SANTA SUSANA MOUNTAINS
TRAILS MASTER PLAN – PHASE II

INITIAL STUDY / MITIGATED NEGATIVE DECLARATION

VOLUME III
APPENDICES D–H

PREPARED FOR:

COUNTY OF LOS ANGELES DEPARTMENT OF PARKS AND RECREATION
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NOVEMBER 2, 2017

Appendix D

Cultural Resources Technical Report

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN – PHASE II

CULTURAL RESOURCES TECHNICAL REPORT

PREPARED FOR:

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SECTION ES
EXECUTIVE SUMMARY

This Cultural Resources Technical Report addresses potential impacts to cultural resources that could result from proposed work associated with the Santa Susana Mountains Trails Master Plan (Trails Master Plan), including Phase II, located within unincorporated Los Angeles County, California. This cultural resources study is based on archival research conducted for the Trails Master Plan. For the purpose of this study, cultural resources include paleontological, archaeological and historical resources, as well as Native American tribal resources.

Historical Resources

The archival research identified eight historic built environment resources within the cultural resources area of potential impact (API) of the Trails Master Plan. Two (2) historic built resources (P-19-190691, P-19-186568) are located within the proposed trails alignment and a 60 feet buffer. Projects requiring excavation within 60 feet of historical resources will require monitoring to ensure avoidance of the resources.

Archaeological Resources

The results of the records searches determined that 41 prehistoric archaeological sites, 16 historic archaeological sites, one multi-component site, three prehistoric isolates, and eight historic isolates are located within the Trails Master Plan project area and a 0.5-mile buffer. Of these, 24 previously recorded prehistoric sites are located within the project area. Seven (7) historic archaeological resources (P-19-000247, P-19-000647, P-19-001593H, P-19-101351, P-19-186538, P-19-101200, P-19-101199) and one (1) prehistoric archaeological resource (P-19-000502) are located within the proposed trails alignment and a 60 feet buffer. Projects requiring excavation within 60 feet of previously recorded archaeological resources will require monitoring. Where archaeological resources are encountered, evaluation, avoidance or recovery, documentation, and curation of such resources would reduce impacts to below the level of significance.

Paleontological Resources

The Chatsworth Formation, Santa Susana Formation, Llajas Formation, Sespe Formation, Topanga Formation, Monterey Formation, Towsley Formation, Pico Formation, Saugus Formation, and older Quaternary Alluvium within the project area can be considered paleontologically sensitive geological units which are characterized by a moderate to high potential for containing unique paleontological resources. Projects requiring excavation within formations with a high potential for containing unique paleontological resources will require monitoring. Where potentially unique paleontological resources are encountered, salvage, recovery, documentation, and repository of such resources would reduce impacts to below the level of significance.

Human Remains

There are no formal cemeteries or previously recorded burial sites located within the project area. In accordance with Section 7050.5 of the California Health and Safety Code, if human remains are encountered during excavation activities, the County Coroner shall be notified within 24 hours of the discovery. No further excavation or disturbance of the site or any nearby areas reasonably suspected to overlie adjacent remains within 100 feet shall occur until the County Coroner has determined, within two working days of notification of the discovery, the appropriate treatment and disposition of the human remains.

Tribal Cultural Resources

Consultation with the Native American Heritage Commission has determined that there are no recorded Sacred Sites within the project's API. Consultation was undertaken with the Tatavium and Gabrieleno Kizh Nation. There are previously recorded archaeological resources that may be considered tribal cultural resources in the vicinity of the trails plan. The County of Los Angeles is working with the tribes to identify the Best Management Practices that can be employed to avoid impacts and provide educational opportunities in conjunction with trail development.

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The location data for the archaeological resources will not be circulated for public review. To protect the sites from unauthorized excavation, looting, and/or vandalism, the County of Los Angeles has been notified of the need to keep confidential the location of known archaeological resources beyond what is necessary. Records in the information centers are exempt from the California Public Records Act (Government Code Section 6250 et seq.). Government Code Section 6254.19 states that "nothing in this chapter requires disclosure of records that relate to archaeological sites information maintained by the Department of Parks and Recreation, the State Historical Resources Commission, or the State Lands Commission." Government Code Section 6254 explicitly authorizes public agencies to withhold information from the public relating to "Native American graves, cemeteries, and sacred places maintained by the Native American Heritage Commission." Due to the sensitive nature of cultural resources described herein, this report is confidential and meant for the exclusive use of the County of Los Angeles and other trustee and responsible agencies related to planning, construction, operation, maintenance, and management of the project.

SECTION 1.0
INTRODUCTION

This Cultural Resources Technical Report (CRTR) addresses potential impacts to cultural resources that could result from proposed work associated with the Santa Susana Mountains Trails Master Plan (Trails Master Plan) located within unincorporated Los Angeles County (County), California. In May 2015, the County adopted the first phase of the Santa Susana Mountains Trails Master Plan (SSMFTMP), which involved the extension of the 35.7 miles of existing County-, City-, and Conservancy-managed trails in the Phase I and Phase II study areas by approximately 35.9 miles with 22 proposed trail segments, for a total of approximately 71.5 miles of trails within the SSMFTMP Area. In 2017, the County initiated planning efforts for further development of the Phase II study area, which has been expanded to Phase II.a and II.b. This assessment is based on archival research for the entire Trails Master Plan study area and a pedestrian survey conducted within a portion of Phase I of the Trails Master Plan study area. In order to identify areas of cultural sensitivity, the area of direct disturbance (cultural resources area of potential impact, or API) was defined as those areas within the Trails Master Plan study area that would be subject to direct trail construction and/or improvements. In accordance with the California Environmental Quality Act (CEQA), this cultural resource study encompasses paleontological resources, archaeological resources, historical resources, human remains, and the presence of Native American Tribal resources. This CRTR presents the results of these efforts and provides a programmatic impact analysis and mitigation recommendations related to cultural resources within the Trails Master Plan study area. While this report focuses on Phase II, it incorporates updated information for the Phase I study area.

1.1 PURPOSE OF THE CULTURAL RESOURCES TECHNICAL REPORT

This CRTR was prepared to characterize the cultural resources that would potentially be affected by construction, operation, and maintenance of the project. As such, the document presents data and information to be used by the County in making a determination of effects to cultural resources resulting from the proposed undertaking and will provide the substantial evidence required with respect to cultural resources for environmental documentation under CEQA.

1.2 INTENDED AUDIENCE

This CRTR summarizes the results of investigations for consideration by the project applicant, cooperating agencies, and Native American tribes. The information contained in this report has been an integral part of the project-planning process effort to avoid and minimize adverse effects to cultural resources to the maximum extent practicable while attaining the objectives of the project. This report summarizes the coordination and consultation that has been undertaken by the County with the Native American Heritage Commission (NAHC) and Native American representatives and documents the coordination and informal consultation that has been undertaken with the County and the Natural History Museum of Los Angeles County. In addition, preparation of this report encompassed data obtained from the South Central Coastal Information Center at California State University, Fullerton, one of eleven independent centers operated under contract to the Office of Historic Preservation, California Department of Parks and Recreation, for the purpose of maintaining the federally and state-mandated California Historic Resources Inventory.

The location data for the archaeological resources will not be circulated for public review. To protect the sites from unauthorized excavation, looting, and/or vandalism, the locations of known archaeological resources will be kept confidential beyond what is necessary. Information concerning the nature and location of archaeological resources is protected under the Archaeological Resources Protection Act (16 U.S.C. 470 hh) and other statutes. Records in the information centers are exempt from the California Public Records Act (Government Code Section 6250 *et seq.*). Government Code Section 6254.10 states,

> Nothing in this chapter requires disclosure of records that relate to archaeological site information and reports maintained by, or in the possession of, the Department of Parks and Recreation, the State Historical Resources Commission, the State Lands Commission, the Native American Heritage Commission, another state agency, or a local agency, including the records that the agency obtains through a consultation process between a California Native American tribe and a state or local agency.

Government Code Section 6254(r) explicitly authorizes public agencies to withhold information from the public relating to "Native American graves, cemeteries, and sacred places maintained by the Native American Heritage Commission." Due to the sensitive nature of cultural resources described herein, this report is confidential and meant for the exclusive use of the County and other trustee and responsible agencies related to planning, installation, operation, maintenance, and management of the proposed projects.

1.3 SOURCES OF RELEVANT INFORMATION

Information used in the preparation of this CRTR was derived from a Class I literature review, including published and gray literature, informal consultation with cooperating agencies, field investigation, and spatial analysis based on geographic information system data. Sources of relevant information are cited in footnotes and compiled in Section 6, *References*.

1.4 WORKING DEFINITIONS

There are a number of technical terms used in the characterization of baseline conditions and assessment of the potential for the project to affect cultural resources.

Archaeological site is defined by the National Register of Historic Places (NRHP) as the place or places where the remnants of a past culture survive in a physical context that allows for the interpretation of these remains. Archaeological remains usually take the form of artifacts (e.g., fragments of tools, vestiges of utilitarian, or nonutilitarian objects), features (e.g., remnants of walls, cooking hearths, or midden deposits), and ecological evidence (e.g., pollen remaining from plants that were in the area when the activities occurred).[1] Prehistoric archaeological sites represent the material remains of Native American groups and their activities. These sites are generally thought to date to the period before European contact but, in some cases, may contain evidence of trade contact with Europeans. Historic archaeological sites reflect the activities of nonnative populations during the Historic period.

Historic period is defined as the period that begins with the arrival of the first nonnative population and thus varies by area. Most Southern California archaeologists use AD 1782 as the date to mark

[1] U.S. Department of the Interior, National Park Service. 2000. *National Register Bulletin: Guidelines for Evaluating and Registering Archeological Properties*. Available at: http://www.cr.nps.gov/nr/publications/bulletins/arch/

the beginning of the Historic period, following the beginning of the Spanish colonization of inland California.

Isolate is defined as one or two distinct artifacts or a few fragments of the same artifact that are too far away (typically more than 30–50 meters) from other artifacts or features to be considered part of a site. It may lack identifiable context but has the potential to add important information about a region, culture, or person. Isolates do not require avoidance or mitigation under the National Historic Preservation Act (NHPA) because they lack contextual integrity and, therefore, are unlikely to meet the criteria for inclusion in the NRHP.

Native American sacred site is defined as an area that has been, and often continues to be, of religious significance to Native American peoples, such as an area where religious ceremonies are practiced or an area that is central to their origins as a people.

Phase I Walkover Survey is defined as an intensive archaeological pedestrian survey in parallel transects that are usually no wider that fifteen meters.

Tribal Cultural Resource is defined as a site feature, place, cultural landscape, sacred place or object, which is of cultural value to a Tribe and is either in or eligible for the California Register of Historical Resources (CRHR) or a local historic register or the lead agency, at its discretion, chooses to treat the resource as a Tribal cultural resource.

SECTION 2.0
PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The Trails Master Plan (approximately 49 square miles) is located north and west of the San Fernando Valley in the Santa Susana Mountains, in the western portion of the unincorporated area of the County of Los Angeles (Figure 2.1-1, *Regional Vicinity Map*). The Santa Susana Mountains are centrally located in the Transverse Ranges, a group of east-west trending mountains paralleling the Pacific Ocean between Santa Barbara and San Diego Counties. The proposed designation and improvement of a portion of the Johnson Motorway Trail is an element of the first phase of the Trails Master Plan (SSMFTMP).

2.2 TRAILS MASTER PLAN STUDY AREA

Phase I Area. The northern boundary of the Trails Master Plan – Phase I is defined by the southern limits of the Newhall Ranch Specific Plan Area and the northern limits of the proposed Santa Susana Mountains / Simi Hills Significant Ecological Area (SEA). The southern boundary is defined by the northern limit of the City of Los Angeles. The eastern boundary is defined by U.S. Interstate 5 (I-5). The western boundary is defined by the corporate boundary between Los Angeles and Ventura Counties (Figure 2.2-1, *Trails Master Plan Location*). The SSMFTMP is divided into two subareas or phases (see Figure 2.2-1). Phase I is the Northwest San Fernando Valley Study Area, and Phase II is the Southwest Santa Clarita Valley Study Area. Phase I includes 16,038.1 acres (25.1 square miles); the northern boundary is defined by the northern limits of the Los Angeles County Oat Mountain Planning Area, the southern boundary is defined by the northern limit of the City of Los Angeles, the eastern boundary is defined by the I-5 freeway, and the western boundary is defined by the boundary between Los Angeles and Ventura Counties.

Phase II Area. Phase II includes 8,084.4 acres (12.6 square miles). The northern boundary is defined by the northern limits of the proposed Santa Susana Mountains / Simi Hills SEA. The southern boundary is defined by the southern limits of the proposed Santa Susana Mountains / Simi Hills SEA. The eastern boundary is defined by the I-5 freeway (Figure 2.2-1). The western boundary is defined by the southern and eastern boundaries of the Newhall Ranch Specific Plan area.

The Trails Master Plan – Phase II has been expanded beyond the spatial extents of Phase II in the SSMFTMP and also divided into two subareas. The Phase II.a area is an approximately 22-square-mile area located in the north-facing slopes of the Santa Susana Mountains and the Santa Clarita Valley that is bound by Henry Mayo Drive (State Route [SR] 126) to the north, the I-5 freeway to the east, Phase I of the adopted SSMFTMP Area to the south, and the Newhall Ranch Specific Plan Area to the west. The Phase II.b area is an approximately 2-square-mile area located in the foothills of the Santa Monica Mountains, including Bell Canyon, Dayton Canyon, and Woolsey Canyon, west of the San Fernando Valley, that is bound by Ventura County to the north and west and the city of Los Angeles to the east and south.

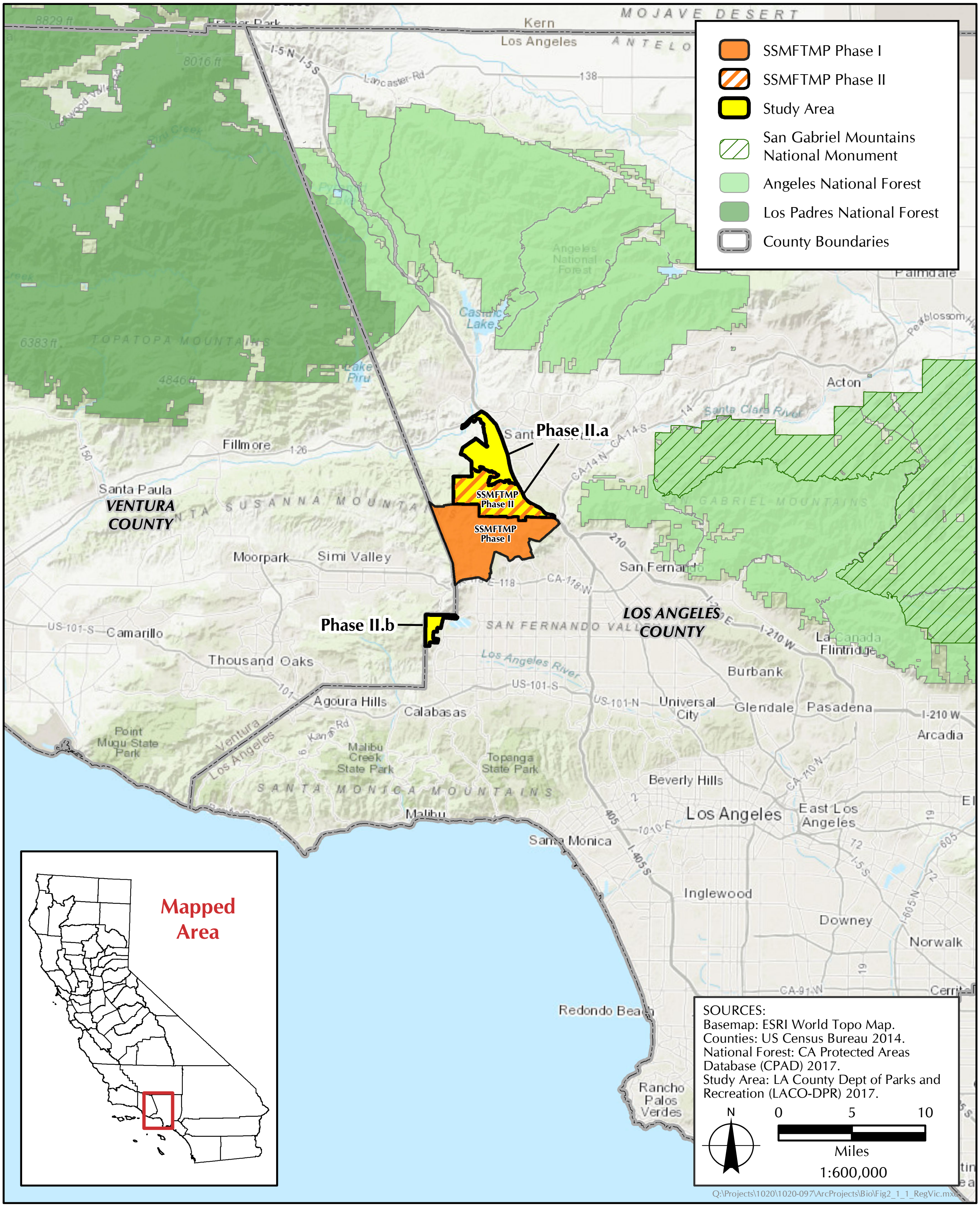

FIGURE 2.1-1

Regional Vicinity Map

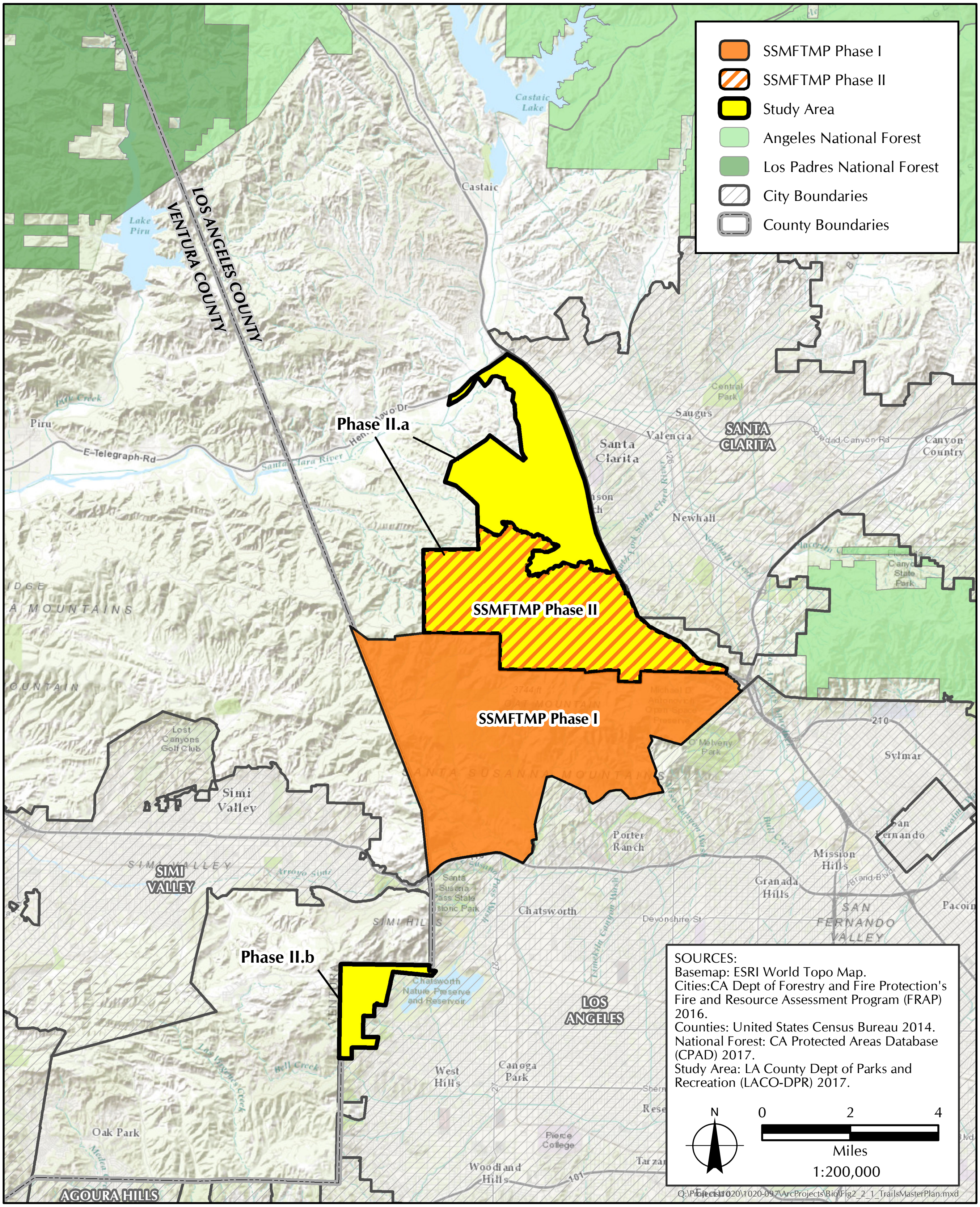

FIGURE 2.2-1

Trails Master Plan Location

Topography. The Trails Master Plan is located in the U.S. Geological Survey (USGS) 7.5-minute series, Newhall, Oat Mountain, Simi Valley East, and Val Verde, California, topographic quadrangles[2,3] and includes portions of Township 2 North, Range 16 West (San Bernardino Baseline and Meridian [SBB&M]); Sections 6 and 7, Township 2 North, Range 17 West (SBB&M), Sections 1, 2, 11, and 12; Township 3 North, Range 16 West (SBB&M), Sections 4–10, 13–24, and 26–34; and Township 3 North, Range 17 West (SBB&M), Sections 1, 2, 11–15, 22–27, and 34–36 (Figure 2.2-2, *Topographic Map with USGS 7.5-minute Quadrangle Index*). Phase I of the Trails Master Plan is located on the USGS 7.5-minute series Simi Valley East and Oat Mountain topographic quadrangles. Phase II of the Trails Master Plan is located on the Val Verde, Newhall, Simi Valley East (Santa Susana), Oat Mountain, and Calabasas topographic quadrangles. Situated along the southern flanks of the Santa Susana Mountains, the topography of the Trails Master Plan is characterized by a series of southwest draining canyons that are separated by steep-sloped and narrow ridge tops. The Trails Master Plan has elevations that range from 946 to 3,400 feet above mean sea level (msl). Vegetation in the area is characterized by a Sage and Chaparral plant communities with scattered yucca plants. Although small areas of exposed bedrock are seen along the trail corridor, much of the proposed project area is characterized by thick vegetative coverage, which is particularly dense in the canyon bottoms and at lower elevations.

2.3 PROJECT SUMMARY

The SSMTMP-PII will guide future trail development and recommend improvements to existing trails. The Trails Master Plan will provide trail users and local populations with seamless transitions throughout the proposed study area to trails of adjacent jurisdictions and prime destinations within and adjacent to the study area. The goals of the plan are to:

1. Develop a complete multi-use trail system connecting user groups and local populations to desired recreation destinations and experiences, with seamless transitions to the trails of adjacent jurisdictions, compatibility with adjacent land uses and environmental resources, and a safe and sustainable design that is consistent with the County of Los Angeles Trails Manual.

2. Develop a recreational trail system that supports low-intensity use, including mountain biking, equestrian use, and hiking, to accommodate the population increase anticipated in the Santa Clarita Valley Planning Area and San Fernando Valley Planning Area through the 2035 planning horizon consistent with the Parks and Recreation Element of the Los Angeles County General Plan 2035.

The overall work efforts will include a trails master plan and associated CEQA documentation. Individual trail alignments would be developed at a later phase of this project, which is intended to provide a trail planning framework for the study area.

[2] U.S. Geological Survey. 1969. *7.5-Minute Series, Oat Mountain, California, Topographic Quadrangle*. Scale 1:24,000. Reston, VA.

[3] U.S. Geological Survey. 1969. *7.5-Minute Series, Willow Springs, California, Topographic Quadrangle*. Reston, VA.

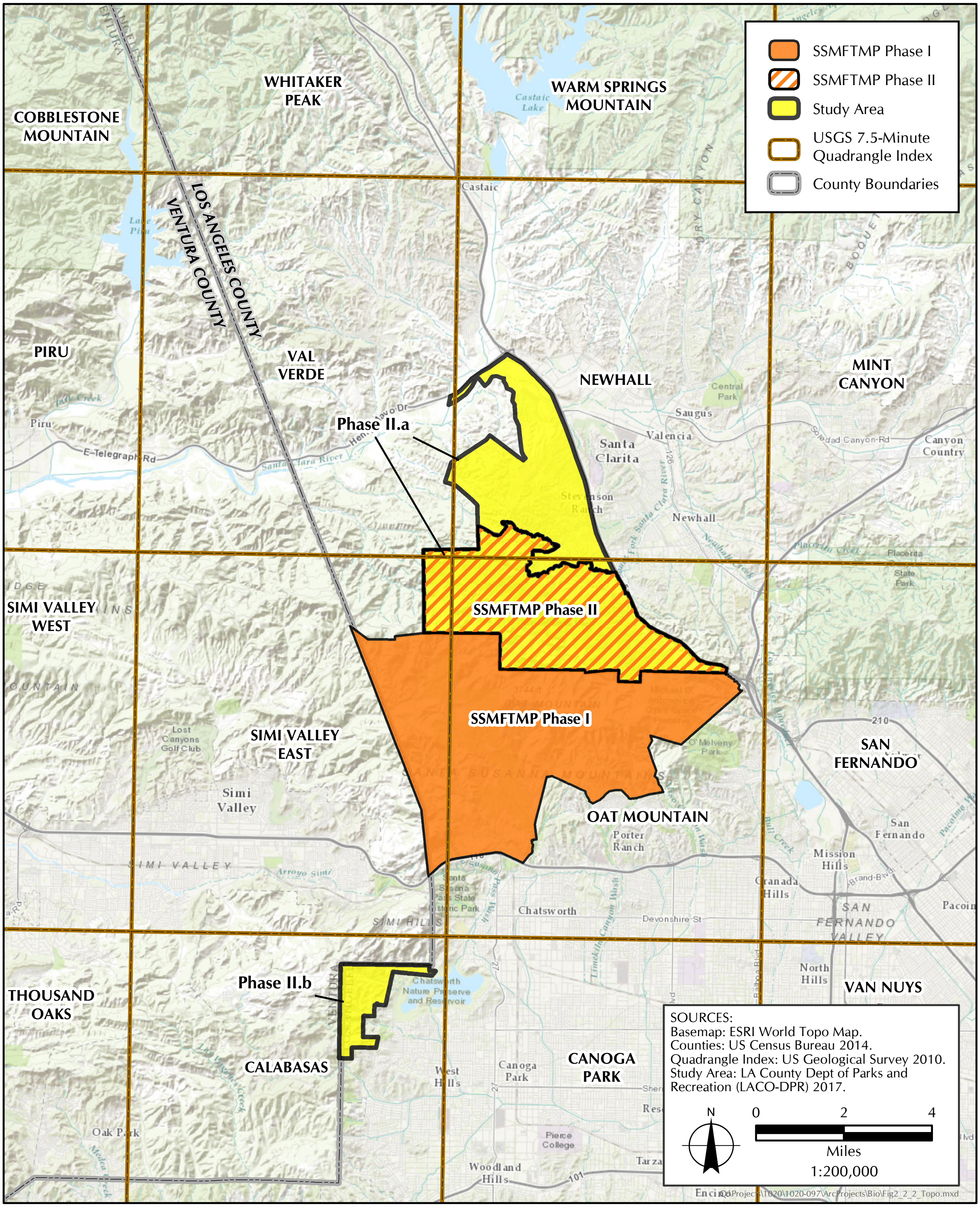

FIGURE 2.2-2

Topographic Map with USGS 7.5 Minute Quadrangle Index

SECTION 3.0
REGULATORY FRAMEWORK

3.1 FEDERAL

Historic Sites Act of 1935

The Historic Sites Act (HAS; 49 Stat. 666; 16 USC 461–467) became law on August 21, 1935, and declared that it is national policy to "Preserve for public use historic sites, buildings, and objects of national significance." The NHPA expanded the scope to include important state and local resources. Provisions of NHPA established the National Register maintained by the National Park Service (NPS), advisory councils on Historic Preservation, State Historic Preservation Offices, and grants-in-aid programs. Section 106 of the NHPA requires all federal agencies to consult the Advisory Council before continuing any activity affecting a property listed on or eligible for listing on the National Register. The Advisory Council has developed regulations for Section 106 to encourage coordination of agency cultural resource compliance requirements (Executive Order 11593).

