4.10 GEOLOGIC RESOURCES

Existing Conditions

A. Geologic Setting

The following geologic description is based on geologic maps of the region prepared by Kennedy (1977). The City of Lemon Grove is located at the western margin of the Peninsular Range geomorphic province of southern California. This range encompasses an area extending 125 miles from the Transverse Range and the Los Angeles basin, south to the Mexican border. The geomorphic province varies in width from 30 to 100 miles, and is characterized by northwest-trending mountain ranges separated by sub-parallel fault zones. The province is generally comprised of rugged mountains underlain by Mesozoic age metamorphic and crystalline rocks to the east, and a coastal plain underlain by Cenozoic age sediments to the west. The geomorphic province within Lemon Grove consists of Tertiary, Quaternary and Jurassic age sedimentary rocks.

Five geologic formations have been identified within the City of Lemon Grove. In order of predominance throughout the City, these formations are the Mission Valley Formation, Lindavista Formation, San Diego Formation sandstone part, Stadium Conglomerate and Santiago Peak Volcanics. The distribution of the geologic formations is illustrated in Figure 4.10-1. The five formations are described below.

The Mission Valley Formation (Tmv) is a Tertiary-age formation, and is a predominantly marine sandstone unit. This formation lies upon the Stadium Conglomerate. The materials comprising the Mission Valley Formation are characteristically soft, easily crumbled and medium grained.

The Lindavista Formation (Ql) is a Quaternary-age formation consisting of nearshore marine and non-marine sediments, which were deposited on a wave-cut platform following the deposition of the San Diego Formation. Comprised of moderate reddish-brown interbedded sandstone and conglomerate, this formation has a reddish-brown color and typically exhibits very few geotechnical limitations and hazards.

The San Diego Formation sandstone part (Tsdss) is a Tertiary-age formation. The sandstone part of the formation is marine and fine to medium grained. The sandstone is typically yellowish brown, poorly hardened, and locally-cemented with limy cement. The formation is characteristically weak and susceptible to rapid erosion.

Stadium conglomerate (Tst), a Tertiary- age formation, consists of massive cobble conglomerate with a matrix of coarse-grained sandstone. The formation is moderately well sorted with an average rock fragment size in the cobble range. The sandstone matrix constitutes less than 20

percent of the unit, but constitutes 50 percent of the unit in local stratigraphic sections of individual sandstone beds and lenses.

Santiago Peak Volcanics (Jsp) is a Jurassic-age formation. These rocks are mostly volcanic and are predominantly dacite and andesite. Highly silicified rock and a variety of dense, fine-grained hornfels occur locally.

B. Topography

The topography of Lemon Grove is characterized by coastal mesas and associated drainages. Most of the topographic features within the City limits have been altered by development. Elevations range from approximately 280 feet above mean sea level (AMSL) at the northwestern boundary of the City to approximately 528 feet AMSL along Golden Avenue near the northeastern boundary of the City. Figure 2.1-4 illustrates the local topography.

Upper South Chollas Valley and several unnamed United State Geographical Survey (USGS) blueline streams, near the southern and western boundaries of the City, are the primary remaining topographic features. All of these streams are tributaries of the South Chollas Valley stream, which eventually flows into San Diego Bay. A description of surface water features is provided in Section 4.8, Hydrology/Water Quality, in this report.

