5.7 GEOLOGY, SOILS, AND SEISMIC HAZARDS

This section describes the geologic conditions of the Plan area, the geology, soils and seismic hazards present within the Plan area, and evaluates potential geological hazards that could affect or be caused by the Plan's proposed development. Unless otherwise noted, all information contained in this section is based on the technical reports entitled: *Reconnaissance of Engineering Geologic Constraints to Development: Proposed Park, Parking and Trail Improvements in Ramirez Canyon, Escondido Canyon, Corral Canyon, Along Latigo Canyon Road, and at Malibu Bluff State Park* (Southwestern Engineering Geology, September 2009) and *Supplemental Engineering Geologic Review of Conceptual Plans; "Malibu Parks Public Access Enhancement/ Restoration – Ramirez Canyon, Escondido Canyon, Latigo Canyon, Corral Canyon, and Malibu Bluffs" City Of Malibu; California* (Southwestern Engineering Geology, January 2010). The Southwestern Engineering Geology technical reports are included in their entirety in *Appendix J*.

5.7.1 Existing Setting

Regional Geology

The Plan area is located within the western portion of a regional geomorphic province (natural region), known as the Transverse Ranges, which is a series of east-west trending mountain ranges and broad alluvial valleys that extend approximately 320 miles from Point Arguello in the west to the Little San Bernardino Mountains at the edge of the Mojave and Colorado Desert provinces in the east. This geomorphic province includes Ventura County and portions of Los Angeles, San Bernardino, and Riverside Counties.

Prominent basins and ranges in the Transverse Ranges include the Ventura basin and the San Gabriel and San Bernardino Mountains. Several active faults, including the San Andreas Fault Zone, are located in the Transverse Ranges. Faults in the province include the Santa Clara River Valley Fault, San Gabriel Fault Zone, Santa Cruz Island and Santa Rosa Island Faults and the Soledad faults. This province is one of the most geologically diverse in California, containing a wide variety of bedrock types and geologic structures. The Transverse Ranges include California's highest peaks south of the central Sierra Nevada and the only Paleozoic rocks in the coastal mountains in the United States.

The Transverse Ranges are an east-west trending series of steep mountain ranges and valleys. The east-west structure of the Transverse Ranges is oblique to the normal northwest trend of coastal California, hence the name "Transverse." The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz islands. Its eastern extension,

the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault. Intense north-south compression is squeezing the Transverse Ranges. As a result, this is one of the most rapidly rising regions on earth. Great thicknesses of Cenozoic petroleum-rich sedimentary rocks have been folded and faulted, making this one of the important oil producing areas in the United States.

Site Geology

The Plan area is located in the western Transverse Ranges geomorphic province of California, in the coastal Malibu area, on the southern side of the Santa Monica Mountains. The Santa Monica Mountains consist of metamorphic and crystalline Jurassic and Cretaceous rocks overlain by a sequence of Miocene-aged marine and non-marine sedimentary rocks. Regional, north-south directed compressional forces associated with the "big bend" have deformed these rocks into a broad, east plunging anticline (an anticline consists of layers of earth material which have been folded into a ridge type of structure) in which the northern and southern limbs of the fold generally correspond with the northern and southern flanks of the mountains. In the coastal Malibu area, this pattern of deformation is complicated by repeated movement along low-angle reverse faults of the Malibu Coast fault system. Shallow subsurface conditions beneath the park sites are characterized by deformed bedrock, poorly consolidated alluvial deposits, faults and landslides (Southwestern Engineering Geology, 2009).

The geologic structure beneath the Plan area reflects intense deformation along the Malibu Coast Fault. Branches of the Malibu Coast fault extend throughout the Plan area. The Malibu Coast fault zone includes a series of bedding planes above faults that extend from offshore to about one mile onshore. The geologic condition of each park in the Plan area is discussed below.

Soil Descriptions

Soil materials in the Plan area include artificial fill, Colluvium, Older Alluvial Deposits, landslide deposits, and weathered bedrock materials assigned to the Monterey, Trancas, and Topanga Formations, and andesitic and basaltic flows and breccias assigned to the Conejo Volcanics (Natural Resource Conservation Service [NRCS], 1969, 2007; Southwestern Engineering Geology, 2009).

Artificial fill in the vicinity of the Plan area includes road fills such as those that support Pacific Coast Highway and Kanan Dume Road, and a variety of thin fill wedges typical of

side-cast fills placed on the down-slope sides of existing trails (Southwestern Engineering Geology, 2009).

Naturally occurring soils within the Plan area are mapped as Altamont-Diablo association, 9 to 30 percent slopes, eroded. This association includes approximately 60 percent Altamont soils, 30 percent Diablo soils, and 10 percent San Benito soils (NRCS, 1969, 2007).

The Altamont series soils are deep, well drained soils that formed from weathered sandstone and shale. The soil has a dark brown clay surface layer about 12 inches thick with calcareous clay subsoil that extends to 24 to 36 inches depth. Clay content is 35 to 60 percent, which shrinks and swells. The topsoil is well-drained and slowly permeable. (NRCS 1969, 2007).

Diablo soils are derived from weathered shale, sandstone, and consolidated sediments with minor areas of volcanic tuff. Diablo soils have a dark gray clay surface layer that extends about 20 inches deep over calcareous clay subsoil at a depth of 20 to 39 inches. Below this is the shale parent material, which forms outcrops of hard shale in a few places. The soil is well drained with slow permeability. (NRCS 1969, 2007).

San Benito soils form from weathered shale and sandstone. The clay loam soil extends to about 48 inches depth over shale. The soil is well-drained; medium to very rapid runoff; moderately slow permeability. (NRCS, 2007).

Soil Hazards

Expansive Soils

Over 80 percent of the soils identified by the NRCS in the Santa Monica Mountains have high or very high erosion potential. Expansive soils are soils that possess clay particles that react to moisture changes by shrinking (when they dry) or swelling (when they get wet). This type of physical change in the soils can, depending upon its degree of expansivity, react unfavorably with building foundations, concrete slabs-on-grade, concrete walkways, patios, swimming pools, roadways, and masonry walls (City of Malibu General Plan EIR, 1995, SCH 9506025).[1]

Each of the different geologic formations mapped in the Malibu area consists of various units which may possess expansive potential. Typically these would be: mudstones,

[1] Interested readers can review a copy of this City of Malibu General Plan EIR at Malibu City Hall, 23815 Stuart Ranch Road, Malibu, California 90265

claystones, siltstones, and clay fault gouge (clay along the fault planes that slice through the rock). Silt and clay deposits near and around the Malibu Creek lagoon would possess expansion potential. Geologic units mapped as colluvium or slopewash, would commonly be expansive in nature. The terrace deposits shown along the coast also generally contain expansive soils (*City of Malibu General Plan Safety and Health Element*).

Seismic Hazards Descriptions

The Plan area is located in a region that is currently experiencing north-south compressional deformation. This deformation is expressed as east-west trending folds and faults that bound topographic and structural basins between the northern edge of the Los Angeles and Ventura basins. Periodically earthquakes occur along these structures. Recent earthquakes have ranged in size from very small events that can only be detected instrumentally to larger events such as the San Fernando Earthquake of 1971, the Whittier Narrows Earthquake of 1987, the Sierra Madre Earthquake of 1991 and the Northridge Earthquake of 1994 (*City of Malibu General Plan Safety and Health Element*).

Possible hazards associated with earthquakes (seismic events) include fault rupture, strong ground shaking, and ground failure from a variety of causes. Many environmental factors contribute to the severity of each of these aspects of seismic hazard. The following paragraphs provide general discussions of each of the possible hazards as they may pertain to the Plan area and proposed improvements.

Malibu Coast Fault Zone

The Malibu Coast fault zone runs in an east-west orientation onshore sub-parallel to and along the shoreline for a linear distance of about 17 miles through the Malibu City limits, but also extends offshore to the east and west for a total length exceeding 37.5 miles. The Malibu Coast fault passes through each of the parks within the Plan area. This fault is part of a structural zone that extends essentially from Fontana on the east to west of Santa Cruz Island. The Malibu Coast fault is a major structural element of coastal southern California; however, its capacity to generate earthquakes and ground rupture is not well understood. Most local practitioners consider the Malibu Coast fault to be "active," though with a low potential for being the primary source of an earthquake, or for generating either primary or secondary ground rupture. Parts of the Malibu Coast fault are classified as active and are included within Alquist-Priolo Special Studies Zones by the State of California. These zones occur on Winter Mesa just west of the Civic Center and just west of Corral Canyon Park, beginning near the intersection of Pacific Coast Highway and Corral Canyon Road. This latter zone extends westward to the northern half of Escondido Canyon Park

(Southwestern Engineering Geology, 2009). The primary concern with a fault trace, or within a fault zone, is that relative movement of earth material on either side of the fault could damage or destroy improvements which are located on the trace, or which traverse the fault trace/zone.

Ground Shaking

The Plan area is likely to be subject to some level of ground shaking in response to earthquakes that occur on southern California faults. The most prominent of these faults is the San Andreas fault located 47 miles to the northeast. Numerous other faults judged to be active occur within a 50 mile radius. Major earthquakes along any of these faults could generate strong ground shaking within the Plan area. Seismic hazard evaluation reports prepared by the California Geological Survey provide probabilistic estimates of peak ground accelerations which could occur at given locations, with a 10% probability of exceedance over the next 50 years. Estimates provided in the vicinity of the Plan area range from about 0.40g to 0.50g (i.e., up to about ½ the force of gravity, [g]) depending on the location and nature of the underlying material. Ground accelerations within the Plan area park sites associated with a strong earthquake along the Malibu Coast fault would probably exceed these values; however, the probability of a strong earthquake along the Malibu Coast fault is considered to be very low (Southwestern Engineering Geology, 2009). The primary concern with ground shaking (seismicity) is the potential for failure of structures, possibility of damage to civil engineering site improvements, and potential for injury or loss of life associated with structural failures.

Liquefaction

Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Liquefaction occurs in saturated soils, that is, soils in which the space between individual particles is completely filled with water. This water exerts a pressure on the soil particles that influences how tightly the particles themselves are pressed together. Prior to an earthquake, the water pressure may be relatively low, and the soil matrix may have adequate bearing strength. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other; at this point, the soil ceases to behave as a solid and instead behaves as a liquid. Earthquake shaking often triggers this increase in water pressure, but construction related activities such as blasting can also cause an increase in water pressure. When liquefaction occurs, the strength of the soil decreases and, the ability of a soil deposit to support foundations for buildings and bridges can be drastically reduced, leading to potential damage or failure of the structures.

Liquefaction potential within the Plan area is restricted to the stream bottoms where high groundwater may saturate loosely consolidated soils. Stream beds in both Ramirez Canyon and Corral Canyon are identified as areas likely to be prone to liquefaction on seismic hazard maps prepared by the California Geological Survey (Southwestern Engineering Geology, 2009).

Seismic Settlement

Seismic settlement occurs as a result of densification of poorly consolidated materials in response to seismic shaking. The potential for seismic settlement at the park sites is likely to be limited to those areas underlain by unconsolidated sediments in the streambeds, and to areas where fills are placed to accommodate improvements (Southwestern Engineering Geology, 2009). Seismic settlement can lead to cracked foundations, impairment of door and window operation, and damage to utility connections serving such structures.

Seismically Induced Slope Failures

Shallow slope failures on steep slopes are common during large seismic events. These range from debris flows, rockfalls and shallow slope failures to re-activation of large, deep-seated failures. Shallow failures typically occur on steeper slopes and are common during large earthquake events even under dry conditions. Larger failures may reactivate in part due to elevated groundwater pore pressures. Essentially all of the elevated slopes in the Plan area are identified as areas that may be prone to seismically induced slope failure on Seismic Hazards Maps prepared by the California Geological Survey. Strong ground shaking can be expected to generate rockfalls, debris flows and slumps on steeper slopes. Reactivation of larger landslides could also occur (Southwestern Engineering Geology, 2009). Each of these landslide events, or mass wasting phenomenon, can cause failure of improvements sited within the landslide boundary, and/or can lead to damage or destruction of improvements down-slope from the landslide failure, and/or can present a risk of injury or loss of life.

Site Specific Geologic Hazards

Ramirez Canyon

Ramirez Canyon Park is underlain by deposits of the Topanga Formation in the south and by Conejo Volcanics in the north. The contact between these two units is depositional. A

trace of the Malibu Coast fault is mapped across the extreme southern end of the park. Bedrock south of the fault is mapped as Trancas Formation. Bedding in the volcanic unit and in the Topanga Formation dips (i.e., is tilted from the horizontal) predominantly to the south. Bedding in the thin sliver of Trancas Formation that occurs in the park is variable but dips mainly to the north. Surficial units include artificial fill (primarily along Kanan Dume Road), alluvium, and landslides. The landslides are likely to be composites of shallow creep, debris flows and slides, rockfalls, and limited areas of deeper bedrock failures (Southwestern Engineering Geology, 2009). Figures 5.7-1 and 5.7-2 provide an illustration of the geologic conditions of Ramirez Canyon Park.

Escondido Canyon Park

Escondido Canyon Park is underlain by Conejo Volcanics, Trancas Formation and Monterey Formation. As mapped by Dibblee, Conejo Volcanics are in depositional contact with the Trancas Formation at the south edge of the study area. The northern contact of the Trancas sequence is in fault contact with a second section of volcanic rock. The northern boundary of this volcanic section is also a fault which juxtaposes the volcanic section against bedrock of the Monterey Formation. The bedding in the Trancas Formation dips at moderate to steep angles both to the north and to the south; and bedding in the Monterey Formation dips predominantly southward at steep angles. A branch of the Malibu Coast fault is included within an Alquist-Priolo Earthquake Fault Zone that encompasses a portion of the Escondido Canyon Park. Surficial units include alluvium in the creek bottom and landslides (i.e., the mapped extent of surface materials displaced from an original position by landslide movement). The landslides are generally considered to be deep rotational or translational failures involving significant thicknesses of bedrock (Southwestern Engineering Geology, 2009). Figure 5.7-3 provides an illustration of the geologic conditions of Escondido Canyon Park.

Latigo Canyon Trailhead

The Latigo Canyon Trailhead property is underlain by Conejo Volcanics and Monterey Formation. Two branches of the Malibu Coast fault traverse the site from east to west just south of the proposed parking area; these two fault branches isolate a small sliver of Trancas Formation between the volcanic unit and Monterey Formation. The bedding in the volcanic unit is variable, but dips generally toward the north. Bedding in the Monterey and Trancas Formations dips at moderate to steep angles both to the north and south. The site has been subject to prior landslide events; Figure 5.7-4 provides an illustration of the geologic conditions existing at the Latigo Trailhead property, including the mapped extent of previous landslide events.