United States Department of Transportation Act of 1966 (Section 4[f])

Section 4(f) of the U.S. Department of Transportation Act of 1966 affords special protection to public recreational lands and facilities, including local parks and school facilities that are open and available to the general public for recreational purposes, significant cultural resources, historical resources, and natural wildlife refuges. Federally funded transportation improvement projects are prohibited from the encroachment (direct or constructive use, or a take) of Section 4(f) lands unless it can be demonstrated that no feasible and prudent alternative exists.

National Historic Preservation Act of 1966

Enacted in 1966, the NHPA (Public Law 89-665; 16 U.S. Code [USC] 470 et seq.) declared a national policy of historic preservation and instituted a multifaceted program, administered by the National Parks Service, to encourage the achievement of preservation goals at the federal, state, and local levels. The NHPA authorized the expansion and maintenance of the NRHP, established the position of State Historic Preservation Officer and provided for the designation of State Review Boards, set up a mechanism to certify local governments to carry out the purposes of the NHPA, assisted Native American tribes to preserve their cultural heritage, and created the Advisory Council on Historic Preservation (ACHP). Section 106 of the NHPA states that federal agencies with direct or indirect jurisdiction over federally funded, assisted, or licensed undertakings must take into account the effect of the undertaking on any historic property that is included in, or eligible for inclusion in, the NRHP, and that the ACHP must be afforded an opportunity to comment, through a process outlined in the ACHP regulations at 36 Code of Federal Regulations (CFR) Part 800, on such undertakings.

The NPS administers two Federal recognition programs, the NRHP and the National Historic Landmarks Program.

National Register of Historic Places

Working with State Historic Preservation Offices, Tribal Historic Preservation Offices, and Federal Preservation Offices, the NPS maintains the NRHP. This is the official list of properties that are deemed worthy of preservation. Properties listed in the NRHP tell stories that are important to a local community, the citizens of a specific state, or all Americans. Properties listed in the NRHP may be owned by private individuals, universities, nonprofits, governments, and/or corporations.

The NRHP was established by the NHPA of 1966 as "an authoritative guide to be used by federal, state, and local governments, private groups, and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment." The NRHP recognizes properties that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. A property is eligible for the NRHP if it is significant under one or more of the following criteria:

Criterion A: It is associated with events that have made a significant contribution to the broad patterns of our history.

Criterion B: It is associated with the lives of persons who are significant in our past.

Criterion C: It embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction.

Criterion D: It has yielded, or may be likely to yield, information important in prehistory or history.

Cemeteries, birthplaces, or graves of historic figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; and properties that are primarily commemorative in nature are not considered eligible for the NRHP unless they satisfy certain conditions. In general, a resource must be at least 50 years of age to be considered for the NRHP, unless it satisfies a standard of exceptional importance.

National Historic Landmarks Program

The NPS also administers the National Historic Landmarks (NHL) Program. Properties designated as NHLs tell important stories related to the history of the nation overall. These properties must also possess a high level of historic integrity. All properties designated NHLs are automatically included in the NRHP.

Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines

The Standards and Guidelines are prepared under the authority of Sections 101(f) (g), and (h), and Section 110 of the NHPA of 1966, as amended. The Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation. These standards and guidelines are not regulatory and do not set or interpret agency policy. They are intended to provide technical advice about archaeological and historic preservation activities and methods. The NPS has not republished "The Secretary of the Interior's Standards and Guidelines for Archeology and Historic

Preservation" since 1983 (48 FR 44716). The NPS has updated portions of the Standards and Guidelines. NPS has officially revised portions and published the revisions in the Federal Register, such as the Historic Preservation Project standards and the treatment definitions. The purposes of the Standards are:

- To organize the information gathered about preservation activities.
- To describe results to be achieved by Federal agencies, States, and others when planning for the identification, evaluation, registration and treatment of historic properties.
- To integrate the diverse efforts of many entities performing historic preservation into a systematic effort to preserve our nation's culture heritage.

Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR Part 68, 1995)

The current version of The Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR Part 68, 1995) consists of four treatment standards—Preservation, Rehabilitation, Restoration and Reconstruction—and is regulatory for NPS Grants-in-Aid programs. The Secretary of the Interior's Standards for Rehabilitation (36 CFR Part 67, 1990), which are included in the treatment standards, are regulatory for the Federal Historic Preservation Tax Incentives program and used as the criteria to determine if a project qualifies as "a certified rehabilitation." The 1990 and the 1995 versions of the Rehabilitation Standards are identical except for their use of "shall" and "will," respectively. The Secretary of the Interior's Standards for the Treatment of Historic Properties, in particular the Standards for Rehabilitation, are intended as general guidance for work on all historic properties and are widely used and have been adopted at the Federal, State and local levels.

Native American Graves Protection and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act (NAGPRA; Public Law 101-601; 25 USC 3001–3013) also applies if human remains of Native American origin are discovered on federal land. NAGPRA requires federal agencies and federally assisted museums to return "Native American cultural items" to the federally recognized Indian tribes or Native Hawaiian groups with which they are associated. Regulations (43 CFR Part 10) stipulate the following procedures be followed. If Native American human remains are discovered, the following provisions would be followed to comply with regulations:

- Notify, in writing, the responsible federal agency.
- Cease activity in the area of discovery and protect the human remains.
- Certify receipt of the notification.
- Take steps to secure and protect the remains.
- Notify the Native American tribes or tribes likely to be culturally affiliated with the discovered human remains within one working day.
- Initiate consultation with the Native American tribe or tribes in accordance with regulations described in 43 CFR, Part 10, Subpart B, Section 10.5.

3.2 STATE

California Implementation of Federally and State-Mandated Historic Preservation Program

The California State Office of Historic Preservation (OHP) is responsible for administering federally and state mandated historic preservation programs to further the identification, evaluation, registration, and protection of California's irreplaceable archaeological and historical resources under the direction of the State Historic Preservation Officer (SHPO), a gubernatorial appointee, and the State Historical Resources Commission.

OHP's responsibilities include:

- Identifying, evaluating, and registering historic properties
- Ensuring compliance with federal and state regulatory obligations
- Encouraging the adoption of economic incentives programs designed to benefit property owners
- Encouraging economic revitalization by promoting a historic preservation ethic through preservation education and public awareness and, most significantly, by demonstrating leadership and stewardship for historic preservation in California

OHP reviews and comments on thousands of federally sponsored projects annually pursuant to Section 106 of the NHPA and state programs and projects pursuant to Sections 5024 and 5024.5 of the Public Resources Code (PRC). OHP also reviews and comments on local government and state projects pursuant to CEQA.

The purpose of OHP's project review program is to promote the preservation of California's heritage resources by ensuring that projects and programs carried out or sponsored by federal and state agencies comply with federal and state historic preservation laws and that projects are planned in ways that avoid any adverse effects to heritage resources. If adverse effects cannot be avoided, the OHP assists Lead Agencies in developing measures to minimize or mitigate such effects.

OHP administers the NRHP, the CRHR, the California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements; all register nominations must be submitted to the Commission for review and approval.

National Register of Historic Places

Applications to nominate California properties to the NRHP are submitted to OHP for review and approval by the State Historic Resources Commission. Authorized under the NHPA, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archaeological resources. The National Register is administered by the NPS, which is part of the U.S. Department of the Interior. Prior to forwarding Nomination Packages for consideration for the National Register, OHP must review the package and make a determination that it conforms to the guidelines published by NPS Bulletin 16A. If approved by the State Historic Resources Commission, the nomination is sent to the State Historic Preservation Officer for nomination to the National Register.

California Register of Historical Resources

The CRHR, or California Register, is an authoritative listing and guide to be used by State and local agencies, private groups, and citizens in identifying the existing historical resources of the State and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change. The criteria for eligibility for the California Register are based upon National Register criteria. These criteria are:

Criterion 1: Associated with events that have made a significant contribution to the broad patterns of local or regional history or the cultural heritage of California of the United States;

Criterion 2: Associated with the lives of persons important to local, California or national history;

Criterion 3: Embodies the distinctive characteristics of a type, period, region or method of construction or represents the work of a master or possesses high artistic values; and

Criterion 4: Has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California or the nation.

The California Register consists of resources that are listed automatically and those that must be nominated through an application and public hearing process. The California Register automatically includes the following:

- California properties listed in the NRHP (Category 1 in the State Inventory of Historical Resources) and those formally Determined Eligible for listing in the NRHP (Category 2 in the State Inventory)
- California Registered Historical Landmarks from No. 0770 onward
- Those California Points of Historical Interest that have been evaluated by the OHP and have been recommended to the State Historical Resources Commission for inclusion in the California Register

Other resources which may be nominated for listing in the California Register include:

- Historical resources with a significance rating of Categories 3 through 5 in the State Inventory. (Categories 3 and 4 refer to potential eligibility for the National Register, while Category 5 indicates a property with local significance);
- Individual historical resources;
- Historical resources contributing to historic districts; and
- Historical resources designated or listed as a local landmark.

Additionally, a historic resource eligible for listing in the California Register must meet one or more of the criteria of significance described above and retain enough of its historic character or appearance to be recognizable as a historic resource and to convey the reasons for its significance. Historical resources that have been rehabilitated or restored may be evaluated for listing.

California Historical Landmarks

California Historical Landmarks are sites, buildings, features, or events that are of statewide significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. The specific standards now in use were first applied in the designation of Landmark # 770. California Historical Landmarks #770 and above are automatically listed in the California Register of Historical Resources.

To be designated as a California Historical Landmark, a resource must meet at least one of the criteria listed below; have the approval of the property owner(s); be recommended by the State Historical Resources Commission; and be officially designated by the Director of California State Parks.

Criteria for Designation. To be eligible for designation as a Landmark, a resource must meet at least one of the following criteria:

- The first, last, only, or most significant of its type in the state or within a large geographic region (Northern, Central, or Southern California)
- Associated with an individual or group having a profound influence on the history of California
- A prototype of, or an outstanding example of, a period, style, architectural movement or construction or is one of the more notable works or the best surviving work in a region of a pioneer architect, designer or master builder

Effects of Designation.

- Limited protection: Environmental review may be required under CEQA if property is threatened by a project. Contact your local planning agency for more information.
- Local assessor may enter into contract with property owner for property tax reduction (Mills Act).
- Local building inspector must grant code alternative provided under State Historic Building Code. Registration will be recorded on the property deed.
- Automatic listing in California Register of Historical Resources.
- Bronze plaque at site (underwritten by local sponsor) ordered through OHP; highway directional sign available through local Department of Transportation (Caltrans) district office.

California Points of Historical Interest

If a site is primarily of local interest, it may meet the criteria for the California Points of Historical Interest Program. California Points of Historical Interest are sites, buildings, features, or events that are of local (city or county) significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Points of Historical Interest designated after December 1997 and recommended by the State Historical Resources Commission are also listed in the California Register. No historical resource may be designated as both a Landmark and a Point. If a Point is subsequently granted status as a Landmark, the Point designation will be retired.

Criteria for Designation. To be eligible for designation as a Point of Historical Interest, a resource must meet at least one of the following criteria:

- The first, last, only, or most significant of its type within the local geographic region (City or County)
- Associated with an individual or group having a profound influence on the history of the local area
- A prototype of, or an outstanding example of, a period, style, architectural movement or construction or is one of the more notable works or the best surviving work in the local region of a pioneer architect, designer or master builder

Effects of Designation.

- Limited protection: Environmental review may be required under CEQA if property is threatened by a project. Contact your local planning agency for more information.
- Local assessor may enter into contract with property owner for property tax reduction (Mills Act).
- Local building inspector must grant code alternative provided under State Historic Building Code.
- Registration is recorded on property deed.
- A small enamel directional sign (no text) available through local Caltrans district office. Owner may place his or her own marker at the site.

California Environmental Quality Act[4]

Pursuant to CEQA, a *historical resource* is a resource listed in, or eligible for listing in, the CRHR. In addition, resources included in a local register of historic resources or identified as significant in a local survey conducted in accordance with state guidelines are also considered historical resources under CEQA, unless a preponderance of the facts demonstrates otherwise. According to CEQA, the fact that a resource is not listed in or determined eligible for listing in the CRHR, or is not included in a local register or survey, shall not preclude a Lead Agency from determining that the resource may be a historic resource as defined in PRC Section 5024.1.[5]

CEQA applies to archaeological resources when (1) the archaeological resource satisfies the definition of a historical resource or (2) the archaeological resource satisfies the definition of a "unique archaeological resource." A unique archaeological resource is an archaeological artifact, object, or site that has a high probability of meeting any of the following criteria:[6]

(1) The archaeological resource contains information needed to answer important scientific research questions and there is a demonstrable public interest in that information.

[4] *California Public Resources Code*, Division 13, Sections 21083.2 and 21084.1.

[5] *California Code of Regulations*, Title 14, Chapter 3: "Guidelines for the Implementation of the California Environmental Quality Act as Amended October 6, 2005," Section 15064.5(a).

[6] *California Public Resources Code*, Division 13, Section 21083.2(g).

(2) The archaeological resource has a special and particular quality such as being the oldest of its type or the best available example of its type.
(3) The archaeological resource is directly associated with a scientifically recognized important prehistoric or historic event or person.

California Health and Safety Code, Section 7050 and Sections 18950 through 18961

Consistent with the provisions of Section 50907.9 of the PRC, Section 7050 of the Health and Safety Code authorizes the NAHC to regulate Native American concerns regarding the excavation and disposition of Native American cultural resources. Among its duties, the Commission is authorized to resolve disputes relating to the treatment and disposition of Native American human remains and items associated with burials. Upon notification of the discovery of human remains by a county coroner, the Commission notifies the Native American group or individual most likely descended from the deceased.

The State Historic Building Code, Sections 18950–18961, provides alternative building regulations and building standards for the rehabilitation, preservation, restoration (including related reconstruction), or relocation of buildings or structures designated as historic buildings. Such alternative building standards and building regulations are intended to facilitate the restoration or change of occupancy so as to preserve their original or restored architectural elements and features, to encourage energy conservation and a cost-effective approach to preservation, and to provide for the safety of the building occupants.

California Penal Code Section 622 – Destruction of Historical Properties

This section of the California Penal Code makes it a misdemeanor for anyone (except the owner) to willfully injure or destroy anything of archaeological interest or value whether on private lands or within any public park or place. In addition, Penal Code Section 622.5 sets the penalties for the damage or removal of cultural resources.

Senate Bill 18 – Traditional Tribal Cultural Places

Senate Bill (SB) 18, enacted in 2004, requires local governments to consult with Native American groups at the earliest point in the local government land use planning process. The consultation intends to establish a meaningful dialogue regarding potential means to preserve Native American places of prehistoric, archaeological, cultural, spiritual, and ceremonial importance. It allows for tribes to hold conservation easements and for tribal cultural places to be included in open space planning.

Assembly Bill 52

Assembly Bill (AB) 52 creates a new category of environmental resources that must be considered under CEQA: "tribal cultural resources." AB 52 is applicable to a project for which a Notice of Preparation (NOP) is filed on or after July 2015.

Recognizing that tribes may have expertise with regard to their tribal history and practices, AB 52 requires lead agencies to provide notice to tribes that are traditionally and culturally affiliated with the geographic area of a proposed project if they have requested notice of projects proposed within that area. If the tribe requests consultation within 30 days upon receipt of the notice, the lead agency must consult with the tribe. Consultation may include discussing the type of environmental review necessary, the significance of tribal cultural resources, the significance of the project's impacts on the tribal cultural resources, and alternatives and mitigation measures recommended by the tribe.

The parties must consult in good faith, and consultation is deemed concluded when either the parties agree to measures to mitigate or avoid a significant effect on a tribal cultural resource (if such a significant effect exists) or when a party concludes that mutual agreement cannot be reached.

3.3 COUNTY

Los Angeles County General Plan 2035

The County's cultural resources objective, found in the Conservation and Natural Resources Element of the Los Angeles County General Plan 2035, is to preserve and protect cultural resources including historic, archaeological, and paleontological resources.[7] Under this objective, the County has established the following policies:[8]

Policy C/NR 14.1: Mitigate all impacts from new development on or adjacent to historic, cultural, and paleontological resources to the greatest extent feasible.

Policy C/NR 14.2: Support an inter-jurisdictional collaborative system that protects and enhances historic, cultural and paleontological resources.

Policy C/NR 14.3: Support the preservation and rehabilitation of historic buildings.

Policy C/NR 14.4: Ensure proper notification procedures to Native American tribes in accordance with Senate Bill 18 (2004).

Policy C/NR 14.6: Ensure proper notification and recovery processes are carried out for development on or near historic, cultural, and paleontological resources.

Los Angeles County Historical Landmarks and Records Commission

The Los Angeles County Board of Supervisors established and has maintained the Los Angeles County Historical Landmarks and Records Commission (Commission) pursuant to Los Angeles County Code Chapter 3.30. Pursuant to Section 26490 of the California Government Code, the Commission is designated as a historical records commission to foster and promote the preservation of historical records. The Los Angeles County Historical Landmarks and Records Commission (Commission) considers and recommends to the Board of Supervisors local historical

[7] County of Los Angeles Department of Regional Planning. Adopted 6 October 2015. *Los Angeles County 2035 General Plan: Chapter 9: Conservation and Natural Resources Element*. Available at: http://planning.lacounty.gov/assets/upl/project/gp_final-general-plan-ch9.pdf

[8] County of Los Angeles Department of Regional Planning. Adopted 6 October 2015. *Los Angeles County 2035 General Plan: Chapter 9: Conservation and Natural Resources Element*. Available at: http://planning.lacounty.gov/assets/upl/project/gp_2035_Chapter9_2014.pdf

landmarks defined to be worthy of registration by the State of California, either as California Historical Landmarks or as Points of Historical Interest. The Commission may also comment for the Board on applications relating to the NRHP. The Commission is also charged with fostering and promoting the preservation of historical records. In its capacity as the memorial plaque review committee of the County of Los Angeles, the Commission screens applications for donations of historical memorial plaques and recommends to the Board plaques worthy of installation as County property.[9]

County of Los Angeles Historic Preservation Ordinance (Title 22 – Planning and Zoning of the Los Angeles County Code, Part 29 of Chapter 22.52)

22.52.3010 Purpose

The County of Los Angeles Historic Preservation Ordinance has seven established basic purposes.

A. Enhance and preserve the distinctive historic, architectural, and landscape characteristics which represent the County's cultural, social, economic, political, and architectural history.
B. Foster community pride in the beauty and noble accomplishments of the past as represented by the County's historic resources.
C. Stabilize and improve property values, and enhance the aesthetic and visual character and environmental amenities of the County's historic resources.
D. Recognize the County's historic resources as economic assets.
E. Encourage and promote the adaptive reuse of the County's historic resources.
F. Promote the County as a destination for tourists and as a desirable location for businesses.
G. Specify significance criteria and procedures for the designation of landmarks and Historic Districts, and provide for the ongoing preservation and maintenance of landmarks and Historic Districts.

22.52.3060 Criteria for Designation of Landmarks and Historic Districts

A. Property which is more than 50 years of age may be designated as a landmark if it satisfies one or more of the following criteria:
   1. It is associated with events that have made a significant contribution to the broad patterns of the history of the nation, State, County, or community.
   2. It is associated with the lives of persons who are significant in the history of the nation, State, County, or community.
   3. It embodies the distinctive characteristics of a type, architectural style, period, or method of construction; or represents the work of an architect, designer, engineer, or builder whose work is of significance to the nation, State, County, or community; or possesses artistic values of significance to the nation, State, County, or community.
   4. It has yielded, or may be likely to yield, information important locally in prehistory or history.

[9] County of Los Angeles Department of Auditor-Controller. 21 October 2002. *Sunset Review for the Los Angeles County Historical Landmarks and Records Commission*. Available at: http://auditor.co.la.ca.us/cms1_003345.pdf

5. It is listed or has been formally determined eligible by the National Park Service for listing on the National Register of Historic Places, or is listed or has been determined eligible by the State Historical Resources Commission for listing on the California Register of Historical Resources.
6. It is one of the largest or oldest trees of the species located in the County.
7. It is a tree, plant, landscape, or other natural land feature having historical significance due to an association with a historic event, person, site, street, or structure, or because it is a defining or significant outstanding feature of a neighborhood.

B. Property less than 50 years of age may be designated as a landmark if it meets one or more of the criteria set forth in Section 22.52.3060.A, above, and exhibits exceptional importance.

C. The interior space of a property, or other space held open to the general public, including but not limited to a lobby, may itself be designated as a landmark or included in the landmark designation of a property if the space is more than 50 years of age and satisfies one or more of the criteria set forth in Subsection A, above, or if the space is less than 50 years of age and satisfies the requirements of Section 22.52.3060.B, above.

SECTION 4.0
METHODS

This section describes the methods employed in the characterization and evaluation of cultural resources in the Trails Master Plan Study Area.

4.1 PALEONTOLOGICAL RESOURCES RECORDS SEARCH AND MAP REVIEW

The presence of recorded paleontological resources and fossil localities within the Trails Master Plan Study Area were assessed using information obtained from records searches at the Natural History Museum of Los Angeles County (NHMLAC).[10] Geologic maps of the San Fernando Valley were also examined to evaluate the potential for the geological deposits within the Trails Master Plan Study Area to yield unique paleontological resources.[11]

Based on the results of the records and map searches, each of the geologic units identified within the Trails Master Plan Study Area were characterized according to their potential to yield paleontological resources. The geological formations were categorized using a three-tiered sensitivity classification scheme:

- **High Potential:** Sedimentary geologic units and other geologic units that have yielded unique paleontological resources
- **Moderate Potential:** Older alluvial geologic units
- **Low to No Potential:** Metamorphic and igneous geologic units

4.2 CULTURAL RESOURCES RECORDS SEARCH AND LITERATURE REVIEW

Cultural resource records searches were conducted at the South Central Coastal Information Center (SCCIC), housed at California State University, Fullerton, on May 15, 2012; December 17, 2012; November 13, 2013; and February 27, 2014. These searches included reviews of all known previously recorded resources and relevant cultural resource survey reports within the Trails Master Plan Study Area and a 0.5-mile buffer to ascertain the presence of known prehistoric and historic archaeological resources within the currently mapped trail system within the Trails Master Plan (i.e., cultural resources API). In addition, the Historic Property Data File for Los Angeles County, which includes the NRHP, CRHR, California Historical Landmarks, and California Points of Historical Interest, was searched to identify known historical resources within the cultural resources API. The records search was updated in 2017 to incorporate and update the findings of the searches conducted in 2014, 2013, and 2012. On January 22, 2017, and March 22, 2017, an updated records search was conducted at the SCCIC. These searches included reviews of all known relevant cultural resource survey reports within the Trails Master Plan Study Area to ascertain the presence of known prehistoric and historic archaeological resources within the Trails Master Plan and a 0.5--mile buffer.

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[10] McLeod, Samuel, Natural History Museum of Los Angeles County. 24 December 2013. Letter response to Roberta Thomas, Sapphos Environmental, Inc., Pasadena, CA.

[11] Jennings, C.W., and R.G. Strand. 1969. *Geologic Map of California, Los Angeles Sheet, 1:250,000*. Sacramento, CA: California Geological Survey, California Division of Mines and Geology.

4.3 CEMETERIES AND HUMAN REMAINS

On January 22, 2017, and March 22, 2017, an updated records search was conducted at the SCCIC. These searches included reviews of all previously recorded cultural resources within the Trails Master Plan Study Area to ascertain the presence of known prehistoric and historic burial sites within the Trails Master Plan Study Area and a 0.5-mile buffer. In addition, historic USGS topographic maps for the study area were reviewed to identify the locations of historic and modern cemeteries.

4.4 TRIBAL CULTURAL RESOURCES

Coordination with the NAHC was initiated for the proposed Johnson Motorway Trail element of the Trails Master Plan on December 21, 2012.[12] The NAHC was requested to conduct a Sacred Lands File Records Search for the presence of Native American sacred sites and human remains within the Johnson Motorway Trail element study area. A written response from NAHC was received by Sapphos Environmental, Inc. on December 28, 2012, stating that the Sacred Lands File search did not indicate the presence of Native American cultural resources within a 0.5-mile radius of the Johnson Motorway Trail element.[13] On the recommendation of the NAHC, Sapphos Environmental, Inc. sent letters to 16 Native American contacts classified by the NAHC as potential sources of information related to cultural resources in the vicinity of the Johnson Motorway Trail element. The letters advised the tribes and specific individuals of the Johnson Motorway Trail element and its geographic area and requested information regarding cultural resources within the vicinity of the Johnson Motorway Trail element, including feedback or concerns related to the project. As of May 20, 2013, responses have been received from Mr. Freddie Romero of the Santa Ynez Tribal Elders Council[14] and Mr. Patrick Tumamait.[15] The NAHC requested ongoing consultation regarding the project.

A supplemental NAHC request was initiated for the entirety of the Trails Master Plan Study Area on November 20, 2013.[16] A written response from NAHC was received by Sapphos Environmental, Inc. on November 25, 2013, stating that the Sacred Lands File search did not indicate the presence of Native American cultural resources within the Trails Master Plan Area, but that there are known Native American cultural places/sites in close proximity.[17] On the recommendation of the NAHC, Sapphos Environmental, Inc. sent letters to eight Native American contacts classified by the NAHC as potential sources of information related to cultural resources in the vicinity of the Trails Master Plan Study Area. These letters also advised the tribes and specific individuals of the Trails Master Plan Study Area and requested information regarding cultural resources within the vicinity of the

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[12] Backes, Clarus, Sapphos Environmental, Inc., Pasadena, CA. 21 December 2012. Letter to Larry Myers, Native American Heritage Commission, Sacramento, CA.

[13] Singleton, Dave, Native American Heritage Commission, Sacramento, CA. 28 December 2012. Faxed letter response to Clarus Backes, Sapphos Environmental, Inc., Pasadena, CA.

[14] Backes, Clarus, Sapphos Environmental, Inc., Pasadena, CA. 10 January 2013. Contact Report to Patrick Tumamait, Ojai, CA.

[15] Backes, Clarus, Sapphos Environmental, Inc., Pasadena, CA. 17 January 2013. Contact Report to Freddie Romero, Santa Ynez Tribal Elders Councils, Santa Ynez, CA

[16] Thomas, Roberta, Sapphos Environmental, Inc., Pasadena, CA. 20 November 2013. Letter to David Singleton, Native American Heritage Commission, Sacramento, CA.

[17] Singleton, Dave, Native American Heritage Commission, Sacramento, CA. 25 November 2013. Faxed letter response to Roberta Thomas, Sapphos Environmental, Inc., Pasadena, CA.

area, including feedback or concerns related to the project. No responses have been received to date.

4.4.1 AB52 Consultation

Coordination with the NAHC was reinitiated by Sapphos Environmental, Inc. on behalf of the County for the proposed Santa Susana Mountains Trails Master Plan – Phase II on March 15, 2017.[18] The NAHC was requested to conduct a Sacred Lands File Records Search for the presence of Native American sacred sites and human remains within the Santa Susana Mountain Trails Master Plan Study Area. A written response from NAHC was received by the County on March 30, 2017, stating that the Sacred Lands File search did not indicate the presence of Native American Tribal Resources within a 0.5-mile radius of the Santa Susana Mountains Trails Master Plan –Phase II.[19] On the recommendation of the NAHC, Sapphos Environmental, Inc. sent letters on behalf of the County to nine Native American contacts classified by the NAHC as potential sources of information related to cultural resources in the vicinity of the Santa Susana Mountain Trails Master Plan – Phase II (Appendix B, *Confidential Native American Consultation*).

Andrew Salas of the Gabrieleno Band of Mission Indians-Kizh Nation responded by letter on April 11, 2017. The letter stated that the project is located within a sensitive area and may cause a substantial adverse change in the significance of the tribe's cultural resources and that the tribe is requesting consultation. On May 11, 2017, the Fernandeño Tataviam Band of Mission Indians notified the DPR that they would like to engage in consultation for the above-referenced project to ensure the avoidance of culturally sensitive areas, in conjunction with the CEQA process.