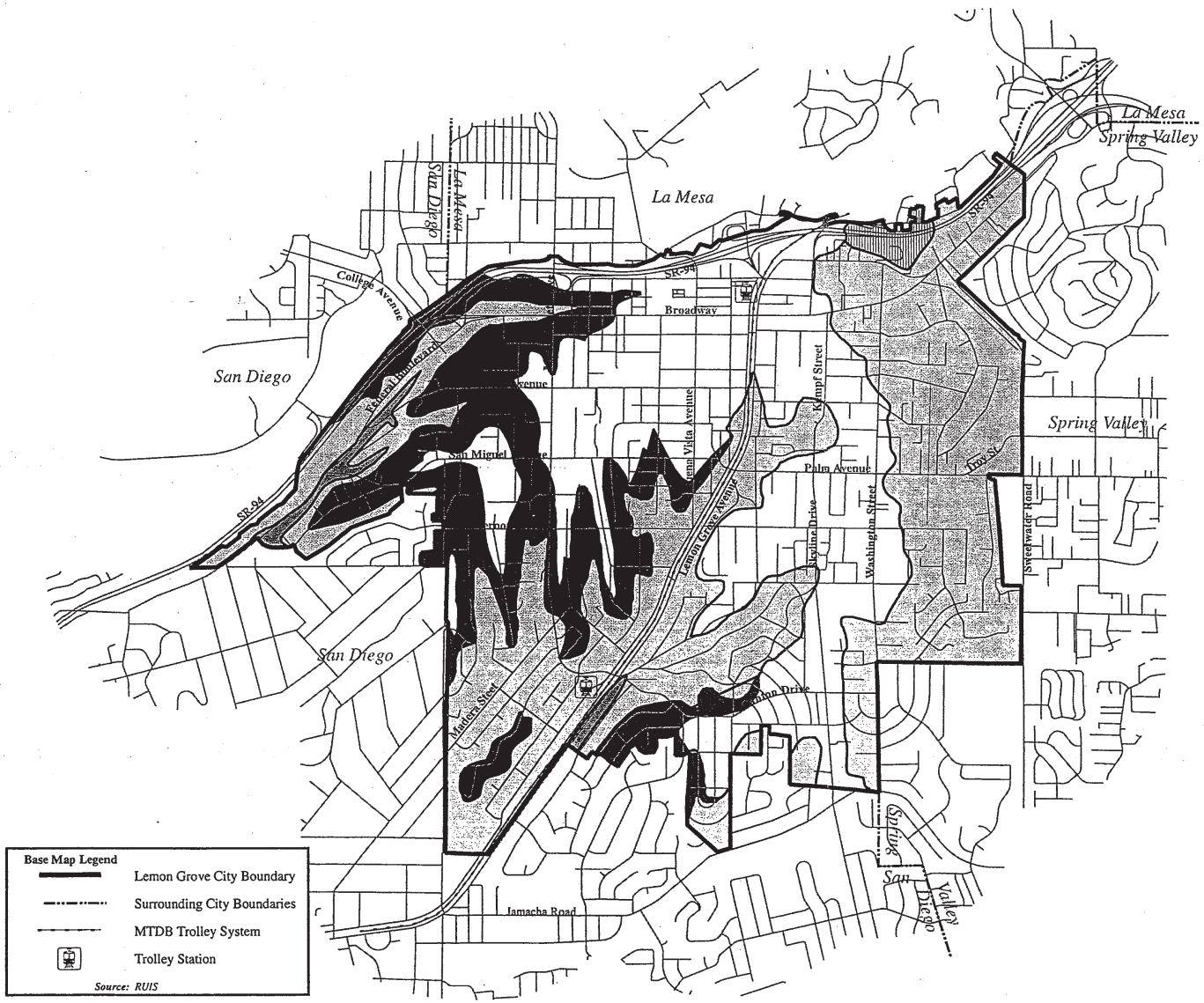
C. Seismic Conditions

Like most urban areas in southern California, Lemon Grove is subject to earthquakes. Substantial groundshaking can result in property damage, injuries and even casualties. The Peninsular Range is traversed by several major active faults. The Elsinore and San Jacinto faults are the major onshore tectonic structures, and the Coronado Bank and the San Clemente faults are the major offshore faults. There are no active or potentially active faults within the City. The nearest known active faults are the Rose Canyon and the Coronado Bank faults which are located approximately eight and 14 miles west of the City, respectively. The nearest potentially active fault is the La Nacion Fault located approximately two miles west of the City. The geographic relationship of these faults to the City is shown in Figure 4.10-2, and the maximum probable earthquake magnitude for these faults is summarized in Table 4.10-1.

D. Soils

Based on the United States Department of Agriculture Soil Survey, San Diego Area (1973), three general soil associations occur in Lemon Grove. Figure 4.10-3 illustrates the distribution of the associations. The associations, Groups IV, VI and VII, are described below.

