To minimize the potential for localized collapse of soils, new septic tank leach fields, seepage pits, drainage facilities, and heavily irrigated areas shall be located away from structural foundations and supports.

Program 1.H.1
The Town shall require that plans indicating the location of leach fields, seepage pits, drainage facilities, and water-dependent landscaping be included in all development applications to allow Town staff to evaluate the potential for ground saturation.
Responsible Agency: Planning Division, Building and Safety Division, Town Engineer.
Schedule: 2009-2010, ongoing.

FLOODING AND HYDROLOGY ELEMENT

PURPOSE

The Flooding and Hydrology Element of the Apple Valley General Plan sets forth goals, policies, and programs to addresses potential drainage and flooding hazards within the community. The protection of the general health, safety and welfare of the community from potential flood and associated hazards is the primary goal of this Element. Further, other elements of the General Plan, which also address threats to the lives and property of the community's residents, are referenced in this Element, and the potential for and extent of major future flooding are assessed. The Town intends to plan for and implement the phased development of project-specific and Town-wide flood control facilities.

BACKGROUND

There are several General Plan Elements that are related to the Flooding and Hydrology Element. These include the Circulation Element, which discusses the need to maintain adequate access and evacuation routes in the event of a major flood or other disaster; the Geotechnical Element and the potential for seismic hazards to rupture aboveground water storage tanks; and the Hazardous and Toxic Materials Element, addressing the transport and storage of hazardous and toxic liquids above and below ground. In addition, the policies and programs of the Land Use Element guide the location of development, key public facilities, and open space, which each have the ability to affect flood damage potential.

General Plans are required by state policies and regulations to offer mitigation measures to lower the impacts associated with the potential flood hazards within a community. California Statute 1939, Chapter 73, mandates that area-wide drainage affecting local jurisdictions be subject to joint planning. Further, the Cobey-Alquist Flood Plain Management Act (Government Code Section 8401c) requires that local governments plan, adopt, and enforce land use regulations for flood plain management. This Act also establishes requirements for receiving state financial assistance for flood control measures. Finally, the mapping of areas subject to inundation in the event of dam failures is required by California Government Code Section 8589.5 and 65302 (g).

Meteorological Setting

There are three types of storms that produce precipitation that have the potential to impact the Apple Valley area: winter storms, local thunderstorms, and summer tropical storms. Winter storms are characterized by heavy and sometimes prolonged precipitation over a large area. These storms usually occur between November and April, and are responsible for most of the precipitation recorded in Apple Valley and southern California. Local thunderstorms can occur at any time, but usually impact relatively small areas. These storms are typically most prevalent in the higher mountains during the summer, but are also common in the Mojave Desert region. Tropical rains typically occur in the summer or early fall, especially in desert areas. These storms

originate in the warm, southern waters off Baja California, in the Pacific Ocean, and move northward into southern California.

Precipitation in southern California is also extremely variable from year to year, ranging from a fraction of the average amount in one year, to more than double the average amount in another. The Town of Apple Valley and surrounding areas are, like most of southern California, subject to unpredictable seasonal rainfall. Most years, the scant winter rains are barely sufficient to turn the hills green for a few weeks, but every few years the region is subjected to periods of intense and sustained precipitation that results in flooding.

For example, record-breaking rainfall has occurred periodically in Apple Valley with peak flows typically ranging from about 500 to 1,000 cubic feet per second. However, record peak flows (measured just upstream of the Mojave Forks Dam) reached about 23,000 cubic feet per second in 1969 and 1978, and more than 37,000 cubic feet per second in 1910. During the winter of 1938 peak stream flow for Deep Creek was estimated at more than 46,000 cubic feet per second, and the Mojave River swelled to more than 70,000 cubic feet per second. The winter rainfall in February and March of 1938 remains the benchmark for damaging storms in the Apple Valley area.

General Conditions and Flood Hazards

Floods are natural and recurring events that only become hazardous when man encroaches onto floodplains, modifying the landscape and building structures in the areas meant to convey excess water during floods. Unfortunately, floodplains have been attractive to development throughout history, since they provide level ground and fertile soils suitable for agriculture, as well as access to water supplies and transportation routes. However, flood hazards are one of the most destructive natural hazards in the world, responsible for more deaths per year than any other geologic hazard. In addition, the average annual monetary flood losses have increased steadily over the last decades as development in floodplains has increased.

As the population in the area increases, there is an increased pressure to build on flood-prone areas, and in areas upstream of previously developed land. The construction of impervious surfaces, such as asphalt, associated with increased development means that water that used to be absorbed into the ground becomes runoff to downstream areas. Areas that have not flooded in the past may be subject to flooding in the future if drainage channels that convey storm waters are not designed or improved to carry these increased flows. Developments near the base of the mountains and downstream from canyons that have the potential to convey mudflows are particularly susceptible.

Stream Flow and Flood Hazard

Most of the drainages from the surrounding hills and mountains in Apple Valley terminate in desert playas (dry lakes). The Apple Valley Dry Lake is the largest playa in the area, collecting runoff from most of Apple Valley. A smaller playa (Reeves Dry Lake) is present in the central part of Fairview Valley, where it receives runoff from the adjacent mountains. In the southeast corner of Apple Valley, drainages from the Ord Mountains, including the Juniper Flats, Arrastre

Canyon, and Lovelace Canyon watersheds, lead to Rabbit Dry Lake in Fifteenmile Valley. Along the eastern edge of the Sphere of Influence, drainages from the Granite Mountains flow eastward to Lucerne Dry Lake in Lucerne Valley. Drainage channels in Apple Valley's local mountains are well carved, however they lose their strong definition upon reaching the valley floor, where sediment-laden water typically spreads out into braided ephemeral stream channels and as sheet flow.

Drainages along the western side of Apple Valley eventually discharge into the Mojave River. The largest tributary to the Mojave River within Apple Valley is Bell Mountain Wash, a natural channel that collects runoff primarily in the area north and west of Bell Mountain. The area west of Catholic Hill is drained by the smaller, partially modified, Desert Knolls Wash. In the southwest corner of Apple Valley, numerous small, unnamed drainages draining the western part of the Ord Mountains flow towards the Mojave River.

The Apple Valley Master Plan of Drainage reports several episodes of flooding including a 20-minute storm in August 1961 that caused several homes near Bell Mountain to be inundated by mud flows, a two-hour summer storm in 1963 that caused flash flood waters to inundate downtown sections of Apple Valley, and a 45-minute storm in August 1974 that flooded streets, homes, and businesses throughout the area. More recently, in January 2005, intense and sustained rainfall in the San Bernardino Mountains caused the release of water impounded behind Cedar Springs Dam (Silverwood Lake) and Mojave Forks Dam, leading to evacuations and flooding downstream, as well as erosion of the earthen levees along the Mojave River.

Seismically Induced Inundation

Dam Inundation

Seismically induced inundation refers to flooding that results when water retention structures, such as dams, fail due to an earthquake. Three dams in the area could potentially impact Apple Valley and the surrounding communities. These include the Mojave Forks Dam (Mojave Reservoir), the Cedar Springs Dam (Silverwood Lake), and the Lake Arrowhead Dam.

Mojave Forks Dam is located at the base of the San Bernardino Mountains, where Deep Creek and the West Fork of the Mojave River merge to form the Mojave River. Constructed in 1971 to control flooding in desert communities downstream along the river, the dam consists of an embankment that is 200 feet higher than the original streambed and is constructed of compacted fill. The reservoir design flood is a peak outflow of 23,500 cubic feet per second, and 131,300 cubic feet per second for the spillway. The maximum release from the dam to date was 16,600 cubic feet per second in January 2005. A worst-case scenario from failure of the Mojave Forks Dam is that floodwaters would be expected to be confined to the existing Mojave Riverbed and the mouths of tributary channels.

Cedar Springs Dam is located in the Summit Valley area of Hesperia, upstream from the Mojave Forks Dam. This dam is constructed across the West Fork of the Mojave River and impounds the Silverwood Lake, a large water supply reservoir that also serves as a recreation facility. The dam captures a thirty-four square mile drainage area. If the Cedar Springs Dam failed it is

expected that it would flood a significant portion of eastern Summit Valley between Silverwood Lake and Mojave Forks Dam in less than 30 minutes.

Lake Arrowhead Dam is located at an elevation of approximately 5,000 feet, approximately15 miles south of Apple Valley in the San Bernardino Mountain. The dam was constructed over a period of years beginning in 1893; subsequent legal delays slowed construction, and the dam opened in 1922. Lake Arrowhead Dam encompasses approximately 780 acres and has an average depth of 100 feet. In the event of dam failure, floodwaters would flow north down the Deep Creek drainage to the Mojave Forks Dam, and would be contained in the Mojave Forks Reservoir area. If the Mojave Forks facility were at or near capacity, however, water from Lake Arrowhead would spill over into the Mojave River.

Inundation from Above-Ground Storage Tanks

Strong ground shaking and rupture can damage aboveground water tanks. Without adequate bracing and baffling, seismically induced inundation can occur. As a result, sloshing water within the tank can potentially lift the tank off of its foundation and split the shell. The Town of Apple Valley does not provide water to its residents, and does not own any water reservoirs. There are numerous private water companies providing the area with water, and also maintaining aboveground water reservoirs within the Town. Most of the tanks have been constructed in recent years and may meet current earthquake design standards. However, older tanks may lack the flexible joints and other seismic upgrades. Such upgrades, associated with newer design requirements, can help to limit the potential for damage to areas downstream resulting from a failed water tank. Therefore, evaluation and retrofitting of existing tanks within the Town should be undertaken as necessary to ensure compliance with the most current water tank design criteria.

FLOOD CONTROL MEASURES

Regional Flood Control

The management of regional drainage within and in the vicinity of Apple Valley is the responsibility of the San Bernardino Flood Control District. Regional drainage includes rivers, major streams and their tributaries, as well as areas of significant sheet flows. The District is mandated to provide flood control planning and construction of drainage improvements for regional flood control facilities, as well as watershed and watercourse protection related to those facilities as part of its broad management functions. In order to accomplish its responsibilities, the District has been invested with the power of taxation bonded indebtedness, land and water rights acquisition, and cooperative partnerships with local, state, and federal agencies. The official decision-making body for the District is the San Bernardino County Board of Supervisors.

Local Flood Control

Although as stated above the San Bernardino County Flood Control District has the primary responsibility for managing regional drainage in and around the community, the Town remains directly responsible for the management of local drainage. To manage local drainage and open

space, areas rich in vegetation and cover, as well as those constrained by topography should be preserved, so as to allow existing alluvial plains and drainage channels to reduce runoff and preserve the capacity of downstream facilities. The size of downstream facilities required can be significantly reduced through the inclusion of on-site stormwater detention facilities significantly. Further, such planning provides opportunities for groundwater recharge as well as enhanced open space and/or recreation areas.

As new developments are considered within the Town, hydrologic studies should be conducted to evaluate the impact that increased development may have on existing downslope development The hydrologic analyses should consider the effects of increased runoff and alterations to natural stream courses and identify the constraints to be assessed while planning and site development are in their earliest stages. If any deficiencies are identified in the project hydrologic study, the project proponent needs to demonstrate that these can be mitigated to a satisfactory level prior to proceeding forward with the project, in accordance with California Environmental Quality Act (CEQA) guidelines. Typical mitigation measures used to address hydrologic deficiencies in project design include the provision of flood control devices such as catch basins, storm drain pipelines, culverts, detention basins, desilting basins, velocity reducers, as well as debris basins for protection from mud and debris flows

The San Bernardino County Flood Control District has established methodology to be used to analyze and design flood control structures. The Town is responsible for operation of the local storm drain network, whereas the regional flood control facilities are the responsibility of the San Bernardino County Flood Control District. As a result, both agencies must be involved in the planning and approval of mitigation measures in order to assure compatibility. The scale, complexity and cost of future flood control facilities is influenced by the effectiveness with which drainage issues are managed within Apple Valley. Prevention and on-site management that recognize the significant physical and financial constraints that exist in many parts of the planning area should be actively integrated into community land use planning and regulation.

Apple Valley Master Plans of Drainage

The drainage within the Town of Apple Valley is defined by the Apple Valley Master Plan of Drainage and the Apple Valley West/Desert Knolls Master Plan of Drainage.

Apple Valley Master Plan of Drainage[2]
The Apple Valley Master Plan of Drainage divides the Town of Apple into subareas based on localized hydrologic features, including topography, soils, and drainage facilities. These subareas include the North Community, the South Community, and the East Community, as discussed below.