A consultation meeting between the DPR and the Fernandeño Tataviam Band of Mission Indians (Tribe). The meeting was held on Wednesday, June 7, 2017, at the tribal offices in San Fernando, California. The County shared the results of the South Central Coastal Information Center (SCCIC) records search conducted by Sapphos Environmental, Inc. with the Fernandeño Tataviam Band of Mission Indians, which resulted in the identification of 41 prehistoric archaeological sites, 16 historic archaeological sites, one multi-component site, three prehistoric isolates, and eight historic isolates within the APE. The County explained that the proposed trail alignments have been designed to avoid impacts to known sites. The Fernandeño Tataviam Band of Mission Indians indicated that the study area has a high level of sensitivity to potential tribal cultural resources, and numerous sites are known from the study area. Since the trail alignments are conceptual and will ultimately be constructed in small segments over a 30-year planning horizon, it was agreed that mitigation measures should be included to ensure that the County undertakes consultation with the Fernandeño Tataviam Band of Mission Indians when trail segments are considered for development. The Fernandeño Tataviam Band of Mission Indians would inform the County if a trail alignment or specific segment of a trail alignment needs to be adjusted to avoid tribal cultural resources, or if other protective measures are warranted to protect tribal cultural resources *in situ*. In addition, the Fernandeño Tataviam Band of Mission Indians would inform the County when Native American monitoring is warranted.

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[18] Yom, Julie, County of Los Angeles. 15 March 2017. Letter to Gayle Totten, Native American Heritage Commission, Sacramento, CA.

[19] Totten, Gayle, Native American Heritage Commission, Sacramento, CA. 30 March 2017. Faxed letter response to Julie Yom, County of Los Angeles.

A consultation meeting between the DPR and the Gabrieleno Band of Mission Indians - Kizh Nation was conducted on June 7, 2017. The Gabrieleno Band of Mission Indians - Kizh Nation indicated that the study area has a high level of sensitivity to potential tribal cultural resources, and that numerous sites are known from the study area. The Gabrieleno Band of Mission Indians - Kizh Nation are not opposed to the project, but want to ensure that resources are avoided and that a Native American monitor is present during ground-disturbing activities in areas with a potential for known tribal cultural resources or a potential for the unanticipated discovery of tribal cultural resources during construction. The tribe would like to provide input on the trail naming. The tribe representatives shared during the meeting a "living map" of Kizh Nation traditional use areas including villages and ceremonial sites. Since the trail alignments are conceptual and will ultimately be constructed in small segments over a 30-year planning horizon, it was agreed that mitigation measures should be included to ensure that the County undertakes consultation with the Gabrieleno Band of Mission Indians - Kizh Nation when trail segments are considered for development. The Gabrieleno Band of Mission Indians - Kizh Nation would inform the County if a trail alignment or specific segment of a trail alignment needs to be adjusted to avoid tribal cultural resources, or if other protective measures are warranted to protect tribal cultural resources *in situ*. In addition, the Gabrieleno Band of Mission Indians - Kizh Nation would inform the County when Native American monitoring is warranted.

A follow-up consultation meeting was conducted between the DPR and the Fernandeño Tataviam Band of Mission Indians (Tribe). The meeting was held on Wednesday, August 16, 2017, from 2:00 to 3:00 p.m., at the tribal offices in San Fernando, California. The purpose of the meeting was to conduct follow-up consultation consistent with the provisions of Assembly Bill 52 (AB 52). The County shared the draft trails plan with the Fernandeño Tataviam Band of Mission Indians, so that they may compare the tribal cultural resources data within the Area of Potential Effect. The County explained that the proposed trail alignments have been designed to avoid impacts to known sites. The Fernandeño Tataviam Band of Mission Indians indicated that the study area has a high level of sensitivity to potential tribal cultural resources, and numerous sites are known from the study area. The Fernandeño Tataviam Band of Mission Indians provided the DPR and Sapphos Environmental, Inc. with a list that indicates the sensitivity of proposed trails in three categories—high, medium, and low sensitivity for tribal cultural resources. The Fernandeño Tataviam Band of Mission Indians reviewed the Tataviam ethnography to be included in the CRTR and provided comments.

A follow-up consultation meeting was conducted between the DPR and the Gabrieleno Band of Mission Indians - Kizh Nation. The meeting was held on Thursday, October 5, 2017, from 1:30 to 2:00 p.m., on a conference call. The purpose of the meeting was to conduct follow-up consultation consistent with the provisions of Assembly Bill 52 (AB 52). The County shared the draft trails plan with the Gabrieleno Band of Mission Indians - Kizh Nation, so that they may compare the tribal cultural resources data within the Area of Potential Effect. The County explained that the proposed trail alignments have been designed to avoid impacts to known sites. The Gabrieleno Band of Mission Indians - Kizh Nation indicated that the study area has a high level of sensitivity to potential tribal cultural resources, and numerous sites are known from the study area. The Gabrieleno Band of Mission Indians - Kizh Nation will provide the Department and Sapphos Environmental, Inc. with a list that indicates the sensitivity of proposed trails in three categories—high, medium, and low sensitivity for tribal cultural resources. This information has not been provided as of October 24, 2017.

This section provides the characterization and evaluation of the potential for the proposed Trails Master Plan (project) to affect cultural resources within the project API. The results described in this section provide the substantial evidence required to address the CEQA scope of analysis, related to prehistoric resources, historic resources, Native American sacred sites, and human remains. Although both prehistoric and historic period resources in the project area are considered to be archaeological sites, for clarity of presentation and analysis, the data have been organized chronologically, with prehistoric period context and resources described in relation to archaeological resources, and historic period context and resources described in relation to historic resources. Characterization of both prehistoric and historic archaeological resources, as well as Native American sacred sites, follows these background sections.

5.1 EXISTING CONDITIONS

5.1.1 Archaeological and Historic Resources

Setting

Prehistoric Context

Several prehistoric cultural chronologies have been proposed for the coastal Southern California region with three of the most frequently cited sequences developed by William Wallace,[20] Claude Warren,[21] and Chester King.[22] Such chronologies provide a framework to discuss archaeological data in relation to broad cultural changes seen in the archaeological record. The chronological sequence presented herein represents an updated synthesis of these schemes as compiled by Glassow and others[23] for the Northern California Bight. This geographic area consists of the coastal area from Vandenberg Air Force Base south to Palos Verdes, as well as the Channel Islands and adjacent inland areas, including the San Fernando Valley and Los Angeles Basin.[24] The prehistoric sequence of the Northern California Bight can be divided into four broad temporal categories (Table 5.1.1-1, *Southern California Coastal Regional Chronology*). It should be noted that the prehistoric chronology for the region is being refined on a continuing basis, with new discoveries and improvements in the accuracy of dating techniques.

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[20] Wallace, William J. 1955. "A Suggested Chronology for Southern California Coastal Archaeology." *Southwestern Journal of Anthropology 11*: 214–30.

[21] Warren, Claude M. 1968. "Cultural Tradition and Ecological Adaptation on the Southern California Coast." In *Archaic Prehistory in the Western United States*, ed. Cynthia Irwin-Williams. Eastern New Mexico University Contributions in Anthropology No. 1. Portales, NM: Eastern New Mexico University.

[22] King, Chester. 1990. *Evolution of Chumash Society: A Comparative Study of Artifacts Used for Social System Maintenance in the Santa Barbara Channel Region before AD 1804*. New York, NY: Garland.

[23] Glassow, Michael A., Lynn H. Gamble, Jennifer E. Perry, and Glenn S. Russell. 2007. "Prehistory of the Northern California Bight and the Adjacent Transverse Ranges." In *California Prehistory, Colonization, Culture, and Complexity*, ed. Terry L. Jones and Kathryn A. Klar. New York, NY: Altamira.

[24] Glassow, Michael A., Lynn H. Gamble, Jennifer E. Perry, and Glenn S. Russell. 2007. "Prehistory of the Northern California Bight and the Adjacent Transverse Ranges." In *California Prehistory, Colonization, Culture, and Complexity*, ed. Terry L. Jones and Kathryn A. Klar. New York, NY: Altamira.

TABLE 5.1.1-1
SOUTHERN CALIFORNIA COASTAL REGIONAL CHRONOLOGY

Epoch	Coastal Region	Dates
Terminal Pleistocene / Early Holocene	Paleo-Coastal Period	Circa 9500 to 7000/6500 BC
Middle Holocene	Millingstone Period	Circa 7000/6500 to 1500/1000 BC
Late Holocene	Intermediate Period	1500/1000 BC to AD 750
Late Holocene	Late Period	AD 750 to Spanish contact

Terminal Pleistocene and Early Holocene: Paleo-Coastal Period (Circa 9500 to 7000/6500 BC)

Although data on early human occupation for the Southern California coast are limited, archaeological evidence from the northern Channel Islands suggests initial settlement within the region occurred at least 12,000 years before present (BP). At Daisy Cave (CA-SMI-261) on San Miguel Island, radiocarbon dates indicate an early period of use in the terminal Pleistocene, sometime between 9600 and 9000 calibrated (cal) BC.[25] Evidence of early human occupation in the Northern California Bight has also been found on nearby Santa Rosa Island, where human remains from the Arlington Springs Site (CA-SRI-1730) have been dated between 11,000 and 10,000 cal BC.[26] Archaeological data recovered from these and other coastal Paleoindian sites indicate a distinctively maritime cultural adaptation, termed the "Paleo-Coastal Tradition,"[27] which involved the use of seafaring technology and a subsistence regime focused on shellfish gathering and fishing.[28]

Relatively few sites have been identified in Los Angeles County that date to the terminal Pleistocene and early Holocene. Currently, the earliest reliable date for human occupation in the area derives from the La Brea Tar Pits (CA-LAN-159), where human bone has been dated to 8520 cal BC.[29] Evidence of possible early human occupation has also been found at the sand dune bluff site of Malaga Cove (CA-LAN-138), located between Redondo Beach and Palos Verdes.[30] Researchers have proposed that archaeological remains recovered from the lowermost cultural stratum at the site, which include shell, animal bone, and chipped stone tools, may date as early as 8000 cal BC.[31,32]

[25] Erlandson, J.M., D.J. Kennett, B.L. Ingram, D.A. Guthrie, D.P. Morris, M.A. Tveshov, G.J. West, and P.L. Walker 1996. "An Archaeological and Paleontological Chronology for Daisy Cave (CA-SMI-261), San Miguel Island, California." *Radiocarbon*, *38*: 355–73.

[26] Johnson, J.R., T.W. Stafford Jr., H.O. Ajie, and D.P. Morris. 2002. "Arlington Springs Revisited." In *Proceedings of the Fifth California Islands Symposium*, ed. D. Browne, K. Mitchell, and H. Chaney, pp. 541–45. Santa Barbara, CA: USDI Minerals Management Service and The Santa Barbara Museum of Natural History.

[27] Moratto, M.J. 1984. California Archaeology, pp. 103-113. Academic Press, New York.

[28] Rick, T.C., J.M. Erlandson, and R.L. Vellanoweth. 2001. "Paleocoastal Fishing along the Pacific Coast of the Americas: Evidence from Daisy Cave, San Miguel Island, California." *American Antiquity*, *66*: 595–614.

[29] Berger, R., R. Protsch, R. Reynolds, C. Rozaire, and J.R. Sackett. 1971. *New Radiocarbon Dates Based on Bone Collagen of California Indians*. Los Angeles, CA: Contributions to the University of California Archaeological Survey.

[30] Walker, Edwin Francis. 1951. *Five Prehistoric Archaeological Sites in Los Angeles County, California*. F. W. Hodge Anniversary Publication Fund VI. Los Angeles, CA: Southwest Museum.

[31] Moratto, M.J. 1984. California Archaeology, pp. 132. Academic Press, New York.

[32] Wallace, W.J. 1986. "Archaeological Research at Malaga Cove." In *Symposium: A New Look at Some Old Sites*, ed. G.S. Breschini and T. Haversat. Salinas, CA: Coyote Press.

Middle Holocene: Millingstone Period (Circa 7000/6500 to 1500/1000 BC)

The Millingstone Period or Horizon, also referred to as the "Encinitas Tradition,"[33,34] is the earliest well-established cultural occupation of the coastal areas of the region. The onset of this period, which began sometime between 7000 and 6500 cal BC, is marked by the expansion of populations throughout the Southern California Bight. Regional variations in technology, settlement patterns, and mortuary practices among Millingstone sites have led researchers to define several local manifestations or "patterns" of the tradition.[35] Groups that occupied the San Fernando Valley are thought to have been relatively small and highly mobile during this time, with a general subsistence economy focused on the gathering of shellfish and plant foods, particularly hard seeds, with hunting being of less importance.[36]

Two temporal subdivisions have been defined for the portion of the Topanga Pattern falling within the Millingstone Period: Topanga I (circa 6500 to 3000 BC) and Topanga II (circa 3000 to 1000 BC).[37] Topanga I assemblages are characterized by abundant manos and metates, core tools and scrapers, charmstones, cogged stone, and discoidals; projectile points are quite rare with those present resembling earlier, large, leaf-shaped forms.[38] Secondary inhumations with associated cairns are the most common burial form at Millingstone sites with small numbers of extended inhumations also identified. The subsequent Topanga II phase largely represents a continuation of the Topanga pattern with site assemblages characterized by numerous manos and metates, charmstones, cogged stones, discoidals, and some stone balls. A significant technological change in ground stone occurs at this time with the appearance of mortars and pestles at Topanga II sites suggesting the adoption of balanophagy by coastal populations.[39] The quantity of projectile points also notably increases in Topanga II site deposits indicating that the hunting of large game may have played a greater role in the subsistence economy than in earlier times. While secondary burials continue to be quite common, a few flexed inhumations have also been recovered from archaeological contexts dating to the Topanga II phase.

A number of Millingstone sites have been identified in the San Fernando Valley and surrounding areas. The early component of the Tank site (CA-LAN-1), located in the nearby Santa Monica Mountains appears to date to the Topanga I phase.[40] In addition, a marine shell sample from the

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[33] Sutton, Mark Q. 2010. "The Del Rey Tradition and Its Place in the Prehistory of Southern California." *Pacific Coast Archaeological Society Quarterly*, *44*(2): 1–54.

[34] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64.

[35] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64.

[36] Glassow, Michael A., Lynn H. Gamble, Jennifer E. Perry, and Glenn S. Russell. 2007. "Prehistory of the Northern California Bight and the Adjacent Transverse Ranges." In *California Prehistory, Colonization, Culture, and Complexity*, ed. Terry L. Jones and Kathryn A. Klar. New York, NY: Altamira.

[37] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64, 8.

[38] Glassow, Michael A., Lynn H. Gamble, Jennifer E. Perry, and Glenn S. Russell. 2007. "Prehistory of the Northern California Bight and the Adjacent Transverse Ranges." In *California Prehistory, Colonization, Culture, and Complexity*, ed. Terry L. Jones and Kathryn A. Klar. New York, NY: Altamira.

[39] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64, 41.

[40] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64, 8.

Encino Village site (CA-LAN-43 / CA-LAN-111) yielded a radiocarbon date of 4570 ± 80, suggesting use of the southern portion of the valley during the Topanga I phase [41] The presence of mortars and pestles alongside stemmed projectile points at the Chatsworth site (CA-LAN-21), located at the western edge of the San Fernando Valley, suggests a Topanga II presence. [42] Finally, the Big Tujunga Wash site, located at the eastern edge of the San Fernando Valley, may have also contained a Topanga II component.[43]

Late Holocene: Intermediate Period (1500/1000 BC to AD 750)

The Intermediate Period, which encompasses the early portion of the "Del Rey Tradition" as defined by Sutton,[44] begins around 3500 BP. At this time, significant changes are seen throughout the coastal areas of Southern California in material culture, settlement systems, subsistence strategies, and mortuary practices. These new cultural traits have been attributed to the arrival of Takic speaking people from the southern San Joaquin Valley.[45] Biological, archaeological, and linguistic data indicate that the Takic groups who settled in the San Fernando Valley were ethnically distinct from the preexisting Hokan-speaking Topanga populations and are believed to be ancestral to ethnographic Gabrielino groups.[46] While archaeological evidence indicates that "relic" Topanga III populations continued to survive in isolation in the Santa Monica Mountains, these indigenous groups appear to have been largely replaced or absorbed by the Gabrielino or Chumash by 2000 BP.[47]

Intermediate Period sites within the San Fernando Valley are represented by the "Angeles Pattern" of the Del Rey Tradition.[48] Three temporal subdivisions have been defined for the portion of the Angeles Pattern that falls within the Intermediate Period: Angeles I (1500 to 600 BC), Angeles II (600 BC to AD 400), and Angeles III (AD 400 to 750).[49] The onset of the Angeles I phase is characterized by the increase and aggregation of regional populations and the appearance of the first village settlements. The prevalence of projectile points, single-piece shell fishhooks, and bone harpoon points at Angeles I sites suggests a subsistence shift in the Intermediate Period with an increased emphasis on fishing and terrestrial hunting and less reliance on the gathering of shellfish resources. Regional trade or interaction networks also appeared to develop at this time with coastal

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[41] Taylor, R.E., P.J. Ennis, P.J. Slota Jr. and L.A. Payen. 1989. "Non-Age-Related Variations in Aspartic Acid Racemization in Bone from a Radiocarbon-dated Late Holocene Archaeological Site." *Radiocarbon*, *31*(3): 1048-56.

[42] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64, 8.

[43] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64, 8.

[44] Sutton, Mark Q. 2010. "The Del Rey Tradition and Its Place in the Prehistory of Southern California." *Pacific Coast Archaeological Society Quarterly*, *44*(2): 1–54.

[45] Sutton, Mark Q. 2009. "People and Language: Defining the Takic Expansion in Southern California." *Pacific Coast Archaeological Society Quarterly*, *41*(2&3): 31-93.

[46] Sutton, Mark Q. 2009. "People and Language: Defining the Takic Expansion in Southern California." *Pacific Coast Archaeological Society Quarterly*, *41*(2&3): 31-93.

[47] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64, 17.

[48] Sutton, Mark Q. 2010. "The Del Rey Tradition and Its Place in the Prehistory of Southern California." *Pacific Coast Archaeological Society Quarterly*, *44*(2): 1–54.

[49] Sutton, Mark Q., and Jill K. Gardner. 2010. "Reconceptualizing the Encinitas Tradition of Southern California." *Pacific Coast Archaeological Society Quarterly*, *42*(4): 1–64, 8.

populations in Los Angeles County obtaining small steatite artifacts and *Olivella* shell beads from the southern Channel Islands and obsidian from the Coso Volcanic Field.[50] Finally, marked changes are seen in mortuary practices during the Angeles I phase with flexed primary inhumations and cremations replacing extended inhumations and cairns.

The Angeles II phase largely represents a continuation and elaboration of the Angeles I technology, settlement, and subsistence systems. One exception to this pattern is the introduction of a new funerary complex around 2600 BP consisting of large rock cairns or platforms which contain abundant broken tools, faunal remains, and cremated human bone. These mortuary features have generally been thought to represent the predecessor of the Southern California Mourning Ceremony.[51] Several important changes in the archaeological record mark the beginning of the Angeles III phase. At this time, larger seasonal villages characterized by well-developed middens and cemeteries were established along the coast or inland areas. Archaeological data from Angeles III sites indicate that residents of these settlements practiced a fairly diverse subsistence strategy which included the exploitation of both marine and terrestrial resources.[52] Notable technological changes occurred at this time with the introduction of the plank canoe and bow and arrow.[53] The appearance of new *Olivella* bead types at Angeles III sites indicates a reconfiguration of existing regional exchange networks with increased interaction with populations in the Gulf of California.[54] Finally, cremations increase slightly in frequency at this time with inhumations no longer placed in an extended position.[55] Intermediate Period sites in Los Angeles County include CA-LAN-2 and CA-LAN-197, both of which are located in the Santa Monica Mountains. The formal cemeteries at these sites are representative of the increased sedentism that occurred during the Intermediate Period.[56]

[50] Koerper, Henry C., Roger D. Mason, and Mark L. Peterson. 2002. "Complexity, Demography, and Change in Late Holocene Orange County." In *Catalysts to Complexity: Late Holocene Societies of the California Coast*, ed. M. Erlandson and Terry L. Jones. Perspectives in California Archaeology, Vol. 6. Los Angeles, CA: University of California, Los Angeles, Institute of Archaeology.

[51] Sutton, Mark Q. 2010. "The Del Rey Tradition and Its Place in the Prehistory of Southern California." *Pacific Coast Archaeological Society Quarterly*, *44*(2): 1–54.

[52] Sutton, Mark Q. 2010. "The Del Rey Tradition and Its Place in the Prehistory of Southern California." *Pacific Coast Archaeological Society Quarterly*, *44*(2): 1–54.

[53] Glassow, Michael A., Lynn H. Gamble, Jennifer E. Perry, and Glenn S. Russell. 2007. "Prehistory of the Northern California Bight and the Adjacent Transverse Ranges." In *California Prehistory, Colonization, Culture, and Complexity*, ed. Terry L. Jones and Kathryn A. Klar. New York, NY: Altamira.

[54] Koerper, Henry C., Roger D. Mason, and Mark L. Peterson. 2002. "Complexity, Demography, and Change in Late Holocene Orange County." In *Catalysts to Complexity: Late Holocene Societies of the California Coast*, ed. M. Erlandson and Terry L. Jones. Perspectives in California Archaeology, Vol. 6. Los Angeles, CA: University of California, Los Angeles, Institute of Archaeology.

[55] Sutton, Mark Q. 2010. "The Del Rey Tradition and Its Place in the Prehistory of Southern California." *Pacific Coast Archaeological Society Quarterly*, *44*(2): 1–54.

[56] Glassow, Michael A., Lynn H. Gamble, Jennifer E. Perry, and Glenn S. Russell. 2007. "Prehistory of the Northern California Bight and the Adjacent Transverse Ranges." In *California Prehistory, Colonization, Culture, and Complexity*, ed. Terry L. Jones and Kathryn A. Klar. New York, NY: Altamira.

Late Holocene: Late Period (AD 750 to Spanish Contact)

The Late Period dates from approximately AD 750 until Spanish contact at AD 1542. Sutton[57] has divided this period, which falls within the larger Del Rey Tradition, into two phases: Angeles IV (AD 750–1200) and Angeles V (AD 1200–1550). The Angeles IV phase is characterized by the continued growth of regional populations and the development of large, sedentary villages. Although chiefdoms appear to have developed in the northern Channel Islands and Santa Barbara region after 850 BP,[58,59] little direct evidence has been found to suggest this level of social complexity existed in the San Fernando Valley during the late prehistoric period.[60]

Several new types of material culture appear during the Angeles IV phase including Cottonwood series points, birdstone and "spike" effigies, *Olivella* cupped beads, and *Mytilus* shell disk beads. The presence of Southwestern pottery, Patayan ceramic figurines, and Hohokam shell bracelets at Angeles IV sites suggests some interaction between groups in Southern California and the Southwest. Notable changes are seen in regional exchange networks after 800 BP with an increase in the number and size of steatite artifacts, including large vessels, elaborate effigies, and *comals*, recovered from Angeles V sites. The presence of these artifacts suggests a strengthening of trade ties between coastal Los Angeles populations and the southern Channel Islands.[61] Finally, Late Period mortuary practices remain largely unchanged from the Intermediate Period with flexed primary inhumations continuing to be the preferred burial method.

Late Period sites in Los Angeles County include CA-LAN-227 and CA-LAN-229, which are situated in the Santa Monica Mountains. Both sites contain less Millingstone artifacts than earlier sites, but more mortars, pestles, projectile points, drills, beads, pipes, and bone tools.[62] Although these sites represent a move toward centralized sedentary villages during this period, it is unclear whether they represent year-round occupation or semi-permanent villages used as base settlements.[63]

Regional Ethnography

Gabrielino

Prior to Spanish contact and the establishment of the Missions, local Native Americans associated themselves with a lineage or village rather than a collective tribal group. Native American

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[57] Sutton, Mark Q. 2010. "The Del Rey Tradition and Its Place in the Prehistory of Southern California." *Pacific Coast Archaeological Society Quarterly*, *44*(2): 1–54.

[58] Arnold, Jeanne E. 1992. "Complex Hunter-Gatherer-Fishers of Prehistoric California: Chiefs, Specialists, and Maritime Adaptations of the Channel Islands." *American Antiquity*, *57*(1): 60–84.

[59] Gamble, Lynn H. 2005. "Culture and Climate: Reconsidering the Effect of Palaeoclimatic Variability among Southern California Hunter-Gatherer Societies." *World Archaeology*, *37*(1): 92–108.

[60] Sutton, Mark Q. 2010. "The Del Rey Tradition and Its Place in the Prehistory of Southern California." *Pacific Coast Archaeological Society Quarterly*, *44*(2): 1–54.

[61] Koerper, Henry C., Roger D. Mason, and Mark L. Peterson. 2002. "Complexity, Demography, and Change in Late Holocene Orange County." In *Catalysts to Complexity: Late Holocene Societies of the California Coast*, ed. M. Erlandson and Terry L. Jones. Perspectives in California Archaeology, Vol. 6. Los Angeles, CA: University of California, Los Angeles, Institute of Archaeology.

[62] Moratto, M. 1984. *California Archaeology*. pp. 141. Academic Press, Inc. Orlando, Florida.

[63] Glassow, Michael A., Lynn H. Gamble, Jennifer E. Perry, and Glenn S. Russell. 2007. "Prehistory of the Northern California Bight and the Adjacent Transverse Ranges." In *California Prehistory, Colonization, Culture, and Complexity*, ed. Terry L. Jones and Kathryn A. Klar. New York, NY: Altamira.

territorial occupation of the San Fernando Valley is traditionally assigned to lineages that are now known by the mission term Gabrielino, or the ethnographic term Tongva; however, the Chumash and Tataviam territories are thought to have bordered the northwest and northern limits of the San Fernando Valley.[64,65,66] The Native American groups in the area became known as the Gabrielino and Fernandeño. The communities identify themselves today as Gabrieleno Kizh and Fernandeño Tataviam. For this study, a description of Gabrielino and Tataviam ethnography is provided.

At the time of European contact, the Native Americans, subsequently known as the Gabrielino Indians, occupied nearly the entire basin comprising the Counties of Los Angeles and Orange. They belonged to the Takic family of the Uto-Aztecan linguistic stock. Named after the Mission San Gabriel, the Gabrielino are considered to have been one of the two wealthiest and largest ethnic groups in aboriginal Southern California,[67] the other being the Chumash. This was largely due to the many natural resources within the land base they controlled, primarily the rich coastal section from Topanga Canyon to Aliso Creek and the offshore islands of San Clemente, San Nicholas, and Santa Catalina.

The ancestors of the Gabrielino arrived in the Los Angeles Basin around 500 BC and began to spread throughout the area, displacing a preexisting Hokan speaking population. The first Spanish contact with the local Native American villages took place in 1520, when Juan Rodriguez Cabrillo arrived in Santa Catalina Island. In 1602, the Spanish returned to Santa Catalina under Sebastián Vizcaíno, and in 1769, Gaspar de Portolá made the first attempt to colonize Gabrielino territory. By 1771, the Spanish had built four missions and the decimation of the local Native Americans had already begun.[68] European diseases and conflicts among the local villages, as well as conversion to Christianity, carried a toll in their numbers, traditions, and beliefs.

Although determining an accurate account of the population numbers is difficult, Bean and Smith[69] state that by AD 500, the local Native Americans established permanent settlements and their population continued to grow. Early Spanish accounts indicate that the local Native Americans lived in permanent villages with a population ranging from 50 to 200 individuals. The local Native American population surpassed 5,000 people by around 1770.

Several types of structures characterized the local Native American villages. They lived in domed circular structures covered with tule, fern, or carrizo. Communal structures measured over 60 feet in diameter and could house three or four families. Sweathouses, menstrual huts, and a ceremonial enclosure were also part of the village arrangements.[70]

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[64] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution.

[65] King, C., and T. Blackburn. 1978. "Tataviam." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 535.

[66] Grant, C. 1978. "Eastern Coastal Chumash." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 538.

[67] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 538.

[68] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 540–41

[69] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 540.

[70] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 542.