Group IV, the Redding association, is generally located in the northern portion of the City, and is typified by well-drained cobbly and gravelly loams with a gravelly clay subsoil over a hardpan. Soils within this association found in the City of Lemon Grove are the Redding-Urban land



Legend

- Lindavista Formation
- San Diego Formation
- Mission Valley Formation
- Stadium Conglomerate
- Santiago Peak Volcanics

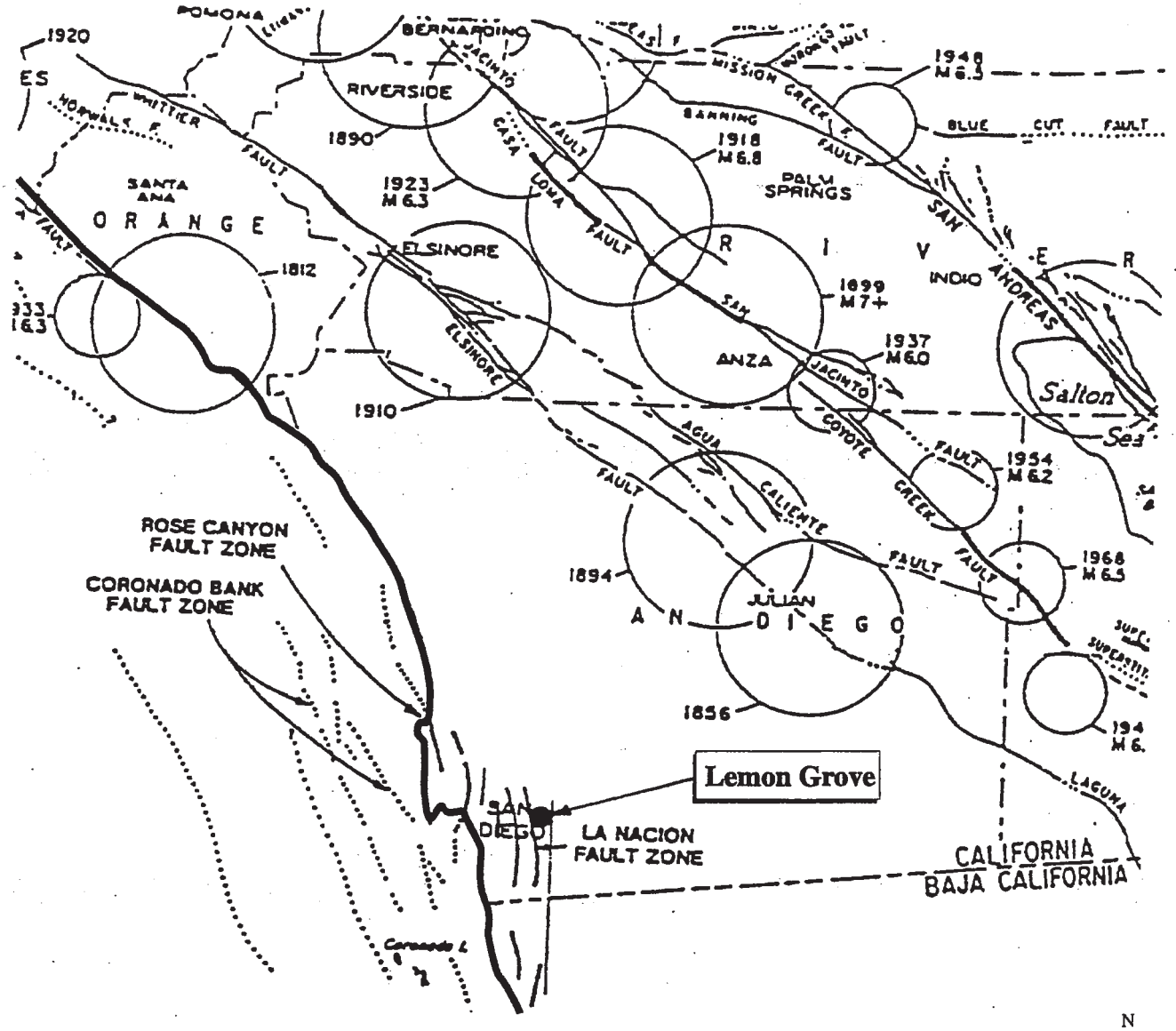
Source: Geology of National City, Imperial Beach and Otay Mesa Quadrangles, Southern San Diego Metropolitan Area, California, M. Kennedy, 1977

N

1 inch = 2,000 feet

General Plan Master Environmental Impact Report

Figure 4.10-1
Geologic Formations



Source: Final Environmental Impact Report for the Broadway Commercial Center.