The North Community Master Drainage Plan identifies numerous drainage courses and regional drainage facilities in the northern part of Town, north of the Apple Valley Dry Lake. The existing and proposed flood control facilities in this area include:

[2] "Apple Valley Master Plan of Drainage," prepared by San Bernardino County Flood Control District, 1991.

- Facility N-01 is an unimproved, open channel that collects runoff from a 3.3 square mile area encompassing Fairview Mountain and is diffused on the valley floor. This channel intercepts runoff and provides flood protection for buildings east of Central Road.

- Facility N-02 is a shallow earthen channel adjacent to the Apple Valley Airport that runs through from Central Road (north of Johnson) to Waalew Road (west of Navajo Road). Runoff transported by Facility N-02 originates on the south side of Black Mountain and the northeast side of Fairview Mountain, collecting runoff from an 8.7 square mile area.

- Facility N-03 is a riprap-lined channel that transports runoff from an industrial area east of the airport, and merges with facility N-02 south of Papago Road.

- Facility N04 is a fully leveed channel that conveys runoff southward from Black Mountain, north of the Mojave Northern Railroad. The channel drains an area of 7.6 square miles. A debris basin is recommended adjacent to the railroad, because upstream of the railroad lines there are many drainage paths through the Black Mountain area.

- Facility N-05 is an earthen channel with a partial riprap lining that transports runoff generated entirely from the industrial area north of the airport. It merges with channel N-04 just south of Gustine Street, where an earthen levee collects flows.

- Facility N-06 carries runoff generated by Bell Mountain, Little Bell Mountain, and Catholic Hill, west of Dale Evans Parkway between Quarry Road and Corwin Road. The channel drains 1.6 square miles and is a natural earthen channel in some areas, has riprap in other sections, and is fully leveed in its southernmost sections. Containment levees are needed on the east side of the upper portions of the channel. In addition, debris basins may be required, since the natural channels that drain Bell Mountain are intercepted.

- Facility N-07 is a riprap-lined channel that carries runoff from Little Bell Mountain and Catholic Hill. This channel runs parallel with Corwin Road and merges with channel N-06 at the intersection of Corwin Road and Papago Road. This facility requires a containment levee along Corwin Road to channelize flows, and a debris basin where the natural channels that drain Catholic Hill are intercepted.

The South Community Master Drainage Plan proposes drainage courses and regional drainage facilities in the southern part of Town, south of the Apple Valley Dry Lake. The existing and proposed flood control facilities in this area include:

- Facility S-01 (Mariana Wash) and its tributaries, which convey most of the initial runoff from the Ord Mountains within the watershed. This facility's outlet is at the Apple Valley Dry Lake, with 100-year peak flows of approximately 9,900 cubic feet per second and a tributary area of about 29 miles. It may be beneficial to elevate the lower reaches of this facility as a rectangular concrete channel to reduce impact on existing development.

- Facility S-02 conveys runoff from the residential area south of the railroad and north of Ocotillo Way. The alignment of this facility closely follows the alignment of the existing wash. This facility outlets to Facility S-01, just south of Ramona Avenue with a 100-year peak flow rate of approximately 5,200 cubic feet per second. This drainage has a tributary area of about 9 square miles.

- Facility S-03 conveys runoff from the Ord Mountains east of the portion that is directly tributary to Facility S-01. At its confluence with S-01, this facility has a peak 100-year flow rate of approximately 3,800 cubic feet per second, and a 5.5 square mile tributary area.

- Facility S-04 conveys runoff originating in the Ord Mountains west of the portion contributing directly to S-01. At its confluence with S-01, this facility has a peak 100-year flow rate of approximately 2,100 cubic feet per second, and a 2.1 square mile tributary area.

- Facility S-05 would be constructed to convey runoff from the single-family residential development south of the railroad. This channel will have a base of 15 feet in width and a riprap lining for its entire 200-foot length. The 100-year peak flow for this facility is estimated to be approximately 780 cubic feet per second.

- Facility S-06 is proposed to follow the existing alignment of Colony wash, and would convey runoff from Deadman Hills and the low-density residential area in the southeast portion of the Town. At its confluence with S-02, this facility would have a peak 100-year flow of approximately 3,100 cubic feet per second, and a 4.4 square mile tributary area.

- Facility S-07's alignment is proposed to closely follow the existing Del Oro Wash for its entire length. It will convey runoff from local residential areas encompassing 2.4 square miles and will have a peak 100-year flow rate of 1,600 cubic feet per second at its outlet to S-03.

- Facility S-08 conveys runoff from a southwest portion of Town to the Apple Valley Dry Lake. The watershed is long and narrow, and includes dense development of single-family homes. At this facility's outlet to the Dry Lake, the 100-year peak flow rate is approximately 2,800 cubic feet per second, with a 7.4-mile tributary area.

- Facility S-09 conveys runoff from the southwest portion of Town and outlets to S-08, just north of Standing Rock Avenue and east of Navajo Road. The 100-year peak flow rate is approximately 1,100 cubic feet per second, with a 2.8-mile square mile tributary area.

- Facility S-10 conveys runoff from the area immediately west of the Apple Valley Dry Lake. At this channel's outlet to the Dry Lake, the 100-year peak flow rate is about 1,100 cubic feet per second, and it has a 1.2 square mile area of contribution.

The East Community Master Drainage Plan proposes drainage courses and regional drainage facilities in the eastern part of Town. There are no significant man made flood control facilities in the East Community, and the natural drainage system consists of one major watercourse, which is the Fairview Wash. The existing and proposed flood control facilities in this area include:

- Facility E-01 is known as the Fairview Wash. Runoff is generated from the Granite Mountains in the east and south, and from the Fairview Mountains to the north. This runoff is contained within a broad flood plain with side slopes with a ratio of approximately 60 to 1. This channel outlets to the Apple Valley Dry Lake, with 100-year peak flows of 8,500 cubic feet per second, and a tributary area of approximately 20 square miles.

- Facility E-02 is planned to meet with E-01 at the outlet to the Dry Lake. Runoff for this facility is generated from Fairview Mountain north of Waalew Road. Runoff will be collected into a concrete channel by means of an earthen levee along the north side of Waalew Road, east of Tokata Road, as well as a short section of levee running north on the west side of the natural watercourse. The 100-year peak flow is expected to be about 1,400 cubic feet per second, with a 1.5-mile tributary area.

- Facility E-03 drains the southern portion of Fairview Mountain in a partially riprap lined channel with a base of 15 feet. This facility has a 100-year peak flow rate of approximately 840 cubic feet per second. The facility's confluence with E-01 occurs approximately 1,200 feet east of Japatul Road.

- Facility E-04 conveys runoff from the western portion of the Granite Mountains and the Deadman Hills. Runoff is channelized just north of Esaws Avenue, approximately 1,600 feet east of Japatul Road. The addition of a levee running southeast from the channel inlet, and another along the east side of Redwing Road, will ensure channelization of runoff. At its outlet into the Dry Lake, this facility has a 100-year peak flow of 5,700 cubic feet per second, from a 10.4 square mile tributary area.

- Facility E-05 conveys runoff from the Granite Mountains between Thunderbird Road and Standing Rock Avenue. The channel confluences with E-04 at Candlewood Road. The 100-year peak flow rate for this facility is 3,800 cubic feet per second, from a tributary area of 4 square miles.

- Facility E-06 conveys runoff from the Deadman Hills. It joins with E-04 approximately 750 feet north of Esaws Avenue and 500 feet west of Shirwaun Road. The 100-year peak flow for this facility is approximately 1,600 cubic feet per second.

- Facility E-07 conveys runoff from the Granite Mountains and Japatul Hills south of Standing Rock Avenue. This facility joins with E-05 at Shirwaun Road, and has a 100-year peak flow of 1,200 cubic feet per second. The channel is riprap lined with a base of 15 feet.

- Facility E-08 conveys runoff from the Granite Mountains between Thunderbird Road and Standing Rock Avenue. The riprap lined channel joins with E-05 at Via Vista Road just east of Lillian Way, with a 100-year peak flow rate of approximately 750 cubic feet per second.

Apple Valley West/Desert Knolls Master Plan of Drainage[3]
The Apple Valley West/Desert Knolls watershed is generally defined by Catholic Hill and Piercy Quarry to the north, the base of the Ord Mountains to the south, Kiowa Road to the east, and the Mojave River to the west. The watershed is long and narrow, with the northern portion moderately sloping to the southwest and the southern portion gently sloping down to the northwest to the Mojave River. The existing and proposed flood control facilities in this area include:

- Line A-01 is known as the "Desert Knolls Wash" and is an existing natural earthen channel that enters the Mojave River just upstream of the Upper Narrows. If levees are constructed on the River in this area, this facility would require approximately 500 feet of containment levees ranging from zero to six feet. The 100-year flow depth in this facility is the same as the River at their confluence.

- Line B-01 has a proposed outlet that will cross Riverside Drive and continue directly into the River. When River levees are constructed, this facility will require containment levees ranging from zero to six feet upstream to Talcony Road, approximately 1,200 feet upstream of Riverside Drive. The 100-year flow depth in this facility is approximately 3 feet higher than the River at their confluence.

- Line C-01 flows across Havasu Road and empties into an earthen swale that flows to the northwest and into the River. Construction of the River levees will require containment levees at this facility, ranging from zero to six feet upstream to Havasu Road. The 100-year flow depth in this facility is the same as the River at their confluence.

- Line E-01 is proposed to utilize existing pits between the railroad and Rock Springs Road. The pits will need to be filled approximately 10 feet and the River levee will have to be lowered to allow flows to reach the River. The railroad and road embankments will act as levees for this facility. With these improvements, the 100-year flow depth of this facility is approximately 4 feet higher than the River at their confluence.

Federal Emergency Management Agency and Federal Flood Rate Maps

The Federal Emergency Management Agency (FEMA) is required to assess flood hazards, as mandated by the National Flood Insurance Act (1963) and the Flood Disaster Protection Act (1973). Through the National Flood Insurance Program (NFIP), FEMA conducts engineering studies to assist communities in evaluating the extent and location of flood hazards, and to encourage appropriate land use and flood plain management and development. The flood zones mapped by FEMA are published in Flood Insurance Rate Maps (FIRMs). The extent of flooding

[3] "Apple Valley Master Plan of Drainage," prepared by San Bernardino County Flood Control District, 1991.

potential in some parts of Apple Valley has been analyzed through Flood Insurance Studies. Exhibit IV-4, Flood Zones in the Study Area, shows the FIRM inundation limits for the 100-year and 500-year flood in the planning area. It should be noted that mapping of flood zones is not complete since the entire area was not studied.

FEMA defines the flood zones based on the potential level of inundation. Each of the applicable flood zones is briefly described below.

Zone A: Areas of 100-year flood for which no base flood elevations have been determined.

Zone AE: Areas of 100-year flood for which base flood elevations have been determined.

Zone D: Areas in which flood hazards have not been determined.

Zone X: Areas that have been determined to be outside the 500-year floodplains.

The FIRM maps are amended periodically to reflect changes in flood control facilities and/or changes in topography (usually as a result of development). Modifications to the FIRM maps typically accompany updated Flood Insurance Studies or Letters of Map Change that FEMA issues in response to an agency supplying new hydraulic data showing that the flooding hazard in a specific area has changed or been abated. FIRM maps in the Town include six community panels from 1996, and one community panel form 1997. Since their original publication, some of the maps have been amended by Letters of Map Change.

Portions of Apple Valley are still vulnerable to inundation during the 100-year flood. These areas occur along the Mojave River and Desert Knolls Wash, and within the Apple Valley Dry Lake.

Except for Desert Knolls Wash, most of the FEMA flood-prone areas are relatively undeveloped, or in the case of Apple Valley Dry Lake, development is minimal. Rock Springs Road is a major roadway and Mojave River crossing in the planning area. This roadway, as well as numerous secondary roads (mostly in the Dry Lake area), would be flooded and impassable as a result of the 100-year storm.

Land Use Planning as a Flood Control Strategy

One of the most effective and direct methods to control flooding and limit threats to lives and property is land use planning. Proper planning is consistent with other primary community goals that call for the preservation of natural areas in the foothills and mountains. These preserved areas can function as natural watersheds for local drainage and ground water recharge and can have positive affects by slowing down storm water flows and reducing erosion and the amount of debris that reaches downstream facilities.