The local Native Americans practiced different subsistence strategies that included hunting, fishing, and gathering. Hunting activities on land were carried out with the use of bow and arrow, deadfalls, snares, and traps. Smoke and throwing clubs also were used to assist with the hunt of burrowing animals. Aquatic animals were hunted with harpoons, spear-throwers, and clubs. Although most fishing activities took place along rivers and from shore, open water fishing trips between mainland and the islands also took place using boats made from wood planks and asphaltum. The prehistoric fishing equipment included fishhooks made of shells, nets, basketry traps, and poison substances obtained from plants.[71]

The diet included a large number of animals, such as deer, rabbit, squirrel, snake, and rats, as well as a wide variety of insects. However, some meat taboos also existed. The meat of bears, rattlesnakes, stingrays, and ravens were not consumed; these animals were believed to be messengers of the god Chengiichngech. Aquatic animals such as fish, whales, seals, sea otters, and shellfish were also an important part of the diet, mainly among the coastal population.[72]

A variety of plant foods were consumed by the local Native Americans, the main one being acorns. These nuts are rich in nutrients and have a high content of fiber and fat. Other plants used for consumption include the seeds of the Islay (*Prunus ilicifolia*), which were ground into a meal, and the seeds and shoots of the Chía (*Salvia columbariae*), which were eaten raw, made into loaves, or mixed with water to make a beverage. Roots and bulbs were also part of the diet among the mainland and island groups, as well as clover, wild sunflower seeds, and cholla seeds. Wild tobacco was used for medicinal purposes and as a sedative and narcotic.[73]

The local Native American villages were involved in trade among themselves and with other regions. Coastal villages exchanged steatite, shell and shell beads, dried fish, sea otter pelts, and salt with inland groups for acorns, seeds, obsidian, and deerskins.[74] During the late prehistoric period, the principal trade item, both among the local villages and for export to other groups, was steatite. Also known as soapstone or soaprock, major outcroppings of steatite are found on Santa Catalina Island. Steatite was widely used among the local villages to make arrow straighteners and artistic or ritualistic objects. In addition, this rock was used in the making of functional objects for food preparation such as bowls, mortars, pestles, and comals.[75] Archaeological data indicate that a steatite "industry" developed prehistorically on the island that involved the large-scale trade of both raw materials and finished artifacts to mainland communities.[76]

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[71] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 546.

[72] McCawley, W. 1996. *The First Angelinos: The Gabrielino Indians of Los Angeles*. Banning, CA: Malki Museum Press., 116–117, 121, 126.

[73] McCawley, W. 1996. *The First Angelinos: The Gabrielino Indians of Los Angeles*. Banning, CA: Malki Museum Press., 128–131.

[74] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 547.

[61] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 547.

[76] Bean, L.J., and C.R. Smith. 1978. "Gabrielino." In *Handbook of North American Indians*, Vol. 8, ed. R.F. Heizer. Washington, DC: Smithsonian Institution, p. 547.

Tataviam

The existing ethnographic data on the Tataviam is limited and limited archaeological research has been directly linked to this group. Most of what is known about the Tataviam comes from the work of two anthropologists, John Harrington and Alfred Kroeber, and from data obtained from the San Fernando Mission's registers, as well as the limited archaeological record.[77] In addition, a recent synthesis of mission's registers has greatly expanded our understanding on Tataviam ethnography.[78]

Tataviam territory was bounded by the Chumash to the west, the Kitanemuk to the north, the Serrano to the east, and the Gabrielino to the south. Thus, their material culture, subsistence strategies, rock art representation, and religious practices resemble those of their neighbors, primarily the Gabrielino and Inland Chumash, as well as the Serrano and even the Kawaiisu, who were located to the north of the Kitanemuk.[79,80]

The Tataviam territory extended from the northwest to the southeast, and encompassed portions of the Antelope, San Fernando, and Santa Clarita Valleys. The center of their territory is assumed to have been the Santa Clarita Basin area (upper portion of the Santa Clara River), east of Piru Creek, just north of what is currently known as the Los Angeles Metropolitan area.[81] The northern portion of their territory probably included the foothills of Liebre Mountain and Sawmill Mountain, located at the southwestern edge of the Antelope Valley. The northeast boundary of Tataviam territory included the south-facing slopes of Sawmill Mountain and Sierra Pelona, extending southeast to Soledad Pass. The southeastern boundary is unclear but it is likely that the upper Soledad Canyon–Acton area was part of Tataviam territory, at least sometime during the Late Prehistoric period. The southern boundary included the high portions of the San Gabriel Mountains and continued to the west towards the Santa Susana Mountains. Piru Creek appears to be the westernmost boundary of the Tataviam territory.[82,83] Tataviam territory included portions of the Lake Hughes/Gorman/West of Lancaster, Castaic/Santa Clarita/Agua Dulce, and Acton initiative subareas.

Linguistically the Tataviam (also known as Alliklik)[84] are considered to be part of the Takic

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[77] King, Chester D., and Thomas C. Blackburn. 1978. "Tataviam." In *Handbook of North American Indians, Volume 8: California, ed*. William C. Sturtevant. Washington, DC: Smithsonian Institute, p. 535-537.

[78] King, Chester D. 2004. "*Ethnographic Overview of the Angeles National Forest Tataviam and San Gabriel Mountain Serrano Ethnohistory*." Prepared for: U.S. Department of Agriculture Southern California Province Angeles National Forest, Arcadia, CA.

[79] King, Chester D., and Thomas C. Blackburn. 1978. "Tataviam." In *Handbook of North American Indians, Volume 8: California, ed*. by William C. Sturtevant. Washington, DC: Smithsonian Institute, pp. 535-537.

[80] Heizer, R.F. (ed). 1978. "Key to Tribal Territories." In *Handbook of North American Indians, Volume 8: California, ed*. William C. Sturtevant. Washington, DC: Smithsonian Institute, p. ix.

[81] Johnson, John R. 1990. "Tataviam Geography and Ethnohistory." In J*ournal of California and Great Basin Anthropology*, 12(2): 191-214. Banning, CA: Malki Museum, Inc.

[82] King, Chester D., and Thomas C. Blackburn. 1978. "Tataviam." In *Handbook of North American Indians, Volume 8: California, ed*. William C. Sturtevant. Washington, DC: Smithsonian Institute, pp. 535-537.

[83] Johnson, John R. 1990. "Tataviam Geography and Ethnohistory." In *Journal of California and Great Basin Anthropology*, 12(2): 191-214. Banning, CA: Malki Museum, Inc.

[84] Kroeber, A. 1925. *Handbook of the Indians of California*. New York: Dover Publications, Inc., p. 995. (Used the term Alliklik, which was the name used by neighboring Chumash groups and roughly translates grunters or stammerers. The Kitanemuk used the term Tataviam or people facing the sun when referring to the inhabitants of the sunny upper Santa Clara River. The term Alliklik is considered to be derogatory, and therefore ceased to be used in literature around the mid-1970s.)

subfamily of the Uto Aztecan linguistic family, who moved inland towards the west and along the California coast. The time frame of the Takic expansion is not clearly defined, because migration of the population throughout the region took place at different times. Moratto indicates that Uto-Aztecan speakers migrated to California and that by the end of the Early period (circa 1500–1200 BC) Takic groups, such as the Tataviam, the Gabrielino, and the northern Serrano, already had firmly established territories.[85]

Ethnographic and archaeological information indicates that the Tataviam lived in villages of various sizes, with large centers occupied by about 200 people, widely separated from each other. Large villages were considered to be the major centers. Very small satellite communities of 10 to 15 people were located near the large centers, while mid-size settlements of 20 to 60 people were situated among the large villages. The total Tataviam population at the time of contact is assumed not to have exceeded 1,000 people.[86] The village located at Vasquez Rocks is known as the Agua Dulce Village. According to King et al.,[87] the Agua Dulce Village was larger than the surrounding villages and was probably an important economic and political center. Alliances with other villages were maintained through intermarriage and trade. It is estimated that the population of the Agua Dulce Village was possibly as low as 50 people during the early portion of the Middle period and approximately 200 to 300 people towards the end of the Middle period and throughout the Historic period (after AD 1200).[88]

Tataviam subsistence strategies were very similar to those of neighboring groups. A variety of plant foods was part of their diet, including the buds of the yucca plant (*Yucca whipplei*), a major staple, as well as coast live oak acorns (*Quercus agrifolia*), sage (*Salvia mellifera*), juniper berries (*Juniperus californica*), and berries of holly-leaf cherry (*Prunus ilicifolia*). Their diet was also supplemented with insects, small mammals, deer, and possibly pronghorn.[89] The Tataviam cooked the flower stalks of the plant in earth ovens lined with rocks. The final product was stored and consumed throughout the year. The flowers, seeds, and leaves at the base of the plant were also consumed. Archaeological evidence suggests that the Tataviam, as well as most native Southern Californians, traveled a long distance to collect acorns during certain times of the year. Ethnographic information indicates that acorn was primarily processed using bedrock mortars.

The Tataviam mortuary practices were influenced by their immediate neighbors, and archaeological evidence indicates that the Tataviam practiced both cremation and inhumation. Among the groups influencing the Tataviam were the Chumash; Coastal and inland Chumash were among the few that used inhumation exclusively.[90] The Gabrielino practiced both, inhumation and

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[85] Moratto, Michael J. [1984] 2004. *California Archaeology*. Salinas, CA: Coyote Press.

[86] King, Chester D., and Thomas C. Blackburn. 1978. "Tataviam.: In *Handbook of North American Indians, Volume 8: California, ed*. William C. Sturtevant. Washington, DC: Smithsonian Institute, pp. 535-537.

[87] King, Chester D., Charles Smith and Tom King. 1974. Archaeological Report Related to the Interpretation of Archaeological Resources Present at Vasquez Rocks County Park. Prepared for: County of Los Angeles Department of Parks and Recreation, p. 43.

[88] King, Chester D., Charles Smith and Tom King. 1974. Archaeological Report Related to the Interpretation of Archaeological Resources Present at Vasquez Rocks County Park. Prepared for: County of Los Angeles Department of Parks and Recreation, p. 33.

[89] King, Chester D., and Thomas C. Blackburn. 1978. "Tataviam." In *Handbook of North American Indians, Volume 8: California, ed*. William C. Sturtevant. Washington, DC: Smithsonian Institute, pp. 535-537.

[90] Kroeber, A.L. 1925. *Handbook of the Indians of California*. New York: Dover Publications, Inc., p. 556.

cremation,[91] until the establishment of the missions, when cremation was eliminated and inhumation alone became the norm. The Serrano cremated their deceased,[92] while the Kitanemuk preferred inhumation.[93] Based on his research of the Gabrielino, McCawley[94] mentions that inhumation (more common along coastal groups) may have been a result of cultural influence by the Chumash or a practice adopted because of a scarcity of fuel required for cremations.[95] With interment came the practice of grave goods, a practice favored by most of the tribes in California. Grave goods usually consisted of beads of various materials, knifes, projectile points, and exotic trade items among other objects. Ethnographic studies, as well as archaeological evidence regarding the presence or absence of grave goods, and their quality, has been an important archaeological tool to determine social hierarchy among individuals in specific social groups. Excavations at two burial sites in the Agua Dulce Village (CA-LAN-361 and CA-LAN-373) show social differentiation, which is reflected as the presence of exotic trade items in the graves, or complete lack of any grave goods.

Historic Context[96]

European Settlement and the Mission Period

The first Europeans to pass through the San Fernando Valley were a group of Spanish explorers on their way to Monterey Bay from San Diego. Under the leadership of Gaspar de Portolá, the exploration party crossed the Santa Monica Mountains and entered the San Fernando Valley on August 5, 1769. After camping in the present day community of Encino, the group headed north traversing the Santa Clarita Valley on their way to Santa Barbara.

In August of 1795, an exploration party set out to identify a site for a new mission, to be located between the San Gabriel Mission and the San Buenaventura Mission. The requirements included that the land be viable for crops, be near a source of abundant water, and have an indigenous population that could be converted to Catholicism. With these objectives met, a site for the new mission was decided upon in the upper half of the Los Encinos Valle, as the San Fernando Valley was then called. The spot for the new mission was located within the property boundary of the Reyes Rancho, which was owned by Francisco Reyes, the *alcalde* (mayor) of the Pueblo de Los Angeles. Reyes had prospered as a result of his land holdings and the Reyes Rancho consisted of a large family home; livestock; crops such as corn, beans, and melon; and numerous Native American ranch hands. At the request of the church, Reyes relinquished an enormous portion of his ranch to be utilized for the new Mission San Fernando Rey de Espana (San Fernando Mission).

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[91] McCawley, William. 1996. *The First Angelinos: The Gabrielino Indians of Los Angeles*. Banning, CA: Malki Museum Press, p. 157.

[92] Bean, Lowell J., and Charles R. Smith. 1978. "Serrano." In *Handbook of North American Indians, Volume 8: California, ed.* William C. Sturtevant. Washington, DC: Smithsonian Institute, pp. 570-574.

[93] Blackburn, Thomas C., and Lowell J. Bean. 1978. "Kitanemuk." In *Handbook of North American Indians, Volume 8: California, ed.* William C. Sturtevant. Washington, DC: Smithsonian Institute, pp. 564-569.

[94] McCawley, William. 1996. *The First Angelinos: The Gabrielino Indians of Los Angeles.* Banning, CA: Malki Museum Press.

[95] McCawley, William. 1996. *The First Angelinos: The Gabrielino Indians of Los Angeles*. Banning, CA: Malki Museum Press, p. 157.

[96] This section is drawn from Robinson, W. 1961. *The Story of the San Fernando Valley*. Los Angeles, CA: Title Insurance and Trust Company.

The San Fernando Mission was established on September 8, 1797 and was the seventeenth mission founded by the Catholic Church in California. Father Fermin Francisco Lausen was appointed in charge of the mission. The name given to the mission honored King Ferdinand III of Spain (1217-1251). In order to assist in the establishment of the San Fernando Mission, several other California missions sent nearly 1,000 animals that included cattle, horses, mules, and sheep. Crops were planted and the people of the traditional lineages and villages associated with the project boundary were forcefully recruited to local missions. The Native Americans that were recruited to Mission San Fernando became collectively known as Fernandeño, while those to Mission San Gabriel became known as Gabrielino. While living at the mission, they were under the direction of the priests who required the Native Americans to farm (wheat, barley, corn, beans, peas, and fruit trees); raise cattle; cure hides; tend vineyards; make wine; and practice a trade, such as carpentry, masonry, tailoring or shoemaking. the Native Americans became associated with their respective missions upon European arrival.

The Mexican Period

In 1822, when Mexico declared its independence from Spain, initially little changed for the missions. At that time there were approximately 1,000 Native Americans living and working at the San Fernando Mission. However, in 1834, the Mexican government secularized the California Missions, which resulted in the San Fernando Mission being turned over to Don Pedro Lopez, who acted as mission *majordomo* (governor of the mission). Under the Secularization Act of 1834, the Native Americans were to retain Mission land under government trust and protection, and had the right to organize electoral village governments. Had the Secularization Plan been effective, and protected in the American period under the 1848 Treaty of Guadalupe Hidalgo, which was established to protect the natives' rights to land, self-government, and citizenship, then it would have supported the placement of land into trust for the Fernandeños. The governor Manuel Micheltorena (1842-1845) tried to support the missions while granting land and liberty to natives at Mission San Fernando and other missions. On May of 1843, Micheltorena granted a square league of land to 41 Fernandeño native petitioners. Of these 41 petitioners were members of lineages/villages originating in the San Fernando, Simi, and Santa Clarita valleys. They received local land grants such as Rancho Tujunga, Rancho Encino, Rancho Cahuenga, and Rancho El Escorpion. Between 1840 and 1846, six separate land grants were carved out of the former Rancho Misión San Fernando Rey de España. Eulogio de Célis was the first to acquire the entire 116,858-acre ranch for an estimated $14,000. Further encroachments on mission lands in the valley included Tujunga (1840), El Escorpión (1845), El Encino (1845), La Providencia (1845), and Cahuenga (1846). In 1846, California governor Pio Pico authorized the sale of remaining mission land to raise money to defend Mexican California from an inevitable American takeover. Rancho El Escorpion was maintained by three Chumash individuals, Odón Chijulla, Urbano, and Mañuel. Odon's daughter, Espritu, maintained the land and fought to protect it for years from both Anglo-settler encroachment and her husband.

The American Period

After the American conquest of Mexican California in 1847, Pio Pico's brother, Andres Pico, still retained a portion of the Rancho Ex-Mission San Fernando, which included the former Mission buildings that he used as his home. This land was eventually given to Pio Pico, who in 1869 sold the land to the San Fernando Farm Homestead Association. Much of the land from this sale came under the control of two men: Isaac Lankershim and Isaac Newton Van Nuys. Together, the two men initially used the land for ranching, but after a drought killed off much of their livestock they switched to farming wheat. By 1874, San Fernando was recognized by the county as a town, bringing in plans for railroad development, improved roads and infrastructure, and more residents. During the 1880s, many of the original Mexican land grants had been subdivided into agricultural tracts that were used primarily for raising citrus, nuts, beans, wheat, and vegetables.

The 20th century brought the San Fernando Valley the critical resource it was lacking, an abundant and reliable source of water for agriculture. The Los Angeles Aqueduct was completed in 1913 and soon after San Fernando Valley was annexed by the City of Los Angeles. Between the 1910s and 1920s, much of the land in the valley was used for field crops and orchard agriculture. Most of the groves were situated on relatively frost-free land, were owner operated, and consisted of tracts of 10 to 15 acres. Major industrial activity in the San Fernando Valley apart from agricultural processing grew to include the fledgling aerospace industry. The entertainment industry set up studios in the San Fernando Valley and used the rugged landscape of the Simi Hills on the northern edge of the valley to film many early western films and television series.

During the 1930s, the population of the San Fernando Valley grew due to the increased use of automobiles, which required the construction of roads and highways. After World War II, the population increased even more dramatically with tract home development to accommodate returning war veterans, which led to many orchards being replaced by the suburban sprawl that today dominates much of the San Fernando Valley.

Fernandeño-associated Native Americans maintained a voluntary coalition of lineages after european arrival until present-day. Today, the community is known as the Fernandeño Tataviam Band of Mission Indians.

Characterization

Previous Archaeological Surveys in the Trails Master Plan Study Area

The results of the literature reviews indicate that 82 archaeological studies (survey, excavation, and monitoring) have been conducted within the Trails Master Plan Study Area (Table 5.1.1-2, *Previous Surveys within the Trails Master Plan Study Area*); of these, 57 have been completed within the cultural resource study area of the Trails Master Plan Study Area. As a result of the previous surveys conducted, approximately 40 percent of the Trails Master Plan Study Area and currently mapped trail system have been previously investigated for the presence of cultural resources.

Previously Recorded Archaeological Resources

The results of the records searches determined that 41 prehistoric archaeological sites, 16 historic archaeological sites, one multi-component site, three prehistoric isolates, and eight historic isolates are located within the Trails Master Plan Study Area and a 0.5-mile buffer (Appendix C: Confidential Map of Previously Recorded Cultural Resources). The majority of resources are unevaluated. Four resources (P-19-000253, P-19-000254, P-19-000292, and P-19-000823) within the 0.5-mile buffer were determined to be significant. One resource (P-19-003989) within the project area is eligible for listing on the NRHP. Eight resources (P-19-000244, P-19-000832, P-19-001538, P-19-001539, P-19-001540, P-19-001607, P-19-001696, and P-19-002240) within the project area are potentially significant. Descriptions of these resources are provided in Table 5.1.1-3, *Previously Recorded Archaeological Resources*.

TABLE 5.1.1-2
PREVIOUS SURVEYS WITHIN THE TRAILS MASTER PLAN STUDY AREA

Report No.	Year	Report Title	Authors	Location
LA-00023	1974	Archaeological Reconnaissance of Tentative Tract # 31399, A Residential Development Near Newhall California	Nelson, Leonard, III, University of California Los Angeles Archaeological Survey	Within project area
LA-00058	1974	An Archaeological Reconnaissance of Union Gardett 1-20	Nelson, Leonard, N., III	Within project area
LA-00059	1974	An Evaluation of the Archaeological Resources of the Oat Mountain Vicinity	Nelson, Leonard, N., III	Within project area
LA-00081	1975	Evaluation of the Archaeological Resources for the Area wide Facilities Plan for the Las Virgenes Municipal District, (Malibu Coast, Western Santa Monica Mountains, Southern Simi Hills), Los Angeles and Ventura Counties	Rosen, Martin D., University of California, Los Angeles Archaeological Survey	Within 0.5-mile buffer
LA-00103	1975	Archaeological Resource Survey of Portions of the South Fork, Santa Clara River, Los Angeles County, California	Singer, Clay A., U.S. Army Corps of Engineers, Los Angeles District Office	Within project area
LA-00113	1974	Assessment of the Impact on Archaeological Resources of Proposed Drilling on Well Location and Rig Site Orcutt-trust No. 1	D'Altory, Trence, N., Terence D'Altory, Consulting Archaeologist	Within 0.5-mile buffer
LA-00267	1981	Cultural Resources Management Plan for Tentative Tract No. 34494	John M. Foster, Greenwood and Associates	Within project area
LA-00306	1978	Report of the Potential Negative Impact on Archaeological Resources of the Proposed Development of Tentative Tract No. 34494, North of Chatsworth California	D'Altroy, Terence N., Archaeological Consultant	Within project area
LA-00468	1978	Archaeological Survey Report: a 17+/- Acre Parcel of Property Located Between the Simi Valley Freeway and Topanga Canyon Boulevard in Chatsworth, California	Murray, John R., Archaeological Consultant	Within 0.5-mile buffer
LA-00510	1979	Preliminary Archaeological Overview: a 3,000+/- Acre Parcel Bordering Portrero Canyon New Newhall, California	Van Horn, David, M., Ultrasystems, Inc.	Within project area
LA-00590	1980	Field Survey and Cultural Resource Assessment for Tentative Tract No. 33622, a 70 Acre Parcel in Chatsworth, Los Angeles County, California	McIntyre, Michael J., Northridge Archaeological Research Center	Within 0.5-mile buffer
LA-00762	1979	Assessment of the Historic Resources Present Within Tentative Tract Number 34494, Chatsworth, California	D'Altroy, Terence N., Northridge Archaeological Research Center	Within project area
LA-00776	1980	Cultural Resources Reconnaissance and Assessment of a Pipeline No. 1192, Chatsworth, Los Angeles County, California	McIntyre, Michael, J., Northridge Archaeological Center, CSUN	Within project area
LA-00807	1980	Archaeological Assessment of Tentative Tract 39482, North of Chatsworth, California	Rosen Martin D., University of California, Los Angeles Archaeological Survey	Within project area
LA-00817	1978	Report of the Field Operations Conducted to Assess the Cultural Resources Located on Tentative Tract No. 33622	Toren, George A., and Tartaglia, Louis, Northridge Archaeological Research Center	Within project area
LA-00842	1977	Archaeological Survey and Cultural Resource Assessment for a Portion of Towsley Canyon, Near Newhall, Los Angeles County, California	Singer, Clay, A., J.I. Planning	Within project area
LA-00878	1977	Assessment of the Impact Upon Cultural Resources by the Development of Lots 9 and 14 of the Porter Ranch in Granada Hills, California	Tartagila, Louis, J., Porter Ranch Development Company	Within project area
LA-00883	1980	Cultural Resource Reconnaissance of the Cadillac-Fairview Property in Chatsworth, California	Greenwood, Roberta S., Greenwood and Associates	Within project area
LA-00986	1981	Archaeological Investigations at Sites LAN-870 and LAN-963, Tentative Tract Number 34622, Chatsworth, California	McIntyre, Michael J., Northridge Archaeological Research Center	Within 0.5-mile buffer
LA-01031	1981	Cultural Resource Survey and Impact Assessment for the Bowers Property in Browns Canyon, Los Angeles County, California	Singer, Clay A., Warden and Associates	Within project area
LA-01038	1977	Assessment of Archaeological Impact of Tentative Tract No. 33622	Toren, George A., Northridge Archaeological Research Center	Within project area
LA-01062	1981	Archaeological Survey of the Sylmar Development Project Site, Los Angeles County, California	Schilz, Alan J., Boyle Engineering	Within project area
LA-01133	1981	An Archaeological Resources Assessment Conducted for a 330 Acre Parcel in the Chatsworth Area of Los Angeles, Formerly known as the Bradeis Ranch	Cottrell, Maria G., Archaeological Resource Management Corp., Garden Grove, CA	Within 0.5-mile buffer
LA-01138	1982	An Archaeological Resources Survey and Impact Assessment of a Portion of Lots 16 and 18 of Addition San Jose Gladstone Ave. San Dimas, Los Angeles County, Ca.	Dillon, Brian, D.	Within project area
LA-01496	1985	An Archaeological Investigation of LAN-870, a Rockshelter in Northwestern San Fernando Valley, Los Angeles County, California	Wlodarski, Robert J., Tartaglia, Louis, Archaeological Consulting	Within 0.5-mile buffer
LA-01583	1986	Archaeological Evaluation of Tentative Tract No. 44327 (sites LAN-761, 762, 1113) Indian Falls Estates, Chatsworth, Los Angeles County, CA	Love, Bruce	Within 0.5-mile buffer
LA-01584	1986	Archaeological Investigations at Tentative Tract 42353, Indian Falls Estates, Los Angeles County, CA (sites LAN-809, 810, 814, 879)	Love, Bruce	Within project area
LA-01677	1987	Cultural Resources Evaluation and Mitigation Alternatives for Archaeological Site CA-LAN-209	Parker, John, John Parker Archaeological Specialist	Within project area
LA-01730	1978	Archaeological Report Status of LAN-816 in Sunshine Canyon	Clewlow, William, C. Jr., University of California, Los Angeles Archaeological Survey	Within project area

TABLE 5.1.1-2
PREVIOUS SURVEYS WITHIN THE TRAILS MASTER PLAN STUDY AREA

Report No.	Year	Report Title	Authors	Location
LA-01771	1989	Draft Environmental Impact Report Porter Ranch Land Use/transportation Specific Plan	Author: Anonymous, City of Los Angeles	Within project area
LA-01734	1988	Archaeological, Historical, and Paleontological Assessment Tt 35714 and Tt 44362, California West Development, Chatsworth, California	Whitney-Desautels, Nancy A., Scientific Resource Surveys, Inc.	Within 0.5-mile buffer
LA-01778	1989	Report of Archaeological Reconnaissance Survey Of: Tentative Tract No. 47329 Simi Hills Los Angeles County, California	Salis, Roy A., Northridge Center for Public Archaeology	Within project area
LA-01779	1989	Report of Archaeological Reconnaissance Survey Of: Tentative Tract No. 45016 Simi Hills Los Angeles County, California	Salis, Roy A., Northridge Center for Public Archaeology	Within project area
LA-01913	1981	Cultural Resources Investigations Re: Castaic Clay Manufacturing Company	Robinson, R.W., Andel Engineering Company	Within 0.5-mile buffer
LA-01978	1990	Report of Archaeological Reconnaissance Survey of Santa Clarita-newhall Carrier Annex Environmental Assessment, Esa Project Number 9094c, Newhall, California	Sails, Roy A., Environmental Science Associates	Within project area
LA-02034	1980	Cultural Resources of the Devil Canyon Project Area, 44 Arcsine Chatsworth, Los Angeles County, California	Bissell, Ronald M., Becker, Kenneth, RMW Paleo Associates, Inc.	Within project area
LA-02204	1990	Cultural Resources Reconnaissance of the Continental Community Project Area 55 Acres in Chatsworth, Los Angeles County, California	Evans, Stuart, A., Bissell Kenneth, RMW Paleo Associates, Inc.	Within project area
LA-02230	1990	Cultural Resource Survey for the Proposed Residential Development of Tentative Tract No. 49567 Located in Los Angeles County, California	Romani, John F., Greenwood and Associates	Within 0.5-mile buffer
LA-02305	1990	Cultural and Paleontological Resources in the Santa Susana and Santa Monica Mountains, Los Angeles County, California	Moratto, Michael, J.	Within project area
LA-02365	1990	Cultural and Paleontological Resources Assessment of the Edwards Cinema Plaza of La Verne, Los Angeles County, California	Desautels, Jacqueline, Scientific Resources Surveys, Inc.	Within project area
LA-02366	1976	Draft Master Environmental Impact Report	Wessel, Richard, L., Northridge Archaeological Research Center, CSUN	Within project area
LA-02427	1990	Archaeological Survey Report: a Surface Mining Project on the Stevenson Television Ranch Near Newhall, Los Angeles County	Van Horn, David, M., Archaeological Associates, Ltd.	Within project area
LA-02608	1991	An Archaeological Assessment of a 25+/- Acre Portion of the Bfi Waste Management Facility Located at 14747 San Fernando Road in Sylmar, Los Angeles County	White, Laura, S., Archaeological Associates, Ltd.	Within 0.5-mile buffer
LA-02848	1992	Cultural Resources Assessment of the Proposed Newhall Alignment, Ventura and Los Angeles Counties	Peak and Associates, Inc.	Within project area
LA-02950	1992	Consolidated Report: Cultural Resources Studies for the Proposed Pacific Pipeline Project	Peak & Associates, Inc.	Within project area
LA-03000	1993	Phase I Archaeological Survey and Cultural Resources Assessment of the 225 Acres Alternative Site 2 Study Area, Santa Clarita, Los Angeles County, California.	Simon, Joseph, M., Whitley, David, S., W & S Consultants	Within project area
LA-03082	1994	Archaeological Reconnaissance of Proposed Communication Site on Oat Mountain Los Angeles County, California	King, Chester, Topanga Anthropological Consultants	Within project area
LA-03282	1995	Archaeological Reconnaissance at 28870 Grayfox Street, Malibu, California	King, Chester, Topanga Anthropological Consultants	Within 0.5-mile buffer
LA-03301	1989	Archaeological Assessment Santa Susana Pass Road Realignment California West Development Chatsworth, California	Scientific Resource Surveys, Inc.	Within 0.5-mile buffer
LA-03397	1994	Intensive Phase I Archaeological Survey of the West Ranch Project Area, Los Angeles County, California	Whitley, David, S., Simon, Joseph, M., W & S Consultants	Within project area
LA-03622	1996	Archaeological Reconnaissance at the Dahl Property, Chatsworth Los Angeles County, California	King, Chester, Topanga Anthropological Consultants	Within project area
LA-03782	1997	Cultural Resources Reconnaissance of a 70 Acre Parcel for the Church at Rocky Peak, Los Angeles County, California	Maxon, Patrick O., RMW Paleo Associates, Inc.	Within 0.5-mile buffer
LA-03962	1996	Archaeological Reconnaissance of a Communications Site at 22601 Santa Susana Pass Road, Chatsworth, Los Angeles County, Ca	King, Chester, Topanga Anthropological Consultants	Within 0.5-mile buffer
LA-04828	1995	Cultural Resources Investigation Report of Two Loci (sc-3 and sc-9) in the Sunshine Canyon Landfill Extension Project Jma Project No. Bfi-94-164 Area	Stickel, Gary, E., John Minch & Associates, Inc.	Within project area
LA-04829	1997	An Archaeological Site (sc-16) Investigation Report in the Sunshine Canyon Landfill Extension Project Area Jma Project #Bfi94-164	Stickel, Gary, E., John Minch & Associates, Inc.	Within 0.5-mile buffer
LA-04830	1997	Cultural Resources Investigation Report of One loci (sc-10) Investigation Report in the Sunshine Canyon Landfill Extension Project Area Jma Project #Bfi94-164	Stickel, Gary, E., John Minch & Associates, Inc.	Within 0.5-mile buffer
LA-05145	1997	Cultural Resources Investigation Report of Five Loci (sc-12) Investigation Report in the Sunshine Canyon Landfill Extension Project Area Jma Project #Bfi94-164	Stickel, Gary, E., John Minch & Associates, Inc.	Within 0.5-mile buffer
LA-05148	1995	A Preliminary Investigation of an Off-site Ridgecrest Archaeological Site (sc-1) for the Sunshine Canyon Landfill Extension Project Area	Stickel, Gary, E., John Minch & Associates, Inc.	Within 0.5-mile buffer
LA-05533	2000	Negative Archaeological Report: Rock-Lined Section and the Addition of an Access to Paved Section of Drainage Channel Near Interstate 5 in Santa Clarita	Smith, Philomene, C., Caltrans District 7	Within project area