Corral Canyon

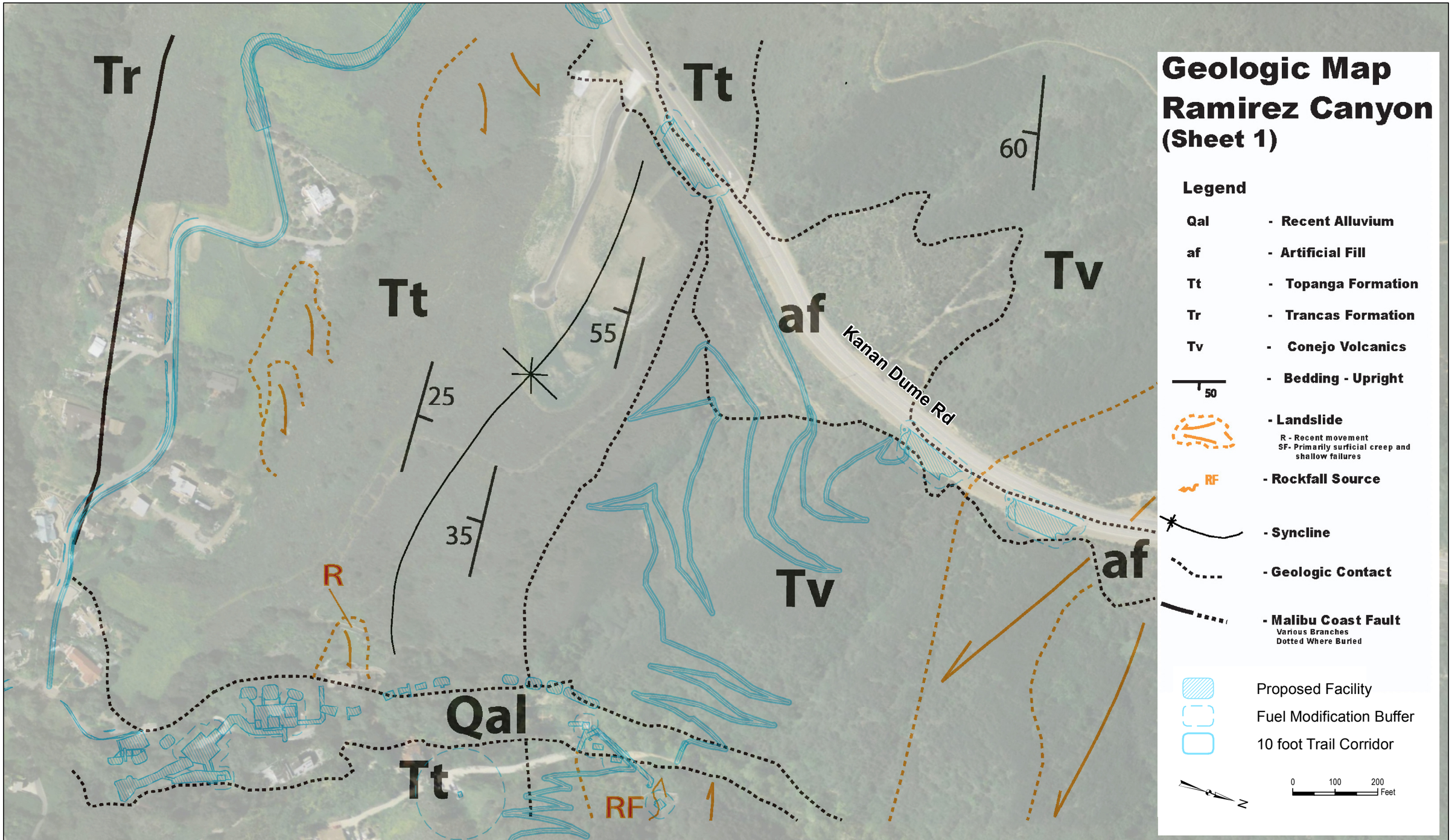
Corral Canyon Park is underlain by three bedrock units, separated by significant reverse faults of the Malibu Coast fault zone. The bedrock is pervasively sheared and fractured; three faults have been differentiated on the Geologic Map. The main trace of the Malibu Coast fault separates Topanga Formation bedrock from the Monterey and Trancas Formations near the northern edge of the study area. Surficial units include artificial fill (primarily along Pacific Coast Highway), alluvium and older alluvium (marine terraces), and landslides (i.e., the mapped extent of surface materials displaced from an original position by landslide movement). The landslides are generally considered to be deep rotational or translational failures involving significant thicknesses of bedrock. Figure 5.7-5 provides an illustration of the geologic conditions of Corral Canyon Park.

Malibu Bluffs Conservancy Property

The Malibu Bluffs property is underlain by terrace deposits designated as Qoa. The flat-lying terrace deposits overlie bedrock units that include the Trancas Formation, the Monterey Formation and Conejo Volcanics. The Monterey Formation is juxtaposed against the volcanic unit across the Malibu Coast fault, which is mapped across the property as a concealed feature with a northwest to east-west trend. The degraded rock onsite associated with steeper slopes commonly fails and is expressed as landslides (Southwestern Engineering Geology, 2009). Figure 5.7-6 provides an illustration of the geologic conditions of Malibu Bluffs area.

Trail System

The proposed trail system has been situated with alignments that would be primarily underlain by bedrock at shallow to moderate depth. Shallow surficial materials anticipated to occur within the trail alignments include soil, colluvium and weathered bedrock that cover nearly all the natural slopes in the coastal canyons of Malibu. The trail alignment in some areas would cross mapped or identified landslide areas located along the coastal canyons (Southwestern Engineering Geology, 2009). Approximate locations of the proposed trail alignments, and the soils/geologic conditions which are present within the proposed trail alignments, are illustrated in Figure 5.7-7.



SOURCE: Southwest Engineering Geology (SEG) 2009

FIGURE 5.7-1

Geologic Map - Ramirez Canyon Region

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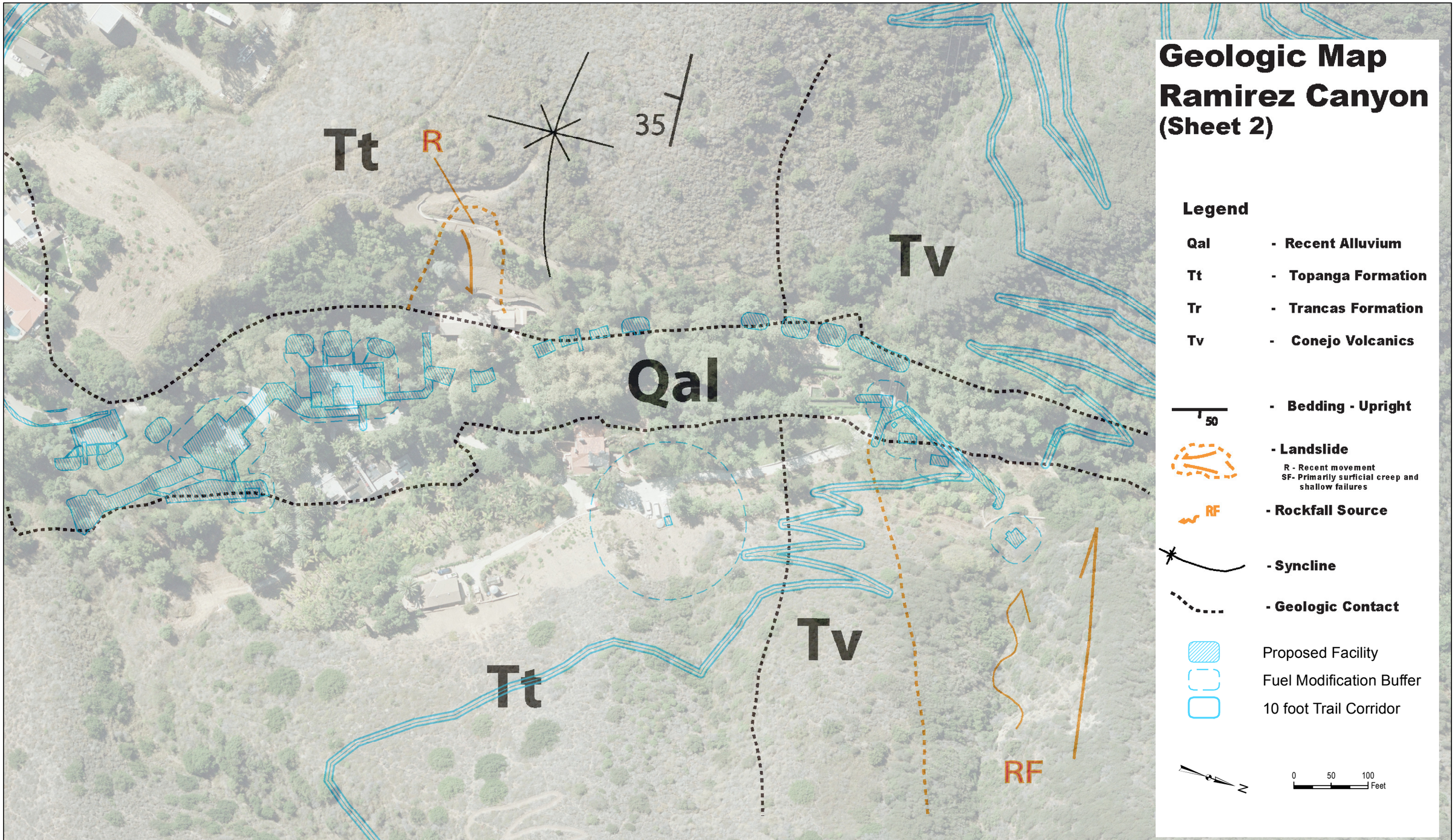

SOURCE: Southwest Engineering Geology (SEG) 2009

FIGURE 5.7-2

Geologic Map - Ramirez Canyon

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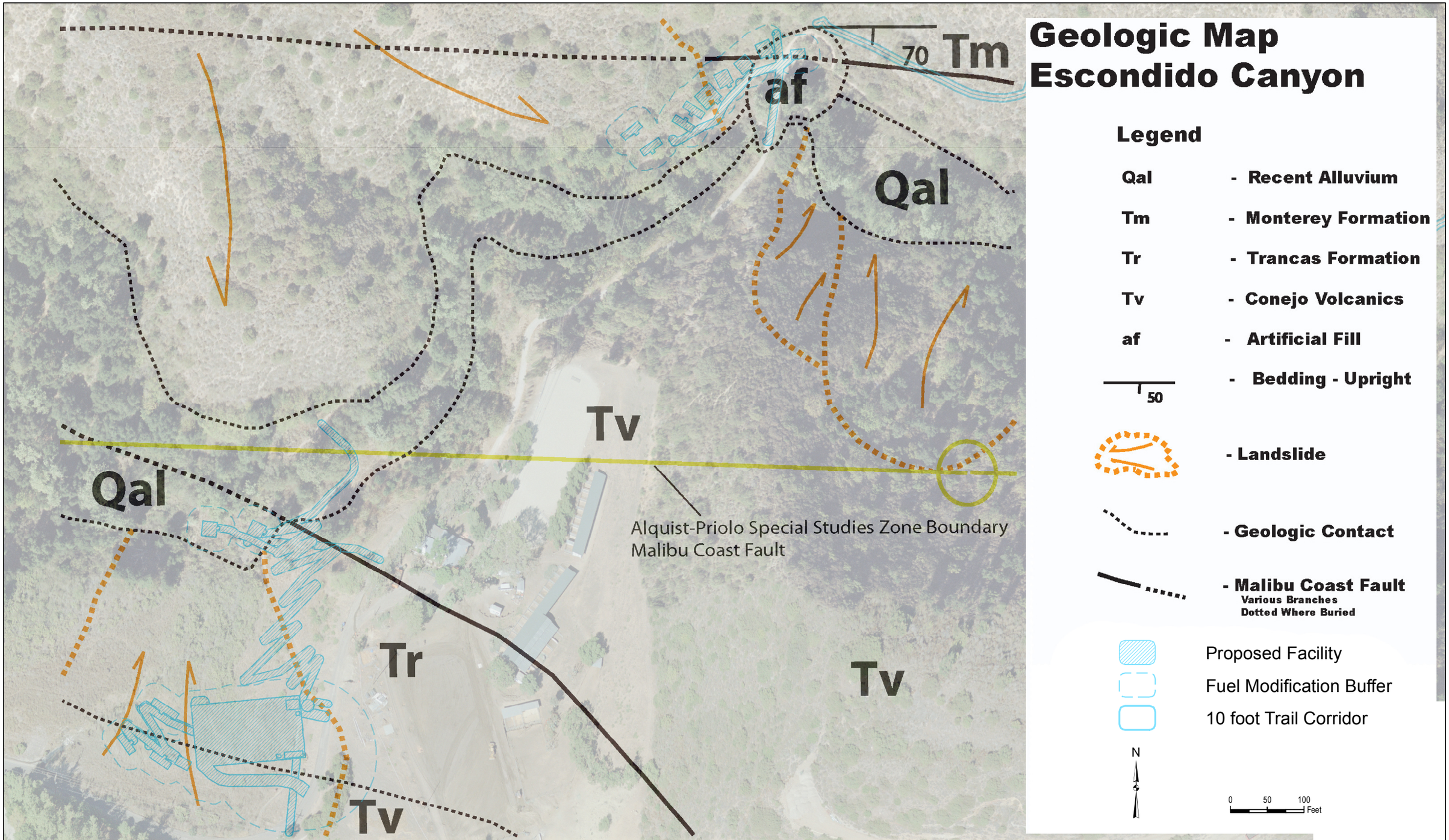

SOURCE: Southwest Engineering Geology (SEG) 2009

FIGURE 5.7-3

Geologic Map - Escondido Canyon

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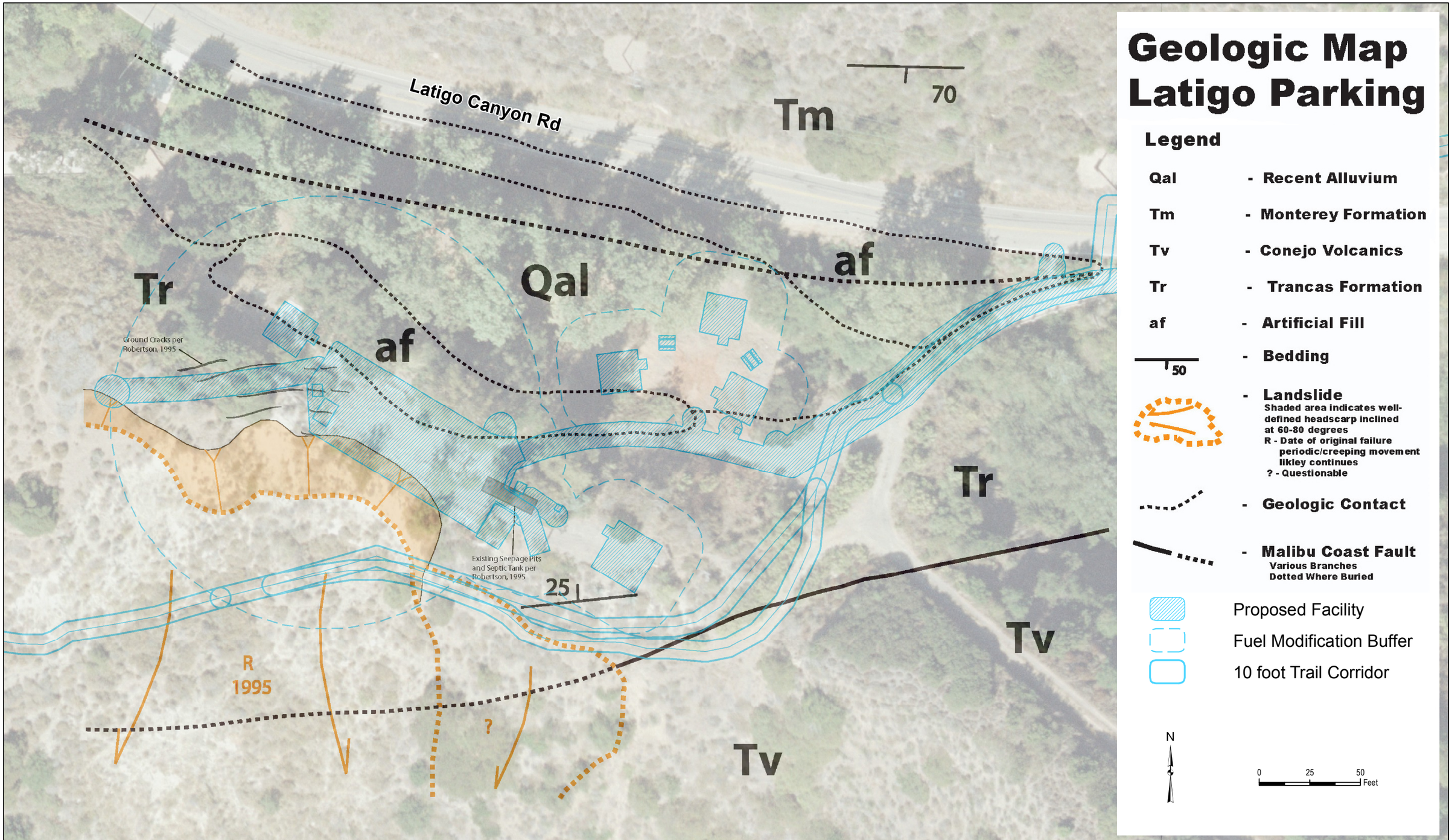