Land use planning can also limit human exposure to the hazards of flooding. Losses to the community can be greatly reduced through the use of restrictions on the type and location of structures in the vicinity of major drainages. Within the limits of improved and unimproved 100-year floodplains development should be severely limited and regulated. Restrictions in the Apple

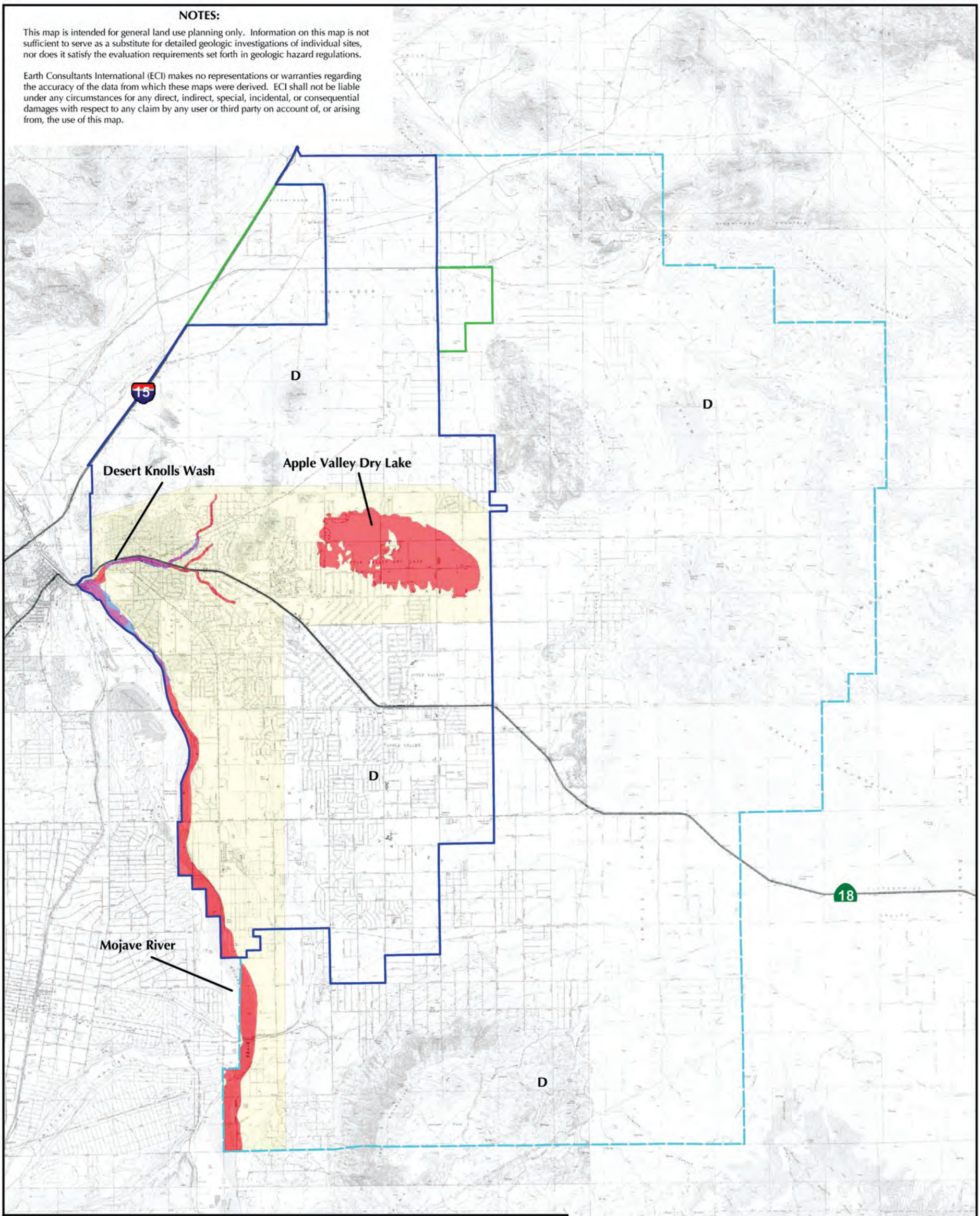
Valley Dry Lake, which allows development of one unit on every 5 acres, or prohibitions on development if flood hazards cannot be eliminated, are examples of how planning can effectively protect against flooding.

Development approvals should be conditioned to assure protection of improvements from flood damage within flood zones subject to sheet flooding. Protection measures may include the raising of buildings' finished floor levels above the flood depth projected for the surrounding area, and providing protection to drainages against scouring. Such measures are standard requirements of the San Bernardino County Flood Control District and the Town, for all projects proposed in FEMA Zone A (see discussion of FEMA Zones, above). Until such time as flood improvements are completed, and flood prone areas are removed from severe threats of flooding, development in these areas should be carefully regulated.

NOTES:

This map is intended for general land use planning only. Information on this map is not sufficient to serve as a substitute for detailed geologic investigations of individual sites, nor does it satisfy the evaluation requirements set forth in geologic hazard regulations.

Earth Consultants International (ECI) makes no representations or warranties regarding the accuracy of the data from which these maps were derived. ECI shall not be liable under any circumstances for any direct, indirect, special, incidental, or consequential damages with respect to any claim by any user or third party on account of, or arising from, the use of this map.



Base Map: USGS Topographic Map from Sure!MAPS RASTER, 1997.
Sources: Federal Emergency Management Agency, 1997; 1996, 1997 (Flood Insurance Rate Maps
Panel Numbers: 06071C6485F, 06071C5845F, 06071C5840F, 06071C5820F, 06071C6505F, and 06071C6515G).

N
W E
S

Scale: 1:108,000

9000 0 9000
Feet

2000 0 2000
Meters

Explanation

- A — Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
- AE — Areas of 100-year flood; base flood elevations and flood hazard factors determined.
- X — Areas of 500-year flood; areas of 100-year flood with average depths of less than one foot or with drainage areas less than one square mile and areas protected by levees from 100-year flood.
- X — Areas determined to be outside the 500-year floodplain.
- D — Areas in which flood hazards are undetermined.
- Town of Apple Valley Boundary
- Apple Valley Sphere of Influence
- Apple Valley Annexed Area

Source: Earth Consultants International, December 2008

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Planning & Research, Inc.

Apple Valley General Plan
Flood Zones in the Study Area
Apple Valley, California

Exhibit
IV-4

Flood Protection Measures for Property Owners

Within the vicinity of the Mojave River and the Apple Valley Dry Lake, flooding remains a significant risk to structures and residents in Town. It is recommended that property owners in flood prone areas make modifications to their houses to reduce the potential impacts of flooding. Flood protection measures are recommended by FEMA for property owners to implement and reduce flood damage, including: the installation of waterproof veneers on the exterior walls of buildings; putting seals on all openings, including doors, to prevent the entry of water; raising electrical components above the anticipated water level; and installing backflow valves that prevent sewage from backing up into the house through the drainpipes. These suggested improvements vary in complexity and cost, and some need to be carried out only by a professional licensed contractor. Structural modifications require a permit from the Apple Valley Building and Safety Division, or the County Building Departments. These agencies should be consulted regarding whether or not flood protection measures would be appropriate for a specific property.

Other Flood Control Measures

Emergency Response

The Town has established the following evacuation routes: Central Road (north/south), State Route 18 (east/west and north/south), and Bear Valley Road (east/west). The County is currently developing County Evacuation/Transportation Committee within each region, with the high desert region plan expected to be addressed in early 2009. Town emergency services staff regularly participate in the County Evacuation/Transportation Committee and attend Caltrans training. As of 2008, no comprehensive mass evacuation plan is in place for the Town or the region.

In order to provide the highest functional reliability of major roadways and the public transportation system serving the Town and the region, the Town shall continue to coordinate with Caltrans, the Federal Highway Administration, adjoining cities and communities, and San Bernardino County. The Town shall also address flooding hazards that threaten people and property, and that may isolate portions of the community, through continued coordination with San Bernardino County Flood Control and FEMA. Through this coordinated effort, programs should be developed that can identify and address weak links in the circulation system, in conjunction with the efforts of the County and other jurisdictions in the high desert region.

All Weather Crossings

U.S. Interstate-15 and State Route 18 are major regional access routes serving the Town. Bridges and underpasses are critical roadway components for delivery of food, water and medical supplies and personnel, as well as for the evacuation of the injured. Freeway underpasses and railroad crossings are generally protected from flooding by existing flood control structures. In the event of a major flood or other disaster, critical roadways and components could be damaged or blocked.

In the event of major flood events, access to the U.S. Interstate-15 freeway, which links Apple Valley with other cities and communities in the region, may become flooded or damaged. However, several roadways cross the Mojave River west of the Town, including Interstate-15, State Route 18, Bear Valley Road and Rock Springs Road. Rock Springs Road is an at-grade roadway that is not passable during moderate to heavy rainfall. Although funding for realignment of this roadway has been authorized through Proposition 1.B (Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006), these improvements do not address the river crossing. An additional crossing, the Yucca Loma Bridge at Yucca Loma Road, is under design by the Town, and construction is anticipated to begin in 2010, with completion likely in the later part of 2011.

Based on information provided by Caltrans, all bridges on U.S. Interstate-15 in the planning area are designed to withstand the 100-year flood and to have 2 feet of freeboard for the 50-year flood.

The National Pollution Discharge Elimination System

The Clean Water Act was passed in 1972 with the goal of restoring and maintaining water quality by reducing "point source pollution" such as pollutants from industry and sewage treatment facilities. Amended in 1987, the Act's focus was shifted to polluted runoff; states were required to reduce discharges into waterways. The US Environmental Protection Agency (EPA) was required to formally regulate polluted runoff through the same mechanism by which it regulates industry and sewage treatment plants: with permits under the National Pollutant Discharge Elimination System (NPDES). Under the NPDES program, communities with populations exceeding 100,000 must apply for a municipal permit that require cities and counties to eliminate or control "non-point source pollution." As defined by the EPA, non-point source pollution is pollution from diffuse sources, such as contaminated runoff, that affect a water body.

The NPDES program emphasizes pollution prevention, control measure activities, utilization of existing resources and programs, and coordination with regional and state compliance activities. The goals of these activities include the following:

- Eliminate illicit connections and illegal discharges to the storm drain system;
- Promote public awareness and participation through the Program's education program, the Storm Water/Clean Water Protection Program;
- Identify and control storm water pollution created by industrial and commercial activities;
- Establish storm water management programs for public agencies to reduce the amount of pollutants that enter and accumulate in storm drains;
- Identify and establish local regulatory control measures for activities that can pollute the storm drain system, such as new development and construction, and residential, commercial and industrial activities;

- Monitor wet and dry weather flows to identify the origin, types, and concentrations of non-point source pollutants;

- Increase existing municipal efforts to clean streets, collect solid waste, and prevent used oil and other hazardous wastes from entering storm drains;

- Develop local ordinances to establish legal authority for cities and counties to regulate stormwater discharges.

In California, as in many other states, the NPDES permitting program is administered by the state rather than the EPA. There are nine Regional Water Quality Control Boards in California with administrative responsibility for the program. San Bernardino County is under the jurisdiction of the Santa Ana Regional Water Quality Control Board.

Flood Control, Wildlife Habitat and Recreation Enhancement

The control of storm water flows, which is consistent with the goals and policies set forth below, should also be viewed as an opportunity for multiple uses, including recreation and wildlife enhancement. This multi-use function should be considered in the design of washes, detention/retention basins and channels. The Biological Resources Element also supports these goals, and should be considered in tandem with the policies and programs in this Element.

Frequently used by numerous birds and small and large mammals, these facilities provide a source of forage and cover. They can also can offer meaningful areas for passive enjoyment by community residents, and serve as a retreat from the more urban environments of the area. These areas are also important as opportunities for the continued integration of the natural habitat into the built environment.

FUTURE DIRECTIONS

The principal implementation of this Element will be accomplished through the enforcement and implementation of the Apple Valley Master Plan of Drainage and the Apple Valley West/Desert Knolls Master Plan of Drainage. The improvements associated with the Master Drainage Plans will help control and confine the area-wide drainage pattern to more discreet and focused routes where it can be better managed. The Master Plans identify facilities that complement land use patterns, provide cost-effective flood control alternatives, and maximize opportunities for multiple uses. The Master Plans also set critical parameters for future development along areas subject to area-wide flooding. The Apple Valley Development Code, Grading Ordinance, and Subdivision Ordinance will be the primary tools the Town will use to implement the flood protection measures required in the Master Plans. An update to the Master Plan of Drainage is currently being drafted in cooperation with the County of San Bernardino Flood Control District and is anticipated to be completed by 2011 or earlier.

GOAL, POLICIES AND PROGRAMS

Goal

Protect lives and property from flooding hazards through a comprehensive system of flood control facilities throughout the Town.

Policy 1.A
Upgrade the Town's local and regional drainage system through proactive planning and coordination with other responsible agencies.