Figure 4.10-2
Fault Location Map

TABLE 4.10-1
Regional Faults

Fault	Approximate Distance from City (miles)	Maximum Probable Earthquake Magnitude[1]	Estimated Acceleration (g)	
			Peak Horizontal[2] Bedrock	Repeatable High Ground[3] Acceleration
Coronado Bank	14	6.2	0.18	0.12
Elsinore	36	7.2	0.14	0.14
La Nacion	2.5	6.6	0.60	0.39
Rose Canyon	8	6.5	0.35	0.23
San Andreas	84	7.5	0.03	0.03
San Clemente	50	7.3	0.07	0.07
San Jacinto	60	6.6	0.03	0.03

Note: All listed faults are considered active, with the exception of the La Nacion fault which is considered potentially active.
Source: City of Lemon Grove Community Development Agency, 1992

complex, Olivenhain-urban complex, Olivenhain cobbly loam and Placentia sandy loam. These soils have medium to high shrink-swell behavior.

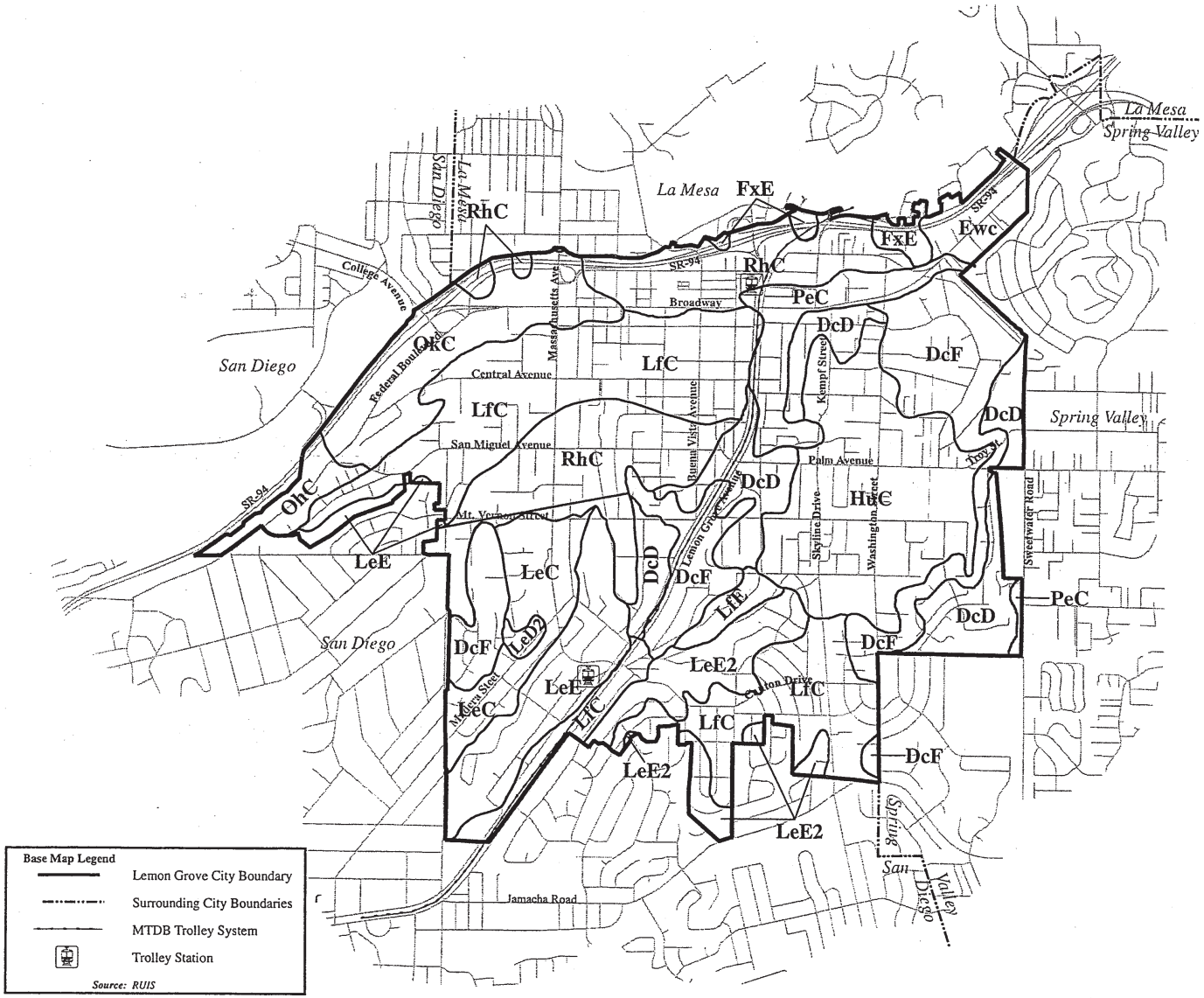
Group VI is the Friant-Escondido association - eroded. This association is located in the northeast portion of the City and is comprised of a well-drained fine, and very fine sandy loams over metasedimentary rock. Escondido very fine sandy loam and Friant rocky fine sandy loam comprise the association within the City. These soils have low shrink-swell behavior.