SOURCE: Southwest Engineering Geology (SEG) 2009

FIGURE 5.7-4

Geologic Map - Latigo Canyon

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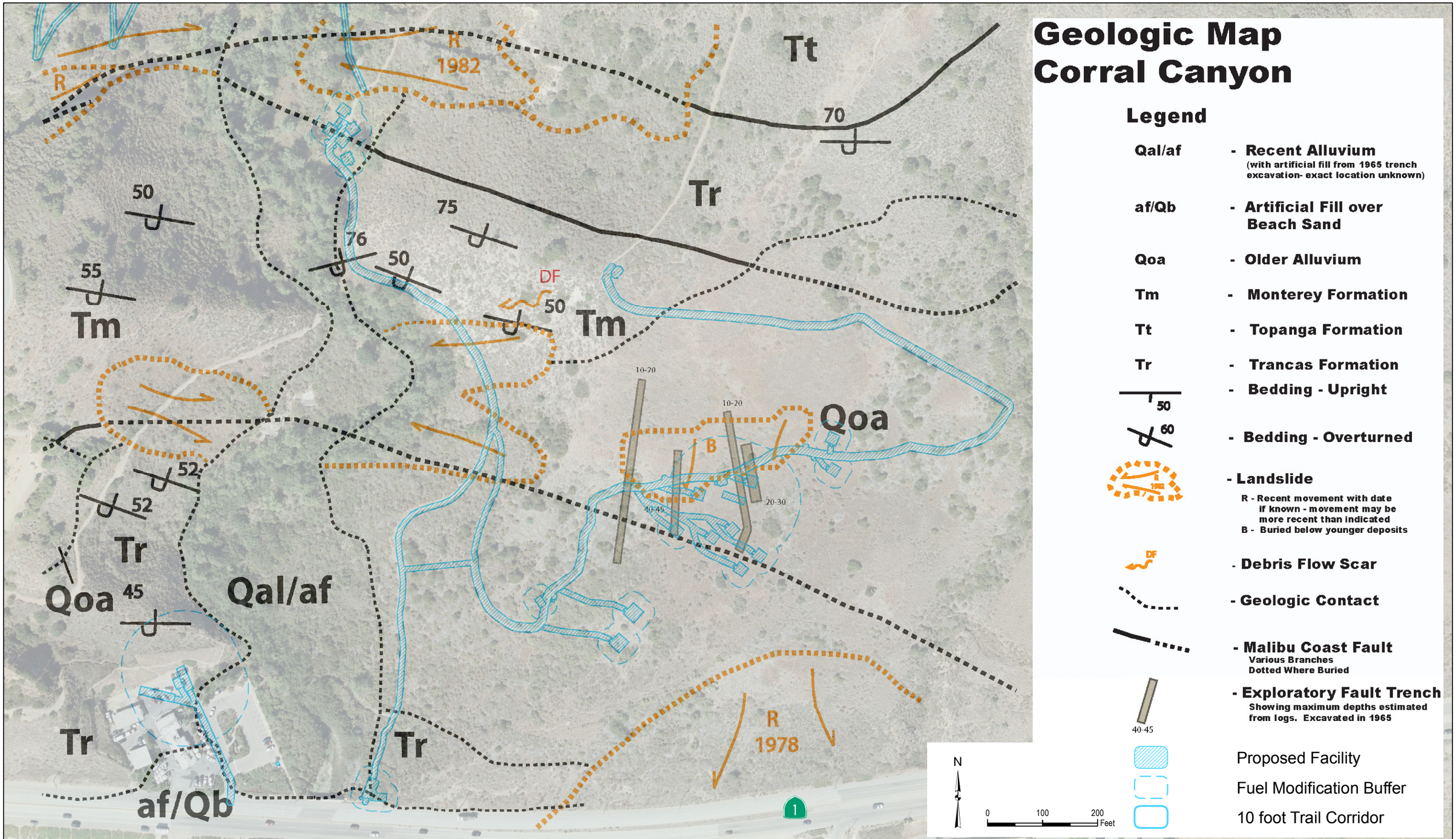

SOURCE: Southwest Engineering Geology (SEG) 2009

FIGURE 5.7-5

Geologic Map - Corral Canyon

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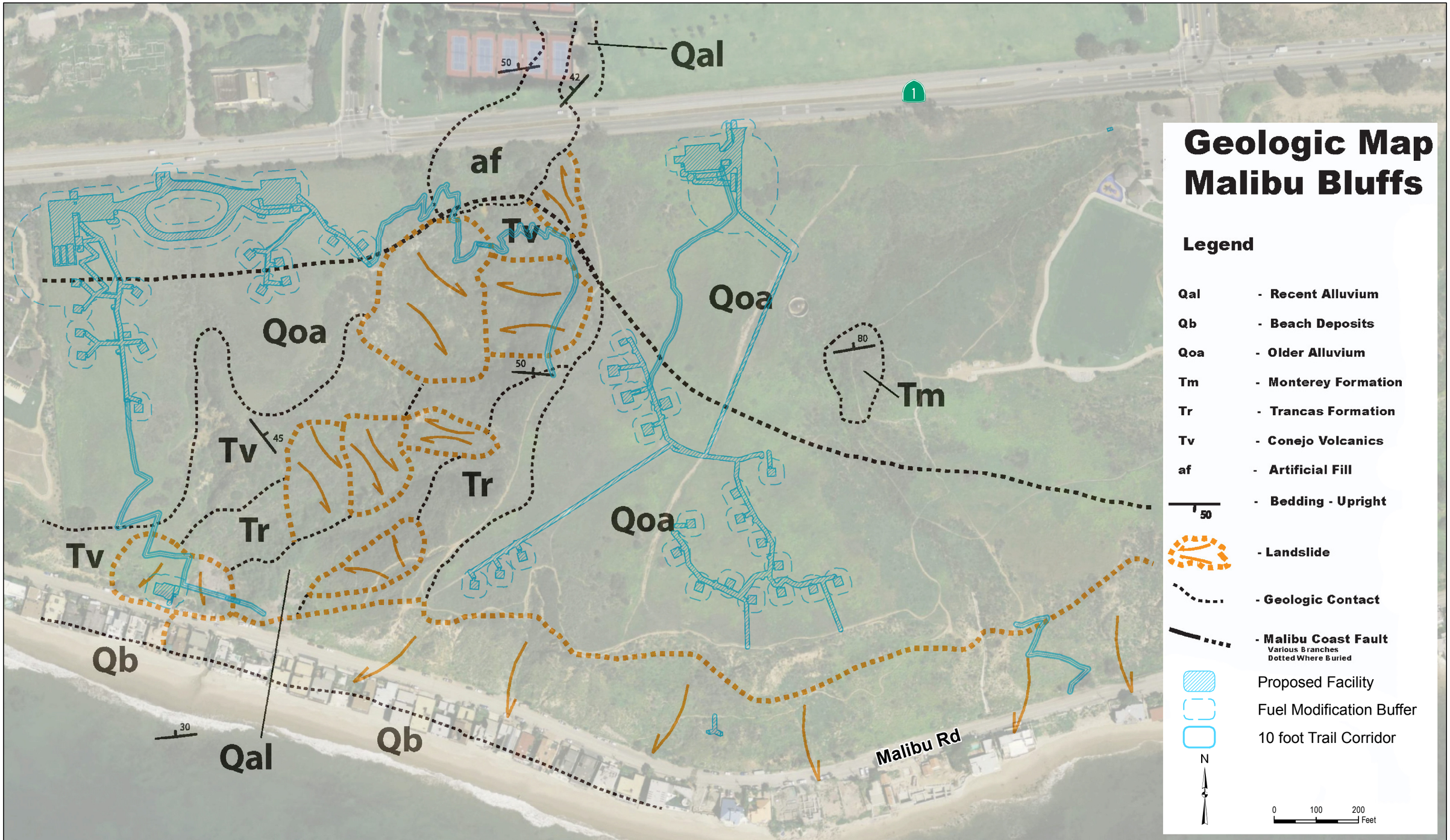

SOURCE: Southwest Engineering Geology (SEG) 2009

FIGURE 5.7-6

Geologic Map - Malibu Bluffs Open Space

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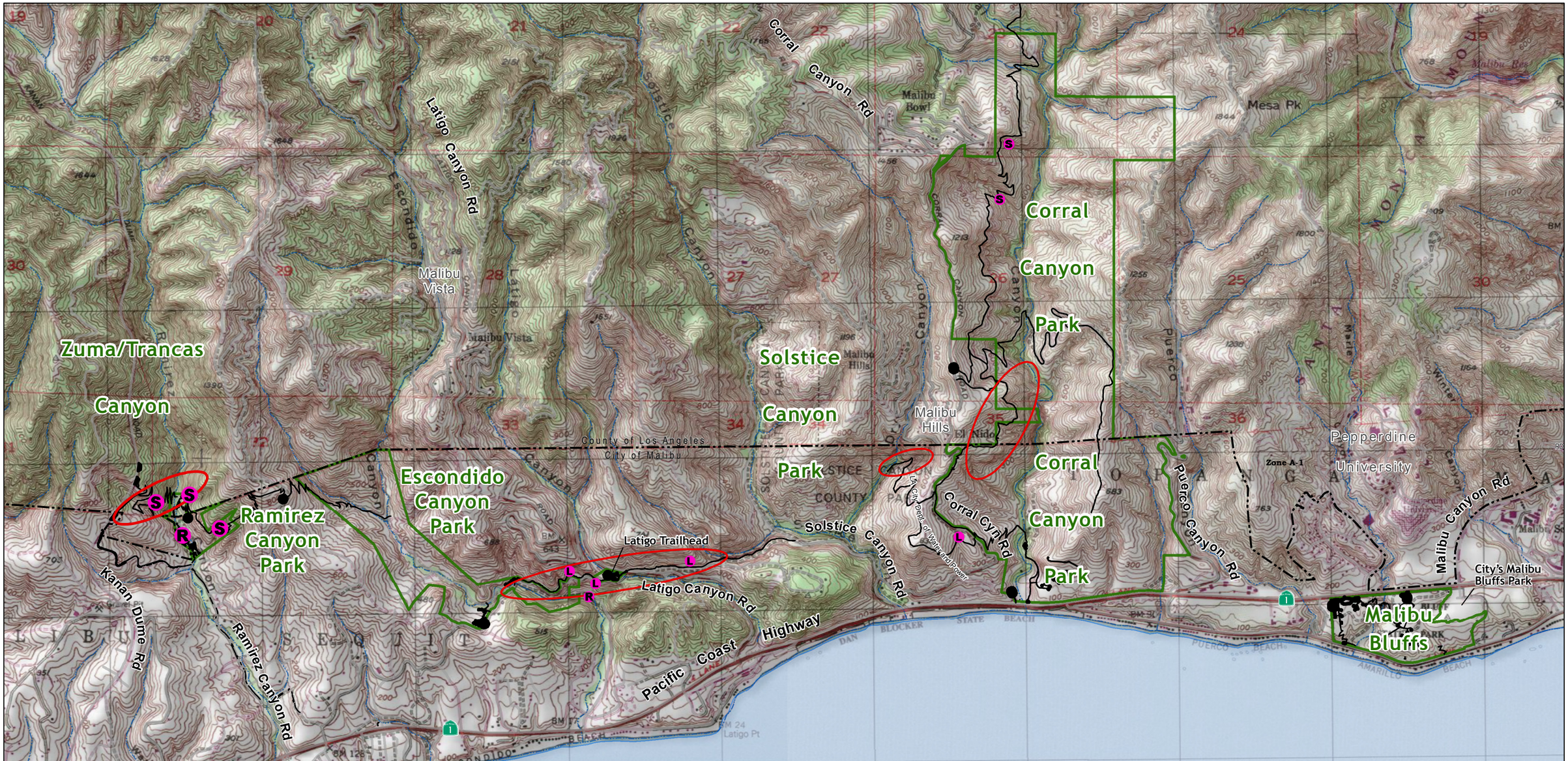

N

0 500 1,000 2,000 Feet

Volcanic Bedrock
Indicates areas where diffcult excavation should be anticipated along trail alignments.

L Indicates areas where proposed trails will cross mapped landslides.

S Indicates areas where proposed trails will cross unusually steep terrain.

R Indicates areas where proposed trails are proposed above existing residences.

Parks with Proposed Improments

Proposed Facility and Trail Improvements

SOURCE: Southwest Engineering Geology (SEG) 2009.

FIGURE 5.7-7

Geologic Map - Proposed Trail & Access

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Regulatory Setting

State Regulations

Alquist-Priolo Act

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) was passed in 1972 to mitigate the hazard of surface faulting to structures intended for human occupancy. This State law was a direct result of the 1971 San Fernando earthquake, which had associated extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The Act addresses only the hazard of surface fault rupture, and is not directed toward other earthquake hazards.

Seismic Hazards Mapping Act

Prompted by damaging earthquakes in northern and southern California, in 1990, the State Legislature passed the Seismic Hazards Mapping Act. The purpose of the Act is to protect public safety against the effects of ground rupture (failure), strong ground shaking, liquefaction, landslides, and other hazards caused by earthquakes. The program and actions mandated by the Seismic Hazards Mapping Act closely resemble those of the Alquist-Priolo Earthquake Fault Zoning Act (which addresses only surface fault-rupture hazards) and are outlined below:

- The State Geologist is required to delineate the various "seismic hazard zones."
- Cities and Counties, or other local permitting authority, must regulate certain development "projects" within the zones. They must withhold the development permits for a site within a zone until the geologic and soil conditions of the Project site are investigated and appropriate mitigation measures, if any, are incorporated into development plans.
- The State Mining and Geology Board provides additional regulations, policies, and criteria, to guide cities and counties in their implementation of the law. The Board also provides guidelines for preparation of the Seismic Hazard Zone Maps and for evaluating and mitigating seismic hazards.
- Sellers (and their agents) of real property within a mapped hazard zone must disclose that the property lies within such a zone at the time of sale.