Program 1.A.1
Implement the recommendations of the 1991 Apple Valley Master Plan of Drainage and the 1994 Apple Valley West/Desert Knolls Master Plan of Drainage.
Responsible Agency: Public Works Division, Planning Division, Town Engineer, San Bernardino County Flood Control District
Schedule: Ongoing

Program1.A.2
Capital Improvement Plans outlined in the Apple Valley Master Plans for Drainage for drainage management and control shall be updated and maintained.
Responsible Agencies: Public Works Division, Planning Division, Town Engineer, San Bernardino County Flood Control District
Schedule: Ongoing

Program 1.A.3
Monitor the Master Plans of Drainage every five years, and amend them to reflect changes in local and regional drainage and flood conditions.
Responsible Agencies: Public Works Division, Planning Division, Town Engineer, San Bernardino County Flood Control District
Schedule: 2010-2011, every five years thereafter

Program 1.A.4
As part of project development, all new development shall be required to complete on site drainage improvements at their expense.
Responsible Agencies: Public Works Division, Planning Division, Town Engineer, San Bernardino County Flood Control District
Schedule: Ongoing

Policy 1.B
Consistent with their functional requirements, major drainage facilities shall be designed to maximize their use as multi-purpose recreational or open space sites. Major drainage facilities include the Mojave River, debris basins, the Apple Valley Dry Lake, and Master Plan flood control channels.

Program 1.B.1
Coordinate and cooperate with the San Bernardino County Flood Control District through multi-use agreements within flood control facilities and designing safe, attractive recreational facilities that maintain the functional requirements of the drainage facilities.
Responsible Agencies: Public Works Division, Planning Division, Community Services Division, Town Engineer, San Bernardino County Flood Control District
Schedule: Ongoing

Program 1.B.2
Continue active participation in regional flood control and drainage improvement efforts.
Responsible Agencies: Public Works Division, Planning Division, Town Engineer, San Bernardino County Flood Control District, Developers
Schedule: Ongoing

Policy 1.C
The Town shall actively cooperate with FEMA regarding amendments to local Flood Insurance Rate Maps, recognizing the importance of redesignation of the 100-year and 500-year flood plains within the Town boundaries as facility improvements are completed.

Program 1.C.1
Consistent with existing and proposed improvements in the Apple Valley Master Plans of Drainage, the Town shall coordinate and cooperate in the filing of appropriate FEMA application materials to incrementally secure amendments to the Flood Insurance Rate Maps for the Town in conjunction with the San Bernardino County Flood Control District.
Responsible Agencies: Public Works Division, Planning Division, Town Engineer, San Bernardino County Flood Control District
Schedule: Ongoing

Policy 1.D
All new development within the Town shall be required to incorporate adequate flood mitigation measures, including the adequate siting of structures located within flood plains, grading that prevents adverse drainage impacts to adjacent properties, and on-site retention of runoff.

Program 1.D.1
The retention of stormwater on a project site shall be enforced through the development review process and routine site inspection.
Responsible Agencies: Planning Division, Town Engineer
Schedule: Ongoing

Policy 1.E
Assure that adequate access is maintained during major storm events, and that safe all-weather crossings over drainage facilities and flood control channels are provided where necessary.

Program 1.E.1
Bridging of General Plan roadways within new development projects shall be the responsibility of the developer on whose project the bridge occurs and shall be included by the Town as a condition of project approval.
Responsible Agency: Public Works Division, Planning Division, Town Engineer, Planning Commission, Town Council
Schedule: Ongoing

Policy 1.F
Pursue all credible sources of funding for local and regional drainage improvements needed for adequate flood control protection.

Program 1.F.1
Consider the establishment of Fair Share Cost Allocations or Assessment Districts for purposes of funding necessary drainage improvements in particular geographic areas throughout Apple Valley.
Responsible Agencies: Public Works Division, Planning Division, Town Engineer, San Bernardino County Flood Control District, Developers
Schedule: Ongoing

Program 1.F.2
Explore state and county funding under the Cobey-Alquist Flood Plain Management Act and other state programs, as well as federal funding options for local and area-wide flood control projects.
Responsible Agencies: Public Works Division, Planning Division, Town Engineer, San Bernardino County, State of California
Schedule: Ongoing

NOISE ELEMENT

PURPOSE

Noise represents a potential hazard to the Town's residents, business people and visitors. This Element is designed to consider the land use patterns of the Land Use Element in the context of the noise it will generate, and the ambient noise levels in Town. The proper attenuation of noise is particularly critical to assure that the noise environment is controlled as the Town grows. The Noise Element describes the current and future noise environment, identifies those areas where noise levels are expected to be unacceptable, and establishes policies and programs designed to reduce these noise levels in the long term.

BACKGROUND

California law governs the scope and content of Noise Elements. Government Code Section 65032(f) identifies the requirements for the evaluation of the noise environment in a community, while the California Environmental Quality Act (CEQA) allows the Town to establish standards to determine whether noise levels will have an effect on the Town's environment. In addition, the California Building Code establishes standards for acceptable noise levels inside new buildings. The Town implements these standards through its Building Department.

The Land Use and Circulation Elements have the most direct impact on the Noise Element. The distribution of land uses, and their relationship to noise sources, is critical to the quality of life of Apple Valley. Similarly, the number of vehicle trips generated on the Town's roadways will continue to be the single largest source of noise in the community for the long term.

Development in general, and urbanization in particular, typically lead to increased levels of noise in the environment. Excessive noise levels have the potential to contribute to temporary and permanent physical impairments including hearing loss, fatigue, stress, annoyance, and anxiety. In order to prevent noise levels from becoming excessive, standards can be adopted and implemented through this Element to establish maximum acceptable levels of noise for all land uses.

The noise environment also in Apple Valley is primarily affected by traffic on Town roadways, and by local airport operations associated with general aviation aircraft at the Apple Valley Airport.

Community Noise Assessment

Noise Rating Terminology

Noise levels are calculated on a logarithmic scale in decibels (dB), which is the unit of measurement that describes the amplitude, or strength, of sound. The measurements are weighted and added over a specified time period to reflect not only the magnitude of the sound, but also its

duration, frequency and time of occurrence. An increase of 10 decibels indicates a sound energy that is ten times greater, which would be perceived by the human ear as being twice as loud.

The most common unit for measuring noise levels is the A-weighted decibel (dBA) scale, which gives less weight to the very low and high frequency components of sound, as does the human ear, resulting in an accurate correlation to the subjective reactions to noise. The most common sounds measure between 40 dBA (very quiet) and 100 dBA (very loud). A rural night-time environment typically measures about 25 dBA, while a jet engine measures 105 dBA.

Due to the logarithmic nature of the decibel scale, doubling the sound energy of a noise source only increases the decibel rating by 3dBA. Therefore, if the noise generated by one car is 72 dB, another car next to it will only increase the noise level by 3 dB, to 75 dB. A sound must be nearly 10 dBA higher than another sound before the human ear perceives it as being twice as loud. An increase of 3 dB is barely perceptible to most people, and in many cases, an increase of 5 dB must occur for the listener to consider it readily perceptible. Noise control measures should reduce noise by 5 to 10 dBA in most circumstances to effectively lower the perceived sound.

Community Noise Equivalent Level (CNEL)

Section 46026 of the California Health and Safety Code established a model noise ordinance that can be used by local communities to establish standards for appropriate levels of noise for all types of land uses. The model uses the Community Noise Equivalent Level (CNEL), which averages noise levels on a 24 hour basis; the CNEL uses a weighted scale that acknowledges the more sensitive evening and nighttime periods. Because of the decrease in ambient noise levels during the evening and nighttime, sounds appear to be louder, and may be more noticeable as a result.

Town of Apple Valley Noise Ordinance

Section 9.73 of the Town of Apple Valley Development Code establishes community-wide noise standards and emphasizes the value of an acceptable noise environment. Section 9.73 sets forth regulations for noise measurement and monitoring, as well as citing special provisions, and exemptions to the ordinance. Section 9.73 is intended to regulate excessive noise from existing uses and their activities. Violations are defined as a nuisance, and procedures, remedies and penalties to which violators are subject are included. Section 9.73 also establishes standards for construction activities, which represent a temporary, but often disruptive noise source.

Types of Noise

Noise sources can be classified as either “line sources” (such as a busy street) or “point sources” (a commercial air compressor). A number of factors affect noise as it travels through the air, including temperature, wind speed and direction, hard and soft ground surfaces, and intervening vegetation and walls. “Soft site” conditions are those that occur over natural surfaces, such as earth and vegetation, while “hard site” conditions are represented by hard ground surfaces, such as asphalt, concrete, and stone. A noise reduction rate of 4.5 dBA per doubling of distance is typically observed in soft site conditions, while a reduction of 3.0 dBA typically occurs in hard site conditions. When considering noise generated by a roadway, these factors are particularly important insofar as they can mitigate or intensify the noise level.

Major Noise Sources in Apple Valley

Traffic Noise

The noise generated by vehicles on Town roadways is the most significant contributor to noise in Apple Valley. More heavily traveled roads generate the most noise, while local streets, which carry fewer cars, are generally quieter. The U.S. Interstate 15 (U.S. I-15) freeway is located along the northwestern Town limits. The primary thoroughfare through Apple Valley is State Route 18. Residential uses adjacent to, or in proximity to U.S. I-15 or State Route 18 are impacted by traffic noise. Schools and the hospital are also located on major roadways.

Traffic noise is also affected by the type of vehicle traveling on Town roads. The higher concentrations of heavy trucks on U. S. I-15, State Route 18, Bear Valley Road and Dale Evans Parkway result in higher noise levels in the areas surrounding these roadways. Similarly, truck traffic can significantly impact residential neighborhoods on arterial roadways. To assure that this impact is minimized, the Circulation Element includes a plan of truck routes that limits the intrusion of truck traffic into residential areas.

Aircraft Noise

Aircraft noise associated with the operation of the Apple Valley Airport, which is owned and operated by the County of San Bernardino, is limited to general aviation aircraft. The airport currently (2008) operates an average of about 103 takeoffs or landings daily, or 38,000 flight operations a year. The 60 dBA noise contour for the airport has been identified as occurring within the Airport's property, and noise levels on surrounding lands are not significantly affected. While aircraft overflights may be heard within the Town, aircraft noise does not create significant noise impacts outside the immediate area.

Rail Noise

While train noise is intermittent, train pass-bys generate high noise levels for short periods of time. A single-track rail line occurs on the north side of Quarry Road for the exclusive use of the Mojave Northern Mining Quarry, which operates trains on the lines about 2 to 4 times per week. An additional single-track rail line is located within the southern portion of Town and extends into the southerly Sphere of Influence area. This rail line is used by quarry operations in San Bernardino County, and generally runs along Tussing Ranch Road, following Kiowa Road south and Rock Springs Road west. Freight trains run on this line about twice a week.

Industrial and Commercial Noise

Industrial and commercial uses can have a varying degree of impact to adjacent uses. Noises from industrial and commercial uses are typically associated with mechanical equipment, generators, truck deliveries, loading/unloading docks, speakerphones, trash compactors and air conditioning units. The level of noise that mechanical equipment generates can be effectively attenuated through screens and baffling, as well as the orientation of the equipment as it relates to more noise-sensitive land uses in the vicinity.

Sensitive Receptors

Sensitive receptors are those land uses that are particularly sensitive to noise intrusion, including residences, schools, libraries, churches, hospitals, nursing homes, and other health care facilities. Day care centers, parks, and other outdoor recreation areas may also be considered sensitive receptors. Moderately sensitive land uses include cemeteries, golf courses, hotels and motels, and dormitories.

Potential problems occur when residential areas are located in close proximity to industrial and commercial uses. The nearest noise sensitive areas potentially impacted by industrial uses are located adjacent to the North Apple Valley Industrial Specific Plan boundary, in the existing residential areas south of Waalew Road and Central Avenue. Intense commercial uses are also located along State Route 18 and Bear Valley Road, and noise from these uses can impact adjacent residential areas.

Existing Noise Environment

The primary noise source in the Town of Apple Valley is motor vehicle traffic. Noise from railroads, which run to the west, north and south of the Town, have a limited impact on the noise environment immediately surrounding them. Aircraft noise from the Apple Valley Airport contributes to the noise environment in North Apple Valley. Other noise sources include mechanical equipment serving commercial and industrial lands, household appliances and garden maintenance equipment, as well as construction activities and equipment.