Group VII, the Diablo-Las Flores association, comprises the majority of the City, and is composed of well- and moderately well-drained loamy fine sands with a sandy clay subsoil. The soils that comprise this association within Lemon Grove are Las Flores loamy fine sand, Las Flores loamy fine sand - eroded, La Flores-Urban land complex, Diablo-Urban land complex and Huerhurero-Urban land complex. This soil association exhibits a high shrink-swell behavior.

E. Liquefaction Potential

Liquefaction of cohesionless soils can be caused by the strong vibratory motions that result from earthquakes. During a strong, nearby earthquake, cohesionless soils can lose strength and cause soil deformation and structural damage. Liquefaction occurs when the sediment is of fine sand or silt size, loosely consolidated, saturated, and subject to vibration. There are no known areas subject to liquefaction within the City of Lemon Grove (County of San Diego, 1991b).

LMA



Base Map Legend

- Lemon Grove City Boundary
- Surrounding City Boundaries
- MTDB Trolley System
- Trolley Station

Source: RUIS

LEMON GROVE — BEST CLIMATE ON EARTH

General Plan Master Environmental Impact Report

Legend

RhC	Redding-Urban land complex
OkC	Olivenhain-Urban land complex
OhC	Olivenhain cobbly loam
PeC	Placentia sandy loam
EvC	Escondido very fine sandy loam
FxE	Friant rocky fine sandy loam
LeD2	Las Flores loamy fine sand *9-15%; high; severe - on surface layer texture*
LfC	Las Flores-Urban land complex *2-9%; high; no interpertation*
LeC	Las Flores loamy fine sand *2-9%; high; severe - on surface layer texture*
LeE	Las Flores loamy fine sand *15-30%; high; severe - on survace layer texture*
LeE2	Las Flores loamy fine sand *15-30%; eroded; high; severe - on surface layer texture*
LfE	Las Flores-Urban land complex *9-30%; high; no interpretation*
DcD	Diablo-Urban land complex
DcF	Diablo-Urban land complex
HuC	Huerhuero-Urban land complex

Source: Geology of National City, Imperial Beach and Otay Mesa Quadrangles. Southern San Diego Metropolitan Area, California, M. Kennedy, 1977.

N

1 inch = 2,000 feet

Figure 4.10-3
Soil Associations

F. Slope Failures

No slope failures were identified on the geologic maps of the region prepared by Kennedy (1977). However, slopes within portions of two residential neighborhoods have been subject to minor slope failure during heavy rainstorms (pers. comm., D. Calvani, 3/9/95). The subject slopes are located along Noble Street and Camino De Las Palmas. These minor slope failures are likely the result of a combination of poor earth compaction during construction and expansive soils.