Uniform Building Code

The Uniform Building Code (UBC) was first enacted by the International Conference of Building Officials (ICBO) in 1927. Revised editions of this code have been published approximately every three years since that time. In California, the California Building Code (CBC) is used, which incorporates by adoption the UBC and includes necessary California amendments. The building codes and standards are developed specifically for the purpose of regulating the life-safety, health and welfare of the public with respect to building construction and maintenance. Once adopted, building codes become law. The UBC and CBC specifically address appropriate construction design criteria and performance standards for buildings in seismically active zones.

California Coastal Act

The State of California Legislature adopted the California Coastal Act in 1976 to implement the federal Coastal Zone Management Act of 1972. The California Coastal Act is the foundation of the California Coastal Management Program (CCMP), which includes the basic policies for managing and balancing the use of resources for state and national interests in the California Coastal Zone. The enforceable policies of the CCMP are the Chapter 3 policies of the California Coastal Act. These policies address critical coastal resource issues including public coastline access, coastal and inland recreation, low-cost visitor activities, protection and enhancement of sensitive habitat and species, water quality, agricultural and visual resources, and natural hazards.

Local Regulations

City of Malibu Local Coastal Program

The policies and implementation measures of the Land Use Plan and Local Implementation Plan pertaining to geology and soils are addressed in this document under Section 4.0, *Consistency with Plans and Policies*.

Non-Regulatory Reference Planning Documents

County of Los Angeles Malibu Local Coastal Program Land Use Plan for the Malibu and Santa Monica Mountains area

The County of Los Angeles Malibu Local Coastal Program Land Use Plan (County LUP) for the Malibu and Santa Monica Mountains provides a framework for future development and establishes policies that focus on local issues and concerns for the unincorporated areas located within the Coastal Zone. The County LUP contains geologic hazard policies that address specific geologic hazards in the area. A discussion of pertinent policies contained in the Malibu Land Use Plan is addressed in this document under Section 4.0, *Consistency with Plans and Policies*.

City of Malibu General Plan

The City of Malibu General Plan was adopted in 1996. Pursuant to California Code Section 65302(1), which requires each local government to prepare and adopt a Safety Element as a component of their General Plan, the City of Malibu adopted the *Safety and Health Element* as a component to their General Plan. This element includes identification and mapping of the natural hazards located within the City and provides direction to reduce the potential for loss of life, injuries, damage to property, and social and economic dislocation resulting from major hazards throughout the community.

5.7.2 Impact Analysis

Methodology and Thresholds of Significance

The analysis of potential geology, soils, and seismicity impacts is based upon available existing geological information, the *Reconnaissance of Engineering Geological Constraints* report (Southwestern Engineering Geology, 2009), *the Supplemental Engineering Geologic Review* (Southwestern Engineering Geology, 2010), the City of Malibu's G*eneral Plan Safety and Health Element* and *Local Coastal Program*, and the *County of Los Angeles Malibu Local Coastal Program Land Use Plan.* In accordance with Appendix G of the CEQA Guidelines, implementation of the proposed Plan's improvements would have a significant environmental impact if it were to create any of the following:

G-1: The Plan would expose people or structures to substantial adverse effects, including the risk of loss, injury, or death involving:

- Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning map issued by the state geologist for the area or based on other substantial evidence of a known fault;
- Strong seismic ground shaking;
- Seismic-related ground failure, including liquefaction; and,
- Landslides.

G-2: The Plan would result in substantial soil erosion or loss of topsoil.

G-3: The Plan area is located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

G-4: The Plan area is located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property.

G-5: The Plan area contains soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Within other impact analysis sections contained within this EIR, the analysis associated with the Plan use of Ramirez Canyon Park is based on two different environmental baseline scenarios—Recreation/ Administration and Vacant Residential (refer to Section 3.0, *Environmental Setting*). The impacts of the Plan's implementation related to geology, soils, and seismic hazards would, however, be similar under either environmental baseline. Therefore, the impact analysis and discussion presented below should be considered applicable to both the Recreation/ Administration and Vacant Residential baselines.

Summary of Proposed Project Components / Features

The proposed Plan involves very little development of new, habitable structures (proposed structures include only new public restrooms, emergency fire shelters, fire-truck storage sheds, and possibly one pre-fabricated camp host structure), each of which would be occupied on an intermittent, temporary basis. Proposed restroom structures would, unless otherwise noted, employ self-contained chemical toilet systems that require no connection to a septic disposal or sanitary sewer system. The proposed emergency fire shelter design

is anticipated to incorporate a pre-fabricated steel or concrete structure, set on a gravel pad. The fire truck shed design is anticipated to incorporate a pre-fabricated steel structure erected over a reinforced concrete slab approximately six inches thick, with perimeter footing to support the structure walls. Where camping is proposed, a Camp Host space would be provided; this feature is simply a large enough parking space to accommodate a recreational vehicle (i.e., motor home or trailer) to be provided by the Host, along with a hose bib (for potable water connection) and electrical hook-up, with the exception of Corral Canyon Park where a prefabricated camp host accommodation may be provided. The following sub-sections provide a description of the physical components or features proposed within each park site of the Plan.

Ramirez Canyon Park

The proposed improvements at Ramirez Canyon Park include off-site 26-space paved parking facilities located immediately adjacent to Kanan Dume Road; a new pedestrian access trail from the Kanan Dume parking area to the park, including a pedestrian bridge facility over Ramirez Canyon Creek; an approximate 4,440 square foot 10-space on-site parking area; construction of 5 campsites; 2 day-use/ multi-purpose areas; 3 restrooms (all of which would be connected to the onsite treatment system); an emergency fire shelter; and, limited trail improvements within existing park boundaries. In addition, there is one vehicle bridge on Ramirez Canyon Road (outside Park boundaries) that would be replaced and upgraded to 20-ft wide as part of the Ramirez Canyon Road widening plan component. Also proposed for Ramirez Canyon is a Creek Restoration/Enhancement Plan (see Concept – Project Plan within *Appendix D-1*) involving approximately 600 linear feet of the Ramirez Creek channel.

The creek enhancement plan includes removing existing gabions and installing pervious boulder berms and/or log deflection structures throughout the creek to control stream degradation; creating areas of overbank enhancement in two areas (by the existing tennis court and at the southerly portion of the park) by removing artificial creek wall linings, grading back the slopes, constructing rock toe protection, installing retaining walls, and planting native plants; and planting of native plant species and removing non-native plants throughout the creek and implementing corresponding best management practices.

The proposed improvements also include administrative and public program uses at Ramirez Canyon Park that would employ existing facilities to provide educational opportunities, support unique access opportunities for disabled visitors, accommodate essential administrative park facility support, and allow for limited events and group gatherings typically permitted and accommodated in State Parks.

Escondido Canyon Park

The proposed Escondido Canyon Park improvements include a 13-regular, 2-accessible, and 3-trailer space parking lot; 13 camp sites; a Camp Host space; 3 self-contained restrooms; 1 emergency fire shelter; a 10,000 gallon water storage tank; and, limited trail improvements within existing park boundaries.

Latigo Canyon Trailhead/Campground

The proposed Park improvements include a 9-regular and 1-accessible space parking lot; a Camp Host space; 5 campsites; one self-contained restroom; 1 emergency fire shelter; a 10,000 gallon water storage tank, and limited trailhead improvements within existing park boundaries.

Corral Canyon Park

The proposed park improvements include repaving /restriping of the existing parking lot on the west side of Corral Canyon Creek, as well as the addition of Camp Host space, fire truck shed, and self-contained restroom within this parking lot; the construction of an accessible drop-off area connecting to Pacific Coast Highway (State Route 1), immediately east of Corral Canyon Creek; 16 camp areas; 2 self-contained restrooms; 2 emergency fire shelters; a 10,000 gallon water storage tank; and, limited trail improvements within existing park boundaries.

Malibu Bluffs

The proposed Malibu Bluffs improvements include four parking areas; 28 regular campsites; 4 tent cabins; 2 Camp Host spaces; 7 self-contained restrooms; 3 emergency fire shelters; a fire truck shed; two (2) 10,000 gallon water storage tanks; a picnic area; and, limited trail improvements within existing park boundaries.

Plan Policies and Implementation Measures

The Plan includes the following policies and implementation measures to specifically address the geologic conditions of the Plan area and to reduce potential geologic hazard impacts which could be associated with implementation of Plan developments and uses. These

policies are considered to comprise an integral component of the Plan proposal (Project Description).

Hazards Policy 1: *All new public access and recreation improvements shall minimize risks to life and property in areas of high geologic, flood, and fire hazard. Development of public access and recreation improvements shall be subject to the following development standards as well as any other applicable development standards of Chapter 9 of the Malibu Local Implementation Plan to minimize risks associated with high geologic, flood, and fire hazard.*

Hazards Policy 2: *Proposed park programs shall be developed and implemented in a manner that minimizes risks to life and property from geologic, flooding and fire hazard.*

Hazards Implementation Measure 1: *A geologic/soils/geotechnical study identifying any geologic hazards affecting areas identified for new, structural park facility development shall be prepared and shall contain recommendations for mitigation measures, where applicable, and a statement as to whether_the project areas are suitable for the proposed improvements and that the improvements will be safe from geologic hazard.*

Hazards Implementation Measure 2: *Engineered structures such as retaining walls, footings for small structures (i.e. restrooms with footings, water service lines, engineered retaining walls, parking areas, etc., as applicable), and significant cut and fill grading will require the preparation of a geotechnical report, prepared by a qualified engineering geologist or a registered geotechnical engineer, to provide recommendations for the design of these structures and grading procedures.*

Hazards Implementation Measure 3: *Where applicable, new park improvements shall include adequate drainage and erosion control facilities that convey site drainage in a non-erosive manner in order to minimize hazards resulting from increased runoff and erosion.*

Project Impacts and Mitigation Measures

Impact G-1a: **Implementation of the Plan's proposed improvements at Ramirez Canyon Park, Escondido Canyon Park, Corral Canyon Park, Malibu Bluffs, and related Plan trail systems have the potential to expose people or structures to substantial geologic and/or seismic hazards due to fault rupture/ground failure, strong seismic ground shaking, liquefaction, and landslides. Absent mitigation, this impact would be potentially significant.**

Impact G-1b: Implementation of the Plan's proposed improvements at the Latigo Trailhead has the potential to expose people or structures to substantial geologic and/or seismic hazards due to fault rupture/ground failure, strong seismic ground shaking, liquefaction, and landslides. This impact would be significant and unavoidable.

The *Reconnaissance of Engineering Geologic Constraints* study (see *Appendices*) was prepared by Southwestern Engineering Geology to specifically identify geologic constraints within the park sites of the Plan area and to provide recommendations for minimizing potential impacts associated with geologic hazards. The potential for seismic ground shaking affects the entire Malibu Coast, and Los Angeles Region, and therefore must be considered in the design of all proposed Plan improvements. Liquefaction potential within the Plan area is restricted to the stream bottoms where high groundwater may saturate loosely consolidated soils. Stream beds in both Ramirez Canyon and Corral Canyon are identified as areas likely to be prone to liquefaction on seismic hazard maps prepared by the California Geological Survey (Southwestern Engineering Geology, 2009).

In addition, essentially all of the elevated slopes in the Plan area are identified as areas that may be prone to seismically induced slope failure on Seismic Hazards Maps prepared by the California Geological Survey. Strong ground shaking can be expected to generate rockfalls, debris flows and slumps on steeper slopes (Southwestern Engineering Geology, 2009). However, all of the proposed park improvements conform to the natural terrain of the Plan area to the maximum extent feasible and would result in minimum alteration of the existing topography.

The *Engineering Geologic Constraints* study concluded that nearly all of the proposed Plan improvements have been designed to be located outside of fault traces, areas prone to liquefaction, and the mapped extent of historic landslide events. The only Plan components proposed within mapped areas of these potential hazards include hiking trails, the parking area for Escondido Canyon Park and various improvements at the Latigo Canyon Trailhead site. The Escondido Canyon Park and Latigo Canyon Trailhead hazards issues are evaluated in the park-specific discussions, below.

Regarding hiking trails, the *Engineering Geologic Constraints* study concluded that given the limited and short-term activities on trails, this use is considered low-risk and appropriate along the trail corridor areas as designed. The *Engineering Geologic Constraints* study recommended that design/construction techniques appropriate to trail substrate (including landslide) be incorporated into the final design and implementation of the trails system to

minimize the need for ongoing maintenance and avoid trail conditions which could be a safety hazard for hikers. With respect to this recommendation, conceptual trail layout utilized the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc. (MIG, June 2006). However, in order to ensure proper final trail design and implementation, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, (including but not limited to those for: Trails on Steep Cross Slopes; Trails on Flat Grades; Eroding and Hazardous Trail Edges; and Trails on Sandy Soils). See the Mitigation Measure discussion, below. Enforcement of the required mitigation measure would minimize long-term maintenance for the trails and avoid trail conditions which could be a safety hazard for hikers.

Ramirez Canyon Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Ramirez Canyon Park. According to the geologic constraints map (Figures 5.7-1 and 5.7-2), the proposed 10-space on-site parking area, day-use areas, and the three restrooms are all located in areas with potential liquefaction hazard. These planned improvements could be damaged or destroyed during a seismically-induced liquefaction episode, leading to potential injury or loss of life for park users. A zone of high seismic potential also encompasses the entire Malibu Coast, including Ramirez Canyon Park. Proposed structural development including restrooms and the emergency fire shelter could be damaged or destroyed by ground acceleration (shaking) produced by the regional earthquake fault system, unless properly designed and constructed to withstand such shaking. Last, the *Geologic Constraints* study concluded that none of the proposed improvements in Ramirez Canyon Park would be located over a fault trace or within the extent of mapped landslide activity.

The proposed improvements also include administrative and public program uses at Ramirez Canyon Park that would employ existing facilities to provide educational opportunities, support unique access opportunities for disabled visitors, accommodate essential administrative park facility support, and allow for limited events and group gatherings typically permitted and accommodated in State Parks. The proposed expanded parking facilities, camp and day-use areas, hiking trails, and continued use of Ramirez Canyon Park for specialized programs may potentially expose people or structures to potentially significant geologic hazards, including seismic and liquefaction hazards.

The proposed Plan - Hazard Policies 1 and 2 and accompanying implementation measures listed above require park improvements be located and constructed to minimize potential risks to life and property. Hazard Implementation Measure 2 requires detailed geotechnical investigation to support final design of any structures or engineered facilities in order to avoid damage from geologic hazard conditions. Furthermore, all structures located within Ramirez Canyon Park that are to be used as part of the proposed activities and special programs would be required to satisfy California Building Code seismic requirements for structures, further minimizing the potential impacts on people and structures from geologic hazards.

However, to ensure avoidance of damage or failure of proposed improvements from liquefaction and seismicity hazards, additional more specific mitigation is required (see Mitigation Measures discussion, below). Without mitigation, potential impacts from geologic hazards, including seismicity and liquefaction, on the proposed park improvements at Ramirez Canyon Park would be considered *potentially significant*.

Escondido Canyon Park

As discussed above, the proposed Plan includes Hazard Policies 1 and 2, with accompanying Implementation Measures that require park improvements be located and constructed to minimize potential risks to life and property. Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Escondido Canyon Park, and provides recommendations for minimizing potential impacts of the proposed uses and improvements associated with geologic hazards. Project impacts arising from the identified geologic constraints and proposed improvements are discussed below.