TABLE 5.1.1-2
PREVIOUS SURVEYS WITHIN THE TRAILS MASTER PLAN STUDY AREA

Report No.	Year	Report Title	Authors	Location
LA-05642	2001	A Phase I Cultural Resources Investigation of a Portion of Tentative Tract Map 44327 (the Indian Springs Development) in the Santa Susana / Chatsworth Area of Los Angeles County, California	McKenna, Jeanette A. and Ahab Afifi, McKenna et al.	Within 0.5-mile buffer
LA-05855	2001	Phase 1 Archaeological Survey of the 558 Acres Old Road Study Area, Los Angeles County, California	Anonymous, Dan Palmer	Within project area
LA-05856	2000	Phase I Archaeological Survey of the Chatsworth Ridge Estates Study Area, Los Angeles County, California	W & S Consultants	Within project area
LA-06900	2003	An Archaeological Monitoring Program-the Indian Springs Project Area in Chatsworth Los Angeles County, California	McKenna, Jeanette A., McKenna et al.	Within 0.5-mile buffer
LA-09063	2003	Negative Archaeological Survey Report: Church of the Nazarene (c.u.p. No 03-090) the Old Road, Santa Clarita, Los Angeles County	Schmidt, June, A., Compass Rose Archaeological, Inc.	Within project area
LA-09065	2006	Dwo 6135-7981, Ai No. 5-7941: Iverson 2.4 Kv Idle Facility Removal, Chatsworth Area, Los Angeles County	Schmidt, James J., Compass Rose Archaeological, Inc.	Within project area
LA-09066	2004	Phase I Cultural Resources Assessment for Lyons Canyon Ranch Specific Plan, Tentative Tract Map 53653, Santa Clarita, Los Angeles County, California	Shepard, Richard, S., Bon Terra Consulting	Within project area
LA-09069	1995	Cultural Resources Investigation Report for Four Loci (sc-4, Sc-5, Sc-7. Sc-8) in the Sunshine Canyon Landfill Extension Project Area	Stickel, Gary, E., John Minch & Associates, Inc.	Within 0.5-mile buffer
LA-09073	1997	A Cultural Resources Investigation of Site Locus Sc-18 Located Within the City of Los Angeles Phase Area of the Sunshine Canyon Landfill Extension Project	Stickel, Gary, E., Archaeological/Cultural Resources Management	Within 0.5-mile buffer
LA-09135	2008	Archaeological Assessment of the Pico Canyon Project, Los Angeles County, California	Glover, Amy, Gust, Sherri, Cogstone Resources Management, Inc.	Within project area
LA-09390	2005	Completion of Cultural Resource Monitoring ProgramRe: Dwo 6335-6783, Ai No. 6-6746: Big Rock 16 kV: Deer Lake Pole Relocation Project, Chatsworth Area, Los Angeles County	Schmidt, James J., Compass Rose Archaeological, Inc.	Within project area
LA-09447	2008	Oaktree Gun Club: LA-2081B	Billat, Lorna, Earth Touch, Inc.	Within 0.5-mile buffer
LA-09990	2009	Sayre Fire: Emergency Fire Damaged Pole Replacement, Gavin 16Kv Distribution Circuit, Los Angeles County, CA.	Schmidt, James, Compass Rose	Within project area
LA-10128	2002 2006	Completion of Cultural Resource Monitoring ProgramDwo 6135-7981, Ai No. 5-7941: Iverson 2.4 Kv Idle Facility Removal, Chatsworth Area, Los Angeles County Completion of Cultural Resource Monitoring ProgramRe: Dwo 6335-6783, Ai No. 6-6746: Big Rock 16 kV: Deer Lake Pole Relocation Project, Chatsworth Area, Los Angeles County	McKenna, Jeanette A., McKenna et al.	Within 0.5-mile buffer
LA-10183	2000	A Phase I Archaeological Reconnaissance Survey of a 13.27 Acre Parcel located in Chatsworth, Los Angeles County, CA	Boxt, Matthew A., Ph.D	Within project area
LA-10359	2009	Draft Program EIR for the County of Los Angeles Proposed Santa Clarita Valley Area Plan	Tebo, Susan, Charles, Judy, Decruyendere, Joe, Austin, Mark, Impact Sciences, Inc.	Within project area
LA-10458	2009	Sayre Fire: Emergency Fire Damage Pole Replacement, Gavin 16Kv Distribution Circuit, Los Angeles County, CA.	Schmidt, James, RSO Consulting	Within project area
LA-10510	2005	A Phase I Cultural Resources Investigation of Aidlin Wickham Tract No. 52796, Approximately 230 Acres in the Pico Canyon Area of Los Angeles County, California	McKenna, Jeanette, A., McKenna et al.	Within project area
LA-10577	2009	(See VN2872) TEA-21 Rural Roadside Inventory: Native American Consultation and Ethnographic Study for Caltrans District 7, Ventura County	Fortier, Jana	Within project area
LA-10578	2009	TEA-21 Rural Roadside Inventory: Native American Consultation and Ethnographic Study for Caltrans District 7, Ventura County	Fortier, Jana	Within project area
LA-10613	2001	Negative Archaeological Survey Report-State Route 118 from New Los Angeles Avenue to Iverson Road	Sylvia, Barbara, Caltrans District 7	Within project area
LA-10792	2010	Revised Draft Program EIR for the County of Los Angeles's Proposed Santa Clarita Valley Area Plan Vol. I	Impact Sciences, Inc.	Within project area
LA-11113	2011	County of Los Angeles's Proposed Santa Clarita Valley Area Plan, Final Program Environmental Impact Report Volumes I through III	Impact Sciences, Inc.	Within project area
LA-12065	2012	Chatsworth Past and Present	Vincent, Ray, Vincent, Ann, Chatsworth Historical Society	Within project area

TABLE 5.1.1-3
PREVIOUSLY RECORDED ARCHAEOLOGICAL RESOURCES

Primary Number	Trinomial	Time Period		Description	Location	NRHP Status
		Prehistoric	Historic			
P-19-000148	CA-LAN-148	x		Prehistoric shell scatter and midden	Within 0.5-mile buffer	Not Evaluated
P-19-000149	CA-LAN-149	x		Prehistoric shell scatter and midden	Within 0.5-mile buffer	Not Evaluated
P-19-000209	CA-LAN-209	x		Seasonal gathering site	Within Phase I project area	Not Evaluated
P-19-000244	CA-LAN-244	x		Prehistoric rock shelter with bedrock milling feature	Within Phase II.b project area	Not Evaluated
P-19-000247	CA-LAN-247		x	Historic kilns	Within 0.5-mile buffer	Not Evaluated
P-19-000249	CA-LAN-249	x		Prehistoric lithic scatter and bedrock mortar	Within 0.5-mile buffer	Not Evaluated
P-19-000250	CA-LAN-250	x		Prehistoric lithic scatter, shell beads and bedrock milling features	Within Phase II.b project area	Not Evaluated
P-19-000251	CA-LAN-251	x		Prehistoric lithic scatter and bedrock mortar	Within 0.5-mile buffer	Not Evaluated
P-19-000252	CA-LAN-252	x		Prehistoric lithic scatter and bedrock milling features	Within Phase II.b project area	Not Evaluated
P-19-000253	CA-LAN-253	x		Prehistoric rock shelters and lithic scatter	Within 0.5-mile buffer	Eligible
P-19-000254	CA-LAN-254	x		Prehistoric habitation with burials	Within 0.5-mile buffer	Eligible
P-19-000292	CA-LAN-292	x		Prehistoric habitation with burials	Within 0.5-mile buffer	Eligible
P-19-000293	CA-LAN-293	x		Prehistoric habitation	Within 0.5-mile buffer	Not Evaluated
P-19-000502	CA-LAN-502	x		Prehistoric lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-000503	CA-LAN-503	x		Prehistoric lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-000504	CA-LAN-504	x		Prehistoric lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-000647	CA-LAN-647H		x	Historic structure foundation	Within Phase II.b project area	Not Evaluated
P-19-000648	CA-LAN-648H		x	Historic structure remains	Within Phase II.b project area	Not Evaluated
P-19-000651	CA-LAN-651H		x	Historic structural remains kiln	Within 0.5-mile buffer	Not Evaluated
P-19-000652	CA-LAN-652	x		Bedrock mortar	Within 0.5-mile buffer	Not Evaluated
P-19-000653	CA-LAN-653	x		Prehistoric midden	Within 0.5-mile buffer	Not Evaluated
P-19-000692	CA-LAN-0692	x		Lithic scatter	Within Phase I project area	Not Evaluated
P-19-000783	CA-LAN-0783		x	Historic kiln structures	Within 0.5-mile buffer	Not Evaluated
P-19-000784	CA-LAN-0784	x		Prehistoric rock shelter	Within 0.5-mile buffer	Not Evaluated
P-19-000798H	CA-LAN-798H		x	Historic adobe structure	Within Phase II.b project area	Not Evaluated
P-19-000802	CA-LAN-802	x		Prehistoric lithic scatter	Within Phase I project area	Not Evaluated
P-19-000823	CA-LAN-823	x	x	Late prehistoric/early historic Native American village with burials	Within 0.5-mile buffer	Eligible
P-19-000811	CA-LAN-0811	x		Lithic scatter	Within Phase I project area	Not Evaluated
P-19-000832	CA-LAN-832	x		Prehistoric rockshelter and lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-000880	CA-LAN-0880	x		Grinding station, quarry and lithic workshop	Within Phase I project area	Not Evaluated
P-19-000962	CA-LAN-962		x	Historic Spanish building debris	Within 0.5-mile buffer	Not Evaluated
P-19-001020	CA-LAN-1020	x		Prehistoric lithic and shell scatter	Within 0.5-mile buffer	Not Evaluated
P-19-001536	CA-LAN-1536	x		Prehistoric midden with lithics	Within Phase II.b project area	Not Evaluated
P-19-001537	CA-LAN-1537	x		Prehistoric lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-001538	CA-LAN-1538	x		Prehistoric rockshelter and lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-001539	CA-LAN-1539	x		Prehistoric rockshelter and midden	Within Phase II.b project area	Not Evaluated
P-19-001540	CA-LAN-1540	x		Prehistoric rockshelter and midden with possible rockart	Within Phase II.b project area	Not Evaluated
P-19-001541	CA-LAN-1541	x		Prehistoric lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-001592	CA-LAN-1542H		x	Historic refuse scatter	Within Phase I project area	Not Evaluated
P-19-001593H	CA-LAN-1543H		x	Historic oil drilling and refuse scatter	Within Phase I project area	Not Evaluated
P-19-001606	CA-LAN-1606	x		Prehistoric rockshelter	Within Phase II.b project area	Not Evaluated
P-19-001607	CA-LAN-1607	x		Prehistoric rockshelter and lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-001608H	CA-LAN-1608		x	Rock walls and historic trash scatter	Within 0.5-mile buffer	Not Evaluated
P-19-001696	CA-LAN-1696	x		Prehistoric rockshelter and lithic scatter	Within Phase II.b project area	Not Evaluated
P-19-001740	CA-LAN-1740H		x	Roads/trails/railroad grade	Within Phase I project area	Not Evaluated

TABLE 5.1.1-3
PREVIOUSLY RECORDED ARCHAEOLOGICAL RESOURCES

Primary Number	Trinomial	Time Period		Description	Location	NRHP Status
		Prehistoric	Historic			
P-19-001744	CA-LAN-1744	x		Lithic scatter	Within Phase I project area	Not Evaluated
P-19-001798	CA-LAN-1798	x		Lithic scatter	Within 0.5-mile buffer	Not Evaluated
P-19-001799	CA-LAN-1799		x	Structural remains	Within 0.5-mile buffer	Not Evaluated
P-19-002240	CA-LAN-2240	x		Prehistoric rockshelter and lithic scatter	Within Phase II.a project area	Not Evaluated
P-19-002369	CA-LAN-2369	x		Lithic scatter	Within 0.5-mile buffer	Not Evaluated
P-19-002370	CA-LAN-2370	x		Lithic scatter	Within 0.5-mile buffer	Not Evaluated
P-19-002529	CA-LAN-2529	x		Lithic scatter	Within 0.5-mile buffer	Not Evaluated
P-19-002577	CA-LAN-2577		x	Adobe structural remains	Within 0.5-mile buffer	Not Evaluated
P-19-002826	CA-LAN-2826	x		Quarry and lithic workshop	Within Phase I project area	Not Evaluated
P-19-003292	CA-LAN-3292H		x	Historic oil drilling site	Within 0.5-mile buffer	Not Evaluated
P-19-003793	CA-LAN-3793H		x	Three foundations with historic refuse scatter	Within Phase I project area	Not Evaluated
P-19-003989	CA-LAN-3989	x		Pictographs, rock shelter/cave	Within Phase I project area	Eligible
P-19-004424			x	Historic foundation and reservoir	Within 0.5-mile buffer	Not Evaluated
P-19-100136	CA-LAN-100136	x		Isolated lithic core	Within 0.5-mile buffer	Not eligible
P-19-100137		x		Isolated prehistoric lithic	Within Phase II.b project area	Not eligible
P-19-100356			x	Isolated historic structural remains	Within Phase I project area	Not eligible
P-19-100357			x	Isolated historic oil tank	Within Phase I project area	Not eligible
P-19-100358			x	Isolated historic well	Within Phase I project area	Not eligible
P-19-101199			x	Isolated historic well	Within Phase I project area	Not eligible
P-19-101200			x	Isolated historic concrete foundation	Within Phase I project area	Not eligible
P-19-101350		x		Isolated prehistoric lithic	Within Phase I project area	Not eligible
P-19-101351			x	Isolated historic glass bottle neck	Within Phase I project area	Not eligible
P-19-186538			x	Isolated historic plaque for California's first commercial oil well	Within Phase I project area	Not eligible
P-19-186573			x	Chatsworth Calera site	Within 0.5-mile buffer	Not eligible

5.1.2 Previously Recorded Historical Resources

The results of the records search indicate 11 historic buildings and/or structures have been recorded within the Trails Master Plan Study Area and a 0.5-mile buffer. Descriptions of these resources are provided in Table 5.1.2-1, *Previously Recorded Historic Buildings and Structures*.

TABLE 5.1.2-1
PREVIOUSLY RECORDED HISTORIC BUILDINGS AND STRUCTURES

Primary Number	Trinomial	Description	Location	California Register Status Code
P-19-120065		Historic Corral	Within Phase I project area	N/A
P-19-150419	4-LAN-H6	House, occupied in 1900	Within 0.5-mile buffer	N/A
P-19-190970		Historic built resource on the campus of the California Institute of the Arts	Within 0.5-mile buffer	3S*
P-19-190315		The Old Road Bridge over Santa Clara River	Within Phase II.a project area	6Z**
P-19-002190	CA-LAN-2190H	1898 Southern Pacific Railroad bridge	Within 0.5-mile buffer	N/A
P-19-186541		Historical Landmark bronze plaque for Oak of the Golden Dream on stone base for the location of the first gold discovery in California	Within Phase II.a project area	CA Historical Landmark No. 168/3D[t] (tree)
P-19-000961	CA-LAN-961	Newhall house built in 1878	Within Phase II.a project area	N/A
P-19-186567		Historical Landmark plaque for Rancho San Francisco	Within Phase II.a project area	State Landmark No. 556 (plaque)
P-19-186568		Mentryville; historic home, barn, and schoolhouse [California Historical Landmark No. 516-2]	Within Phase I project area	State Landmark No. 516 (plaque)
P-19-190691		Historic house and outbuildings	Within Phase I project area	5S3°
P-19-192297		Historic check dam	Within Phase I project area	6Z

NOTE: *3S: Appears eligible for NRHP as an individual property through survey evaluation.
**6Z: Found ineligible for NRHP, CRHR, or local designation through survey evaluation.
[t]: Appears eligible for NRHP as a contributor to a NRHP eligible district through survey evaluation.
° 5S3: Not eligible for local listing but is eligible for special consideration in local planning.

5.1.3 Paleontological Resources

The results of the map review and fossil locality records searches at the NHMLAC indicate that the Trails Master Plan Study Area is characterized by a variety of sedimentary rock formations (Figure 5.1.3-1, *Geological Formations within the Trails Master Plan Study Area*; Figure 5.1.3-2, *Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation*).[97] The following rock units are known to occur within the Trails Master Plan Study Area: Chatsworth Formation (marine late Cretaceous), Santa Susana Formation (marine late Paleocene), Llajas Formation (marine middle Eocene), Sespe Formation (non-marine late Eocene to Oligocene), Topanga Formation (marine middle Miocene), Monterey Formation (marine middle to late Miocene), Towsley Formation (marine late Miocene), Pico Formation (marine latest Miocene to Pliocene), Saugus Formation (non-marine Plio-Pleistocene), older Quaternary Alluvium (non-marine Pleistocene), and younger Quaternary Alluvium (non-marine Pleistocene to recent).[98] The Chatsworth Formation, Santa Susana Formation, Llajas Formation, Sespe Formation, Topanga Formation, Monterey Formation, Towsley Formation, Pico Formation, Saugus Formation, and older Quaternary Alluvium can be considered paleontologically sensitive geological units which are characterized by a moderate or high potential for containing unique paleontological resources.

Three fossil localities have been recorded within the Trails Master Plan Study Area.[99] One vertebrate fossil locality, LACM 7310, from the Llajas Formation, is situated in the western side of Devil Canyon in the central western portion of the Trails Master Plan Study Area. LACM 7310 produced a fossil specimen of bonito shark (*Isurus praecursor*). Two vertebrate fossil localities, LACM 5456 and 6365, from the Pico Formation, are within the Trails Master Plan Study Area. Locality LACM 6365 produced a skull of an undetermined sea lion (*Otariidae*) in the northern portion of the Trails Master Plan Study Area on the north side of Pico Canyon. Locality LACM 5456, in the south-central portion of the Trails Master Plan Study Area in Brown Canyon south of Oat Mountain, produced fossil specimens of bonito shark (*Isurus praecursor*) and white shark (*Carcharodon sulcidens*). Also within the Pico Formation, there are two vertebrate fossil localities, LACM 6145-6146, within and adjacent to the northeastern border of the Trails Master Plan Study Area near Santa Clarita, that produced fossil specimens of bat ray (*Myliobatis*), guitarfish (*Rhinobatos*), requiem shark (*Carcharhinus*), basking shark (*Cetorhinus*), and sheephead (*Semicossyphus*). Vertebrate fossil localities within the Chatsworth Formation, Santa Susana Formation, Sespe Formation, Topanga Formation, Monterey Formation, Towsley Formation, Saugus Formation, and older Quaternary Alluvium in the vicinity of the Trails Master Plan Study Area have produced a variety of fossil specimens, including but not limited to; fossil shark specimens, eagle ray specimens, several chimaeroids, boa snake specimens, Boidae specimens, opossum specimens, and primitive insectivores.[100]

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[97] McLeod, Samuel, Natural History Museum of Los Angeles County, Los Angeles, CA. 24 December 2013. Letter response to Roberta Thomas, Sapphos Environmental, Inc., Pasadena, CA

[98] McLeod, Samuel, Natural History Museum of Los Angeles County, Los Angeles, CA. 24 December 2013. Letter response to Roberta Thomas, Sapphos Environmental, Inc., Pasadena, CA

[99] McLeod, Samuel, Natural History Museum of Los Angeles County, Los Angeles, CA. 24 December 2013. Letter response to Roberta Thomas, Sapphos Environmental, Inc., Pasadena, CA

[100] Welton, B.J., and J.M. Alderson. 1981. "A Preliminary Note on the Late Cretaceous Sharks of the Chatsworth Formation at Dayton Canyon, Simi Hills, Los Angeles County, California." In *Simi Hills Cretaceous Turbidites, Southern California*, ed. M.H. Link, R.L. Squires, and I.P. Colburn. Pacific Section, Society of Economic Paleontologists and Mineralogists, Fall Field Trip Guide. Tulsa, OK: SEPM.

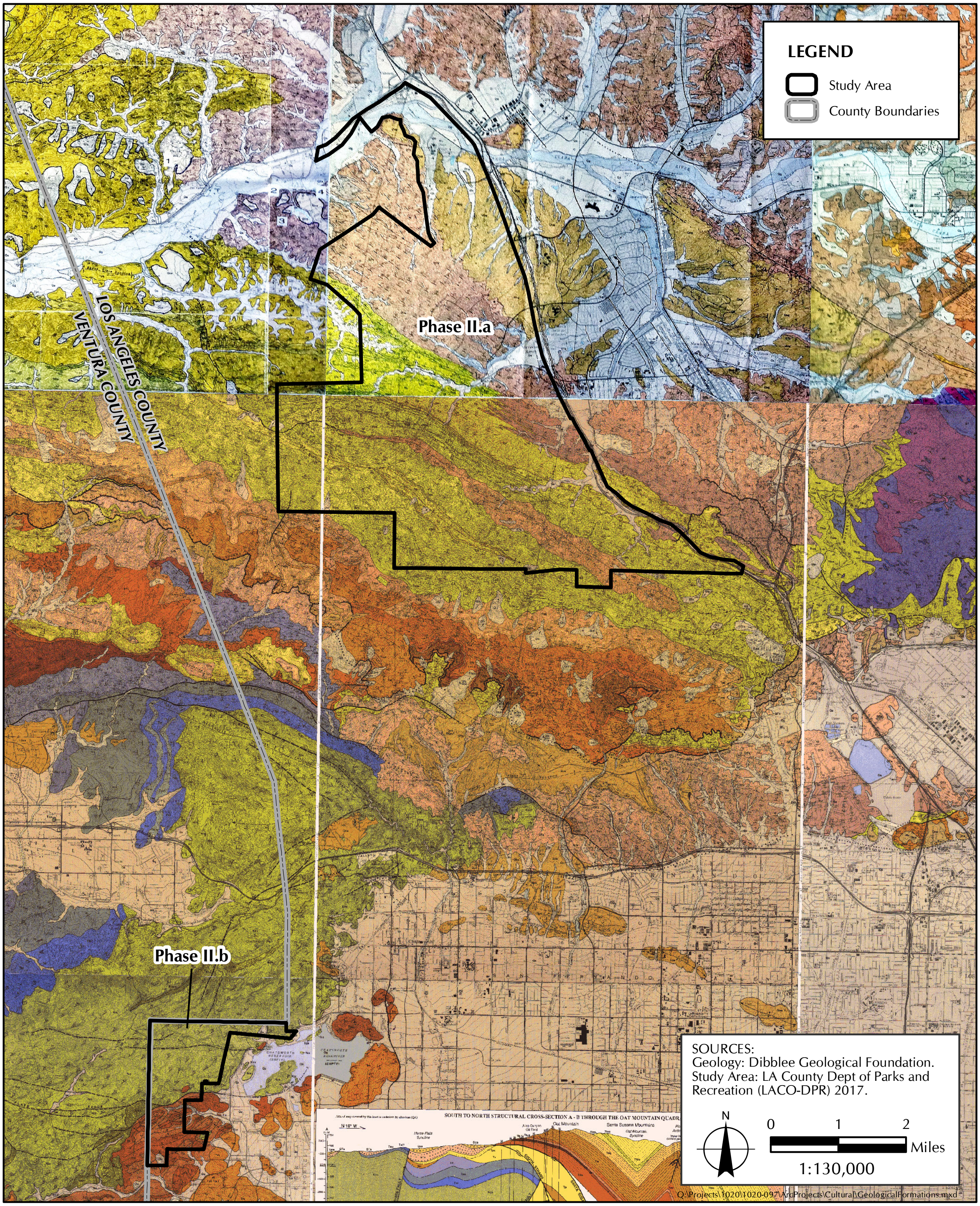


FIGURE 5.1.3-1

Geological Formations within the Trails Master Plan Study Area

CALABASAS MAP (DF-37)

LEGEND

af
Qa

SURFICIAL SEDIMENTS

af *Artificial cut and fill*
Qa *Alluvium: gravel, sand and clay of valley areas, includes gravel of stream channels, gravel and sand of alluvial fans, and slope wash; undissected to slightly dissected*

Qls

LANDSLIDE DEBRIS

Qoa

OLDER SURFICIAL SEDIMENTS

Qoa *Dissected alluvial gravel, sand and clay*

Holocene
?
Pleistocene
QUATERNARY

— UNCONFORMITY —

Tush Tust Tuss Tud

UNNAMED SHALE AND SANDSTONE

(Upper part of Modelo Formation of Hoots 1931; Soper 1938; Durrell 1954; A.E.G. maps 1982; Modelo Formation of Weber 1984; Modelo and Santa Margarita Formations of Truex and Hall 1969; Trurex 1976; equivalent to Sisquoc Shale of Dibblee 1989; in Ventura vasin
Marine clastic; and biogenic; late Miocene age (Mohnian-"Delmontian" Stage)
Tust *Light gray fine grained sandstone and minor siltstone [Towsley (?) Sandstone of Weber 1984] at Laskey Mesa*
Tush *Light gray claystone and siltstone, moderately to vaguely bedded; crumbly where weathered*
Tud *Light gray, white-weathering diatomaceous shale, thin-bedded, soft, semi-punky*
Tuss *Light gray to tan sandstone, friable, vaguely bedded*

Tm Tmss Tmcg

MONTEREY FORMATION

(Lower part Modelo Formatin of Hoots 1931; Soper 1938; Durrell 1954; A.E.G. maps 1982; Modelo Formation of Yerkes and Campbell 1979; Weber 1984; Modelo-Monterey and lower Monterey Formation of Truex and Hall 1969, Trurex 1976; ; equivalent to Monterey Formation of Dibblee 1989, in Ventura basin)
Marine, biogenic and clastic; middle and late Miocene age [late (?) Luisian and Mohnian Stages]
Tm *Gray-brown, white weathering siliceous shale, thin bedded, moderately hard with platy fracture; includes soft fissile diatomaceous shale, hard, brittle, cherty shale, and few layers of hard, yellow-weathering calcareous concretions or lenses*
Tmss *Light gray to tan, semi-friable bedded sandstone*
Tmcg *Gray cobble conglomerate of mostly granitic detritus in sandstone matrix*