Threshold of Significance

Based on the CEQA Guidelines, a project will normally have a significant impact to geology if it will:

- Affect unique geologic or physical features;
- Expose people or structures to major geologic hazards; or
- Cause substantial flooding, erosion or siltation.

Impacts

A. Plan-wide

No unique geologic or physical features occur within the City. Therefore, implementation of the proposed General Plan will not have a significant effect on major landform features.

Hazardous geologic conditions in the City would be primarily related to seismic activity. A moderate or major earthquake could occur in future years and could threaten lives and property. Structural damage could occur to older buildings. New structures could be damaged if they do not meet building codes, were constructed of poor materials, or are located on unstable soils. Ground shaking could cause secondary geologic hazards such as slope failures and seismically-induced settlement. The proposed General Plan will result in the construction of 1,220 new residential units and will expose an estimated 3,589 additional residents to the effects of ground-shaking. As such, there will be a proportionate increase in personal and property damage as the population within the City increases.

New construction may be constrained by existing geologic conditions such as high shrink-swell potential which occurs in two of the three soils formations found within the City and erosion. Further studies will be required at the time future projects are proposed to determine site-specific geologic conditions and to develop engineering parameters to minimize potential hazards.

B. STAs and Other Development Areas

Downtown Village (STA I)

This STA is entirely developed, and no unique geologic resources exist. This area is underlain by the Lindavista Formation which exhibits few geologic hazards. However, soils in this area of the City exhibit medium to high shrink-swell potential. The proposed General Plan Land Use Plan designates this area for mixed-use development which would include residential units. Risks associated with seismic activity will be comparable to other areas of the City.

Massachusetts Station (STA II)

This STA is also fully developed, and no unique geologic resource exist within this STA. This STA is underlain by the Mission Valley Formation which could be unstable. The soil within this STA exhibits high shrink-swell potential. The mixed-use designation for this STA would allow residential development. Risks associated with seismic activity will be comparable to other areas of the City.

Regional Commercial (STA III)

The majority of this STA is developed. This STA is underlain with the Lindavista Formation, which exhibits very few geotechnical limitations and hazards, and the San Diego Formation, which is weak and susceptible to erosion. Soils in this STA exhibit medium to high shrink-swell characteristics. No unique physical or geologic features occur within this STA. No residential use is planned for this area of the City. However, similar to the remainder of the City, the retail commercial uses planned for this STA could experience property damage in the event of an earthquake.

West Central Residential (STA IV)

STA IV is undeveloped. This STA is comprised of a drainage and adjacent slopes. This STA is underlain with three geologic formations, two of which exhibit potentially hazardous characteristics. The soil type within STA IV is the Las Flores loamy fine sand which exhibits high shrink-swell potential. Single-family residential use is planned for this STA. Development of the STA will expose additional residents to seismic shaking, but there will be no greater risk in this location than in other areas of the City.

Federal Boulevard Automobile Sales District (STA V)

STA V is currently developed with automotive-related commercial use. No residential uses are planned for this STA. The STA is underlain with the San Diego Formation and the Mission Valley Formation, both of which exhibit some geologic instability. The soil type within this STA exhibits high shrink-swell potential. Infill development or redevelopment of this ares will expose

additional automotive commercial uses to seismic activity which could result in property damage. However, this impact is no greater than in any other area of the City.

Skyline Commercial Center (STA VI)

The Skyline Commercial Center is currently developed with some commercial use and a church. No unique geologic or physical features are within this STA. This STA is underlain with the Lindavista Formation which exhibits few geologic hazards. Soils in the STA exhibit high shrink-swell potential. The proposed General Plan Land Use Plan will redevelop this STA with commercial use. As such, commercial development may be exposed to seismic shaking in the event of an earthquake. This impact will be no greater than in any other area of the City.

Troy Street/SR-125 Planning Area (STA VII)

This portion of the City is currently developed with single-family residential use. No unique geologic or physical features occur within this STA. The majority of STA VII is designated for transportation use associated with SR-125. This STA is entirely underlain by the Mission Valley Formation which exhibits some instability. Soils in this STA exhibit high-shrink swell potential. Any geologic impacts associated with the construction of SR-125 will be mitigated by Caltrans. No redevelopment is proposed for the remaining residential area of this STA.