According to the geologic constraints map (Figure 5.7-2), the new vehicle parking lot with access drive from Winding Way, Camp Host space, restrooms (2), 10,000 gallon water storage tank, emergency fire shelter, and three camp sites are proposed to be located within areas identified as having landslide potential. These planned improvements could be damaged or destroyed by landslide activity, leading to potential injury or loss of life for park users. The restroom facility and one camp site in Camp Area 3 are currently proposed at locations over the fault trace for the Malibu Coast Fault; remaining structural improvements as proposed would not be sited over a fault trace. The Camp Area 3 restroom could be destroyed by movement along the trace of the Malibu Coast Fault. A zone of high seismic potential also encompasses the entire Malibu Coast, including Escondido Canyon Park. Proposed structural development including restrooms, emergency fire shelter, and water

tank could be damaged or destroyed by ground acceleration (shaking) produced by the regional earthquake fault system, unless properly designed and constructed to withstand such shaking. The *Geologic Constraints* study concluded, however, that none of the proposed improvements in Escondido Canyon Park would be located within an area with liquefaction potential.

With respect to the proposed Escondido Canyon Park parking lot (including access drive from Winding Way), Camp Host space, restrooms (2), 10,000 gallon water storage tank, emergency fire shelter, and immediately adjacent three camp sites, the proposed location for these improvements is underlain by clay-rich soils which exhibit a particular type of land-sliding known as soil creep (the gradual down-slope movement of materials in response to moisture-driven cycles of shrinking / swelling of the clay). This hazard can be addressed with final engineering design incorporating the findings of detailed geologic and soil information from field borings and laboratory analysis, as generally required under Hazard Implementation Measure 2. However, to ensure the avoidance of damage to these proposed improvements from soil creep landsliding, additional more specific mitigation is required (see Mitigation Measures discussion, below). The type and extent of the hazard (soil creep) would not render the proposed improvements infeasible or subject park visitors to significant geologic risk.

Portions of the proposed on-site trail system would also partially be located within the area of identified soil creep (described above). Soil creep may result in the need for increased frequency of maintenance activities for the improved trail system, but would not expose hikers to significant hazards or risks. The *Engineering Geologic Constraints* study recommended that design/construction techniques appropriate to trail be incorporated into the final design and implementation of the trails system to minimize the need for ongoing maintenance and avoid trail conditions which could be a safety hazard for hikers. With respect to this recommendation, the Plan conceptual trail design utilized recommendations contained within the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines,* prepared by Moore Iacofano Goltsman, Inc. (MIG, June 2006). However, in order to ensure proper final trail design and implementation, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, (including but not limited to those for: Trails on Steep Cross Slopes; Trails on Flat Grades; Eroding and Hazardous Trail Edges; and Trails on Sandy Soils). See the Mitigation Measure discussion, below.

The proposed Camp Area 3 is located partially within the limits of a mapped landslide, and a trace of the Malibu Coast fault is mapped here. No evidence of recent landslide movement was noted during site reconnaissance in 2006 or 2009. Sudden, significant

movement is considered unlikely under existing conditions; past movement within this landslide area consisted of the same soil creep as described for the parking lot area Southeastern Engineering Geology, 2009). With respect to the proposed Camp Area 3 restroom and campsite closest to the restroom, the geologic constraints map (Figure 5.7-2) depicts the trace of the Malibu Coast Fault passing through the current location proposed for these improvements. To avoid failure of these improvements from ground rupture, they should be shifted to avoid the fault trace. Both restroom and closest camp site could be shifted northeast 30-40 feet to avoid the fault trace, and still remain in the clearing area on level ground. Alternatively, these improvements should be removed from the plan (see Mitigation Measure discussion, below).

Compliance with Hazard Policies 1 and 2, and accompanying Hazard Implementation Measures, adherence to requirements of the CBC, and enforcement of the prescribed mitigation measures would ensure potential impacts to people and structures from geologic hazards including fault rupture, seismicity, and landsliding (soil creep) in Escondido Canyon Park are reduced to less than significant. Associated impacts, therefore, would be considered *potentially significant*.

Latigo Canyon Trailhead/Campground

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Latigo Canyon Park, and provides recommendations for minimizing potential impacts of the proposed uses and improvements associated with geologic hazards, including faulting, seismicity, landsliding, and liquefaction. According to the geologic constraints map (Figure 5.7-4), the proposed structural improvements including parking lot, Camp Host space, self-contained restroom, emergency fire shelter, and 10,000 gallon water storage tank would be located on a ridge feature immediately adjacent to, or within, the boundaries of recent landslide activity. These planned improvements could be damaged or destroyed by landslide activity, leading to potential injury or loss of life for park users. A zone of high seismic potential also encompasses the entire Malibu Coast, including Latigo Canyon Trailhead / Campground. Proposed structural development including restrooms, emergency fire shelter, and water tank could be damaged or destroyed by ground acceleration (shaking) produced by the regional earthquake fault system, unless properly designed and constructed to withstand such shaking. The *Geologic Constraints* study concluded, however, that none of the proposed improvements in Latigo Canyon Trailhead / Campground would be located within an area with liquefaction potential, and there are no proposed structures located over trace of the Malibu Coast Fault.

The southwest edge of the proposed parking lot is within the limits of a recent landslide; the proposed emergency fire shelter and water storage tank are located essentially coincident with the northern limit of the same landslide; the self-contained restroom and Camp Host space are within 30-40 feet of the current landslide boundary. The landslide failure plane is estimated to be about 30 feet below the ground surface, and the scarp (vertical face) associated with the landslide is about 200 feet across at the widest point (Southwestern Engineering Geology, 2009). The above- described improvements within, or immediately adjacent to, the identified boundary of the historic landslide could be subject to damage or failure via further landslide activity. The landslide mass could be stabilized with deep caissons, but the cost associated with this solution deem it infeasible, compared to the value of the improvements protected. Therefore, the site layout proposed for structural improvements at Latigo Canyon Trailhead / Campsites is considered to have *significant, and unavoidable* landslide hazard impacts.

The current site plan for Latigo Canyon includes a cluster of three camp sites on the north side of the access road. This area of the site does not have landslide risks, and the proposed three camp sites in this area would therefore have less than significant landslide impacts.

Portions of the proposed on-site trail system would also partially be located within the area of identified landslide (described immediately above). Landslide activity may result in the need to re-construct the trail periodically, unless it is relocated outside of the landslide footprint. The *Geologic Constraints* study (Southwestern Engineering Geology, 2009), concluded that due to the limited and short-term activities on trails, and low level risk associated with the identified type of landslide phenomenon affecting trail alignments, the proposed trail system is an acceptable use within this identified hazard area. The Concept Plan trail design utilized recommendations contained within the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc. (MIG, June 2006). However, in order to ensure proper final trail design and implementation, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, (including but not limited to those for: Trails on Steep Cross Slopes; Trails on Flat Grades; Eroding and Hazardous Trail Edges; and Trails on Sandy Soils). See the Mitigation Measure discussion, below. Adherence to the prescribed Mitigation Measure would minimize the need for ongoing trail maintenance.

Compliance with Hazard Policies 1 and 2, and accompanying Hazard Implementation Measures, adherence to requirements of the CBC, and enforcement of the prescribed mitigation measures would ensure potential impacts to people and structures from geologic

hazards including fault rupture and seismicity in Latigo Canyon Trailhead / Campsite are reduced to less than significant. Absent mitigation, associated impacts would be considered *potentially significant*.

Due to the unavailability of economically feasible mitigation for identified landslide hazards, potential impacts from landslide activity upon proposed structural improvements at Latigo Canyon would remain *significant and unavoidable*.

Corral Canyon Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Corral Canyon Park, and provides recommendations for minimizing potential impacts of the proposed uses and improvements associated with geologic hazards. According to the geologic constraints map (Figure 5.7-5), all proposed structural improvements (including restrooms, Camp Host space, fire truck shed, emergency fire shelters, water tank, and camp sites) are proposed to be located outside of the mapped boundaries of areas identified as having landslide potential. Hiking trails are proposed to be located at least partially within mapped landslide area. No structural improvements are proposed to be situated over the mapped fault trace for Malibu Coast Fault; however, a zone of high seismic potential encompasses the entire Malibu Coast, including Corral Canyon Park. Proposed structural development including restrooms, emergency fire shelter, fire truck shed and water tank could be damaged or destroyed by ground acceleration (shaking) produced by the regional earthquake fault system, unless properly designed and constructed to withstand such shaking. The *Geologic Constraints* study concluded, however, that none of the proposed improvements in Corral Canyon Park would be located within an area with liquefaction potential.

Because structural improvements would be located outside of mapped boundaries for landslide hazard or the identified fault trace for Malibu Coast fault improvements would not be anticipated to be impacted by these geologic hazards. However, final design of these improvements must incorporate site specific ground acceleration information, to be confirmed by an engineering geologist and structural engineer (see Mitigation Measures).

Portions of the proposed on-site trail system would also partially be located within the area of identified landslide (described immediately above). The *Geologic Constraints* study (Southwestern Engineering Geology, 2009), concluded that due to the limited and short-term activities on trails, and low level risk associated with the identified type of landslide

phenomenon affecting trail alignments, the proposed trail system is an acceptable use within this identified hazard area. The Concept Plan trail design utilized recommendations contained within the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc. (MIG, June 2006). However, in order to ensure proper final trail design and implementation, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, (including but not limited to those for: Trails on Steep Cross Slopes; Trails on Flat Grades; Eroding and Hazardous Trail Edges; and Trails on Sandy Soils). See the Mitigation Measure discussion, below. Adherence to the prescribed Mitigation Measure would minimize the need for ongoing trail maintenance.

Compliance with Hazard Policies 1 and 2, and accompanying Hazard Implementation Measures, adherence to requirements of the CBC, and enforcement of required mitigation measures would ensure potential impacts to people and structures from geologic hazards in Corral Canyon Park are reduced to less than significant. Absent mitigation, associated impacts would be considered *potentially significant.*

Malibu Bluffs Park

As discussed above, the proposed Plan includes Hazard Policies 1 and 2, with accompanying Implementation Measures that require park improvements be located and constructed to minimize potential risks to life and property. Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Malibu Bluffs Park, and provides recommendations for minimizing potential impacts of the proposed uses and improvements associated with geologic hazards. According to the geologic constraints map (Figure 5.7-6), all proposed structural improvements (including restrooms, Camp Host spaces, fire truck shed, emergency fire shelters, water tank, and camp sites) are proposed to be located outside of the mapped boundaries of areas identified as having landslide potential. Hiking trails are proposed to be located at least partially within mapped landslide area. No structural improvements are proposed to be situated over the mapped fault trace for Malibu Coast Fault; however, a zone of high seismic potential encompasses the entire Malibu Coast, including Malibu Bluffs Park. Proposed structural development including restrooms, emergency fire shelter, fire truck shed and water tank could be damaged or destroyed by ground acceleration (shaking) produced by the regional earthquake fault system, unless properly designed and constructed to withstand such shaking. The *Geologic Constraints* study concluded, however, that none of the proposed improvements in Malibu Bluffs Park would be located within an area with liquefaction potential.

Because structural improvements would be located outside of mapped boundaries for landslide hazard or the identified fault trace for Malibu Coast fault improvements would not be anticipated to be impacted by these geologic hazards. However, final design of these improvements must incorporate site specific ground acceleration information, to be confirmed by an engineering geologist and structural engineer (see Mitigation Measures).

Portions of the proposed on-site trail system would partially be located within an area identified with ancient landslide. Land sliding in this area has been described as consisting of shallow bedding layers, with limited mass wasting for individual episodes. These shallow bedding plane failures may result in the need for increased frequency of maintenance activities for the improved trail system, but would not expose hikers to significant hazards or risks (Southeastern Engineering Geology, 2009). The Concept Plan trail design utilized recommendations contained within the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc. (MIG, June 2006). However, in order to ensure proper final trail design and implementation, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, (including but not limited to those for: Trails on Steep Cross Slopes; Trails on Flat Grades; Eroding and Hazardous Trail Edges; and Trails on Sandy Soils). See the Mitigation Measure discussion, below. Adherence to the prescribed Mitigation Measure would minimize the need for ongoing trail maintenance.

Compliance with Hazard Policies 1 and 2, and accompanying Hazard Implementation Measures, adherence to requirements of the CBC, and enforcement of the required mitigation measures, would ensure potential impacts to people and structures from geologic hazards in Malibu Bluffs Park are reduced to less than significant. Absent mitigation, associated impacts would be considered *potentially significant*.

Trail System

The proposed trail system improvements include several hiking trails located throughout the Plan area. The Plan includes Hazard Policies 1 and 2, with accompanying Implementation Measures that require park and trail facilities to be located and designed to provide geologic stability and structural integrity, and to minimize risks to life and property in areas of high geologic hazard. Some of the trail alignments include segments situated within areas with identified landslide potential. The *Geologic Constraints* study (Southwestern Engineering Geology, 2009), concluded that due to the limited and short-term activities on trails, and low level risk associated with the identified type of landslide phenomenon affecting trail

alignments, the proposed trail system is an acceptable use within the identified hazard areas.

The *Engineering Geologic Constraints* study recommended that design/construction techniques appropriate to trail be incorporated into the final design and implementation of the trails system to minimize the need for ongoing maintenance and avoid trail conditions which could be a safety hazard for hikers. With respect to this recommendation, the Concept Plan trail design utilized recommendations contained within the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc. (MIG, June 2006). However, in order to ensure proper final trail design and implementation, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, (including but not limited to those for: Trails on Steep Cross Slopes; Trails on Flat Grades; Eroding and Hazardous Trail Edges; and Trails on Sandy Soils). See the Mitigation Measure discussion, below.

Compliance with Hazard Policies 1 and 2, and accompanying Hazard Implementation Measures, and enforcement of the required mitigation measures, would ensure potential impacts to people utilizing the trail system associated with geologic hazards are reduced to less than significant. Absent mitigation, associated impacts would be considered *potentially significant.*

Mitigation Measures

Implementation of the proposed Plan, even with adherence to the Plan's policies and implementation measures, could result in potentially significant impacts related to geologic hazards including fault rupture, seismicity (ground shaking), liquefaction, and landsliding. The following mitigation measures would be required in order to address the identified potential impacts.

MM G-1.1 Site-specific geotechnical investigations, including borings and laboratory analysis of soil characteristics, shall be conducted for the following Ramirez Canyon proposed improvements: 10-space on-site parking area, day-use areas, and new restrooms. The geotechnical investigation shall identify site preparation techniques and/or engineering design specifications to address liquefaction potential of the encountered earth materials. All requirements identified in the geotechnical investigation shall be incorporated into design and construction.

MM G-1.2 A certified engineering geologist (CEG) shall calculate ground acceleration

values within Ramirez Canyon Park for the maximum credible earthquake produced by the regional fault system, for use in designing improvements located within Ramirez Canyon Park. A structural engineer shall then certify the proposed design is capable of withstanding the identified ground acceleration, for the following structures: a) the three new restroom facilities; b) the emergency fire shelter; c) existing structures proposed for new or expanded public use in Ramirez Canyon Park, under the Plan.