Tls Tlsc

DETRITAL SEDIMENTS OF LINDERO CANYON

(Included in Topanga Formation of Weber 1984; unconformable on Chatsworth Formation; best exposed in Lindero Canyon, Thousand Oaks quadrangle; may be equivalent to upper Topanga Formation of Durrell 1954, or Calabasas Formation of Yerkes and Campbell 1989
Marine transgressive clastic; middle Miocene age [Luisian (?) Stage]
Tls *Light gray to nearly white massive sandstone, semi-friable, locally conglomeratic*
Tlsc *Light gray calcareous sandstone, massive to crudely bedded, with calcite veins; includes gray conglomerate composed of cobbles of metavolcanic, granitic, and quartzitic rocks and of sandstone derived from Chatsworth Formation; sparsely fossiliferous*

CENOZOIC

— UNCONFORMITY —

Ttuc Ttus Ttucg

UPPER TOPANGA FORMATION

(Of Durrell 1954; Topanga Formation of Soper 1938; Truex and Hall 1969; Truex 1976; Weber 1984; Calabasas Formation of Yerkes and Campbell 1979, 1980)
Marine clastic; middle Miocene age (Luisian Stage)
Ttuc *Gray claystone, bedded; crumbly with ellipsoidal fracture*
Ttus *Light gray sandstone, semi-friable, thick bedded*
Ttucg *Gray conglomerate of cobbles of granitic rocks, sandstone, and volcanic rocks in sandstone matrix*

Tcvab Tcvb Tcva

CONEJO VOLCANICS

(Of Taliaferro 1924; Yerkes and Campbell 1979; 1980; Weber 1984; middle Topanga Formation of Soper 1938; Durrell 1954; Topanga Volcanics of Truex and Hall 1969; Truex 1976)
Extrusive volcanic flows and volcaniclastic rocks; middle Miocene age
Tcvab *Andesitic breccia-conglomerate, composed of subangular to subrounded cobbles and boulders of light pinkish gray andesitic rocks in andesitic detrital matrix, moderately sorted, bedded; deposited as epiclastic (reworked) breccias*
Tcva *Andesitic breccia, brown, massive to crudely bedded autoclastic flow breccia and some mud-flow (laharic) breccias*
Tcvb *Basaltic flows and flow-breccias: dark gray to dark brown, composed of basaltic to basaltic-andesitic rocks, crudely bedded, includes some reworked breccias of basaltic detritus; moderately coherent; at Mullholland Highway gray-black, massive, fine grained basalt, weakly coherent where weathered, includes hyaloclastic basaltic breccia, massive to crudely bedded*

db

DIABASE

db *Black; fine grained diabase or basalt, intrusive as sills in* **Ttls**

Ttls Ttlc

LOWER TOPANGA FORMATION

Of Durrell 1954; Topanga Formation of Soper 1938; Truex and Hall 1969; Weber 1984; Topanga Canyon Formation of Yerkes and Campbell 1979, 1980)
Marine transgressive clastic; early and middle Miocene age [Saucesian-Relizian (?) Stage]
Ttls *Light gray to tan sandstone, coherent, thick bedded*
Ttlc *Gray micaceous clay shale; crumbly with ellipsoidal fracture where weathered*

Miocene

Tsp

SESPE FORMATION

Non-marine; primarily Oligocene age
Not exposed in quadrangle, but present in subsurface (see cross section) in southern part of area and exposed just south of this quadrangle

Oligocene

Tll
Tllg

LLAJAS FORMATION

(Of Cushman and McMasters 1936; Stipp 1943; Squires and Filewicz 1983)
Marine clastic; middle Eocene age (Domengine and Capay molluscan Stages)
Tll *Gray micaceous claystone and siltstone, crumbly with ellipsoidal fracture where weathered*
Tllg *Gray to brown cobble conglomerate of granitic, metavolcanic and quartzitic detritus in sandstone matrix; includes some brown sandstone strata*

Eocene
TERTIARY

Tsu Tsus
Tsuv
Tsi

SANTA SUSANA FORMATION

(Of Cushman and McMasters 1936; Stipp 1943; Squires and Filewicz 1983)
Marine and non-marine (?) clastic; lower Eocene and Paleocene ages
(Meganos and Martinez molluscan Stages)
Tsu *Gray micaceous claystone and siltstone, few minor thin sandstone beds*
Tsus *Tan coherent fine grained sandstone; locally contains thin shell-beds and calcareous concretions*
Tsuv *Las Virgenes Sandstone Member: tan semi-friable bedded sandstone, locally pebbly*
Tsi *Simi Conglomerate Member: gray to brown cobble conglomerate with smooth cobbles of quartzite, metavolcanic and granitic rocks in sandstone matrix that locally includes thin lenses of red clay; marine or non-marine (?)*

?
Paleocene

Kcs Kcg Kcsh

CHATSWORTH FORMATION

(Of Colburn et al. 1981; Weber 1984; "Chico Formation of Sage 1971)
Marine clastic; late Cretaceous age (Maastrichtian and Campanian Stages)
Kcs *Light gray to light brown sandstone, hard, coherent arkosic, micaceous, mostly medium grained, in thick strata separated by thin parings of siltstone*
Kcg *Gray conglomerate of cobbles of metavolcanic and granitic detritus in hard sandstone matrix*
Kcsh *Gray clay shale, crumbly with ellipsoidal fracture where weathered; includes some thin sandstone strata in western area*

Upper
CRETACEOUS
MESOZOIC

FIGURE 5.1.3-2
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

NEWHALL MAP (DF-56)

LEGEND

af
Qg
Qa

SURFICIAL SEDIMENTS

af *Artificial cut and fill; includes areas of grading and/or development (updated from Treiman 1986, 1987a)*
Qg *Gravel and sand of major stream channels*
Qa *Alluvial gravel, sand and clay of valley areas*

Qls

LANDSLIDE DEBRIS

Does not include small landslides caused by 1994 Northridge earthquake (shown in Harp and Jibson 1995)

Qls *Landslide debris*

Qoa
Qog

OLDER SURFICIAL SEDIMENTS

Unconsolidated alluvial sediments deposited by streams; late Pleistocene age

Qoa *Low terrace remnants of alluvial gravel and sand*
Qog *Alluvial fan and high terrace deposits of gravel and sand; detritus of mostly crystalline basement rocks and some of Tertiary rocks; assigned to Pacoima Formation (of Oakeshott 1958) by Teiman 1986, 1987a*

— *UNCONFORMITY* —

QTs
Tsr

SAUGUS FORMATION

(Of Kew 1924; Winterer and Durham 1962)
Nonmarine fluviatile, weakly indurated; Pliocene and Pleistocene age

QTs *Light gray to light reddish brown pebble-cobble conglomerate, sandstone and minor siltstone; conglomerate composed of granitic, gneissic, metavolcanic, quartzitic, gabbroic and anothositic detritus in friable sandy matrix, bedded; deposited by westward flowing streams; probably mostly of Pleistocene age*
Tsr *Sunshine Ranch member of Treiman 1987b, (differentiated only in cross-section B-B') same as* **QTs**, *but includes more interbedded greenish siltstone; grades westward into unit* **Tpc** *of Pico Formation*

Holocene
?
Pleistocene
?
QUATERNARY
?

— *UNCONFORMITY* —

(Northeast of San Gabriel fault)

Tpc
Tps
Tp

PICO FORMATION

(Of Kew 1924; Winterer and Durham 1962)
Marine clastic; weakly lithified; Pliocene age

Tpc *North of Potrero and Pico Canyons, tan to light brown, friable, medium to coarse grained sandstone and pebble-cobble conglomerate, in places hard, calcareous, brown, with molluscan shell fragments south of Potrero Canyon*
Tps *Light gray to tan, semi-friable sandstone, medium to fine grained, massive to bedded*
Tp *Gray to light gray micaceous siltstone/claystone, vaguely bedded; includes few thin sandstone layers*

Ttos
Ttoc
Tto

TOWSLEY FORMATION

(Of Winterer and Durham 1962; Stitt 1986)
(Mostly in subsurface: top exposed only at southwest corner of quadrangle)
Marine clastic; late Miocene (?) and early Pliocene age

Ttos *Mostly light gray sandstone; inclues some gray micaceous claystone*
Ttoc *Gray micaceous silty claystone and siltstone*
Tto *Undivided, in cross-sections*

Tmo

MIOCENE UNDIFFERENTIATED

(In subsurface only; "Modelo Formation" correlation with exposed lithologic units uncertain, may be equivalent to Towsley, Sisquoc and Monterey Formations of areas to west) marine clastic; Mohnian and "Delmontian" Stages, late Miocene age

Tmo *Dark gray micaceous claystone, shale and light gray sandstone, includes conglomerate at Honor Rancho oil field*

Tc

CASTAIC FORMATION

(Of Crowell 1954; Stitt 1986); northeast of San Gabriel Fault
Marine clastic; late Miocene age (Mohnian - "Delmontian" Stage)

Tc *Gray micaceous clay shale, bedded; includes thin layers of light gray to tan sandstone*

Tmc

MINT CANYON FORMATION

(Of Kew 1923, 1924); northeast of San Gabriel Fault
Nonmarine clastic; middle Miocene age, Barstovian to Clarendonian vertebrate Stages (Durham et al 1954)

Tmc *Light gray to pinkish-gray to tan, fine grained sandstone, locally pebbly and interbedded reddish to greenish-gray siltstone and claystone; base not exposed in quadrangle*

— *UNCONFORMITY* —

bc

BASEMENT COMPLEX

bc *In subsurface only: granitic rocks and biotite-actinolite schist encountered in some deep exploratory wells in eastern area of quadrangle*

Pliocene
?
Miocene
TERTIARY
PRE-TERTIARY
CENOZOIC

FIGURE 5.1.3-2
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

OAT MOUNTAIN AND NORTH 1/2 CANOGA PARK MAP (DF-36)

LEGEND

af
Qa Qg

SURFICIAL SEDIMENTS

Unconsolidated alluvial deposits; generally undissected

af *artificial cut and fill*
Qg *gravel and sand of major stream channels*
Qa *alluvial gravel, sand and clay of valley and floodplain areas*

Qls

LANDSLIDE DEBRIS

Qos
Qoa

OLDER SURFICIAL SEDIMENTS

Dissected, weakly consolidated alluvial deposits

Qos *older sandy alluvium, including slope wash, derived from Chatsworth Formation* (**Kcs**)
Qoa *older alluvium composed largely of angular pebble-size fragments of Miocene shale and some of sandstone* (**Tm, Tsq, and Ttos**) *in light gray to tan silty matrix in part indurated by calcareous caliche; crudely bedded to massive; about 200 ft (60m) thick; blends northward upslope in Browns Canyon drainage area into old debris-flow landslides* (**Qls**)*; slightly deformed and much dissected where elevated; but at Horse Flats top surface of deposition preserved; late Pleistocene age; mapped as slope wash, older alluvium, and Saugus Formation (upper member) by Barrows 1975; Evans and Miller 1978; and Saul 1979; probably in places equivalent to Pacoima Formation of Oakeshott 1958; Barrows et al. 1975; and Dibblee 1991*

— *UNCONFORMITY* —

QTs
Ts Tsr

SAUGUS FORMATION

Mostly terrestrial, weakly consolidated; Pleistocene and Pliocene age

QTs *light gray to brown pebble-cobble conglomerate, sandstone and lesser amounts of grayish to reddish brown, soft siltstone/claystone; conglomerate composed of granitic, gneissic, metavolcanic, quartzitic, gabbroic and anorthositic detritus in sandy matrix; deposited by westward-flowing streams; Pleistocene age; south of Santa Susana fault mapped as middle member of Saugus Formation by Barrows et al. 1975, Evans and Miller 1978, and Saul 1979 [in adjacent San Fernando quadrangle (Dibblee 1991)* **QTs** *west of Elsmere Canyon should be shown as* **Ts**]
Ts *(in Newhall area) similar to* **QTs**, *but correlative in age with units* **Tsr** *and* **Tps** *in part; probably Pliocene age*
Tsr *Sunshine Ranch Member (of Hazzard 1940, in Treiman 1987; Barrows et al. 1974; Evans and Miller 1978; and Saul 1979; type area extends eastward from lower Aliso Canyon to Van Norman Reservoir, Hazzard 1940); terrestrial deposits similar to* **QTs**, *but south of Santa Susana fault composed largely of more indurated greenish gray claystone, siltstone and fine grained sandstone, and contains in lower part brackish marine layers of oyster shells; in exposures northwestward from San Fernando Pass, consists mostly of interbedded conglomerate and fine grained sediments that locally contain few thin layers of peat, unit intertongues westward into* **Tps**; *mostly Pliocene age*

Tps
Tp Tpg

PICO FORMATION

Marine clastic; mostly Pliocene age

Tps *south of Santa Susana fault: Pico sandstone (included in Saugus Formation by Kew 1924; Pico Formatioin by Butler 1977, Lant 1977, Yeats 1979; Pico and Saugus Formatioins by Evans and Miller 1978) mostly light gray to nearly white, soft friable sandstone, locally pebbly, contains abundant whole and fragmented bivalve shells west of Browns Canyon; deposited under marine to lagoonal conditions; grades upward into terrestrial Saugus Formation; unconformable on Miocene formations*
Tpg *conglomerate in lower Limekiln Canyon: gray massive conglomerate of cobbles of granitic and metavolcanic rocks in sandstone matrix; nonmarine (?), unconformable on Monterey Shale* (**Tml**), *overlain by Saugus Formation*
Tp *and* **Tps** *north of Santa Susana fault: Pico Formation of Kew 1924, Winterer and Durham 1958, 1962;* **Tps** *mostly light gray semi-friable sandstone, locally pebbly; upper beds contain bivalve shell fragments; intertongues into Saugus Formations* (**Ts**); **Tp** *mostly gray micaceous siltstone-claystone, bedded to massive, includes few thin sandstone layers*

Ttos Ttoc

TOWSLEY FORMATIOIN

Marine clastic; early Pliocene age (Repettian Stage) and possibly latest Miocene ("Delmontian Stage")

Ttos *light gray to tan coherent to semi-friable sandstone, medium grained to locally gritty and pebbly, bedded; includes minor micaceous siltstone; grades laterally northward into Saugus Formation* (**Ts**) *in San Fernando Pass area*
Ttoc *gray micaceous silty claystone and siltstone; minor sandstone*

Tsq Tsqs

SISQUOC SHALE

(Included in Modelo Formation by Kew 1924; Winterer and Durham 1958, 1962; Saul 1979; same lithologic unit as Sisquoc Formation in northern Ventura basin)
marine clastic; late Miocene age (Mohnian to "Delmontian" Stage)

Tsq *dark gray to brownish gray clay shale, bleaches to light gray; crumbly with spheroidal to sub-platy fracture, gypsiferous in fractures, some layers contain large tan dolomitic concretions; includes some thin interbedded semi-siliceous layers; about 1000 ft (300 m) thick*
Tsqs *light gray coherent to semi-friable sandstone*

Tm
Tml

MONTEREY SHALE

(Modelo Formation of Kew 1924; Winterer and Durham 1958, 1962; Barrows et al. 1974; Evans and Miller 1978; Saul 1979; same lithologic unit as Monterey Shale of northern Ventura basin); marine biogenic; nearly 2000 ft. (610m) thick north of Santa Susana fault, very thin south of it; middle and late Miocene age

Tm *upper part: thin bedded siliceous shale, dark gray brown but weathers cream-white, hard, platy, brittle, porcelaneous, locally cherty, closely fractured, some layers fissile, about 1500 ft (485m) thick; middle and late Miocene age (mostly Mohnian Stage); south of Santa Susana fault: soft, white weathering thin-bedded, fissile diatomaceous semi-siliceous shale*
Tml *lower part: thin-bedded, fissile semi-siliceous shale to soft shaly claystone, dark brown, weathers cream white; includes some calcareous shale, and thin tan-weathering hard dolomite strata that are increasingly abundant upward, unit as thick as 500 ft (150m); middle Miocene age (Luisian-Relizian Stage)*

Tlsc

DETRITAL SEDIMENTS OF LINDERO CANYON

(Included in Topanga Formation of Weber 1984; unconformable on Chatsworth Formation; best exposed in Lindero Canyon, Thousand Oaks quadrangle)
marine transgressive clastic; Miocene age [Luisian (?) Stage]

Tlsc *crudely bedded brown to gray conglomerate composed of cobbles of metavolcanic, granitic and quartzitic rocks, and of sandstone derived from Chatsworth Formation; sparsely fossiliferous; contains minor interbeds of light gray calcareous sandstone*

Ttus Tb
Ttls

TOPANGA FORMATION

(Of Yeats 1979; Topanga Group of Saul 1979)
marine transgressive clastic; middle Miocene age

Ttus *upper sandstone: light gray to white semi-friable, locally pebbly, massive to vaguely bedded; about 150 ft (45m) thick*
Tb *basalt flow (or diabase sill?); black, massive fine grained weakly coherent where weathered, present north of Santa Susana fault only; probably correlative with Conejo Volcanics to west*
Ttls *lower sandstone: light gray to tan, semi-friable to somewhat hard, massive to vaguely bedded; as thick as 600 ft (180m), base unexposed; present north of Santa Susana fault only*

— *UNCONFORMITY* —

Tll
Tllg

LLAJAS FORMATION

Marine clastic; middle Eocene age

Tll *gray micaceous claystone-siltstone and some interbeds of light gray to tan soft sansdstone*
Tllg *basal cobble conglomerate as thick as 50 ft (17m) with cobbles of granitic, metavolcanic and quartzitic rocks*

Tsu
Tsi

SANTA SUSANA FORMATION

Mostly marine clastic; Paleocene age

Tsu *dark gray micaceous claystone, crumbly with ellipsoidal fracture; includes few thin sandstone layers*
Tsi *Simi Conglomerate Member: gray to brown cobble conglomerate with smooth rounded cobbles up to 1 ft (1/3m) in diameter of pinkish-gray quartzite, metavolcanic and granitic rocks in gray sandstone matrix; possibly in part nonmarine, deposited as fan delta*

Kcsh
Kcs

CHATSWORTH FORMATION

(Of Colburn et al. 1981; "Chico" Formation of Kew 1924; Evans and Miller 1978)
marine clastic; late Cretaceous age (Maestrichtian and Campanian Stages)

Kcsh *gray micaceous shale and siltstone; includes some sandstone strata; included in Martinez Formation (Paleocene) by Evans and Miller 1978*
Kcs *light gray to light brown, hard, thick bedded sandstone; locally gritty; includes few thin layers of micaceous siltstone; base not exposed*

Holocene ? Pleistocene ? QUATERNARY ? Pliocene ? ? Miocene TERTIARY CENOZOIC Eocene ? Paleocene Upper CRETACEOUS MESOZOIC

FIGURE 5.1.3-2
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

SANTA SUSANA MAP (DF-38)

LEGEND

af
Qa Qg

SURFICIAL SEDIMENTS
Unconsolidated alluvial deposits; generally undissected

af *Artificial cut and fill*
Qg *Gravel and sand of major stream channels*
Qa *Alluvial gravel, sand and clay of valley and floodplain areas*

Qls

LANDSLIDE DEBRIS

Qos
Qoa

OLDER SURFICIAL SEDIMENTS
Dissected, weakly consolidated alluvial deposits

Qos *Older sandy alluvium, including slope wash, derived from Chatsworth Formation (***Kcs***)*
Qoa *Older alluvial gravel, sand and silt/clay; in areas south of Santa Susana fault composed of sub-angular detritus of Miocene shale and sandstone (***Tm***,* **Tsq** *and* **Ttos***)*

— *UNCONFORMITY* —

QTs

SAUGUS FORMATION
(Of Kew 1924), non-marine fluviatile; Pleistocene and Pliocene (?) age

QTs *Weakly consolidated light gray pebble conglomerate and sandstone composed of pebbles and few cobbles of granitic, gneissic, metavolcanic, quartzitic, gabbroic and anorthositic detritus in sandy matrix; includes minor interbeds of light greenish to light reddish silty claystone; unconformity at base near Santa Susana fault*

Tps
Tp

PICO FORMATION
Marine clastic; mostly Pliocene age

Tps *South of Santa Susana fault: Pico sandstone (included in Saugus Formation by Kew 1924; White 1983; in Fernando Formation by Whaley and Ricketts 1975; Yeats 1979; in Pico Formation by Butler 1977; Hanson 1981; Yeats 1987); regressive near-shore facies of Pico Formation; mostly soft, friable, nearly white, medium to coarse grained sandstone, locally pebbly and cross-bedded, contains many bivalve shells, especially in hard calcareous shell reefs, and local shell coquina; deposited in shallow marine to lagoonal conditions (White 1983); grades upward into terrestrial Saugus Formation; unconformable on Monterey Shale and older formations; not everywhere present*
Tp *North of Santa Susana fault (Pico Formation of Kew 1924, Winterer and Durham 1958, 1962); mostly soft gray micaceous siltstone-claystone; includes thin layers of light gray to tan sandstone; conformable on Towsley Formation*

Holocene
?
Pleistocene
? ?
Pliocene
QUATERNARY

Ttos Ttoc

TOWSLEY FORMATION
(Of Winterer and Durham 1958), marine clastic; early Pliocene age (Repettian Stage) and possibly latest Miocene ("Delmontian Stage")

Ttos *Light gray to tan coherent to semi-friable sandstone, medium grained to locally gritty and pebbly, bedded; includes minor micaceous siltstone*
Ttoc *Gray micaceous silty claystone and siltstone; minor sandstone*

Tsq Tsqs

SISQUOC SHALE
(Included in Modelo Formation by Kew 1924; Winterer and Durham 1958, 1962; Whaley and Ricketts 1975; Butler 1977; same lithologic unit as Sisquoc Formation in northern Ventura basin) marine clastic; late Miocene age (Mohnian to "Delmontian" Stage)

Tsq *Dark gray to brownish gray clay shale, bleaches to light gray; crumbly with ellipsoidal to sub-platy fracture, gypsiferous in fractures, includes some thin bedded semi-siliceous layers; some layers contain large tan dolomitic concretions*
Tsqs *Light gray coherent to semi-friable sandstone*

Tm
Tml

MONTEREY SHALE
(Modelo Formation of Kew 1924; Winterer and Durham 1958, 1962; Yeats 1987; Butler 1977; same lithologic unit as Monterey Shale of northern Ventura basin) marine biogenic; middle and late Miocene age

Tm *Upper part north of Santa Susana fault: thin bedded platy siliceous shale, dark gray-brown but weathers cream-white, hard, platy, brittle, porcelaneous, locally cherty, closely fractured, some layers fissile, about 1500 ft (500m) thick; middle and late Miocene age (mostly Mohnian Stage); south of Santa Susana fault: white weathering, soft, punky to fissile, thin-bedded, semi-siliceous shale, with diatom debris and fish scales; about 600 ft (180m) thick, middle and late Miocene age (Mohnian-Luisian Stage)*
Tml *Lower part: thin-bedded, soft, fissile, clayey to calcareous shale about 150-200 ft (45-60m) thick; middle Miocene age (Luisian Stage, Clarke 1983); grades upward into* **Tm**

Ttus

UPPER TOPANGA SANDSTONE
(Calabasas Formation of Squires 1983; Fritsche et al. 1983) marine transgressive clastic; middle Miocene age

Ttus *Soft friable, massive, nearly white sandstone; up to 200 ft (60m) thick*

?
Miocene
CENOZOIC

— *UNCONFORMITY* —

bi

INTRUSIVE ROCKS

bi *Black basaltic dike or sill (?) of probable Miocene age; intrusive into Santa Susana Formation (***Tsu***)*

Tsp

SESPE FORMATION
Non-marine fluviatile; Oligocene and late Eocene age

Tsp *Predominantly semi-friable bedded sandstone, light gray, tan to pink, locally pebbly and cross-bedded; includes interbeds of variegated maroon-red and greenish micaceous claystone, mostly in middle part; locally includes conglomerate of scattered pebbles and cobbles of granitic, metavolcanic and quartzitic rocks in sandstone matrix; deposited by westward-flowing streams (Taylor 1983)*

Tll
Tllg

LLAJAS FORMATION
(Of Squires 1983; Meganos Formation of Kew 1924), marine clastic; middle Eocene age

Tll *Gray micaceous claystone-siltstone and light gray to tan, soft to semi-friable sandstone, mostly fine grained; locally with large concretions; commonly fossilferous; claystone predominates south of Simi Valley; sandstone predominates in Las Llajas Canyon area*
Tllg *Basal cobble conglomerate, gray to brown, composed of cobbles of granitic, metavolcanic and quartzitic rocks in sandy matrix*

Tsu Tsus
Tsuv
Tsi

SANTA SUSANA FORMATION
(Martinez Formation of Kew 1924), mostly marine clastic; Paleocene age

Tsu *Dark gray micaceous clay shale, crumbly with ellipsoidal fracture; includes siltstone and thin sandstone strata*
Tsus *Light gray to tan sandstone*
Tsuv *Las Virgenes Sandstone Member: light gray to light brown sandstone; includes some cobble conglomerate locally*
Tsi *Simi Conglomerate Member: gray to brown cobble conglomerate of smooth rounded cobbles up to 1 ft (1/3m) in diameter of pinkish-gray quartzite, metavolcanic and granitic rocks in gray sandstone matrix; possibly in part non-marine, deposited as fan delta*

Kcs Kcsh

CHATSWORTH FORMATION
(Of Colburn et al. 1981; "Chico" Formation of Kew 1924), marine clastic; late Cretaceous age

Kcsh *Gray micaceous clay shale*
Kcs *Light gray to light brown, hard, thick bedded sandstone; locally gritty; includes few thin layers of micaceous siltstone; base not exposed in this quadrangle*

?
Oligocene
?
Eocene
Paleocene
TERTIARY
Upper
CRETACEOUS
MESOZOIC

FIGURE 5.1.3-2
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

'30"

SIMI MAP (DF-39)

LEGEND

QUATERNARY

Holocene

af
Qg
Qa

SURFICIAL SEDIMENTS

Unconsolidated alluvial deposits; generally undissected

af *Artificial cut and fill*
Qg *Gravel and sand of major stream channels*
Qa *Alluvial gravel, sand and clay of valley and floodplain areas*

Qls

LANDSLIDE DEBRIS

In northern areas derived mostly from Monterey Shale (**Tm**)

?

Pleistocene

Qoa

OLDER SURFICIAL SEDIMENTS

Dissected, weakly consolidated alluvial deposits

Qoa *Older alluvial gravel, sand and silt/clay; composed largely of detritus derived from formations within quadrangle*

— *UNCONFORMITY* —

QTs
QTsv

SAUGUS FORMATION

(Of Kew 1924), non-marine fluviatile; Pleistocene and Pliocene (?) age

QTs *Weakly consolidated light gray pebble conglomerate and sandstone composed of pebbles of small cobbles, mostly of granitic rocks and few of gneiss, metavolcanic rocks, quartzite, anorthosite, gabbro, and Tertiary volcanic rocks (Conejo Volcanics?), in soft sandy matrix; includes minor gray soft micaceous siltstone-claystone; unconformity at base in Moorpark area*
QTsv *Southwest corner of quadrangle only: crudely bedded to massive brown breccia-conglomerate composed of andesitic-basaltic, angular to subrounded detritus of Conejo Volcanics, and a few clasts of Monterey Shale locally*

? ?

QTlp

LOS POSAS SAND

(Of Pressler 1929), shallow marine regressive; probably early Pleistocene and possibly late Pliocene age

QTlp *Weakly indurated light gray to tan sand; locally contains molluscan shelf fragments; grades upward into Saugus Formation; about 70 ft (22m) thick near Tierra Rejada Valley; unconformity at base*

? ?