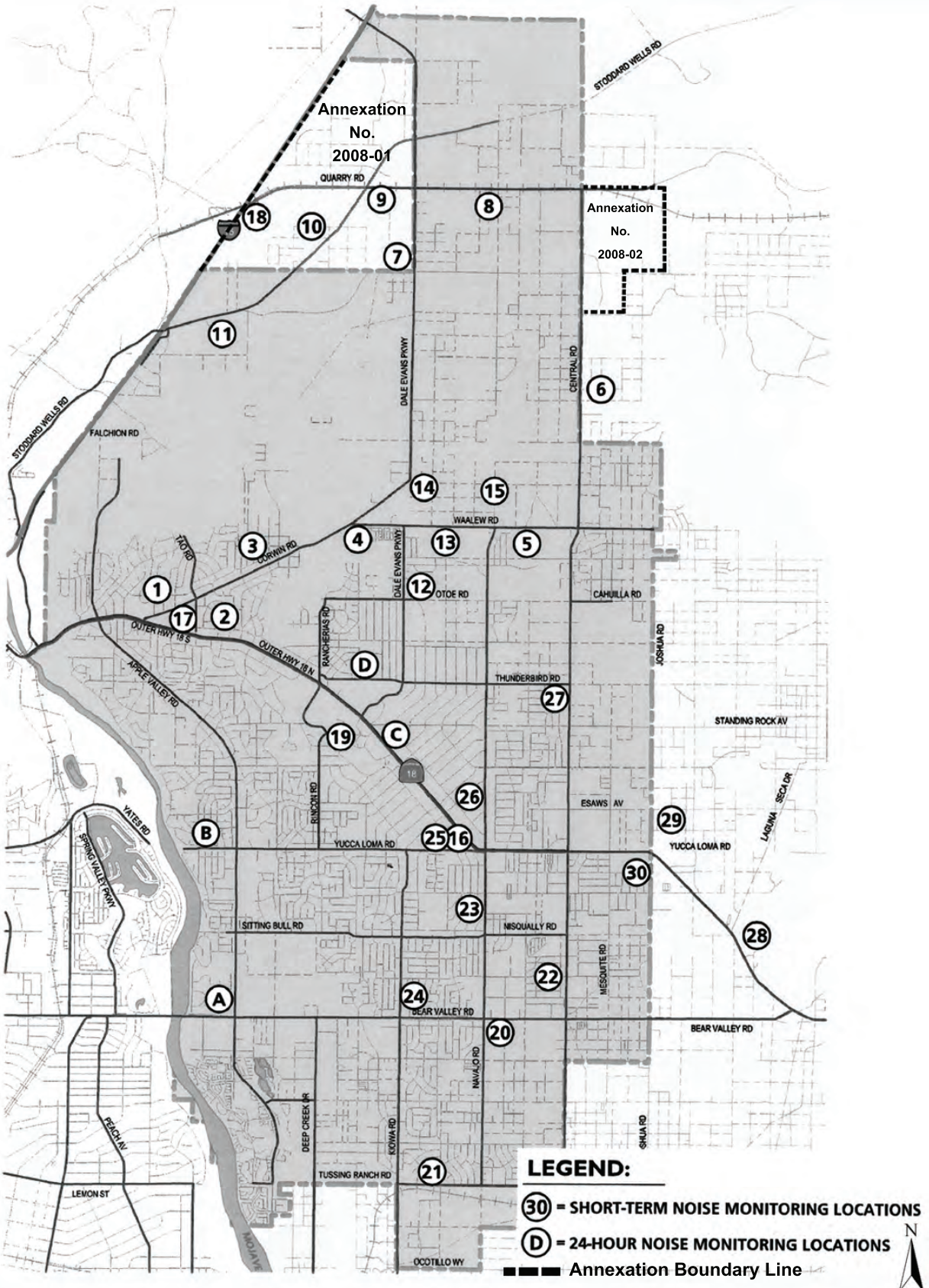
In order to establish a baseline for the Town's noise environment, the noise impact analysis[4] prepared for this General Plan included two types of noise monitoring. Four sites were monitored for a 24-hour period, while short term monitoring was performed at 30 sites. The monitoring locations are depicted in Exhibit IV-5. Long-term and short-term monitoring results are depicted in Tables IV-2 and IV-3, respectively. As shown in these tables, the existing residential neighborhoods adjacent to State Route 18, Bear Valley Road, Central Road, Waalew Road and Corwin Road currently experience exterior noise levels approaching 65 dBA CNEL.

[4] Town of Apple Valley Noise Element Update, Technical Study; Urban Crossroads, November 2008

Table IV-2
Existing (Ambient) 24-hour Noise Level Measurements[1]

OBSERVER LOCATION[2]	DESCRIPTION	HOURLY NOISE LEVELS (1h-Leq) MINIMUM	HOURLY NOISE LEVELS (1h-Leq) MAXIMUM	24-HOUR NOISE LEVELS (CNEL)
A	Located in a residential area behind a 5-foot high sound wall.	49.1	57.8	60.5
B	Located in a residential area near the intersection of Apple Valley Rd. and Yucca Loma Rd.	58.1	66.6	69.7
C	Located in a residential area approximately 200 feet north of the 18 Highway.	48.0	66.7	65.1
D	Located at the Vista Campana Middle School approximately 200 feet from Thunderbird Rd.	52.2	66.5	65.7

[1] Noise measurements taken by Urban Crossroads, Inc. on June 18 and 19, 2008.
[2] See Exhibit 5-A for the location of the monitoring sites, and Appendix C for Study Area Photos.
[3] Taken with a Quest DL Type 2 noise dosimeter.



Source: Urban Crossroads 11.14.2008

TERRA NOVA®
Planning & Research, Inc.

Apple Valley General Plan
Noise Monitoring Locations
Apple Valley, California

Exhibit
IV-5

Table IV-3
Existing (Ambient) Noise Level Measurements[1]

OBSERVER LOCATION[2]	DESCRIPTION	TIME OF MEASUREMENT	PRIMARY NOISE SOURCE	MEASURED NOISE LEVELS (Leq dBA)	CALCULATED NOISE LEVELS (Leq CNEL)
1	Located 50 feet from the road centerline by the Valley Crest Residential Care.	8:30 a.m.	traffic noise from Corwin Road	65.2	65.8
2	Located approximately 150 feet from the road centerline by the Corwin Park.	8:50 a.m.	traffic noise from Corwin Road	56.5	57.1
3	Located 50 feet from the road centerline in a residential area along Corwin Road south of Choco Road.	9:10 a.m.	traffic noise from Corwin Road	66.8	67.4
4	Located 50 feet from the road centerline in front of the Rancho Del Lago residential community near a 7-foot high masonry wall.	9:30 a.m.	traffic noise from Corwin Road	62.1	62.7
5	Located 50 feet from Waalew Road centerline in a single family frontyard across the Specific Plan area.	9:50 a.m.	traffic noise from Waalew Road.	63.2	63.8
6	Located 50 feet from Central Road near residential developments.	10:20 a.m.	traffic noise from Central Road.	62.5	63.1
7	Located approximately 100 feet from Dale Evans Parkway south of Johnson.	10:40 a.m.	traffic noise from Dale Evans Pkwy.	59.4	60.0
8	Located 50 feet from Quarry Road centerline east of Dale Evans Pkwy.	11:10 a.m.	traffic noise from Quarry Rd.	62.1	62.6
9	Located 30 feet from the centerline of Quarry Road in front of a house.	11:30 a.m.	traffic noise from Quarry Rd.	62.5	63.0
10	Located 50 feet from the centerline of Stoddard Wells Road by a single family home.	11:50 a.m.	traffic noise from Stoddard Wells Rd.	57.5	58.0
11	Located 50 feet form Stoddard Wells Road west of Johnson Road.	8:50 a.m.	traffic noise from Stoddard Wells Rd.	61.5	62.1
12	Located 50 feet from Dale Evans Parkway south of Waalew Rd. near single family homes.	9:20 a.m.	traffic noise from Dale Evans Pkwy.	58.4	59.0

Table IV-3
Existing (Ambient) Noise Level Measurements[1]

OBSERVER LOCATION[2]	DESCRIPTION	TIME OF MEASUREMENT	PRIMARY NOISE SOURCE	MEASURED NOISE LEVELS (Leq dBA)	CALCULATED NOISE LEVELS (Leq CNEL)
13	Located 100 feet from Waalew Rd. near a gas station east of Dale Evans Pkwy. south.	9:40 a.m.	traffic noise from Waalew Rd.	61.1	61.7
14	Located 50 feet from the centerline of Stoddard Wells Road by a single family home.	11:50 a.m.	traffic noise from Stoddard Wells Rd.	57.5	58.0
15	Located 50 feet form Stoddard Wells Road west of Johnson Road.	8:50 a.m.	traffic noise from Stoddard Wells Rd.	61.5	62.1
16	Located 50 feet from Dale Evans Parkway south of Waalew Rd. near single family homes.	9:20 a.m.	traffic noise from Dale Evans Pkwy.	58.4	59.0
17	Located 100 feet from Waalew Rd. near a gas station east of Dale Evans Pkwy. south.	9:40 a.m.	traffic noise from Waalew Rd.	61.1	61.7
18	Located 100 feet from Dale Evans Pkwy. approximately 500 feet from Waalew Rd.	10:00 a.m.	traffic noise from Dale Evans Pkwy.	53.9	54.5
19	Located 400 feet from Waalew Rd. near a single family home east of Dale Evans Pkwy.	10:20 a.m.	traffic noise from Waalew Rd.	47.6	48.2
20	Located at the Apple Valley High School approximately 100 feet from Bear Valley Rd.	2:00 p.m.	Traffic noise from Bear Valley Rd.	64.1	69.2
21	Located in a residential area approximately 100 feet north of Tussing Ranch Rd.	2:20 p.m.	Traffic noise from Tussing Ranch Rd.	57.1	62.2
22	Located in a residential area approximately 100 feet west of Central Rd.	2:50 p.m.	Traffic noise from Central Rd.	57.0	61.3
23	Located at the Apple Valley Middle School approximately 100 feet east of Navajo Rd.	3:00 p.m.	Traffic noise from Navajo Rd.	62.2	66.5
24	Located in a residential area approximately 100 feet west of Kiowa Rd.	3:20 p.m.	Traffic noise from Kiowa Rd.	59.9	64.2
25	Located in a residential area approximately 40 feet from Yucca Loma Rd.	1:40 p.m.	Traffic noise from Yucca Loma Rd.	59.8	64.1
26	Located in a residential area approximately 100 feet from State Route 18.	1:20 p.m.	Traffic noise from State Route 18	53.4	58.3

Table IV-3
Existing (Ambient) Noise Level Measurements[1]

OBSERVER LOCATION[2]	DESCRIPTION	TIME OF MEASUREMENT	PRIMARY NOISE SOURCE	MEASURED NOISE LEVELS (Leq dBA)	CALCULATED NOISE LEVELS (Leq CNEL)
27	Located in a residential area approximately 150 feet from Central Rd.	11:50 p.m.	Traffic noise from Central Rd.	67.1	71.4
28	Located at the Horseman's Center Park.	12:10 p.m.	Traffic noise from State Route 18.	53.4	57.7
29	Located at a park by the swimming pool approximately 150 feet from Dale Evans Pkwy.	11:10 a.m.	Traffic noise from Dale Evans Pkwy.	59.6	65.0
30	Located in a residential area approximately 100 feet west of Joshua Rd.	3:00 p.m.	Traffic noise from Joshua Rd.	54.5	58.8

[1] All measurements were taken with a Larson Davis 824 Series Type 1 noise meter.
[2] See Exhibit 5-A for the location of the monitoring sites, and Appendix C for Study Area Photos.
[3] Noise measurements 1 to 10 taken by Urban Crossroads, Inc. on March 24, 2006.
[4] Noise measurements 11 to 16 taken by Urban Crossroads, Inc. on January 26, 2007.
[5] Noise measurements 16, 17 and from 25 to 30 taken by Urban Crossroads, Inc. on May 20, 2008.
[6] Noise measurements 18 to 24 taken by Urban Crossroads, Inc. on June 9, 2008.

The Community Noise and Land Use Compatibility Model

In the Town of Apple Valley, the applicable limit for outdoor noise levels in single-family residential areas is 50 dBA from 7 am to 10 pm, and 40 dBA from 10 pm to 7 am. (Ordinance 9.73.050).

The standard used for maximum outdoor noise levels in residential areas in California is a CNEL of 65 dBA. These noise impacts are characteristically "unmitigated" and represent the worst-case noise impact without any obstruction of the noise.

Table IV-4 below shows the CNEL ranges of allowable exterior ambient noise levels for various land uses at build out. The allowable noise levels increase as the sensitivity of the receptor decreases. Therefore, noise levels at a commercial shopping center, where people will congregate for short periods during the day, but are not present at night, can be higher than noise levels in residential neighborhoods.

The Town has consistently implemented the noise levels shown in Table IV-4 for a number of years.