MM G-1.3 Site-specific geotechnical investigations, including borings and laboratory analysis of soil characteristics, shall be conducted for the following Escondido Canyon Park proposed improvements: parking lot (including access drive from Winding Way), Camp Host space, restrooms (2), 10,000 gallon water storage tank, emergency fire shelter, and immediately adjacent three camp sites. The geotechnical investigation shall identify site preparation techniques and/or engineering design specifications to address soil creep / shallow landslide potential of the encountered earth materials. All requirements identified in the geotechnical investigation shall be incorporated into design and construction.

MM G-1.4 A certified engineering geologist (CEG) shall calculate ground acceleration values within Escondido Canyon Park for the maximum credible earthquake produced by the regional fault system, for use in designing improvements located within Escondido Canyon Park. A structural engineer shall then certify the proposed design is capable of withstanding the identified ground acceleration, for the following structures: a) the three new self-contained restroom facilities; b) the emergency fire shelter; c) the 10,000 gallon water storage tank.

MM G-1.5 For Camp Area 3 of Escondido Canyon, the northern-most campsite and restroom facility, located over the fault trace for the Malibu Coast Fault[2], shall be removed from the Plan.

MM G-1.6 A certified engineering geologist (CEG) shall calculate ground acceleration values within Latigo Canyon Traihead / Campsite property for the maximum

2 The existing site layout for Camp Area 3 demonstrates such a reconfiguration would be feasible; an easily identifiable solution could be to eliminate the one small camp site closest to the restroom location, and then replace the immediately adjacent small campsite with the re-located restroom facility. Net change would be two less small campsites, and no development outside the previously envisioned disturbance footprints. It also appears there would be sufficient space within level, disturbed, areas to simply shift these two components 40 feet northeast to avoid the fault trace.

credible earthquake produced by the regional fault system, for use in designing any structural improvements located within Latigo Canyon Traihead / Campsite property. A structural engineer shall then certify the proposed design is capable of withstanding the identified ground acceleration, for any of the following proposed structures: a) self-contained restroom facilities; b) emergency fire shelter; c) water storage tank.

MM G-1.7 A certified engineering geologist (CEG) shall calculate ground acceleration values within Corral Canyon Park for the maximum credible earthquake produced by the regional fault system, for use in designing improvements located within Corral Canyon Park. A structural engineer shall then certify the proposed design is capable of withstanding the identified ground acceleration, for the following structures: a) self-contained restroom facilities; b) emergency fire shelters; c) the 10,000 gallon water storage tank; d) fire truck shed.

MM G-1.8 A certified engineering geologist (CEG) shall calculate ground acceleration values within Malibu Bluffs Park for the maximum credible earthquake produced by the regional fault system, for use in designing improvements located within Malibu Bluffs Park. A structural engineer shall then certify the proposed design is capable of withstanding the identified ground acceleration, for the following structures: a) self-contained restroom facilities; b) emergency fire shelters; c) the 10,000 gallon water storage tank; d) fire truck shed.

MM G-1.9 The final design and construction of trail segments located within areas of landslide potential (soil creep) shall adhere to the Best Practices identified in *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc., 2006 (pp 25-35), including but not limited to those for: Trails on Steep Cross Slopes; Trails on Flat Grades; Eroding and Hazardous Trail Edges; and Trails on Sandy Soils.

Plan Requirement and Timing: Geotechnical, structural, and engineering analyses, and any recommendations resulting therefrom, shall be prepared and submitted to MRCA for review and approval prior to soil disturbance activity. Applicable recommendations shall be identified as a note(s) on the grading, construction, and restoration plans for each phase.

Monitoring: Prior to grading, MRCA shall review Geotechnical, structural, and engineering analyses and shall review final grading, construction, and restoration plans to ensure consistency with the technical recommendations. MRCA staff shall inspect construction sites during construction to verify compliance with this requirement.

Residual Impacts

With implementation of the Plan's Policies and Implementation Measures, and adherence to the above required mitigation measures, potential impacts on, or caused by, the Plan's park improvements associated with unstable earth materials hazards in Ramirez Canyon Park, Escondido Canyon Park, Corral Canyon Park, Malibu Bluffs Park, and the proposed Trail System would be reduced *to* ***less than significant levels (Class III).***

Significant landslide hazard impacts upon proposed structural improvements in Latigo Canyon Trailhead / Campsite property would remain ***significant and unavoidable (Class I).***

Impact G-2: Absent mitigation, implementation of the proposed Plan's improvements would result in potentially significant impacts due to soil erosion or the loss of topsoil.

In general, as described in detail in *Section 5.10, Hydrology, Drainage and Water Quality*, the Plan includes conceptual project plans that utilize non-structural devices such as graded bio-swales for controlling and diverting run-off in a non-erosive manner from the proposed Plan's parking surfaces, which would serve to minimize erosion and ensure geologic stability of the site. These non-structural methods, rather than standard urban-type BMPs (i.e., curb and gutter, etc.), have been incorporated into the Plan to maintain the rural character of the parklands. The Plan area and park sites include ample land area to implement non-structural Best Management Practices (BMPs) to reduce, control, and filter runoff, and to further minimize site erosion and subsequent sedimentation in coastal waterways. Proposed swales would convey storm-water from developed areas to an appropriate discharge point in existing drainages where ungrouted rip-rap would serve as energy dissipaters to disperse runoff in a non-erosive manner.

As is further described in detail in *Section 5.10, Hydrology, Drainage and Water Quality*, the proposed Plan must comply with the Construction General Permit, which will ensure that

erosion and loss of topsoil are avoided or minimized during construction. The Plan includes several policies and implementation measures that require all graded and disturbed areas to be planted and maintained for erosion control purposes within sixty (60) days of completing any construction activities that involve soil disturbance or vegetation removal. Restoration efforts for areas disturbed via construction would consist primarily of native/drought tolerant plants.

Construction of trails on the steeper slopes could result in the collection, channeling, and concentration of storm water resulting in accelerated erosion and sediment delivery to the creeks. The proposed Plan utilized the *Park and Trail Accessibility Design Guidelines* prepared by MIG (June 2006), in providing the conceptual layout for the trail system. Also, the United State Forest Service Standards for Construction and Maintenance of Trails (USFS Standards) was referenced as a guide in planning trail construction and maintenance activities, to ensure resource protection through implementation of appropriate best management practices and drainage control measures. The *Park and Trail Accessibility Design Guidelines* include a number of best practices to be used in designing and constructing the trail corridors to improve drainage control. The guidelines and the USFS Standards have been incorporated into the conceptual design of each trail corridor as project features. However, in order to ensure final design and trail implementation achieve proper drainage control, additional specific mitigation is required (see Mitigation Measure discussion, below).

In addition, the Plan includes Water Quality Implementation Measures 2, 3 and 4 (see *Section 5.10 Hydrology, Drainage, and Water Quality*) that require preparation of an Interim Erosion Control Plan and location of Plan improvements in level, disturbed areas to the maximum extent feasible to minimize the need for grading. In addition to Hazards Implementation Measure 3, discussed above, the Plan also includes the following implementation measure to address soil disturbance and erosion associated with the implementation of the Plan's proposed improvements.

> ***Facilities Implementation Measure 4:*** *New support facilities shall be located in areas of level terrain to minimize the need for grading as much as feasible.*

Implementation of the project design features and mitigation measures as described in this section and in *Section 5.10, Hydrology, Drainage and Water Quality*, would ensure that impacts due to soil erosion and loss of top soil would be reduced to *less than significant,* as more particularly described, below**.**

Ramirez Canyon Park

With regard to soil disturbance activity and erosion potential for Ramirez Canyon Park improvements, the proposed ADA compliant overnight camp area would be located within the existing tennis court location which is slated for demolition. The accessible campsite locations are planned in level, previously disturbed areas of the park. The accessible campsites would incorporate the recommended guidelines for the universal design of trails and trail facilities as described in the *Park and Trail Accessibility Design Guidelines* prepared by MIG (2006) and the USFS Standards. The new day-use picnic areas are planned within small, open meadow areas just east of the park entrance gate and along the west bank of Ramirez Canyon Creek. These areas would be improved with picnic amenities and the periphery of the areas would be re-vegetated with native plants to enhance the visual quality and habitat of the degraded site. Both day-use areas are located in proximity to Ramirez Canyon Creek but are within level areas of the park previously disturbed and/or developed. As such, installation of the day-use amenities would not require grading, and therefore would not result in any impact due to erosion or loss of topsoil.

The proposed Kanan Dume parking facility would require approximately 1,275 cubic yards of grading. Project plans illustrate the location and type of drainage facilities and polluted run-off control measures that would serve to reduce, treat and convey run-off from the improved parking area in a non-erosive manner. In addition to compliance with the Construction General Permit, which would control erosion impacts during construction, the proposed Plan's policies and implementation measures (*Water Quality Policies 1 and 2, Environmentally Sensitive Habitat Area [ESHA] Implementation Measures 6 and 8*) would require that areas disturbed during construction of the parking lot would be re-vegetated with native plants immediately upon completion of construction. Interim erosion control measures would be implemented during the construction period consistent with NPDES requirements and the ESHA and water quality protection requirements of the Plan. Re-vegetation efforts would focus on establishing full vegetative coverage of disturbed soils as well as providing for visual screening of the parking facility from Kanan Dume Road.

Compliance with the Construction General Permit and implementation of the project design features to control erosion, as discussed in *Section 5.10*, and implementation of the proposed Plan's policies and implementation measures, together with the guidelines outlined in the MIG document, as required by mitigation measure G-2(a), would ensure that impacts due to soil erosion and loss of topsoil from proposed Plan improvements in Ramirez Canyon Park would be reduced to *less than significant.*

Escondido Canyon Park

The proposed Escondido Canyon Park improvements may be divided into three development areas. The largest area is just east of the park entrance, off Winding Way, and would include the new vehicle parking lot, Camp Host space, restrooms (2), 10,000 gallon water storage tank, emergency fire shelter, and three camp sites. A second area, connected by trail to the parking lot, would be located on level land at the bottom of Escondido Canyon, and would contain two camp sites. The third area would be clustered the extension and terminus of Winding Way, and would contain 8 camp sites and a self-contained restroom. Only the first area (with parking lot) would involve substantial grading or new paving. Grading for the proposed parking facility and camp areas would consist of 2,450 cubic yards of cut and 169 cubic yards of fill. Project plans illustrate the location and type of drainage facilities and polluted run-off control measures which would be implemented to reduce, treat and convey run-off from the improved parking area and associated improvements in a non-erosive manner thereby minimizing erosion and sedimentation. Areas disturbed during construction of the parking lot and associated improvements would be re-vegetated with native plants immediately upon completion of construction and interim erosion control measures would be implemented during the construction period. Re-vegetation efforts would focus on establishing full vegetative coverage of disturbed soils as well as providing for visual screening of the parking, emergency fire shelter, water tank, and restroom facilities from Winding Way and from trails within the park.

The accessible camp area would be designed in accordance with the *Park and Trail Accessibility Design Guidelines* prepared by MIG (2006). In addition, hike-in trail camps are proposed along and adjacent to the primary trail as illustrated on the project plans. All sites are located in areas of disturbed vegetation and/or areas that do not contain sensitive native vegetation to minimize the need for significant vegetation removal. The sites are also located in relatively level areas; therefore, very little soil disturbance would be required to establish the camp facilities. Some minor planting efforts would be employed to provide additional buffer areas for the trail camps, in which case appropriate native vegetation would be used.

Compliance with the Construction General Permit and implementation of the project design features to control erosion, as discussed in *Section 5.10*, and implementation of the proposed Plan's policies and implementation measures, together with the guidelines outlined in the MIG document, as required by mitigation measure G-2(a), would ensure

that impacts due to soil erosion and loss of topsoil from proposed Plan improvements in Escondido Canyon Park would be reduced to *less than significant.*

Latigo Canyon Trailhead/Campground

The proposed Latigo Canyon Park improvements are intended to increase accessibility, public access and recreational opportunities to Escondido Canyon Park and Solstice Canyon Park. The Plan provides for parking, camping, and trail access. Structural improvements, including water tank, emergency fire shelter, restroom, and parking lot would be located in relatively level areas. As a result, very little soil disturbance would be required to establish the parking and camp facilities. Grading for the proposed parking facility and camp areas would consist of 370 cubic yards of cut and 85 cubic yards of fill. Project plans illustrate the location and type of drainage facilities and polluted run-off control measures which would be implemented to reduce, treat and convey run-off from the improved parking area and associated improvements in a non-erosive manner, thereby minimizing erosion and sedimentation. Areas disturbed during construction of the parking lot and associated improvements would be re-vegetated with native plants immediately upon completion of construction and interim erosion control measures would be implemented during the construction period. Re-vegetation efforts would focus on establishing full vegetative coverage of disturbed soils as well as providing for visual screening of the parking, emergency fire shelter, water tank, and restroom facilities from trails within the park.

The on-site segments of the trail system were designed in accordance with the *Park and Trail Accessibility Design Guidelines* prepared by MIG (2006). The trail improvements would be located in an existing alignment, and/or areas that do not contain sensitive native vegetation, to minimize the need for significant vegetation removal.

Compliance with the Construction General Permit and implementation of the project design features to control erosion, as discussed in *Section 5.10*, and implementation of the proposed Plan's policies and implementation measures, together with the guidelines outlined in the MIG document, as required by mitigation measure G-2(a), would ensure that impacts due to soil erosion and loss of topsoil from proposed Plan improvements in Latigo Canyon Trailhead/Campground would be reduced to *less than significant.*

Corral Canyon Park

The proposed Corral Canyon park improvements are intended to increase accessibility, public access and recreational opportunities at the park; however, in the case of Corral Canyon Park, a number of existing support facilities exist at the trailhead that currently facilitate public use of the park including a public parking lot, chemical restroom, drinking fountain, and an accessible picnic area. Within this existing paved parking area including Conservancy property north of the existing restaurant, a stationary, self-contained restroom;, a Camp Host space and fire truck shed would be developed. The addition of these project elements within the currently paved parking area and the adjoining dirt parking area would have no effect upon soil erosion potential.

The Plan also provides for development of an accessible drop-off area across Corral Canyon Creek from the existing parking facility; one new camp area with 2 fully accessible campsites, 9 hike-in camps, a self-contained restroom, an emergency fire shelter, and a 10,000 gallon water storage tank; and a second camp area with 5 hike-in sites and a self-contained restroom; and, finally, a separate emergency fire shelter along the east side of Corral Canyon Road, on the Corral North Trail Link. The accessible camp area would be designed in accordance with the *Park and Trail Accessibility Design Guidelines* prepared by MIG (2006).

All camp sites are located in areas either previously developed or consisting of disturbed vegetation, in order to minimize vegetation removal to accommodate the camp sites. The sites are also located in level areas; therefore, very little soil disturbance would be required to establish the camp facilities. Total grading for the proposed camp facilities would include 255 cubic yards of cut and135 cubic yards of fill.

Compliance with the Construction General Permit and implementation of the project design features to control erosion, as discussed in *Section 5.10*, and implementation of the proposed Plan's policies and implementation measures, together with the guidelines outlined in the MIG document, as required by mitigation measure G-2(a), would ensure that impacts due to soil erosion and loss of topsoil from proposed Plan improvements in Corral Canyon Park would be reduced to *less than significant.*.