CENOZOIC

TERTIARY

Pliocene

Tps

PICO SANDSTONE

(Included in Pico Formation of Kew 1924; Fernando Formation by Whaley and Ricketts 1975, Yeats 1979; lower Saugus Formation by White 1983; similar to and possibly in part correlative with Los Posas Sand of Dibblee and Ehrenspeck 1990); shallow marine and lagoonal clastic; mostly Pliocene age

Tps *Light gray, tan to nearly white, soft friable sandstone, medium to coarse grained, cross-bedded, commonly pebbly with numerous smooth rounded pebbles of quartzite and some metavolcanic and granitic rocks; locally fossilferous with bivalve seashells, locally contains calcareous shell reefs; grades westward through finer sandstone into soft gray siltstone (***Tp/Tps***) in Moorepark Quadrangle, grades upward into Saugus Formation (***QTs***)*

Miocene

Tsq

SISQUOC SHALE

(Included in Modelo Formation by Kew 1924; Whaley and Ricketts 1975, Yeats 1979, 1983, 1987; same lithologic unit as Sisquoc Shale in northern Ventura basin), marine clastic and biogenic; late Miocene age (Mohnian Stage in this quadrangle)

Tsq *Dark gray to brownish gray clay shale, weathers light gray; some layers contain large, tan dolomitic concretions; includes some white-weathering, thin bedded, diatomaceous semi-siliceous shale*

Tm
Tml

MONTEREY SHALE

(Modelo Formation of Kew 1924; Canter 1973, Whaley and Ricketts 1975, Yeats 1979, 1983, 1987; same lithologic unit as Monterey Shale of northern Ventura basin) marine biogenic; middle and late Miocene age (Luisian and Mohnian Stages)

Tm *Upper part: thin-bedded platy to fissile siliceous shale, dark gray-brown, but weathers cream-white; in Oak Ridge area, in large part hard, platy brittle, porcelaneous, locally cherty, closely fractured; about 1500 ft (485m) thick; about 1200 ft (360m) thick on Big Mountain*
Tml *Lower part: thin-bedded, soft, fissile, clayey to calcareous shale; about 150 ft (45m) thick on Oak Ridge, up to 100 ft (30m) on Big Mountain; middle Miocene (Luisian) age (Clark 1983)*

Tts
Ttus
Tcvb
Ttlc
Ttls

TOPANGA FORMATION

(Vaqueros Formation of Kew 1924; Vaqueros-Topanga Formation of Whaley and Ricketts 1975); marine transgressive clastic; early to middle Miocene age (Zemorrian, Saucesian, and Relizian Stages)

Tts *Undivided sandstone, semi-friable, light gray to tan, massive to vaguely bedded; sparsely fossilferous in places*
Ttus *Upper Topanga Sandstone, similar to* **Tts***; correlated with Calabasas Formation (of Yerkes and Campbell 1979) in Santa Monica Mountains by Fritsche et al. 1983; middle Miocene age (Luisian and Relizian Stages)*
Tcvb *Conejo Volcanics: thin wedge of basalt south of Big Mountain (see below)*
Ttls *Lower Topanga Sandstone, similar to* **Tts***; early Miocene age (Saucesian-Zemorrian Stage); includes Vaqueros Formation (of Kew 1924, Fritsche 1983)*
Ttlc *Sandstone similar to* **Ttls***, but includes interbeds of soft gray micaceous siltstone*

Tcva
Tcvb
bi

CONEJO VOLCANICS

(Of Taliaferro 1924; Yerkes and Campbell 1979)

Submarine to subaerial extrusive volcanic rocks; middle Miocene age

Tcva *Predominantly andesitic-basaltic flows and breccias: gray, maroon-gray and brown aphanitic to slightly porphyritic rocks, vaguely stratified, flows range from platy to massive coherent but much fractured; deposited as flows and flow breccias; contain some epiclastic volcanic sediments and minor reddish, scoriaceous pyroclastic (?) horizons; probably emplaced subaerially*
Tcvb *Mostly basaltic rocks: gray-black to olive-brown, weathering brown, fine grained, composed of mafic minerals and plagioclase feldspar, vaguely bedded to massive, altered, crumbly and much fractured, locally vessicular, emplaced as flows and flow breccias, and in part as submarine flows, hyaloclastic breccias and marine tuffaceous sediments; fossilferous (oyster) sandstone at base locally*
bi *Black intrusive basaltic to andesitic dikes at base of, or within Conejo Volcanics*

Oligocene

Tsp

SESPE FORMATION

Non-marine fluviatile; Oligocene and late Eocene age

Tsp *Predominantly semi-friable bedded sandstone, light gray, tan to pink, locally pebbly and cross-bedded; includes interbeds of variegated maroon-red and greenish micaceous claystone, mostly in middle part; locally includes conglomerate of scattered pebbles and cobbles of granitic, metavolcanic and quartzitic rocks in sandstone matrix; about 5300 ft (1650m) thick; deposited by westward-flowing streams (Taylor 1983)*

?

Eocene

Tll

LLAJAS FORMATION

(Of Cushman and McMasters 1936; Meganos Formation of Kew 1924)

Marine clastic; middle Eocene age

Tll *Gray micaceous claystone and siltstone; only uppermost part exposed at southeast corner of quadrangle*

FIGURE 5.1.3-2

Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

VAL VERDE MAP (DF-50)

LEGEND

af
Qg
Qa

SURFICIAL SEDIMENTS

af *Artificial cut and fill*
Qg *Gravel and sand of major stream channels*
Qa *Alluvial gravel, sand and silt of valley and floodplain areas*

Qls

LANDSLIDE DEBRIS

Qoa

OLDER DISSECTED SURFICIAL SEDIMENTS

Qoa *Older alluvial gravel, sand, and silt/clay*

— *UNCONFORMITY* —

QTs

SAUGUS FORMATION
(of Kew 1924, Winterer and Durham 1962, Yeats et al. 1985)
Nonmarine fluviatile, weakly consolidated; Pliocene(?) and Pleistocene ages; lower part intertongues westward into Pico Formation

QTs *Slightly indurated, light gray, pebble conglomerate, sandstone and claystone, most pebbles are of granitic rocks*

Tp Tps
Tpsg Tpc

PICO FORMATION
(Of Kew 1924; Winterer and Durham 1962, Weber 1973, Yeats et al. 1985, Stitt 1986; upper part intertongues eastward into Saugus Formation)
Marine; mostly Pliocene age

Tp *Light gray, vaguely bedded, soft, micaceous claystone and siltstone; minor thin sandstones*
Tps *Tan, semi-friable sandstone, locally pebbly*
Tpsg *Light gray to tan, massive sandstone and pebble conglomerate of mostly granitic detritus in westernmost exposures only*
Tpc *Gray, cobble conglomerate of mostly granitic and metavolcanic clasts in clayey sandstone matrix in south area*

Holocene
?
Pleistocene
?
Pliocene
QUATERNARY

'ey

Ttos Ttoc
Ttog

TOWSLEY FORMATION
(Of Winterer and Durham 1962, Yeats et al. 1985, Stitt 1986; in south area included in Modelo Formation by Kew 1924, but in northwest area included by him in Pico Formation; probably correlative with lowest part of Pico Formation of areas west; in south area gradational into both Pico and Sisquoc Formations; type area - Towsley Canyon, Oat Mountain quadrangle)
Marine clastic; late Miocene to early Pliocene ages (Mohnian, "Delmontian" and Repettian Stages)

Ttos *In south area mostly light gray to tan, bedded, semi-coherent sandstone, locally pebbly, includes thin interbeds of silty shale*
Ttoc *In northwest area crumbly, gray, micaceous clay shale to siltstone; in south area includes thin strata of sandstone*
Ttog *(Hasley Conglomerate Member of Stitt 1986) basal gray conglomerate of rounded cobbles and pebbles of mostly granitic rocks, some of metavolcanic rocks in semi-coherent sandy matrix; not present in south area*

— *DISCONFORMITY* —
in northwest area

Tc

CASTAIC FORMATION
Marine; late Miocene age (Mohnian Stage), probably correlative with Sisquoc Formation

Tc *Gray clay shale with thin sandstone beds; northeast of San Gabriel fault only*

Tsq

SISQUOC FORMATION
(Included in Modelo Formation by Eldridge and Arnold 1907, Kew 1924; Bailey and Jahns 1954, Winterer and Durham 1962, Weber 1973, Yeats et al. 1985, Stitt 1986; Sisquoc Formation of Dibblee 1991)
Marine; late Miocene age (Mohnian-"Delmontian" Stage)

Tsq *Gray-brown, crumbly, micaceous clay shale to siltstone, in part somewhat siliceous, bedded; contains some dolomitic lenses*

Tm
Tmss

MONTEREY SHALE
(Modelo Formation of Eldridge and Arnold 1907, Kew 1924, Bailey and Jahns 1954, Winterer and Durham 1962, Weber 1973, Yeats et al. 1985, Stitt 1986; Monterey Formation of Dibblee 1991)
Marine; late Miocene age (Mohnian Stage)

Tm *White-weathering, thin bedded, platy, siliceous to soft, fissle, semi-siliceous shale; contains thin calcareous beds*
Tmss *Tan, semifriable sandstone with thin interbeds of silty shale*

? ?
Miocene
TERTIARY
CENOZOIC

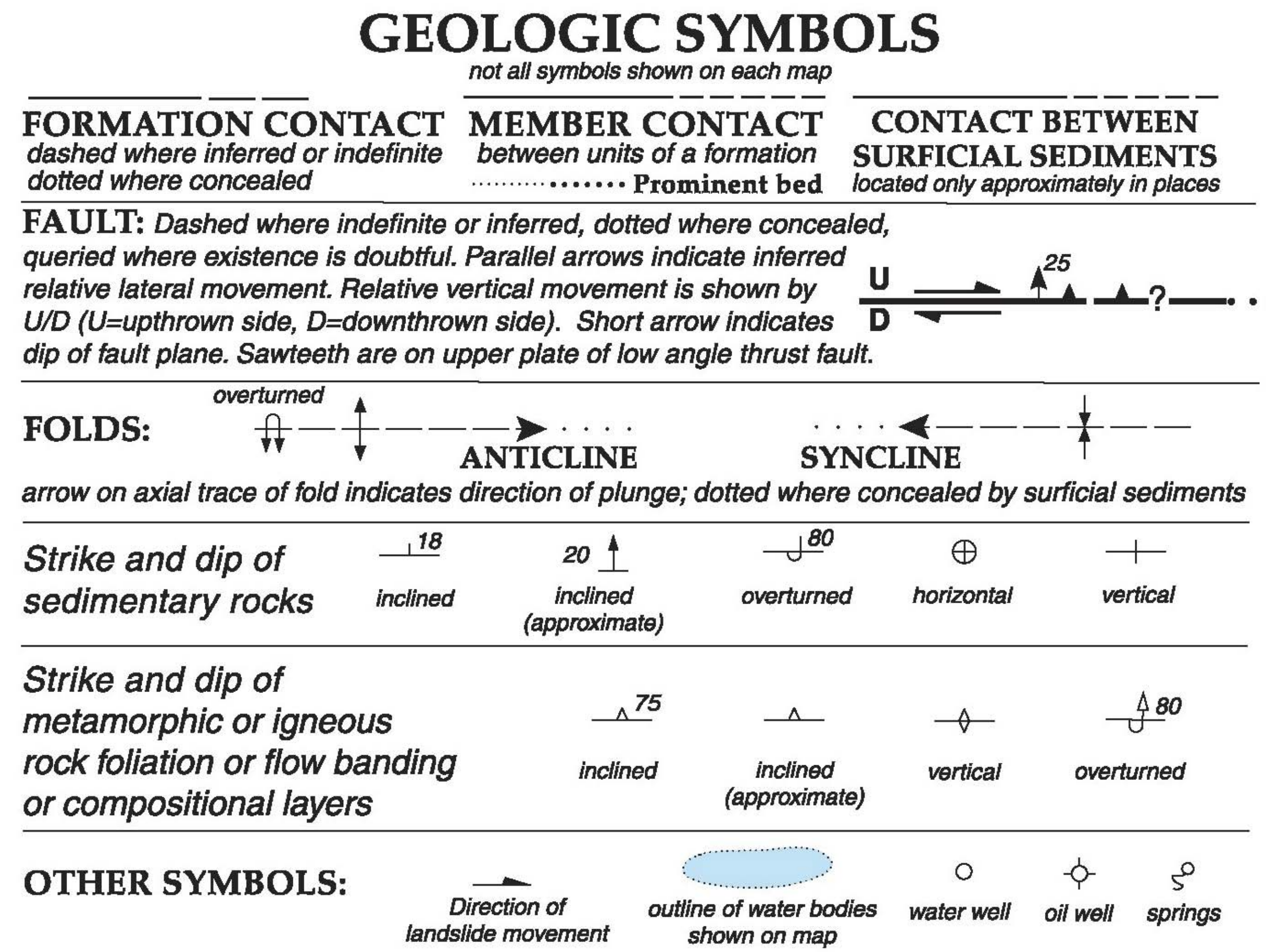
FIGURE 5.1.3-2
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

AGE CORRELATION CHART

AGE		ma	EPOCH		STAGE
CENOZOIC	QUAT.	.01	HOLOCENE		"HALLIAN"
CENOZOIC	QUAT.		PLEISTOCENE		"HALLIAN" ? — ? WHEELERIAN
CENOZOIC	TERTIARY	1.6	PLIOCENE	LATE	VENTURIAN
CENOZOIC	TERTIARY		PLIOCENE	EARLY	REPETTIAN
CENOZOIC	TERTIARY	5.3	MIOCENE	LATE	? — ? "DELMONTIAN" ? — ?
CENOZOIC	TERTIARY	9.5	MIOCENE	LATE	MOHNIAN
CENOZOIC	TERTIARY		MIOCENE	MIDDLE	LUISIAN
CENOZOIC	TERTIARY	16	MIOCENE	EARLY	RELIZIAN
CENOZOIC	TERTIARY		MIOCENE	EARLY	SAUCESIAN
CENOZOIC	TERTIARY	24	OLIGOCENE	?	ZEMORRIAN
CENOZOIC	TERTIARY	38	EOCENE	LATE ?	REFUGIAN
CENOZOIC	TERTIARY		EOCENE	LATE	NARIZIAN
CENOZOIC	TERTIARY		EOCENE	MIDDLE ?	ULATISIAN
CENOZOIC	TERTIARY		EOCENE	EARLY	PENUTIAN
CENOZOIC	TERTIARY	56	PALEOCENE		BULITIAN
CENOZOIC	TERTIARY		PALEOCENE		YNEZIAN
MESOZOIC		65	CRETACEOUS		
MESOZOIC		138	JURASSIC		
MESOZOIC		205	TRIASSIC		
		250	PALEOZOIC		
		570	PRECAMBRIAN		
		4000+			

Radiometric ages, in millions of years (ma), are from current geological literature. Time relationships between California provincial microfaunal stages and epochs are subject to continued revision and refinement, as indicated by dashed and/or queried lines. (Neogene stages are adapted mostly from Micropaleo Consultants, Inc., 1989). Partitions between stages and epochs are diagrammatic and not to scale.

GEOLOGIC SYMBOLS



An updated paleontological records search was completed in June 2017 for the Phase IIb project area.[101] Five vertebrate fossil localities occur directly within the proposed project area boundaries, and other localities occur nearby from the same sedimentary deposits that occur in the proposed project areas.

In all of the drainages in the proposed project areas, most particularly in the far north with the Santa Clara River and the converging Castaic Creek drainage and in Pico Canyon and Towsley Canyon in the middle and southern portions of the northern parcels of the proposed project areas, there are surface deposits of younger Quaternary Alluvium. These deposits typically do not contain significant vertebrate fossils in the uppermost layers, but they may be underlain at relatively shallow depth by older sedimentary deposits that may well contain significant fossil vertebrate remains. Where the very northern part of the proposed project areas extends into the elevated terrain on the northern side of the Saugus Ventura Road (Highway 126), there are exposures of the Plio-Pleistocene Saugus Formation. In the northern portion of the proposed project areas in the slightly less elevated terrain west of the Golden State Freeway (I-5), north of about Pico Canyon up to immediately west of Six Flags Magic Mountain, there are surface deposits mapped as older Quaternary gravels. These coarse alluvial fan deposits are unlikely to contain significant vertebrate fossils, but they overlie the Saugus Formation that is exposed immediately to the west and southwest down to just north of Potrero Canyon and the area just south of Pico Canyon to the Golden State Freeway (I-5). From the Ridge on the northern side of Potrero and Pico Canyons southwestward there are exposures of the marine Pliocene Pico Formation. Further southwestward there are exposures of the marine latest Miocene to Pliocene Towsley Formation and then the middle of an anticline with exposures of the marine late Miocene Modelo Formation (although it may be referred to as the Monterey Shale or, for the younger upper part, the Sisquoc Formation, in this area). Continuing southwestward there are further exposures of the Towsley Formation, smaller exposures of the Pico Formation, and even some exposures of the Saugus Formation near the Golden State Freeway (I-5) northeast of Rice Canyon and East Canyon.

In the southern parcel of the proposed project areas near the Chatsworth Reservoir, there are exposures of younger Quaternary Alluvium in the drainages and in the lower lying terrain in the very northeastern portion of the parcel around the Chatsworth Reservoir. In the elevated terrain west of the Chatsworth Reservoir there are exposures of the marine late Cretaceous Chatsworth Formation. South of the Chatsworth Formation exposures the bedrock consist of the marine middle Miocene Topanga Formation [also called the Upper Topanga Formation or even detrital sediments of Lindero Canyon in this vicinity].

5.1.4 Cemeteries and Human Remains

The records searches, supplemental research, and consultation did not reveal any known cemeteries or burial sites within the Trails Master Plan Project Area. Three previously recorded Native American village sites with burials are located within 0.5 miles of the Trails Master Plan Study Area. No formal historic or modern cemeteries were identified within the Trails Master Plan Study Area or the 0.5-mile buffer.

[101] McLeod, Samuel, Natural History Museum of Los Angeles County, Los Angeles, CA. 28 July 2017. Letter response to Dustin Keeler, Sapphos Environmental, Inc., Pasadena, CA

5.1.5 Tribal Cultural Resources

A Native American sacred site is defined by the NAHC as an area that has been, and often continues to be, of religious significance to Native American peoples, such as an area where religious ceremonies are practiced or an area that is central to their origins as a people.[102] Consultation with NAHC identified no Native American sacred sites in the vicinity of the Trails Master Plan Study Area.[103,104] Letters to the recommended tribal organizations and individuals identified by NAHC resulted in replies from two Native American contacts, Mr. Freddie Romero of the Santa Ynez Tribal Elders Council[105] and Mr. Patrick Tumamait.[106] Neither individual identified any sacred sites within the Trails Master Plan Study Area. The NAHC requested ongoing consultation regarding the project.

Letters to the recommended tribal organizations and individuals identified by NAHC under the AB 52 consultation on behalf of the County resulted in replies from three Native American contacts. Mr. Andrew Salas of the Gabrieleno Band of Mission Indians-Kizh Nation stated that the project is in a sensitive area and may cause a substantial adverse change in the significance of tribal cultural resources. Mr. Rudy Ortega of the Fernandeño Tataviam Band of Mission Indians stated that the project is in a sensitive area and may cause a substantial adverse change in the significance of tribal cultural resources. A Chumash representative responded by phone and stated that they will not be consulting because this project is outside their ancestral territory.

There are previously recorded archaeological sites within the study area that may be considered Tribal Resources. The local tribal contacts stated during the AB 52 consultation meeting that there are traditional use areas within the study area.

5.2 IMPACT ANALYSIS

5.2.1 Archaeological and Historical Resources

Recorded archaeological resources occur within or adjacent to the Trails Master Plan Study Area, and other unknown and unrecorded archaeological and/or historical resources could be located within and adjacent to the Trails Master Plan Study Area, especially in those areas that are selected for trail construction and/or improvements. Therefore, trail-related construction activities that would entail ground disturbance may have the potential to damage or destroy intact archaeological and/or historical resources that may be eligible for the California Register of Historical Resources (CRHR). Additionally, buried resources could be inadvertently unearthed during ground-disturbing activities, resulting in demolition of or substantial damage to significant archaeological resources.

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[102] Native American Heritage Commission. Accessed 21 July 2006. "Understanding Cultural Resources." Available at: www.nahc.ca.gov/understandingcr.html

[103] Singleton, Dave, Native American Heritage Commission, Sacramento, CA. 28 December 2012. Faxed letter response to Clarus Backes, Sapphos Environmental, Inc., Pasadena, CA.

[104] Singleton, Dave, Native American Heritage Commission, Sacramento, CA. 25 November 2013. Faxed letter response to Roberta Thomas, Sapphos Environmental, Inc., Pasadena, CA.

[105] Backes, Clarus, Sapphos Environmental, Inc., Pasadena, CA. 10 January 2013. Contact Report to Patrick Tumamait, Ojai, CA.

[106] Backes, Clarus, Sapphos Environmental, Inc., Pasadena, CA. 17 January 2013. Contact Report to Freddie Romero, Santa Ynez Tribal Elders Councils, Santa Ynez, CA

Two (2) historic built resources (P-19-190691, P-19-186568), seven (7) historic archaeological resources (P-19-000247, P-19-000647, P-19-001593H, P-19-101351, P-19-186538, P-19-101200, P-19-101199) and one (1) prehistoric archaeological resource (P-19-000502) are located within the proposed trails alignment and a 60-foot buffer. The mitigation measures provided below in section 5.3 would serve to avoid, minimize, or substantially reduce impacts to cultural resources.

5.2.2 Paleontological Resources

The Chatsworth Formation, Santa Susana Formation, Llajas Formation, Sespe Formation, Topanga Formation, Monterey Formation, Towsley Formation, Pico Formation, Saugus Formation, and older Quaternary Alluvium can be considered paleontologically sensitive geological units which are characterized by a moderate to high potential for containing unique paleontological resources. As such, substantial excavations in these geologic units have a good chance of encountering significant vertebrate fossil remains. It is unlikely that shallow excavations will encounter any significant fossil vertebrate remains. In the event that further improvements to the existing trail system located within the Trails Master Plan Study Area consist of ground disturbance in native soil at depths greater than 12 inches, a qualified paleontologist should be consulted to determine if additional paleontological studies and/or monitoring are necessary.

5.2.3 Native American Sacred Sites and Human Remains

There are no known Native American sacred sites or burial sites within the Trails Master Plan Project Area. There are previously recorded archaeological sites that may be considered Tribal Resources within the Trails Master Plan Project Area. Ground-disturbing activities associated with the construction of trail elements would not be expected to directly or indirectly affect or destroy a Native American sacred site or human remains. However, because there are known prehistoric and historic archaeological sites within the Trails Master Plan Study Area, ground-disturbing work associated with the project has the potential to damage or destroy previously recorded, previously unknown, and/or buried prehistoric Native American archaeological and historic archaeological resources. The mitigation measures provided below would serve to avoid, minimize, or substantially reduce impacts to cultural resources.

5.3 MITIGATION RECOMMENDATIONS

The following mitigation measures are recommended, as applicable, for ground disturbing activities associated with trail construction and/or improvements within the Trails Master Plan. These measures, with proper implementation, will serve to avoid, minimize, or substantially reduce impacts to cultural resources.

Mitigation Measure CULTURAL-1: *Archaeological and Historical Resources – Avoidance and Monitoring*. Completion of a Worker Education and Awareness Program for all personnel who will be engaged in ground-disturbing activities shall be required prior to the start of ground-disturbing activities. This shall include training that provides an overview of cultural resources that might potentially be found and the appropriate procedures to follow if cultural resources are identified. This requirement extends to any new staff prior to engaging in ground disturbing activities.

Prior to the initiation of ground-disturbing activities, the County of Los Angeles Department of Parks and Recreation (DPR) shall review the construction plans to ensure that any known cultural resources that are required to be avoided have been marked as "off-limits" areas for construction and construction staging. In addition, DPR shall require monitoring of all ground disturbing activities by a qualified archaeologist within 60 feet of a known extant unique archaeological resources, significant historical resources, or tribal cultural resource. In addition, consultation shall be undertaken with the Native American local Tribal contacts designated by the Native American Heritage Commission to determine if a Native American monitor shall also be present during all or a portion of the ground-disturbing activities.

In the event that previously unknown unique archaeological resources, significant historical resources, or tribal cultural resources are encountered during construction, the resources shall either be left *in situ* and avoided through realignment of the trail, or the resources shall be salvaged, recorded, and reposited at the Los Angeles County Natural History Museum or other repository consistent with the provisions of a Phase III data recovery program and the provisions of a Cultural Resource Management Plan. Data recovery is not required by law or regulation. It is, though, the most commonly agreed-upon measure to mitigate adverse effects to cultural resources eligible or listed under Section 106 Criterion D, as it preserves important information that will otherwise be lost.

Mitigation Measure CULTURAL-2: *Pre-Construction Surveys.* At the time that any new segment of trail is proposed for development that would require ground-disturbing activities in soils that have been predominantly *in situ* during the past 50 years, records and archival information shall be reviewed to determine if there are any recorded unique archaeological resources and significant historical resources as defined in Section 15064.5(a) of the CEQA Guidelines, or Tribal cultural resources as defined by AB52 in the project footprint. At a minimum, the records and archival review will include a search of the South Central Coastal Information Center if more than two years have passed since the previous records search, a request for Sacred Lands File from the Native American Heritage Commission, and a request for information regarding Tribal cultural resources from the Native American local Tribal contacts designated by Native American Heritage Commission. The appropriate course of action will be undertaken in light of the results of the records search:

(A) Where the project study area has been subject to a Phase I Walkover Survey within two years of the proposed activity and no unique archaeological resources, significant historical resources, or Tribal cultural resources are known within the project footprint, work shall proceed per the provision of Mitigation Measure CULTURAL-1.

(B) Where all or a portion of the project footprint has not been surveyed for cultural resources within two years of a proposed ground-disturbing activity, a qualified archaeologist who meets the Secretary of the Interior's professional qualification standards for archaeology and shall conduct a Phase I Walkover Survey to ascertain the presence or absence of unique archaeological and/or significant historical resources, as defined in Section 15064.5(a) of the CEQA Guidelines.

   a. If the survey and record searches determines no unique archaeological resources or significant historical resources, including potential Tribal cultural resources, then the work shall proceed consistent with the provisions of Mitigation Measure CULTURAL-1.

   b. If the survey determines potential unique archaeological resources or significant historical resources, including potential Tribal cultural resources, then one of two courses of action shall be employed:

i. Where avoidance is feasible, the trail alignments shall be realigned to avoid the potentially significant cultural resource, and the work shall then proceed consistent with the provisions of Mitigation Measure CULTURAL-1. The new alignment will be surveyed by a qualified archaeologist who meets the professional qualification standards of the Sectary of the Interior. An archaeological monitor under direction of a qualified archaeologist who meets the professional qualification standards of the Sectary of the Interior shall be present during ground-disturbing activities within 60 feet of previously recorded cultural resources. In addition, consultation shall be undertaken with the Native American local Tribal contacts designated by Native American Heritage Commission to determine if a Native American monitor shall also be present during all or a portion of the ground-disturbing activities.

ii. Where avoidance is not feasible, a Phase II evaluation of the cultural resources shall be undertaken by a qualified archaeologist who meets the professional qualification standards of the Sectary of the Interior to determine the significance of the cultural resource. If the Phase II investigation identifies a unique/eligible cultural resource within the area proposed for ground-disturbing work, the County shall determine whether to avoid the resource through redesign or to proceed with a Phase III data recovery program consistent with the provisions of a Cultural Resource Management Plan. The work shall then proceed consistent with the provisions of Mitigation Measure CULTURAL-1.

Mitigation Measure CULTURAL-3: *Paleontological Resources – Paleontological Monitoring*. Impacts to cultural resources related directly or indirectly to the destruction of a unique paleontological resource from the proposed project shall be reduced to below the level of significance by monitoring, salvage, and curation at the Los Angeles County Natural History Museum of unanticipated paleontological resources discovered during ground-disturbing activities in previously undisturbed native soils located five or more feet below the ground surface that would have the potential to contact geologic units with a high to moderate potential to yield unique paleontological resources. Ground-disturbing activities include, but are not limited to, drilling, excavation, trenching, and grading. If paleontological resources are encountered during ground-disturbing activities, the County of Los Angeles Department of Parks and Recreation (DPR) shall require and be responsible for salvage and recovery of those resources by a qualified paleontologist consistent with standards for such recovery established by the Society of Vertebrate Paleontology.

Paleontological Resources Sensitivity Training given by a qualified paleontologist or archaeologist cross-trained in paleontology shall be required for all project personnel involved in ground disturbing activities prior to the start of ground-disturbing activities in geologic units with a moderate to high potential to yield unique paleontological resources. This shall include a brief field training that provides an overview of fossils that might potentially be found, and the appropriate procedures to follow if fossils are identified. This requirement extends to any new staff involved in earth disturbing that joins the project.