Other Development/Land Use Changes

Multiple-Family Residential Development. Multi-family residential development would occur in several areas of the City. These residential areas will be exposed to seismic-shaking and possibly personal or property damage resulting from an earthquake. However, this risk is no greater or less than in any other area of the City. A variety of soils and geologic formation occur within the multi-family areas, some of which exhibit unstable geologic characteristics.

Industrial and Commercial Areas. Industrial development would only occur in the northwestern portion of the City adjacent to SR-94. Several soil types and geologic formations occur within this area of the City, some of which exhibit unstable geologic conditions. The industrial and commercial businesses will be exposed to seismic shaking and possibly personal or property damage resulting from an earthquake. However, this risk is no greater than in any other area of the City.

Skyline Neighborhood Commercial Area. This area is fully developed with commercial use and is planned for redevelopment with single-family use consistent with the surrounding uses. No impacts to unique geologic resources will occur from implementation of the proposed General Plan. This area of the City is underlain with the Lindavista Formation which is relatively stable, however soils in this area of the City are known to have high shrink-swell potential.

Civic Center Concept Area. This area is currently developed and is planned for a variety of uses including some residential was associated with the mixed-use area. No unique geologic features will be impacted within this area of the City. The majority of this area of the City is underlain with the Lindavista Formation which has few geotechnical limitations. Soils within this area of the City exhibit high shrink-swell potential. Development within this area of the City will be exposed to seismic shaking and possibly personal or property damage resulting from an earthquake. However, this risk is no greater than in any other area of the City.

Mitigation Measures

The following mitigation measures are required to reduce impacts to geology to less than significant. The mitigation measures correspond to applicable programs of the General Plan Implementation Manual, as noted.

A. Plan-wide

Mitigation Measure 4.10-1: The City shall prepare an earthquake and preparedness program that will consists of the following actions.

- During the annual statewide earthquake preparedness month, educate the community about precautionary measures to take before an earthquake occurs (such as establish a food and water supply, identify the natural gas shut-off valve), what to do during an earthquake to prevent injuries, and what to do after an earthquake to prevent fires and other hazards. Disseminate information through the City newsletter and local schools, churches, civic organizations and the Lemon Grove Chamber of Commerce.

- Buildings, particularly structures constructed prior to current seismic standards, require reinforcement to minimize the potential for damage. Provide literature on earthquake preparedness and structural reinforcement at City Hall year round. During earthquake preparedness month, co-sponsor educational workshops with local lumber and home improvement businesses to demonstrate reinforcement techniques for residential and commercial structures.

- Survey all City-owned buildings for conformance to current seismic codes. If reinforcement is necessary, conduct press releases describing the improvement projects to provide community leadership. (General Plan Implementation Manual, Safety Program #1).

Mitigation Measure 4.10-2: For existing structures, the City shall enforce current building codes in order to reduce the potential for structural failure during an earthquake. The City shall require improvements where necessary to bring buildings up to code. (General Plan Implementation Manual, Safety Program #2).

Mitigation Measure 4.10-3: Through the environmental review process required by the California Environmental Quality Act (CEQA), the City shall require an assessment of the potential geologic hazards associated with new development projects and require appropriate mitigation measures to reduce the risk to acceptable levels. Hazards related to earthquakes, soils with shrink-swell potential and slopes shall be examined. Also, grading and landform alterations required for new development shall be examined for potential hazards, appropriate geotechnical engineering studies shall be required, and all engineering recommendations shall be properly implemented. (General Plan Implementation Manual, Safety Program #3).

Mitigation Measure 4.10-4: The City shall monitor and map slope failures and shall assist property owners in planning remedial actions. (General Plan Implementation Manual, Safety Program #4).

B. STAs and Other Development Areas

Mitigation Measures 4.10-1 through 4.10-4 include all of the STAs and other development areas. These mitigation measures will reduce potential impacts to geologic features within the STAs and other development areas. No other mitigation measures are required for these specific areas of the City.

Level of Significance After Mitigation

With implementation of the mitigation measures identified above, impacts related to geological resources will be reduced to below significance.