Malibu Bluffs Park

The Plan includes development of 4 new parking areas; a new day-use area with picnic amenities; 5 camp site areas that would include a total of 32 campsites (four of which would be designed as accessible sites and four that would be designed as tent cabins); two

Camp Host spaces; three emergency fire shelters; a fire truck shed; 7 self-contained restrooms; and a 10,000 gallon water storage tank . All sites are located in level areas; therefore, very little soil disturbance would be required to establish the camp and parking facilities. However, development of access to the Bluffs from Highway 1 would require a substantial amount of soil disturbance. In addition, the parking lot with access from Malibu Road would also necessitate substantial grading, and the incorporation of a retaining wall. Total earthwork for the proposed improvements within Malibu Bluffs would entail approximately 1,930 cubic yards of cut and 985 cubic yards of fill. The earthwork for vehicular access to the site would be a component incorporated in the NPDES permit for the Plan. These engineered elements would also be subject to the Plan's Hazard Implementation Measure 2 which requires a geotechnical investigation, and to Hazard Implementation Measure 3 which requires proper drainage and erosion control.

Compliance with the Construction General Permit and implementation of the project design features to control erosion, as discussed in *Section 5.10*, and implementation of the proposed Plan's policies and implementation measures, together with the guidelines outlined in the MIG document, as required by mitigation measure G-2(a), would ensure that impacts due to soil erosion and loss of topsoil from proposed Plan improvements in Malibu Bluffs Park would be reduced to *less than significant.*

Trail System

The proposed trail system includes new trail connection alignments that have been planned to utilize existing trail corridors (whether they have been formally established and improved or unofficially established by use), and to utilize previously disturbed areas and gradual sloping terrain wherever feasible. The conceptual layout for the proposed trail system was in accordance with the *Park and Trail Accessibility Design Guidelines* prepared by MIG (2006). The *Park and Trail Accessibility Design Guidelines* include a number of best practices to be used in designing and constructing the trail corridors to improve drainage control. However, in order to ensure final design and trail implementation achieve proper drainage control, additional specific mitigation is required (see Mitigation Measure discussion, below).

Compliance with the Construction General Permit and implementation of the project design features to control erosion, as discussed in *Section 5.10*, and implementation of the proposed Plan's policies and implementation measures, together with the guidelines outlined in the MIG document, as required by mitigation measure G-2(a), would ensure

that impacts due to soil erosion and loss of topsoil associated with the trail system improvements would be reduced to *less than significant.*

Mitigation Measures

Even with incorporation of the Plan's policies and implementation measures, and compliance with NPDES permitting requirements, impacts associated with soil erosion and loss of top soil from trail construction and use could be potentially significant; therefore, the following mitigation measure is required.

MM G-2 The final design and construction of trail segments located within areas with soils susceptible to erosion shall adhere to the Best Practices identified in *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc., 2006 (pp 25-35), including but not limited to those for: Trails on Steep Cross Slopes; Eroding and Hazardous Trail Edges; and Drainage Control and Trails.

Plan Requirement and Timing: Geotechnical, structural, and engineering analyses, and any recommendations resulting therefrom, shall be prepared and submitted to MRCA for review and approval prior to soil disturbance activity. Applicable recommendations shall be identified as a note(s) on the grading, construction, and restoration plans for each phase.

Monitoring: Prior to grading, MRCA shall review Geotechnical, structural, and engineering analyses and shall review final grading, construction, and restoration plans to ensure consistency with the technical recommendations. MRCA staff shall inspect construction sites during construction to verify compliance with this requirement.

Residual Impacts

With implementation of the Plan's policies and implementation measures, compliance with NPDES permitting requirements, and enforcement of the above required mitigation measure, potential impacts on soil erosion and loss of topsoil would be reduced to a **less than significant level (Class III).**

Impact G-3: **Proposed Plan improvements have the potential to be located on a geologic unit or soil that is unstable or that**

would become unstable as a result of the project and potentially result in landslide, lateral spreading, subsidence, liquefaction or collapse. Absent mitigation, associated impacts would be potentially significant.

Landslide risk and liquefaction potential are fully analyzed under *Impact G-1*; the reader is referred to that sub-section for evaluation of these two geologic hazards. Recent age alluvium may include poorly consolidated, loose earth materials that are subject to subsidence (consolidation), lateral spreading, or collapse when a structure or other site improvements are placed upon them (this is referred to as "surcharging" the soil with a load of some type). Recent age alluvium (map symbol Qal) occurs within each of the Plan area park sites, as indicated in maps prepared by the California Geological Survey (Southwestern Engineering Geology, 2009). Furthermore, the Plan includes several policies and implementing measures that require compliance with State building and safety codes designed to minimize potential impacts associated with unstable soils or other geologic conditions, such as lateral spreading, subsidence, or collapse. Nevertheless, to avoid potential damage to site improvements from these unstable soils, site-specific soils evaluation must occur as part of the final design to specify proper foundation system components and/or appropriate site preparation. With adherence to the policies and implementation measures of the Plan, compliance with building codes, and enforcement of identified required mitigation measures, impacts from soils hazards, including compression/consolidation, lateral spreading, or collapse, on Plan implementation would be reduced to less than significant. This Plan impact is therefore considered *potentially significant*, but mitigable.

Ramirez Canyon Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Ramirez Canyon Park. According to the geologic constraints map (Figures 5.7-1 and 5.7-2), the proposed off-site 26-space paved parking facility immediately adjacent to Kanan Dume Road is located in an area of artificial fill; proposed improvements including Ramirez Canyon Road bridge replacement, 10-space on-site parking area, the three ADA day-use areas, the three restrooms, and two separate emergency fire shelters are all located in areas underlain by recent alluvium (Qal map symbol). Earth materials included in this mapping unit could involve poorly consolidated, loose soils prone to subsidence or lateral spreading upon surcharge by structures or other improvements. Hazard Implementation Measure 2 requires detailed geotechnical investigation to support final design of any structures or engineered facilities in order to avoid damage from, or creation of, unstable

earth conditions. However, to ensure avoidance of damage to proposed improvements from unstable soils conditions, additional more specific mitigation is required (see Mitigation Measures discussion, below). Potential impacts from soils hazards, including compression/consolidation, lateral spreading, or collapse, on the proposed park improvements at Ramirez Canyon Park would be considered *potentially significant*, but mitigable.

Escondido Canyon Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Escondido Canyon Park. Included in the constraints mapping for Escondido Canyon Park are areas with landslide activity; this hazard is discussed above under *Impact G-1*. With respect to soil hazards, according to the geologic constraints map (Figure 5.7-3), the northern-most restroom facility would be located in an area of artificial fill. Earth materials included in this mapping unit could involve poorly consolidated, loose soils prone to subsidence or lateral spreading upon surcharge by structures or other improvements. Hazard Implementation Measure 2 requires detailed geotechnical investigation to support final design of any structures or engineered facilities in order to avoid damage from, or creation of, unstable earth conditions. However, to ensure avoidance of damage to the proposed northern-most restroom facility from unstable soils conditions, additional more specific mitigation is required (see Mitigation Measures discussion, below). Potential impacts from soils hazards, including compression/consolidation, lateral spreading, or collapse, on the proposed park improvements at Escondido Canyon Park would be considered *potentially significant*, but mitigable.

Latigo Canyon Trailhead/Campground

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Latigo Canyon Trailhead/Campground. Included in the constraints mapping for Latigo Canyon Trailhead/Campground are areas with landslide activity; this hazard is discussed above under *Impact G-1*. With respect to soil hazards, according to the geologic constraints map (Figure 5.7-4), none of the structural improvements proposed for Latigo Canyon Trailhead would be located on recent alluvium or artificial fill materials. Therefore, as currently proposed, potential impacts from soils hazards, including compression/consolidation, lateral spreading, or collapse, on the proposed park improvements at Latigo Canyon Trailhead/Campground would be considered *less than significant.*

The portion of the site lying to the north of the existing access road (between the access road and Latigo Canyon Road) is underlain by either recent alluvium or artificial fill materials. A level area on the north side of the access road is currently proposed to accommodate one large camp-site and two small camp sites, which are uses not impacted by the presence of looser soils. Nonetheless, the currently proposed locations for the structural improvements at the Latigo Canyon Trailhead/Campground are affected by landslide activity (please refer to *Impact G-1*), which could compel a redesign of the layout for structural improvements. If structural development such as the proposed water storage tank, emergency fire shelter, and restroom were to be relocated to the camping site area north of the access road, such improvements could be damaged via subsidence, lateral spreading, or soil collapse. Hazard Implementation Measure 2 requires detailed geotechnical investigation to support final design of any structures or engineered facilities in order to avoid damage from, or creation of, unstable earth conditions. However, to ensure avoidance of damage to future structural development which could be located within portions of the Latigo Canyon Trailhead property underlain by recent alluvium or artificial fill material, additional more specific mitigation would be required (see Mitigation Measures discussion, below).

Corral Canyon Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Corral Canyon Park. According to the geologic constraints map (Figure 5.7-5), proposed improvements including two restrooms, two separate emergency fire shelters, and the 10,000 gallon water storage tank are all located in areas underlain by alluvium (Qal or Qoa map symbols). Earth materials included in this mapping unit could involve poorly consolidated, loose soils prone to subsidence or lateral spreading upon surcharge by structures or other improvements. Hazard Implementation Measure 2 requires detailed geotechnical investigation to support final design of any structures or engineered facilities in order to avoid damage from, or creation of, unstable earth conditions. However, to ensure avoidance of damage to proposed improvements from unstable soils conditions, additional more specific mitigation is required (see Mitigation Measures discussion, below). Potential impacts from soils hazards, including compression/consolidation, lateral spreading, or collapse, on the proposed park improvements at Corral Canyon Park would be considered *potentially significant*, but mitigable.

Malibu Bluffs Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Malibu Bluffs Park. According to the geologic constraints map (Figure 5.7-6), improvements including 7 self-contained restrooms, three emergency fire shelters, a fire truck shed, and two (2) 10,000 gallon water storage tanks are all located in areas underlain by alluvium (Qal or Qoa map symbols). Earth materials included in this mapping unit could involve poorly consolidated, loose soils prone to subsidence or lateral spreading upon surcharge by structures or other improvements. Hazard Implementation Measure 2 requires detailed geotechnical investigation to support final design of any structures or engineered facilities in order to avoid damage from, or creation of, unstable earth conditions. However, to ensure avoidance of damage to proposed improvements from unstable soils conditions, additional more specific mitigation is required (see Mitigation Measures discussion, below). Potential impacts from soils hazards, including compression/consolidation, lateral spreading, or collapse, on the proposed park improvements at Malibu Bluffs Park would be considered *potentially significant*, but mitigable.

Trail System

The proposed Plan trail system includes new trail connection alignments that have been planned to utilize existing trail corridors, or to utilize previously disturbed areas and gradual sloping terrain wherever feasible. Furthermore, the *Geologic Constraints* study (Southwestern Engineering Geology, 2009), concluded that due to the limited modification associated with the proposed trail system, and low intensity of intended use, they are an acceptable use within even areas with identified soil instability hazards; the trails would not cause or increase soils instability to any substantial degree. In addition, conceptual trail layout utilized the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc. (MIG, June 2006). However, in order to ensure proper final trail design and implementation, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, (including but not limited to those for: Trails on Steep Cross Slopes and Trails on Sandy Soils). See the Mitigation Measure discussion, below. Enforcement of the required mitigation measure would ensure trail development and use would not lead to increases in soil instability. Implementation of the proposed Plan's policies and implementation measures, in conjunction with enforcement of the required mitigation measure, would reduce potential soil instability hazards associated with the trail system to *less than significant*.

Mitigation Measures

Implementation of the proposed Plan, even with adherence to the Plan's policies and implementation measures, could result in potentially significant impacts related to instable earth materials. The following mitigation measures would be required in order to address the identified potential impacts.

MM G-3.1 Site-specific soil investigations, including borings and laboratory analysis of soil characteristics, shall be conducted for the following Ramirez Canyon proposed improvements: off-site 26-space paved parking facility immediately adjacent to Kanan Dume Road, Ramirez Canyon Road bridge replacement, 10-space on-site parking area, three ADA day-use areas, three restrooms, and two separate emergency fire shelters. The soil investigation shall identify site preparation techniques and/or engineering design specifications to address compression, collapse, or lateral spreading potential of the encountered soil materials.

MM G-3.2 Site-specific soil investigation, including borings and laboratory analysis of soil characteristics, shall be conducted for the northern-most restroom facility proposed for Escondido Canyon Park. The soil investigation shall identify site preparation techniques and/or engineering design specifications to address compression, collapse, or lateral spreading potential of the encountered soil materials.

MM G-3.3 For any structural improvements (i.e., water storage tank, emergency fire shelter, restroom) proposed to be located north of the access road at Latigo Canyon Trailhead/Campground, site-specific soil investigation, including borings and laboratory analysis of soil characteristics, shall be conducted. The soil investigation shall identify site preparation techniques and/or engineering design specifications to address compression, collapse, or lateral spreading potential of the encountered soil materials.

MM G-3.4 Site-specific soil investigations, including borings and laboratory analysis of soil characteristics, shall be conducted for the following Corral Canyon proposed improvements: the two restroom facilities near proposed camping areas (excluding the restroom in the parking lot), two separate emergency fire shelters, and the 10,000 gallon water storage tank. The soil investigation shall identify site preparation techniques and/or engineering

design specifications to address compression, collapse, or lateral spreading potential of the encountered soil materials.

MM G-3.5 Site-specific soil investigations, including borings and laboratory analysis of soil characteristics, shall be conducted for the following Malibu Bluffs Park proposed improvements: 7 self-contained restrooms, three emergency fire shelters, a fire truck shed, and two (2) 10,000 gallon water storage tanks. The soil investigation shall identify site preparation techniques and/or engineering design specifications to address compression, collapse, or lateral spreading potential of the encountered soil materials.

MM G-3.6 The final design and construction of trail segments located within areas of mapped loose soil materials (i.e., recent alluvium, artificial fill, steep slopes) shall adhere to the Best Practices identified in *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc., 2006 (pp 25-35), including but not limited to those for: Trails on Steep Cross Slopes and Trails on Sandy Soils.

Residual Impacts

With implementation of the Plan's Policies and Implementation Measures, and adherence to the above required mitigation measures, potential impacts on, or caused by, the Plan's park improvements associated with unstable earth materials hazards would be reduced to **less than significant levels (Class II).**

Impact G-4: Implementation of the proposed Plan's improvements have the potential to be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating risks to life and property. Absent mitigation, associated impacts would be potentially significant.

Surface soils at most of the campsite areas are characterized by networks of large ground cracks; these cracks suggest that the surface soils are expansive (Southwestern Engineering Geology, 2009). Soil expansion can contribute to downhill creep, and can damage poorly designed foundations. Proper placement, design and maintenance of the planned improvements would reduce the potential hazard from locating park facilities on or near expansive soils. The Plan's proposed improvements are minor in nature with no structures that are permanently habitable (i.e., the only proposed structures include restrooms,

emergency fire shelters, and fire truck sheds, which would be occupied on an intermittent, temporary basis). While gradual damage to such improvements could occur from expansive soils, sudden failure of the structure or other related hazards to park users would not be anticipated, given the nature of this soil condition and the sporadic occupation of the structures. Furthermore, the Plan includes a number of policies and implementation measures to ensure proper placement, design and maintenance of the proposed facilities consistent with the recommendations of The *Reconnaissance of Engineering Geologic Constraints* (Southwestern Engineering Geology, 2009) prepared for the Plan area. Based on the recommendations of *Geologic Constraints* study, the location of most of the proposed park facilities (with the exception of trails) have been sited to be located outside of identified expansive soil hazard areas within the Plan area.