Table IV-4
Land Use Compatibility for Community Noise Environments

Land Uses	CNEL (dBA)						
	50	55	60	65	70	75	80
Residential - Single Family Dwellings, Duplex, Mobile Homes	A	B	B	B	C	D	D
Residential – Multiple Family	A	A	B	B	C	D	D
Transient Lodging: Hotels and Motels	A	A	B	B	C	C	D
School Classrooms, Libraries, Churches, Hospitals, Nursing Homes and Convalescent Hospitals	A	A	B	B	C	C	D
Auditoriums, Concert Halls, Amphitheaters	B	B	B	B	C	C	C
Sports Arenas, Outdoor Spectator Sports	B	B	B	B	C	C	C
Playgrounds, Neighborhood Parks	A	A	A	C	C	D	D
Golf Courses, Riding Stables, Water Recreation, Cemeteries	A	A	A	A	C	C	D
Office Buildings, Business, Commercial and Professional	A	A	A	B	B	D	D
Industrial, Manufacturing, Utilities, Agriculture	A	A	A	A	B	D	D

Source: *California Department of Health Services, "Guidelines for the Preparation and Content of the Noise Element of the General Plan," 1990*

A Normally Acceptable: With no special noise reduction requirements assuming standard construction.

B Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirement is made and needed noise insulation features included in the design

C **Normally Unacceptable**: New construction is discouraged. If new construction does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

D **Clearly Unacceptable**: New construction or development should generally not be undertaken.

Projected Future Noise Levels

Based the land use map and projected traffic increases resulting from build out of the General Plan, noise level estimates have been prepared, and are depicted in Table IV-5 below. The noise levels shown in the Table do not reflect any barrier that may currently occur on the roadway, such as walls or landscaping screens.

Table IV-5
General Plan Build Out Noise Contours

Road	Segment	dBA CNEL At 100 Feet	Distance To Contour (Feet)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Alembic Street	between Norco Street & Saugus Road	72.6	149	321	692	1,492
Alembic Street	between Saugus Road & Stoddard Wells Road	73.1	161	348	749	1,613
Alembic Street	n/o High Desert Corridor	75.3	227	488	1,051	2,265
Alembic Street	s/o High Desert Corridor	73.2	163	352	758	1,632
Apple Valley Road	between Bear Valley Road & Tussing Ranch Road	71.8	131	282	607	1,308
Apple Valley Road	between Sitting Bull Road & Bear Valley Road	73.9	181	391	842	1,815
Apple Valley Road	between SR-18 & Yucca Loma Road	71.3	122	263	567	1,221
Apple Valley Road	between Yucca Loma Road & Sitting Bull Road	73.5	171	369	795	1,713
Apple Valley Road	n/o SR-18	69.4	91	196	422	910
Bear Valley Road	between Apple Valley Road & Deep Creek Drive	74.3	193	416	896	1,931
Bear Valley Road	between Central Road & SR-18	69.7	95	205	442	952
Bear Valley Road	between Deep Creek Drive & Kiowa Road	74.1	188	405	872	1,880
Bear Valley Road	between Kiowa Road & Navajo Road	72.8	153	330	711	1,533
Bear Valley Road	between Navajo Road & Central Road	71.6	128	275	593	1,279
Bear Valley Road	w/o Apple Valley Road	75.2	222	478	1,030	2,220
Central Road	between Bear Valley Road & Tussing Ranch Road	68.9	85	183	394	848
Central Road	between Nisqually Road & Bear Valley Road	71.4	125	268	578	1,245
Central Road	between SR-18 & Nisqually Road	71.8	131	283	610	1,314
Central Road	between Thunderbird Road & SR-18	72.3	143	308	664	1,430
Central Road	between Waalew Road & Thunderbird Road	73.8	180	387	834	1,797
Central Road	n/o Waalew Road	72.9	155	334	720	1,552
Central Road	n/o Lafayette Street	70.8	112	242	522	1,124
Choco Road	between Norco Street & Saugus Road	69.7	96	207	446	960
Corwin Road	between SR-18 & Tao Road	71.4	124	267	575	1,238
Corwin Road	between Tao Road & Waalew Road	70.5	108	233	502	1,081

Table IV-5
General Plan Build Out Noise Contours

Road	Segment	dBA CNEL At 100 Feet	Distance To Contour (Feet)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Corwin Road	between Waalew Road & Dale Evans Parkway	70.2	103	222	477	1,029
Corwin Road	between Dale Evans Parkway & Dakota Road	72.1	138	297	640	1,379
Dachshund Avenue	n/o Fresno Road	67.7	70	151	326	702
Dakota Road	s/o Fresno Road	71.1	118	255	550	1,184
Dale Evans Parkway	between Corwin Road & Waalew Road	73.6	174	374	806	1,736
Dale Evans Parkway	between Thunderbird Road & SR-18	70.4	106	228	492	1,059
Dale Evans Parkway	between Waalew Road & Thunderbird Road	72.1	139	299	645	1,389
Dale Evans Parkway	n/o Fresno Road	74.2	191	411	885	1,907
Dale Evans Parkway	s/o I-15 Freeway	74.2	191	412	889	1,914
Dale Evans Parkway	between High Desert Corridor & Corwin Road	75.1	219	472	1,017	2,190
Dale Evans Parkway	between High Desert Corridor & Norco Street	74.8	210	452	974	2,098
Dale Evans Parkway	s/o Quarry Road	74.1	187	402	866	1,866
Deep Creek Drive	between Bear Valley Road & Tussing Ranch Road	63.9	RW	85	183	394
Deep Creek Drive	s/o of Rock Springs Road	59.0	RW	RW	86	186
Falchion Road	between Apple Valley Road & Pauma Street	71.1	119	257	554	1,193
Falchion Road	between Pauma Street & Alembic Street	71.3	123	265	571	1,230
Falchion Road	w/o Apple Valley Road	68.2	76	163	352	759
Falchion Road	e/o Alembic Street	70.3	104	224	483	1,041
Fresno Road	between Dale Evans Parkway & Navajo Road	69.6	95	204	440	948
High Desert Corridor	between Alembic Street & I-15 freeway	79.8	451	972	2,094	4,510
High Desert Corridor	between Central Road & Waalew Road	76.4	268	577	1,243	2,677
High Desert Corridor	between Dale Evans Parkway & Alembic Street	79.1	405	872	1,878	4,046
High Desert Corridor	between Standing Rock Avenue & Central Road	73.6	174	374	806	1,736
High Desert Corridor	between Waalew Road & Dale Evans Parkway	78.0	341	735	1,583	3,411
Kiowa Road	between Bear Valley Road & Tussing Ranch Road	71.3	123	265	571	1,230

Table IV-5
General Plan Build Out Noise Contours

Road	Segment	dBA CNEL At 100 Feet	Distance To Contour (Feet)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Kiowa Road	between Sitting Bull Road & Bear Valley Road	71.2	121	261	562	1,210
Kiowa Road	between SR-18 & Yucca Loma Road	68.2	76	163	351	756
Kiowa Road	between Yucca Loma Road & Sitting Bull Road	71.2	121	260	560	1,207
Lafayette Street	w/o Dale Evans Parkway	69.0	86	186	401	864
Navajo Road	between Bear Valley Road & Tussing Ranch Road	64.2	RW	89	192	413
Navajo Road	between Nisqually Road & Bear Valley Road	71.3	122	264	568	1,224
Navajo Road	between SR-18 & Nisqually Road	71.9	134	289	622	1,341
Navajo Road	between Thunderbird Road & SR-18	69.6	94	202	436	940
Navajo Road	s/o Lafayette Street	67.3	66	142	305	658
Norco Street	w/o Alembic Street	70.6	110	237	510	1,099
Outer Highway I-15 S	between Quarry Road & Dale Evans Parkway	68.5	80	172	371	800
Outer Highway I-15 S	between Stoddard Wells Road & Quarry Road	69.9	98	212	456	982
Pauma Street	n/o Falchion Road	69.7	95	205	441	950
Pauma Street	s/o Saugus Road	70.3	104	224	483	1,040
Quarry Road	between Dale Evans Parkway & Navajo Road	69.9	99	214	460	992
Quarry Road	between I-15 Frontage Road & Stoddard Wells Road	73.6	175	377	812	1,749
Quarry Road	e/o I-15 freeway	75.1	219	472	1,018	2,193
Quarry Road	e/o Navajo Road	68.7	82	176	380	819
Quarry Road	w/o Dale Evans Parkway	72.2	140	301	649	1,397
Rincon Road	between SR-18 & Yucca Loma Road	67.1	64	137	295	637
Saugus Road	w/o Pauma Street	69.1	88	189	407	877
Sitting Bull Road	between Apple Valley Road & Kiowa Road	66.3	57	122	262	565
SR-18	between Apple Valley Road & Corwin Road	74.0	184	397	856	1,845
SR-18	between Central Road & Joshua Road	67.7	71	152	328	706
SR-18	between Corwin Road & Tao Road	71.3	123	264	570	1,227
SR-18	between Dale Evans Parkway & Kiowa Road	72.8	153	330	711	1,533
SR-18	between Kiowa Road & Navajo Road	70.8	114	245	528	1,137
SR-18	between Navajo Road & Central Road	71.8	133	286	615	1,326
SR-18	between Rancherias Road & Dale Evans Parkway	72.1	139	299	644	1,387
SR-18	between Tao Road & Rancherias Road	72.8	154	333	716	1,543

Table IV-5
General Plan Build Out Noise Contours

Road	Segment	dBA CNEL At 100 Feet	Distance To Contour (Feet)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
SR-18	w/o Apple Valley Road	75.5	234	504	1,085	2,339
Stoddard Wells Road	e/o I-15 Freeway	74.6	202	436	939	2,022
Stoddard Wells Road	between Quarry Road & Dale Evans Parkway	71.2	120	258	556	1,199
Stoddard Wells Road	e/o Alembic Street	74.4	196	423	912	1,965
Stoddard Wells Road	n/o Johnson Road	71.2	120	259	558	1,201
Stoddard Wells Road	w/o Navajo Road	67.5	68	146	314	677
Thunderbird Road	between Dale Evans Parkway & Navajo Road	66.8	61	131	283	610
Thunderbird Road	between Navajo Road & Central Road	68.8	83	178	383	826
Thunderbird Road	between Rancherias Road & Dale Evans Parkway	64.7	RW	96	207	446
Tussing Ranch Road	between Apple Valley Road & Kiowa Road	70.8	113	244	526	1,134
Tussing Ranch Road	between Kiowa Road & Navajo Road	70.2	103	223	480	1,033
Tussing Ranch Road	between Navajo Road & Central Road	69.7	95	205	442	952
Tussing Ranch Road	w/o Apple Valley Road	72.1	139	299	644	1,387
Waalew Road	between Corwin Road & Dale Evans Parkway	67.3	66	143	307	662
Waalew Road	e/o Dale Evans Parkway	67.6	69	148	320	688
Waalew Road	w/o Central Road	68.0	73	158	340	733
Yucca Loma Road	between Apple Valley Road & Rincon Road	72.5	148	319	686	1,479
Yucca Loma Road	between Kiowa Road & SR-18	71.8	133	286	616	1,327
Yucca Loma Road	between Rincon Road & Kiowa Road	71.1	118	253	546	1,175
Yucca Loma Road	w/o Apple Valley Road	73.3	166	357	769	1,656

[1] RW: Noise contour located within the road right of way.

Managing the Noise Environment

The noise environment in the Town of Apple Valley can be managed using a variety of strategies. For areas particularly impacted by noise, site planning and design standards, including the use of buffer zones such as building orientation, walls, and landscaping between sensitive land uses and roadways, can effectively lessen noise levels. As new noise-sensitive projects are developed adjacent to the roadways described above, noise impact analyses will be required to assure that all possible design features and mitigation measures are incorporated into the project to lower the noise levels and assure good quality of life for the residents.

Noise is most effectively reduced by barriers. A solid row of vegetation, 15 feet in height, will reduce noise levels by about 5 dBA, while a solid masonry wall can provide a reduction of 15 dBA. Barriers must be high enough to complete block the line of sight between the noise source and the receptor. As a result, a home located on a hillside above a noisy freeway will not benefit from a sound wall adjacent to that freeway. The placement of noise barriers, therefore, is critical to their being effective.

Airport Noise

The Apple Valley Airport currently generates a limited number of flight operations, associated with general aviation. In the future, however, the County intends to expand the Airport's capabilities to better serve the industrial and commercial land uses which will develop within the North Apple Valley Industrial Specific Plan. Even with expansion, however, the future noise contours are expected to remain within the airport boundary, and noise impacts on surrounding land uses, particularly the residential development to the east, are expected to be less than significant.