However, the proposed parking and camp area at Escondido Canyon adjacent to Winding Way and the widening of Ramirez Canyon Road are located on expansive soils, which if not properly designed could create potentially significant impacts to life and property from these expansive soils. Plan development on expansive soils may require special earthwork or construction techniques, such as addition of soil stabilizers or replacement of near-surface native soils with engineered fill. Mitigation measures have been required to address these components of the plan identified to be located within expansive soil hazard zones (see Mitigation Measures, below). Compliance with the Plan's policies and implementation measures that require detailed geotechnical investigations, adherence to Building Code requirements, and enforcement of required mitigations would result in *potentially significant,* but mitigable *impacts.*

The *Geologic Constraints* study concluded that trail development, given the limited and short-term activities on trails, is considered low-risk and appropriate, even in areas with identified expansive soils. Conceptual trail layout utilized the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* (MIG, June 2006). However, in order to ensure proper final trail design and implementation, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, *(*including but not limited to those for: Trails on Steep Cross Slopes; Eroding and Hazardous Trail Edges; and Trails Damaged by Maintenance Vehicle Use). See the Mitigation Measure discussion, below. Implementation of the proposed Plan's policies and implementation measures, in conjunction with enforcement of the required mitigation measure, would reduce potential expansive soil hazards associated with the trail system to *potentially significant,* but mitigable.

Ramirez Canyon Park

Within the Ramirez Canyon Park property, the *Geologic Constraints* study concluded proposed improvements would not be located on soils with expansive potential. However, the Plan proposes Ramirez Canyon Road be widened between the park entrance and Delaplane Road, and that Delaplane Road be widened from Ramirez Canyon Road to Pacific Coast Highway. According to the *Geologic Constraints* study, expansive soils have been identified to exist within this roadway widening corridor. Expansive soils could lead to roadway damage, including localized failure of pavement sections. The Plan includes Hazards Implementation Measures 1 and 2 that require preparation of a detailed geotechnical study to ensure proper design and grading procedures are incorporated into the Plan improvements to reduce potential geologic hazards. However, to ensure avoidance of damage to the proposed widened roadway sections of Ramirez Canyon Road and Delaplane Road from expansive soils conditions, additional more specific mitigation is required (see Mitigation Measures discussion, below). Overall considerations associated with the proposed road improvements can be effectively mitigated with routine engineering design and construction practices based on site-specific geotechnical analyses. As a result, impacts from expansive soils hazards on the proposed widening of Ramirez Canyon Road and Delaplane Road would be considered *potentially significant,* but mitigable.

Escondido Canyon Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Escondido Canyon Park. Included in the constraints mapping for Escondido Canyon Park are areas with landslide activity; this hazard is discussed above under *Impact G-1*. With respect to expansive soil hazards, according to the *Geologic Constraints* study, the following structural improvements would be located within an area with expansive soils: parking lot (including Camp Host space); two self-contained restrooms, emergency fire shelter, 10,000 gallon water storage tank, and three small campsites, each employing a retaining wall. Expansive soils at this location could impact the proposed structural improvements through cracking or failure of foundation elements, cracking of pavement materials, and/or gradual down-slope movement. Hazard Implementation Measure 2 requires detailed geotechnical investigation to support final design of any structures or engineered facilities in order to avoid damage from, or creation of, unstable earth conditions. However, to ensure avoidance of damage to the proposed parking lot and proximate structural improvements from expansive soils conditions, additional more specific mitigation is required (see Mitigation Measures discussion, below). Potential impacts from expansive soils hazards on

the proposed park improvements at Escondido Canyon Park would be considered *potentially significant,* but mitigable.

Latigo Canyon Trailhead/Campground

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Latigo Canyon Trailhead /Campground property. Included in the constraints mapping for Latigo Canyon Trailhead /Campground property are areas with landslide activity; this hazard is discussed above under *Impact G-1*. With respect to expansive soil hazards, the *Geologic Constraints* Study concluded the proposed Latigo Canyon improvements would not be located on soils identified as expansive. As a result, no impacts would be anticipated from expansive soils upon Latigo Canyon Trailhead/Campground. Therefore, potential impacts would be considered *less than significant.*

Corral Canyon Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Corral Canyon Park. With respect to expansive soil hazards, the *Geologic Constraints* Study concluded the proposed Corral Canyon Park improvements would not be located on soils identified as expansive. As a result, no impacts would be anticipated from expansive soils upon Corral Canyon Park. Therefore, potential impacts would be considered *less than significant.*

Malibu Bluffs Park

Pursuant to Hazard Implementation Measure 1, a geologic study was prepared (Southwestern Engineering Geology, 2009) which identifies geologic constraints within Malibu Bluffs Park. With respect to expansive soil hazards, the *Geologic Constraints* Study concluded the proposed Malibu Bluffs Park improvements would not be located on soils identified as expansive. As a result, no impacts would be anticipated from expansive soils upon Malibu Bluffs Park. Therefore, potential impacts would be considered less than significant.

Trail System

The proposed Plan trail system may include improvements located on soils identified as expansive. However, as mentioned above, the Geologic Constraints analysis concluded that trail development, given the limited and short-term activities on trails, is considered low-risk and appropriate in these areas. Conceptual trail layout utilized the *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* (MIG, June 2006). However, in order to ensure proper final trail design and construction, a specific mitigation measure is required to ensure adherence to the Best Practices in the *Park and Trail Accessibility Guidelines*, (including but not limited to those for: Trails on Steep Cross Slopes; Eroding and Hazardous Trail Edges; and Trails Damaged by Maintenance Vehicle Use). See the Mitigation Measure discussion, below. Enforcement of the required mitigation measure would ensure trail development and use would not be subject to excessive maintenance demands and would avoid the occurrence of conditions that could pose safety hazards for trail users. Implementation of the proposed Plan's policies and implementation measures, in conjunction with enforcement of the required mitigation measure, would reduce potential expansive soil hazards associated with the trail system to *less than significant* .

Mitigation Measures

Implementation of the proposed Plan, even with adherence to the Plan's policies and implementation measures, could result in potentially significant impacts related to expansive soil hazards. The following mitigation measures would be required in order to address the identified potential impacts.

MM G-4.1 Site-specific geotechnical investigation, including borings and laboratory analysis of soil characteristics, shall be conducted for the segments of Ramirez Canyon Road and Delaplane Road proposed to be widened under the Plan. The geotechnical investigation shall identify site preparation techniques and/or engineering design specifications to address encountered expansive soil materials.

MM G-4.2 Site-specific geotechnical investigations, including borings and laboratory analysis of soil characteristics, shall be conducted for the following Escondido Canyon Park proposed improvements: parking lot (including Camp Host space) and immediately proximate self-contained restrooms (2), emergency fire shelter, 10,000 gallon water storage tank, and small campsites (3, including individual retaining walls). The geotechnical

investigation shall identify site preparation techniques and/or engineering design specifications to address encountered expansive soil materials.

MM G-4.3 The final design and construction of trail segments located within areas of mapped expansive soil materials shall adhere to the Best Practices identified in *Malibu Parks Public Access Enhancement Plan, Park and Trail Accessibility Design Guidelines* prepared by Moore Iacofano Goltsman, Inc., 2006 (pp 25-35) including but not limited to those for: Trails on Steep Cross Slopes; Eroding and Hazardous Trail Edges; and Trails Damaged by Maintenance Vehicle Use.

Residual Impacts

With implementation of the Plan's Policies and Implementation Measures, and adherence to the above required mitigation measures, potential impacts on, or caused by, the Plan's park improvements associated with expansive soils hazards would be reduced to ***less than significant (Class II).***

Impact G-5: The proposed Plan would not create an impact from soils incapable of supporting the use of septic tanks or alternative wastewater disposal systems; associated impacts would be less than significant.

The proposed Plan does not involve new development that is reliant on a conventional septic wastewater disposal system. The Plan includes policies and implementation measures requiring all new public restroom facilities consist of self-contained systems, employing chemical wastewater disposal technology, and that any new permanent restroom facility at Ramirez Canyon Park must connect to the existing on-site advanced wastewater treatment and recycled water reuse system. The reader is referred to *Section 5.10* (*Hydrology, Drainage, and Water Quality*) for a more detailed evaluation of the Ramirez Canyon on-site advanced wastewater treatment and recycled water reuse system. As the Plan would avoid reliance on soils incapable of supporting the use of septic tanks or alternative wastewater disposal systems, impacts are considered *less than significant.*

Ramirez Canyon Park

The proposed Ramirez Canyon Park improvements include the development of three new restroom facilities; all of which would connect to the existing on-site advanced wastewater treatment and recycled water reuse system. The reader is referred to *Section 5.10,*

(*Hydrology, Drainage, and Water Quality*) for a more detailed discussion of the Ramirez Canyon on-site advanced wastewater treatment and recycled water reuse system. As a result, the three proposed new restroom facilities would not be anticipated to produce impacts associated with soils incapable of supporting the use of septic tanks. Therefore, soil-related wastewater disposal impacts within Ramirez Canyon Park would be considered *less than significant.*

Escondido Canyon Park

The proposed Escondido Canyon Park improvements include the development of three self-contained restroom facilities. The restroom facilities would be chemical toilets. This system does not involve the release of any effluent to on-site soils. As a result, no impacts would be anticipated from soils incapable of supporting the use of septic tanks or alternative wastewater disposal systems within Escondido Canyon Park. Therefore, potential impacts would be considered *less than significant.*

Latigo Canyon Trailhead/Campground

The proposed Latigo Canyon improvements include the development of one self-contained restroom facility. The restroom facility would be a chemical toilet. This system does not involve the release of any effluent to on-site soils. As a result, no impacts would be anticipated from soils incapable of supporting the use of septic tanks or alternative wastewater disposal systems within Latigo Canyon Park. Therefore, potential impacts would be considered *less than significant.*

Corral Canyon Park

The proposed Corral Canyon Park improvements include the development of three self-contained restroom facilities. The restroom facilities would be chemical toilets. This system does not involve the release of any effluent to on-site soils. As a result, no impacts would be anticipated from soils incapable of supporting the use of septic tanks or alternative wastewater disposal systems within Corral Canyon Park. Therefore, potential impacts would be considered *less than significant.*

Malibu Bluffs Park

The proposed Malibu Bluffs Park improvements include the development of a total of seven self-contained restroom facilities. The restroom facilities would be chemical toilets. This

system does not involve the release of any effluent to on-site soils. As a result, no impacts would be anticipated from soils incapable of supporting the use of septic tanks or alternative wastewater disposal systems. Therefore, potential impacts would be considered *less than significant.*

Trail System

The proposed Plan trail system does not include the development of any restroom or wastewater facilities. As a result, potential impacts associated with soils unsuitable for wastewater disposal systems would be avoided all together (i.e., *less than significant).*

Mitigation Measures

The proposed Plan does not include the development of any new wastewater disposal system, including septic disposal systems for individual restrooms. Proposed restroom facility at Ramirez Canyon Park would connect to the existing wastewater disposal system already in place. No expansion of the existing wastewater system at Ramirez Canyon Park is proposed (the reader is referred to *Section 5.10, Hydrology, Drainage, and Water Quality* for a more detailed evaluation of the Ramirez Canyon on-site advanced wastewater treatment and recycled water reuse system). Consequently, Plan impacts associated with native soils unsuitable for septic disposal would remain *less than significant*. Therefore, no mitigation measures are required.

Residual Impacts

Impacts on soils incapable of supporting the use of septic tanks or alternative wastewater disposal systems would be ***less than significant (Class III).***

Analysis of Impacts Post-Mitigation

Impact G-6: Implementation of mitigation measures intended to reduce impacts associated with the proposed Plan's improvements would result in less than significant impacts associated with geology, soils, and seismic hazards.

In addition to analysis of the project (as proposed), CEQA requires that an EIR discuss the environmental impacts associated with the implementation of any required mitigation. This

section, therefore, evaluates how mitigation measures required in other sections of this EIR would affect impacts associated with hazardous materials.

The mitigation measures identified in the all environmental impact analysis sections would have a less than significant impact related to geology, soils, & seismic hazards as implementation of the mitigations would create no new habitable structures; geologic and seismic risks factors would, therefore, not be an issue. In addition, soil stability issues would be adequately addressed through Plan policies and implementation measures, in addition, to the requirements for short-and long-term drainage best management practices. Additional mitigation would not be required. Impacts associated with geology, soils, & seismic hazards would, therefore, be considered *less than significant*.

Mitigation Measures

None required.

Residual Impacts

With implementation of the Plan's policies and implementation measures and compliance with applicable regulations and policies, any potential risk associated with geology, soils, & seismic hazards associated with implementation of mitigation measures intended to reduce impacts associated with the proposed Plan's improvements would considered ***less than significant (Class III)***.

5.7.3 Cumulative Impacts

Cumulative projects are listed in Section 3.6, *Projects Considered for Cumulative Analysis*. The Plan Area's contribution to cumulative geologic, soils, and seismic hazard impacts is evaluated below. Where necessary, mitigation is identified to reduce the Plan Area's "cumulatively considerable" contribution to a less than "cumulatively considerable" level. The *Area of Influence*, or geographic region for the respective environmental resource for which cumulative projects are assessed, is identified below and forms the basis of the cumulative impact analysis for this section.

Area of Influence: The Plan area is located in the western Transverse Ranges geomorphic province of California, in the coastal Malibu area, on the southern side of the Santa Monica Mountains. The geologic structure beneath the Plan area reflects intense deformation along

the Malibu Coast Fault. Branches of the Malibu Coast fault extend throughout the Plan area. Therefore, the Area of Influence for assessing cumulative effects in combination with the proposed Plan would be the City of Malibu and County of Los Angeles west and north of Malibu.

Impact G-7: With implementation of Plan policies coupled with adherence to the California Building Code, the proposed project's contribution to cumulative impacts associated with geology, soils, and seismic hazards would be less than significant.

Although the proposed Plan would result in a Class I significant and unavoidable impact with respect to location of proposed park improvements in an area subject to landslide issues, it is anticipated that the decision-maker will either remove this element of the Plan, adopt a proposed Plan alternative, or entertain making findings and a Statement of Overriding Consideration if such elements are deemed crucial to implementation of the Plan and/or satisfaction of the basic project objectives.
Cumulatively, the City of Malibu and adjacent County of Los Angeles lands are subject to varying degrees of hazards from local geologic conditions, such as settlement, landslides, erosion, and seismic ground shaking. The most recognizable regional impact is earthquake damage caused by large earthquakes on the major active fault systems in the area. The California Building Code is intended to reduce the risk of structural collapse and loss of life in new and retrofitted buildings in the City and County, but major damage and harm to humans could occur on a broader regional basis because cumulative development may attract residents and businesses to less seismically stable areas.

It is the expectation that regardless of what decision is made relative to addressing the Class I geological impact identified within this section, that most new projects constructed on a cumulative basis throughout the region would be built to current, safer seismic standards than that which was required for the construction of older structures. Injuries and property damage, therefore, related to geology, soils, and seismic hazards would not be anticipated to be significant on a cumulative basis. Based on the above discussion, the proposed Plan's contribution to cumulative impacts associated with geology, soils, and seismic hazards would be *less than significant*.

Mitigation Measures

As no significant cumulative impacts relating to geological hazards are identified, no mitigation measures are required.

Residual Impacts

As there are no cumulatively significant impacts relating to geological hazards, impacts would be considered ***less than significant (Class III).***

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