Bus Stops and Bus Routes

The Victor Valley Transit Authority (VVTA) operates bus routes within Apple Valley and regionally. Currently, bus routes travel on major arterial roadways. In the future, as bus service is expanded, bus routes may occur on collector or local streets. Bus noise is equivalent to heavy truck noise in terms of its impact on sensitive receptors. Therefore, as bus service is expanded in Town, care must be taken that noise levels for sensitive receptors are not significant, if the bus routes expand onto less traveled streets.

Truck Routes

Truck routes have been assigned in the Circulation Element. These routes generally occur near U.S. I-15, on State Route 18, and on major arterials and secondary roads, in commercial and industrial areas. Based on an analysis of existing and proposed truck routes, sensitive receptors should not be significantly impacted, and the long-range increases in noise should not affect residential neighborhoods.

Train Traffic

The two train lines that currently operate in the planning area are owned by third parties, over which the Town has no control. Although no plans for expansion are currently known, train traffic on both lines, in the northern and southern ends of Town, could expand in the future. The trains that pass on the Quarry Road line generate noise levels of about 49 dBA CNEL at a

distance of 100 feet from the rail line; the trains operating on the rail line in the southern end of Town generate a noise level of 44 dBA CNEL at a distance of 100 feet. These noise levels reflect engine noise, and do not reflect the additional noise intrusion of whistles and horns. Should train traffic increase in the future, the noise levels would also increase, and given the land use pattern in the area of both lines, could impact sensitive receptors.

FUTURE DIRECTIONS

The Land Use pattern in Town has been designed to place sensitive noise receptors as far as possible from noise sources. However, as the Town continues to develop, and noise levels increase, it will be increasingly difficult to buffer all uses from noise sources. Careful consideration of the placement of new residential projects, and the noise-creating components of commercial and industrial projects, will need to be reviewed by Town staff and elected and appointed officials to assure that compatibility is maintained. The Town's ongoing efforts to preserve a high quality of life for all its residents, present and future, must include the protection of a quiet noise environment.

Particular care will need to be taken when the Town considers development along the High Desert Corridor. This roadway does not currently exist, but when constructed has the potential to generate significant noise levels.

GOAL, POLICIES, AND PROGRAMS

Goal

Noise levels that are consistent with the Town's rural character and high quality of life.

Policy 1.A
The Town shall adhere to the standards of "Land Use Compatibility for Community Environments."

Program 1.A.1
The Town shall continue to maintain and enforce its Noise Control Ordinance.
Responsible Agency: Planning Division, Code Enforcement, Police Department
Schedule: Ongoing

Program 1.A.2
The Town shall include noise attenuation in its development review process when development projects are proposed. Design techniques that can alleviate noise include, but are not limited to building setbacks, the installation of wall and window insulation, sound walls and earthen berms
Responsible Agency: Planning Division, Planning Commission, Town Council
Schedule: Ongoing

Program 1.A.3
The mechanical equipment associated with commercial and industrial development, including compactors, trash disposal areas, heating and air conditioning systems shall be located as far as

practicable from adjacent sensitive receptors, or from lands designated on the Land Use map for noise sensitive uses.
Responsible Agency: Planning Division
Schedule: Continuous

Policy 1.B
New development projects shall assure that exterior noise levels in back yards and/or useable open space do not exceed 65 dBA CNEL, and that interior noise levels are consistent with the requirements of the Building Code.

Program 1.A.4
Minimum requirements for noise analyses for proposed development projects shall be developed and distributed to applicants early in the development review process. Studies shall evaluate project impacts and the effectiveness of proposed mitigation measures.
Responsible Agency: Planning Division
Schedule: 2009-2010

Program 1.A.5
Residential projects proposed adjacent to any street where the build out noise level at 50 feet from centerline is expected to exceed 65 dBA shall be required to submit a noise analysis in conjunction with entitlement applications.
Responsible Agency: Planning Division
Schedule: Ongoing

Program 1.A.6
Commercial and industrial projects proposed adjacent to sensitive receptors, or lands designated for sensitive receptors, including residential, school or hospital sites, shall be required to submit a noise analysis in conjunction with entitlement applications.
Responsible Agency: Planning Division
Schedule: Ongoing

Policy 1.B
Changes proposed to the Land Use Map shall include consideration of the potential noise impacts associated with such a change.

Policy 1.C
The Town shall assure low levels of traffic within neighborhoods by assigning truck routes to major roadways only.

Policy 1.D
The development review and environmental review process shall require all development proposals within the noise impact area of U.S. I-15, State Route 18, the High Desert Corridor or the railroads to mitigate both noise and vibration to acceptable levels through the preparation of focused studies.

Program 1.D.1
The Town shall closely coordinate with Caltrans to encourage the installation of sound walls, rubberized pavement and other noise attenuating measures on roadway improvements for which it is responsible, including U.S. I-15, State Route 18 and the future High Desert Corridor.
Responsible Agency: Town Engineer, Caltrans
Schedule: Ongoing

Policy 1.E
The Town shall coordinate with adjoining jurisdictions to ensure noise-compatible land uses across jurisdictional boundaries.

Policy 1.F
The Town shall ensure that flight paths and airport improvements adhere to all local, state and federal noise regulations.

Program 1.F.1
The Town shall maintain airport compatibility standards in its Development Code, route development applications to the County of San Bernardino, and coordinate with Airport staff to assure that land uses located adjacent to the airport are not significantly impacted by airport noise.
Responsible Agency: Planning Division
Schedule: Ongoing

Policy 1.G
The Town shall monitor bus route expansions to assure that any expansion on a collector or local street does not significantly impact the noise levels of adjacent sensitive receptors.

Program 1.G.1
The Town shall coordinate with VVTA to assure the orderly expansion of bus routes on major arterials and secondary roads, and limit access on collectors and local streets. Mitigation of noise impacts on collector and local streets shall be incorporated into bus stops if necessary.
Responsible Agency: Planning Division, Town Engineer
Schedule: Ongoing

Policy 1.H
The Town shall coordinate, to the greatest extent possible, with the owners of the two rail lines to assure that significant increases in train activity do not occur.

HAZARDOUS & TOXIC MATERIALS ELEMENT

PURPOSE

The Hazardous and Toxic Materials Element identifies those factors that need to be considered in order to provide protection to residents and visitors from potentially harmful hazardous and toxic materials within the Town. Such hazards may pose a threat to life and property, or may call for costly public improvements. The Element characterizes these hazards and presents methods to reduce or eliminate them by establishing policies and programs to ensure the utilization of appropriate management practices, as well as the effective and secure use, storage, and transport of hazardous and toxic substances in the community.

BACKGROUND

Hazardous and toxic materials are substances that have the potential to pose a threat to people or the environment. Hazardous materials are commonly used in a number of industries and often produce hazardous wastes. Hazardous and toxic materials can also be produced as a byproduct of new technologies and chemical processes. Communities and the environment can face potentially significant threats from accidental spills, illegal dumping, and other uncontrolled discharges of these materials. Proper use, disposal, and management of such material is necessary to prevent any adverse impacts from exposure to hazardous and toxic materials.

There are a number of other elements within this General Plan that relate directly or indirectly to the Hazardous and Toxic Materials Element. The Air Quality and Water Resources Elements set forth policies to minimize impacts from pollutants including hazardous and toxic materials. The Land Use Element establishes zoning criteria that are intended to limit any conflict in land use so that hazardous material use, storage, or disposal does not impact people or the environment. Improper management of hazardous and toxic materials has the potential to negatively impact the Biological Resources Element. The Emergency Preparedness Element is also related to the hazardous and toxic materials element by establishing policies and programs that protect the general public from adverse impacts associated with such materials.

Section 65302(g) of the California Government Code requires General Plans to address safety issues, including but not limited to hazardous materials. A number of agencies including local, state, and federal agencies are responsible for regulating and monitoring the management, disposal, labeling, and use of toxic and hazardous materials. The U.S. Environmental Protection Agency, the California Office of Health Planning and Development, and the San Bernardino County Department of Environmental Health Services are some of the regulatory agencies that deal with hazardous and toxic materials. The Tanner Bill, AB 2948 (Chapter 1504, Statutes of 1986), adopted in response to the need for safe management of hazardous materials and waste products, empowers counties to prepare Hazardous Waste Management Plans (HWMP).

A variety of federal, state and local agencies oversee water quality and maintain data regarding specific hazardous waste sites. These are further discussed under Hazardous Waste Management Planning, below.

Hazardous And Toxic Materials

Potential hazardous/toxic material generators that may be located in the Town include commercial, quasi-industrial, and medical operations. Typical businesses that may use or generate hazardous materials or waste include service stations, petroleum product and equipment suppliers, pesticide vendors and users, automotive dealers, medical practitioners, and hospitals and clinics.

In addition, there are three hazardous materials transportation corridors located in the Town of Apple Valley. The Atchison Topeka & Santa Fe Railroad, U.S. Interstate 15, and State Route 18 have the potential to be involved in the transport of hazardous wastes and materials. Accidental spills, purposeful illegal dumping, air emission, and other uncontrolled discharges into the environment from such hazardous/toxic material generators or transporters may potentially expose residents or the environment to hazardous and toxic materials.

Hazardous and toxic material can be composed of a wide variety of chemical and purified chemical compounds, products, and elements. As mentioned above, such materials can be used in commercial businesses, industrial operations and processes, and medical facilities. The more common chemicals include chlorine products, chemical fertilizers, herbicides and pesticides, stored fuels and waste oil, chemical solvents and lubricants, and a variety of medical materials. Such hazardous and toxic material users and producers are considered “small quantity generators”.

Within the Town of Apple Valley there are a limited number of “small quantity generators,” that use or produce hazardous materials. Such businesses are required on an annual basis to certify any onsite hazardous materials with the County’s Hazardous Materials Division (HMD). These facilities including waste-generating medical clinics, gasoline service stations, equipment and fuel storage yards, and waste haulers. These businesses are inspected and monitored to assure compliance with California Code of Regulation (Title 22).

The most significant hazards from these “small quantity generators” are due to leaks from underground storage tanks, typically located at service stations, maintenance yards, and at the airport. A search for Leaking Underground Fuel Tank (LUFT) cleanup sites identified 15 spills within the Town of Apple Valley. To limit the number of spills associated with underground fuel tank storage, the U.S. EPA requires all service stations to retrofit or replace underground storage tanks with double-walled construction.

A search of the US EPA Envirofacts Data Warehouse for the Town of Apple Valley conducted on March 10, 2008 did not identify any Federal Superfund Sites (NPL), State Response Sites, Voluntary Cleanup Sites, School Cleanup Sites, Permitted Sites, or Corrective Action Sites. The

search did identify 7 school investigation sites, however, these require no further action since no hazards were found.[5]

The Town of Apple Valley does not currently contain any large quantity generators of hazardous waste. All businesses that use, generate, transport, or store hazardous waste are required to submit a hazardous waste management business plan to the County of San Bernardino.

Airport Hazardous Waste

The Apple Valley Airport, located at 21284 Corwin Road in the northern portion of Apple Valley, has a moderate to high potential for hazardous material spills. The airport is permitted to discharge less than 1,000 gallons per day of treated sewage, which is considered a minor threat to groundwater. In addition, the site contains four underground fuel storage tanks, none of which have any reported spills or leaks.

Medical Hazardous Waste

The Medical Waste Management Program (California Health and Safety Code, Section 117600) protects the public and the environment from potentially hazardous medical waste by regulating the generation, handling, storage, and disposal of medical hazardous waste through the implementation of the Medical Waste Management Act (MWMA). Through the program, generators of medical waste are exposed to classes and workshops that provide management tools and strategies for minimizing hazardous waste. Under the MWMA the County of San Bernardino is the local enforcement agency for Apple Valley's medical hazardous waste generators. All medical hazardous waste generators within the Town and Sphere of Influence are required to abide by the MWMA, Title 22 and Title 8 of the California Code of Regulations, and any other pertinent laws that regulate medical hazardous waste.

Household Hazardous Waste

Household hazardous waste includes a number of common household products such as fluorescent lamps, batteries, pesticides and herbicides, paint, motor oil, mercury containing devices, medications, and electronic equipment. As of February 8, 2006 all household hazardous waste must be disposed of at specified disposal facilities. In the Town of Apple Valley such waste can be taken to the Town of Apple Valley Public Works building located at 22411 South Outer Highway 18. This collection facility is open on the first and third Saturday of each month from 10:00 am to 2:00 pm.

Hazardous Waste Management Planning

There are several responsible agencies, including federal, state, and regional agencies, that regulate hazardous material, monitor and manage hazardous sites, and enforce compliance with applicable hazardous materials laws and regulations.

The Town of Apple Valley, in conjunction with the San Bernardino County Hazardous Materials Team, works with appropriate county, state, and federal agencies in the identification of hazardous material sites and the active regulation of their cleanup. Management and planning for

[5] "http://www.epa.gov/enviro/html/toxic_releases.html" accessed March 10, 2008.

facilities and operations that use, store, or produce hazardous and toxic materials may include establishing and maintaining information on these sites, and periodic monitoring of such facilities. A comprehensive monitoring program that utilizes multiple agencies to monitor the storage and disposal of hazardous materials and regulates illegal dumping in the Town is appropriate. Special attention should be paid to monitoring and regulating underground storage tanks and septic systems, and the transport and disposal of hazardous materials.

The California Regional Water Quality Control Board (CRWQCB), the Town of Apple Valley, Apple Valley Ranchos Water Company, and the Golden State Water Company maintain information concerning contaminated wells and groundwater. The state and federal Environmental Protection Agencies (EPA) and the State Department of Health also supply information concerning specific hazardous waste sites and their locations.

Federal Agencies and Management

At the federal level the EPA, Occupational Safety & Health Administration (OSHA), Federal Emergency Management Agency (FEMA), and Department of Transportation (DOT) regulate hazardous materials. Through the Resource Conservation and Recovery Act (RCRA), the EPA was charged with the responsibility of creating regulations that manage hazardous waste from "cradle to grave," including treatment, storage, and disposal of hazardous waste. OSHA, in addition to overseeing safety in the workplace, maintains a guide to "The Globally Harmonized System of Classification and Labeling of Chemicals" (GHS), which is an international system for classifying the toxicity of a chemical. FEMA is responsible for developing policies and programs for emergency management at the local, state, and federal level. For the transport of hazardous waste, the DOT has established standards for packaging, container labeling, vehicle placarding[6], and emergency response.

In addition to the RCRA mentioned above, the following federal laws governs the production, use, storage, and disposal of hazardous waste:

- Hazardous and Solid Waste Amendments Act (HSWA)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- Superfund Amendments and Reauthorization Act (SARA)
- Emergency Planning and Right-to-Know (SARA Title III)

State Agencies and Management

The state of California has a number of agencies that oversee management of hazardous materials. Collectively, these are known as Certified Unified Program Agencies (CUPA), which regulate and implement laws pertaining to hazardous materials. The two primary agencies on the state level are the Department of Toxic Substances Control (DTSC) and the Regional Water Quality Control Board (RWQCB). The Office of Emergency Services, California Department of Fish and Game, Air Resource Board, Caltrans, State Office of Environmental Health Hazard Assessment, and California Integrated Waste Management Board are also involved in state management of hazardous materials. The Cal-OSHA Division of the California Department of

[6] A placard is a sign-like device that provides information pertaining to the contents on which it is attached. For hazardous materials the placard will identify the type of hazard that is presented.

Industrial Relations is the regulatory agency responsible for regulating industrial users and producers of hazardous materials,. State transport of hazardous materials is monitored by the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). Requirements for these agencies to provide information on the location, type, and associated health risks of hazardous materials to emergency response personnel, authorized government officials, and the public can be found in the California State Health & Safety Code, Division 20, Chapter 6.95, Sections 25500 - 25520; California Code of Regulations (CCR), Title 19, Division 2, Chapter 4, Article 4, Sections 2729 - 2732. Further, Title 22 and 27 of the California Code of Regulations are also relevant to the proper management of hazardous materials. Private database and documentation services are also available; these services will search, extract, and summarize reports on contaminated sites recorded in various locations throughout state databases.

Regional Agencies and Management

The Town of Apple Valley is a member of the Southern California Hazardous Waste Management Authority, a joint powers authority between Southern California Association of Governments (SCAG) member counties. The draft Regional Comprehensive Plan (RCP) addresses a number of areas of resource management. The RCP includes an overview of the current solid and hazardous waste management planning process in Southern California, and will discuss potential strategies and actions for improving the SCAG region's solid and hazardous waste management system. The Draft RCP is currently (2008) in the environmental review stage.

The Town works with the Hazardous Materials Division (HMD) of the San Bernardino County Fire Department, which has been designated by the State as the Certified Unified Program Agency for handling hazardous waste and materials in the High Desert. Local businesses must certify any hazardous materials at their facilities with the County HMD on an annual basis. HMD performs compliance inspections of facilities that handle hazardous materials, which are defined by California Code of Regulations (Title 22) as substances that are toxic, ignitable, flammable, reactive, or corrosive. The Apple Valley Fire Protection District Duty Chief acts as the liaison with HMD in the event of a hazardous materials spill or leak.

Standards established by the Town of Apple Valley’s Development Code are intended to ensure that the use, handling, storage, and transportation of hazardous materials comply with all applicable requirements of the State Government Code Section 65850.2 and Health and Safety Code Section 25505, and Article 80 of the Uniform Fire Code.

As mentioned above, AB 2948 (Chapter 1504, Statures of 1986), also known as the Tanner Bill, allows counties to prepare Hazardous Waste Management Plans (HWMP) to respond to the need for safe hazardous materials and waste products management. The County of San Bernardino prepared the Business Emergency/Contingency Plan (Business Plan) to meet the requirements of the aforementioned bill. The plan was revised and updated as recently as February 2008 and requires new and existing businesses that generate or use hazardous materials to obtain approval from the County or Town prior to onsite use of such materials.

In order to comply with Health and Safety Code Section 25135, the County of San Bernardino uses the Business Plan to assure that adequate treatment and disposal capacity is available to manage the hazardous wastes generated within the jurisdiction, and to address issues related to

the manufacturing and use of hazardous waste. The Business Plan provides a management tool that requires each business to individually address the disposal, handling, processing, storage and treatment of hazardous materials and waste products used.

For the Town of Apple Valley, the Hazardous Materials Division of the San Bernardino County Fire Department is the administering agency and the Certified Unified Program Agency (CUPA) responsible for the regulation of hazardous materials.

Hazardous Materials Response

The Town of Apple Valley has developed a Multi Hazard Functional Planning Guidance Document (Multi Hazard Plan) that, among other priorities, establishes contingency plans when an incident involving hazardous materials occurs. The Multi Hazards Plan is compliant with the statewide Standardized Emergency Management System (SEMS), which enables a multiple agency response to an incident, and the National Incident Response Management System (NIMS), which is intended to standardize agency response across federal, state and local jurisdictions. The Emergency Preparedness Element provides additional information regarding SEMS and NIMS.

As mentioned above, the Town of Apple Valley is served by the Hazardous Materials Division of the San Bernardino Fire Department, which acts as the participating agency in the statewide Certified Uniform Program Administration. Other responsible agencies that assure that the Multi Hazard Plan addresses the production, storage, transport, and disposal of hazardous and toxic materials include the County of San Bernardino Hazardous Materials Division and the Regional Water Quality Control Board.

When the Town receives a call related to hazardous materials, the Hazardous Materials Team, a unit of the Apple Valley Fire Protection District and a member of the San Bernardino County Hazardous Materials Team, responds. The Hazardous Materials Team consists of specialist level, certified personnel. This level of certification allows members to identify the hazardous material, participate in Level A entries (fully encapsulated suits), and assist with any measures necessary to mitigate the hazard, with the exception of disposal. The Hazardous Materials Team responds to hazardous material spills including fuel spills and the illegal dumping of unknown products in the Town, and may assist in other jurisdictions as requested.

FUTURE DIRECTIONS

For spills and accidents associated with hazardous materials within the Town of Apple Valley, the Town's Hazardous Materials Team, as a member of the County's Hazardous Materials Division, is the first line of defense. To identify, regulate, and properly manage sites and businesses where hazardous materials are stored, the Town defers to the County to contact and coordinate with the appropriate regulatory and enforcement agencies. Similarly, the Town of Apple Valley, in conjunction with the County of San Bernardino, is responsible for coordinating with other agencies to identify contaminated sites as they occur and actively regulate cleanup.

Implementation of the Hazardous and Toxic Materials Element can be accomplished through regular consultation with the Regional Water Quality Control Board and the County Department of Environmental Health, by maintaining and updating a database on hazardous material sites, including an inventory of underground storage tanks and septic systems, and by monitoring facilities that utilize or produce hazardous materials within the Town. Also of importance in the management of hazardous materials is the monitoring of the transport and disposal of hazardous materials.

Processes for determining oversight, management, and coordination between responsible agencies, including determining responsibilities of appropriate levels of local, State, and County personnel and facilities is critical to an efficient and timely response to an emergency situation involving hazardous or toxic materials. This can be achieved through regular consultation and coordination between the Town's Emergency Preparedness Manager and responsible County and State agencies. Goals, policies and programs included herein guide planning and management strategies to effectively address hazardous and toxic materials in Apple Valley.

GOAL, POLICIES, AND PROGRAMS

Goal

Ensure that the environment and all residents, workers, and visitors are protected from exposure to hazardous materials and wastes.

Policy 1.A
The Town shall cooperate with regulators and encourage the enforcement of laws that require all users, producers, and transporters of hazardous materials and wastes to clearly identify such materials, and notify the appropriate county, state and/or federal agencies as required by law.

Program 1.A.1
The Town shall maintain a protocol for communicating with responsible agencies, and will coordinate efforts to assure that state and federal regulations for the testing and monitoring of leaking underground fuel storage tanks are enforced.
Responsible Agencies: Apple Valley Fire Protection District, San Bernardino County Fire Department, state and federal EPA, San Bernardino County Department of Environmental Health.
Schedule: Ongoing

Policy 1.B
The County Sheriff's Department shall work with the Town Engineer, Caltrans, and California Highway Patrol, to regulate the transport of hazardous materials along local roadways, state highways and routes, and interstates in the Town or the vicinity.

Policy 1.C
The Town shall coordinate with the Apple Valley Fire Protection District and the San Bernardino County Environmental Health Department to assure improved response to, and capability for, handling hazardous materials incidents.

Policy 1.D
The Town shall require all business that use, store, or produce hazardous material to comply with the County's Business Plan.

Program 1.D.1
As part of the development approval process, new businesses handling hazardous materials shall be required to submit a Business Plan for handing, storing, transporting, and disposing of hazardous materials and wastes.
Responsible Agencies: Planning Division, Apple Valley Fire Protection District, San Bernardino County Fire Department, San Bernardino County Department of Environmental Health.
Schedule: Ongoing

Policy 1.E
The Town shall maintain documentation of known hazards to public health and safety and shall make this information available to government officials and organizations, emergency response personnel, and the general public.

Program 1.E.1
The location of hazardous spills will be maintained and updated on an ongoing basis as they occur.
Responsible Agencies: Apple Valley Fire Protection District, San Bernardino County Fire Department, San Bernardino County Department of Environmental Health.
Schedule: Ongoing

Policy 1.F
The Town shall thoroughly evaluate development proposals for lands directly adjacent to sites known to be contaminated with hazardous or toxic materials, or sites that use or contain potentially hazardous or toxic materials.

Policy 1.G
Require and facilitate an efficient cleanup of contaminated sites identified within the Town of Apple Valley.

Program 1.G.1
Coordinate with responsible county, state, and federal agencies to initiate cleanup procedures, and monitor the status of cleanup efforts.
Responsible Agencies: Apple Valley Fire Protection District, San Bernardino County Fire Department, State and federal EPA, California Regional Water Quality Control Board, San Bernardino County Department of Environmental Health.
Schedule: Ongoing

Policy 1.H
Designate appropriately managed access routes to facilitate the transport of hazardous and toxic materials.

Program 1.H.1
The Town shall maintain an Emergency Response Program, which provides for evacuation routes, and emergency services in the event of a hazardous spill or airborne release.
Responsible Agencies: Town of Apple Valley
Schedule: Ongoing

Program 1.H.2
Coordinate with the Fire District, Sheriff's Department, and other appropriate agencies to identify segments of highway or local roadways that necessitate the restricted transport of hazardous and toxic materials.
Responsible Agencies: Apple Valley Planning Division, Apple Valley Protection Fire Department, Sheriff's Department.
Schedule: 2009-2010

Policy 1.I
Continue to promote programs that encourage or educate the public in the proper handling and disposal of household hazardous waste or other potential dangerous or toxic materials.

Policy 1.J
Land use designations that may involve the production, storage, transportation, handling, or disposal of hazardous materials will be located at a safe distance from land uses that may be adversely impacted by such activities.

Program 1.J.1
The Town shall ensure that all major natural gas transmission lines and liquid fuel lines that run though the Town are clearly identified, that right-of-way and maintenance easements are maintained, and that all existing and proposed development is located a safe distance from these lines.
Responsible Agencies: Utility Companies, Building and Safety Division, Planning Division, Apple Valley Fire Protection District.
Schedule: Ongoing