Construction monitoring by a qualified monitor (archaeologist cross-trained in paleontology or paleontologist) shall be implemented during all ground-disturbing activities that affect previously undisturbed geologic units 12 or more inches below the ground surface and have the potential to encounter geologic units with a moderate to high potential to yield unique paleontological resources. In the event that a paleontological resource is encountered during construction, all ground-disturbing activity within 100 feet of the find shall be halted until a qualified paleontologist can evaluate the significance of the discovery. Additional monitoring recommendations may be required. If the resource is found to be significant, the paleontologist shall determine the most appropriate treatment and method for stabilizing and collecting the specimen. Curation of the any significant paleontological finds shall be housed at a qualified repository, such as the Natural History Museum of Los Angeles County (LACM).

Within 90 days of the completion of any salvage operation or monitoring activities, a mitigation report shall be submitted to DPR with an appended, itemized inventory with representative snapshots of specimens. The report and inventory, when submitted to DPR, shall signify the completion of the program to mitigate impacts to paleontological resources. A copy of the report/inventory shall be filed with the County of Los Angeles Planning and Development Agency and the Natural History Museum of Los Angeles County.

Mitigation Measure CULTURAL-4: *Regulatory Requirements – Human Remains*. In accordance with Section 7050.5 of the California Health and Safety Code, if human remains are encountered during excavation activities, the County Coroner shall be notified within 24 hours of the discovery. No further excavation or disturbance of the site or any nearby areas reasonably suspected to overlie adjacent remains within 100 feet shall occur until the County Coroner has determined, within two working days of notification of the discovery, the appropriate treatment and disposition of the human remains.

If the County Coroner determines that the remains are or are believed to be Native American, s/he shall notify the Native American Heritage Commission (NAHC) in Sacramento within 24 hours. In accordance with Section 5097.98 of the California Public Resources Code, the NAHC shall immediately notify the person(s) it believes to be the most likely descendant (MLD) of the deceased Native American. The descendants shall complete their inspection and make a recommendation within 48 hours of being granted access to the site. The designated Native American representative would then determine, in consultation with the County of Los Angeles Department of Parks and Recreation (DPR), the disposition of the human remains. The MLD's recommendation shall be followed if feasible, and may include scientific removal and non-destructive analysis of the human remains and any items associated with Native American burials. If DPR rejects the MLD's recommendations, the agency shall rebury the remains with appropriate dignity on the property within a time frame agreed upon between the County and the MLD's in a location that will not be subject to further subsurface disturbance (14 California Code of Regulations §15064.5(e)).

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APPENDIX A
RESUME OF PROJECT PERSONNEL

Sapphos environmental inc.

Dustin M. Keeler, Ph.D., RPA

Senior Archaeological Resources Coordinator

Ph.D., Anthropology, emphasis in Archaeology
State University of New York at Buffalo, Buffalo, 2010

M.A., Anthropology, emphasis in Archaeology
State University of New York at Buffalo, Buffalo, 2003

Bachelor of Arts, Anthropology
Arizona State University, Tempe, 2001

- *Project Management*
- *Principle Investigator*
- *Pedestrian Survey*
- *Data Recovery*
- *Archaeological/ Paleontological Monitoring*
- *Native American tribal consultation*
- *GPS (Trimble/Garmin)/ Geographic information systems (GIS)*
- *Lithic Analysis*
- *Prehistoric Ceramic Analysis*
- *Historical Resource Identification and Analysis*

Years of Experience: 17+

Relevant Experience:

- *CEQA/NEPA/ NHPA, Section 106 compliance*
- *Archaeological Management and Treatment Plans*
- *Central California Coast Archaeology*
- *Colorado/Mojave Desert Archaeology*
- *Southern California Coast Archaeology*
- *Great Basin Archaeology*

Dr. Dustin Keeler, Senior Archaeological Resources Coordinator for Sapphos Environmental, Inc., has more than seventeen years of experience in the field of archaeology including project management, field direction, planning, technical writing, archaeological field survey, data recovery, construction monitoring, Geographic Information Systems and laboratory analysis.

As Senior Archaeological Resources Coordinator, Dr. Keeler has undertaken and contributed to work efforts for Historic and Prehistoric Archaeology and Paleontology in Los Angeles, San Diego, Imperial, Riverside, San Bernardino, Orange, Kern, San Luis Obispo, Santa Barbara, El Dorado, and Mono Counties. He has been involved in cultural resources investigations under Section 106 of the National Historic Preservation Act (NHPA) and the California Environmental Quality Act (CEQA) and in consultation with the SHPO and Native American tribes in accordance with the Secretary of the Interior's Standards. Dr. Keeler has directed and performed archaeological field surveys, site recordation, mapping, construction monitoring, and data recovery. In addition, Dr. Keeler has performed laboratory analysis, including GIS spatial analysis, ceramic and lithic formal artifact analysis, and historical artifact analysis. He is also experienced in the management of archaeological GIS data.

Dr. Keeler has extensive experience in paleontological monitoring including recordation and reporting. Dr. Keeler is experienced using ArcGIS, GPS and Trimble. His responsibilities have included identification, analysis and interpretation of archaeological material, preparation of site records and preparation of reports. Dr. Keeler has experience collaborating with Native American Tribal representatives as well as City, County, State and Federal agencies and compliance with each of their respective regulations and codes, including but not limited to the State Historic Preservation Officer (SHPO), U.S. Army, U.S. Navy, California Department of Parks and Recreations, California Department of Public Works, Bureau of Land Management, and CALTRANS.

Dr. Keeler has presented original research at the Society for American Archaeology Annual Meetings. Current research interests include GIS intrasite and regional spatial analysis, marine adapted hunter-gatherers, and prehistoric Mojave desert archaeology. His qualifications meet the Secretary of the Interior's Professional Qualifications Standards in archaeology as a project archaeologist for both prehistoric and historic cultural remains.

Dustin Keeler, Ph.D., RPA (continued)

EXPERIENCE

California High Speed Rail, Kern and Tulare Counties, CA 2016–2017
Dr. Keeler serves as archaeological consultant in support of the California High Speed Rail project for Construction Package 4, which will run from Fresno to Bakersfield. His responsibilities include review of reporting for CEQA and Section 106 compliance as well as oversight of field work and documentation conducted by the Design-Build team.

SoCalGas ANF Span Pipeline Maintenance Project, Los Angeles County, CA 2016–2017
Dr. Keeler serves as archaeological consultant in support of the ANF Span Pipeline Maintenance Project. He conducted a record search at the ANF offices, performed the field survey and will coordinate the archaeology monitoring efforts.

SoCalGas El Horno St. Pipeline Replacement Project, San Juan Capistrano, CA 2016-2017
Dr. Keeler serves as archaeological consultant in support of the El Horno St. Pipeline Replacement Project. He coordinated the archaeology monitoring efforts and prepared the monitoring report.

SoCalGas Foothill Rd. Pipeline Maintenance Project, Santa Barbara, CA 2016–2017
Dr. Keeler serves as archaeological consultant in support of the Foothill Rd. Pipeline Maintenance Project. He performed the field survey, coordinated the archaeological and Native American monitoring efforts, and prepared the ASR and monitoring report.

SoCalGas Avila Beach Pipeline Replacement Project, Avila Beach, San Luis Obispo County, CA 2016
Dr. Keeler serves as archaeological consultant in support of the Avila Beach Pipeline Replacement Project. He performed the extended Phase I testing, coordinated the Native American monitoring efforts, and prepared the letter report.

SoCalGas Line 85 Fatal Flaw Analysis, Kern, Los Angeles, and Kings Counties, CA, 2016
Dr. Keeler served as archaeological consultant for SoCalGas for the preparation of a Fatal Flaw Analysis for Line 85.

Owens Lake Dust Control Project, Keeler, CA, 2016–2017
Dr. Keeler serves as the archaeologist/principal investigator, and is providing senior oversight and technical expertise on cultural resources located within the Owens Lake Dust Control Project. Support includes preparing reports, coordinating archaeological monitoring, and budget oversight and management.

Crenshaw/LAX Metro Project-Archaeo/Paleo Monitoring, Los Angeles, CA, 2016–2017
Dr. Keeler served as Project Manager during construction phase of this project. Sapphos Environmental, Inc. serves as subcontractor to AECOM in a joint effort to provide archaeo/paleo monitoring. Dr. Keeler was tasked with scheduling and coordination of monitors, invoicing, ensuring safety protocols are followed and all training is provided to staff. This project is conducted under CEQA regulations.

Regional Connector Metro Project Los Angeles, CA, 2016–2017
Dr. Keeler served as Project Manager and Archaeo/Paleo Monitor during construction phase of this project. Sapphos Environmental, Inc. serves as subcontractor to AECOM in a joint effort to provide archaeo/paleo monitoring. Dr. Keeler was tasked with scheduling and coordination of monitors, invoicing, ensuring safety protocols are followed and all training is provided to staff; as well as archaeo/paleo monitoring of several sites during construction phase and preparing DPR forms for archaeological discoveries. This project is conducted under CEQA regulations.

Barren Ridge Transmission Line Project, Los Angeles County, CA, 2015–2016
Dr. Keeler served as Paleontological Monitor for this project from Santa Clarita, CA to Mojave, CA.

VA Long Beach Fisher House Project, Long Beach, CA. 2015
Dr. Keeler served as Field Director for mechanical archaeological excavation within prehistoric sites at the VA Long Beach. He directed the field work, coordinated archaeological and Native American monitoring efforts and prepared the testing report.

Hidden Oaks Project, Chino Hills, CA.2015
Dr. Keeler served as Principle Investigator and field director for this archaeological field survey project in Chino Hills, CA. He performed the record search, directed the field survey and prepared the assessment report.

Temecula Gateway Project, Temecula, California. Principle Investigator. Archaeological field survey. 2015
Dr. Keeler served as Principle Investigator for this archaeological field survey project in Temecula, CA. He performed the record search, directed the field survey and prepared the assessment report.

Ft Irwin TO37 Project, Ft. Irwin, California. Field Director/Data Specialist. Archaeological field survey. 2014-2015
Dr. Keeler served as Field Director for this archaeological field survey project on Fort Irwin, CA. He directed the field survey of 20,000 acres, performed Phase II testing of five prehistoric sites, and prepared the technical report.

BLM Bishop FY14 Project, Bodie Hills, California. 2014
Dr. Keeler served as Field Director and Data Specialist for this archaeological field survey project in Bodie Hills, CA. He directed the field survey and prepared the technical report.

Extended Phase I Testing for the Caltrans High Desert Corridor XPI Project, Los Angeles and San Bernardino Counties, CA. 2014
Dr. Keeler directed the field pedestrian survey and extended Phase I testing of sites along the High Desert Corridor and prepared the technical report.

Metropole Vault Replacements Project, Southern California Edison, Avalon, Catalina Island, Los Angeles County, CA. 2014
Dr. Keeler performed archaeological monitoring, Data Recovery of Native American burials and coordination with Native American monitors during ground disturbing activities of a 30,000 s.f. APE for the replacement of two underground electrical vaults. The site is located in proximity to the original Tongva tribal village on the island.

Chuckwalla Valley Emergency Response Project, Southern California Edison, Desert Center, Riverside County, CA. 2013
Dr. Keeler performed a cultural resources survey and monitoring to support the emergency removal, replacement and repair of poles damaged or destroyed by a flash flood located on land administered by the BLM and on private land. He assessed the potential for adverse effect to historic properties, per Section 106 of the National Historic Preservation Act, and impacts to cultural resources under CEQA.

Cascade Renewable Interconnection Project, Southern California Edison, Sunfair, San Bernardino County, CA. 2013
Dr. Keeler conducted archaeological and paleontological awareness training for the SCE crew. He performed monitoring during ground disturbing activities for the removal and replacement of poles.

APPENDIX B
CONFIDENTIAL NATIVE AMERICAN CONSULTATION
(REDACTED)

APPENDIX C
CONFIDENTIAL MAP OF
PREVIOUSLY RECORDED CULTURAL RESOURCES
(REDACTED)

Appendix E

Geology and Soils Technical Report

Santa Susana Mountains Trails Master Plan – Phase II

Geology and Soils Technical Report

Prepared for:

County of Los Angeles
Department of Parks and Recreation
510 S. Vermont Ave.
Los Angeles, CA 90020

Prepared by:

Sapphos Environmental, Inc.
430 North Halstead Street
Pasadena, California 91107

November 2, 2017

EXECUTIVE SUMMARY

This Geology and Soils Technical Report addresses potential impacts to geology and soils that could result from proposed work associated with the Santa Susana Mountains Trails Master Plan – Phase II (SSMTMP-PII, or proposed project), located within unincorporated Los Angeles County, California. This study is based on a desktop analysis using existing geologic/soils/seismic reports, records, and maps; as well as evaluation of the planned construction, recreational use, and maintenance activities associated with the proposed project. Impacts to geology and soils were considered with respect to Appendix G of the California Environmental Quality Act Guidelines and the County of Los Angeles Department of Parks and Recreation's Environmental Checklist form.

Earthquake Fault Rupture. The proposed project would result in less than significant impacts in regard to exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault. The Holser and Chatsworth fault segments could experience a few inches to several feet of ground rupture offset and related ground disturbance. Project design should not allow any facilities that may be habitable for extended periods to be built over or within 50 feet of the active or potentially fault traces. Project maintenance should consider fault displacement and severe cracking in these areas as post-earthquake maintenance issues.

Seismic Ground Shaking. The proposed project would result in less than significant impacts in regard to exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking. Severe shaking can be very destructive to narrow ridgelines and steep slopes, causing severe cracking and slope failures. Project maintenance should consider severe ground shaking affects in these areas as post-earthquake maintenance issues.

Seismic-Related Ground Failure/Liquefaction. The proposed project would result in less than significant impacts in regard to exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure. The larger canyon alluvial deposits are subject to liquefaction. Liquefaction would only be an issue for larger or habitable structures. If any significant structures are planned within or immediately adjacent to a potential liquefaction zone, they should be evaluated with a geotechnical study to define the potential hazards and make appropriate recommendations.

Landslides. The proposed project would result in less than significant impacts in regard to exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides. Landslide and earthquake-induced landslide movement may occur along bedding planes within the bedrock formations, as rocks dislodged from exposures on steep slopes, or as surficial failures of weathered rock and soil/colluvium potentially affecting overlying facilities and facilities nearby and downslope. The proposed project design within areas of potential/mapped landslides should be evaluated with a geotechnical study to define the potential hazards and make appropriate recommendations.

Soil Erosion / Loss of Topsoil. The proposed project would result in less than significant impacts in regard to substantial soil erosion or the loss of topsoil. The proposed project could result in soil erosion or the loss of topsoil mainly in proposed SSMTMP-PII areas with numerous primary and secondary drainages. Project design should consider the effects of any significant structures or facilities that would block, divert, or accentuate change to an existing drainage and as such cause potential soil erosion or loss of topsoil, and a geotechnical study should provide specific design recommendations to avoid these affects.

Stability of Geologic Unit / Soil. The proposed project would result in less than significant impacts in regard to being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project. Landslide and liquefaction potential are the most significant potential hazards. With the large variation in geologic units, the relative difficulty of excavation, the suitability for safe trail or roadway surfaces, the stability of construction slopes, and the suitability of excavated materials for use as backfill would also vary. Potentially unstable areas should be evaluated with a geotechnical study to define the unstable areas and to provide appropriate project design recommendations to avoid affects from unstable areas.

Expansive Soil. The proposed project would result in less than significant impacts in regard to being located on expansive soil. Portion of the proposed project trails and related structures would overlie areas of expansive soil, which can be affected by repeated episodes of wetting and drying to cause distress to structures in contact with such soils. A geotechnical study should be performed to define these unfavorable conditions and where they cannot be avoided it could be necessary for project design to use non-expansive materials to overcome these potential effects.

Portions of the proposed SSMTMP-PII area have plugged (abandoned) wells, active and inactive wells, and buried wells that represent potential vertical migration pathways for crude oil, methane, H_2S, and other compounds. While there may be limited opportunity for exposure to these hazards, it would be advisable where possible to avoid these oil field areas and where not possible to perform an appropriate technical study to define trail- and facility-specific project design elements as necessary.

Capability of Soils to Support Wastewater Treatment Systems. The proposed project would result in less than significant impacts in regard to the capability of soils to adequately support the use of onsite wastewater treatment systems where sewers are not available for the disposal of wastewater. Areas of the proposed project could encounter soils incapable of adequately supporting the use of onsite wastewater treatment systems where sewers are not available for the disposal of wastewater. Project design and location of restroom facilities should consider groundwater depth and proximity to potentially shallow groundwater in existing drainages, as well as soils incapable of adequately supporting the use of onsite wastewater treatment systems where sewers are not available. A geotechnical study should be performed for design and construction of wastewater disposal facilities if the use of such unsuitable areas is necessary.

Conflicts with Hillside Management Area Ordinance or Hillside Design Standards. The proposed project would result in less than significant impacts in regard to conflicts with the Hillside Management Area Ordinance or hillside design standards in the County General Plan. Trails and facilities would be subject to the requirements and design standards of the Hillside Management Area Ordinance and hillside design standards in the Conservation and Open Space element of the County's General Plan, as well as in the County of Los Angeles Trails Manual.

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SECTION 1.0
INTRODUCTION

This Geology and Soils Technical Report (Report) has been prepared to support the County of Los Angeles (County) Department of Parks and Recreation (DPR) in the development of Phase II of the Santa Susana Mountains Trails Master Plan (SSMTMP-PII or proposed project), located within unincorporated Los Angeles County, California. In accordance with the California Environmental Quality Act (CEQA), this Report encompasses geologic, soils, and seismic information to address the general conditions and specific hazards that may impact the proposed project. This Report presents the results of these efforts and provides a programmatic impact analysis and mitigation recommendations related to geology and soils within the SSMTMP-PII area. While this report focuses on Phase II, it incorporates updated information for the Phase I study area.

1.1 CEQA COMPLIANCE

DPR proposes to complete the SSMTMP-PII, ultimately to amend the Parks and Recreation Element of the Los Angeles County General Plan 2035 (County General Plan) to include the SSMTMP-PII, which would guide future trail development and recommend improvements to existing trails. The proposed project would ultimately result in the construction and use of trails in public and private lands, some of which may involve the expenditure of public funds, and thus constitutes a project pursuant to the California Environmental Quality Act (CEQA). These trails would be located in the unincorporated territory of Los Angeles County; therefore, the County would be the Lead Agency pursuant to CEQA.

1.2 PURPOSE

This Report serves two purposes: (1) to provide information regarding geology and soils to inform the planning process; and (2) to provide the substantial evidence required with respect to geology and soils for consideration of the potential for environmental effects under CEQA. This Report was prepared to characterize the geology and soils conditions that would potentially be affected by construction, operation, and maintenance of the proposed project. As such, the document presents data and information to be used by the County in making a determination of effects to geology and soils resulting from the proposed project. The Report provides information in relation to the geology and soils areas identified in Appendix G of the State CEQA Guidelines and the County DPR's Environmental Checklist form.

The objective of this analysis is to provide a level of technical and regulatory background sufficient to allow the identification of trail planning concerns and constraints related to geologic, seismic, and soils conditions. Consideration of this background information should extend to trails and all trail related facilities within the SSMTMP-PII area.

1.3 INTENDED AUDIENCE

This Report provides information for consideration by DPR and the design team, Alta Planning+Design, engaged in the development of the SSMTMP-PII. The substantial evidence would be available for the responsible and trustee agencies, and the public, including property owners, during circulation of the draft environmental document for public review. Ultimately, the

Report would be used by the County Board of Supervisors to support their decision-making process related to the SSMTMP-PII. The Report would also inform the County and private parties in the ultimate development, operation, and maintenance of trails in the plan area.

1.4 SCOPE

In May 2015, the County adopted the first phase of the Santa Susana Mountains Trails Master Plan (SSMFTMP), which involved the extension of the 35.7 miles of existing County-, City-, and Conservancy-managed trails in the Phase I and Phase II study areas by approximately 35.9 miles with 22 proposed trail segments, for a total of approximately 71.5 miles of trails within the SSMFTMP area. In 2017, the County initiated planning efforts for further development of the Phase II study area, which has been expanded to Phase II.a and II.b.

1.5 SOURCES OF RELEVANT INFORMATION

Information used in the preparation of this Report was derived from a review of relevant literature, including published reports and maps, and unpublished County documents, informal consultation with cooperating agencies, and spatial analysis based on geographic information system data. Sources used in the preparation of this Report include, but are not limited to: U.S. Geological Survey (USGS) 7.5-minute quadrangle maps; Dibblee Foundation maps; data from the National Resource Conservation Service (NRCS), the California Geological Survey (CGS), California Division of Mines and Geology (CDMG), and the California Department of Conservation Division of Oil, Gas, and Geothermal resources; and information from DPR, the County of Los Angeles Trails Manual (County Trails Manual), and the California Building Standards Commission. These and any other source of relevant information used in the preparation of this GSTR are cited in footnotes and compiled in Section 6.0, *References*.

1.6 WORKING DEFINITIONS

Technical terms used in the characterization of baseline conditions and assessment of the potential for the proposed project to affect geology and soils are given below:

Alluvium: An unconsolidated accumulation of stream-deposited sediments, including sands, silts, clays or gravels.

Extrusive Igneous Rocks: Rocks that crystallize from molten magma on earth's surface.

Fault: A fracture or fracture zone in rock along which movement has occurred.

Formation: A laterally continuous rock unit with a distinctive set of characteristics that make it possible to recognize and map from one outcrop or well to another. The basic rock unit of stratigraphy.

Holocene: An interval of time relating to, or denoting the present epoch, which is the second epoch in the Quaternary period, from approximately 11,000 years ago to the present.

Miocene: An interval of time relating to, or denoting the fourth epoch of the Tertiary period, between the Oligocene and Pliocene epochs, from approximately 23 to 5.5 million years ago.

Oligocene: An interval of time relating to, or denoting the third epoch of the Tertiary period, between the Eocene and Miocene epochs, from approximately 34 to 23 million years ago.

Outcrop: A rock formation that is visible on earth's surface.

Paleocene: An interval of time, relating to, or denoting the earliest epoch of the Tertiary period, between the Cretaceous period and the Eocene epoch.

Paleozoic: An interval of time relating to, or denoting the era between the Precambrian eon and the Mesozoic era.

Pleistocene: An interval of time relating to, or denoting the first epoch of the Quaternary period, between the Pliocene and Holocene epochs, from approximately 2.6 million years ago to 11,000 years ago.

Pliocene: An interval of time relating to, or denoting the last epoch of the Tertiary period, between the Miocene and Pleistocene epochs, from approximately 5.5 to 2.6 million years ago.

Plutonic Igneous Rocks: Igneous rocks that have crystallized beneath the earth's surface.

Quaternary: The most recent period in geological time; includes the Pleistocene and Holocene Epochs.

2.1 PROJECT LOCATION

The Trails Master Plan (approximately 49 square miles) is located north and west of the San Fernando Valley in the Santa Susana Mountains, in the western portion of the unincorporated area of the County of Los Angeles (Figure 2.1-1, *Regional Vicinity Map)*. The Santa Susana Mountains are centrally located in the Transverse Ranges, a group of east-west trending mountains paralleling the Pacific Ocean between Santa Barbara and San Diego Counties. The proposed designation and improvement of a portion of the Johnson Motorway Trail is an element of the first phase of the SSMFTMP.

2.2 TRAILS MASTER PLAN STUDY AREA

Phase I Area

The northern boundary of the Trails Master Plan – Phase I is defined by the southern limits of the Newhall Ranch Specific Plan Area and the northern limits of the proposed Santa Susana Mountains / Simi Hills Significant Ecological Area (SEA). The southern boundary is defined by the northern limit of the City of Los Angeles. The eastern boundary is defined by U.S. Interstate 5 (I-5). The western boundary is defined by the corporate boundary between Los Angeles and Ventura Counties (Figure 2.2-1, *Trails Master Plan Location*). The SSMFTMP is divided into two subareas or phases. Phase I is the Northwest San Fernando Valley Study Area, and Phase II is the Southwest Santa Clarita Valley Study Area. Phase I includes 16,038.1 acres (25.1 square miles); the northern boundary is defined by the northern limits of the Los Angeles County Oat Mountain Planning Area, the southern boundary is defined by the northern limit of the City of Los Angeles, the eastern boundary is defined by the I-5 freeway, and the western boundary is defined by the boundary between Los Angeles and Ventura Counties.

Phase II Area

The Trails Master Plan – Phase II has been expanded beyond the spatial extents of Phase II in the SSMFTMP and divided into two subareas. The proposed project, including Phase II.a and Phase II.b, represents approximately 24 square miles (approximately 15,360 acres) (see Figure 2.2-1). The project study area appears on the U.S. Geological Survey (USGS) 7.5-minute series Val Verde, Newhall, Simi Valley East (Santa Susana), Oat Mountain, and Calabasas topographic quadrangles (Figure 2.2-2, *Topographic Map with USGS 7.5-minute Quadrangle Index*).

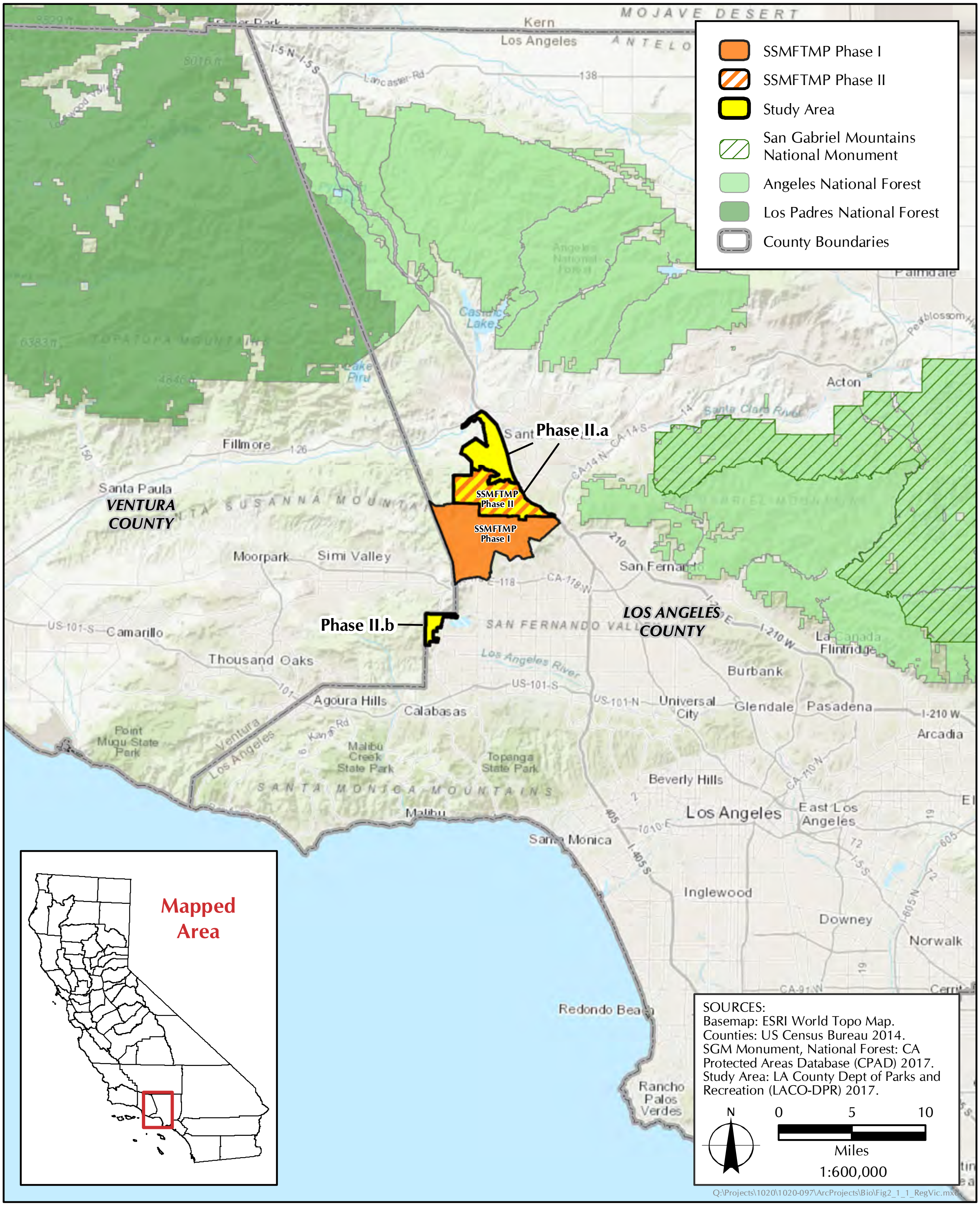


FIGURE 2.1-1

Regional Vicinity Map

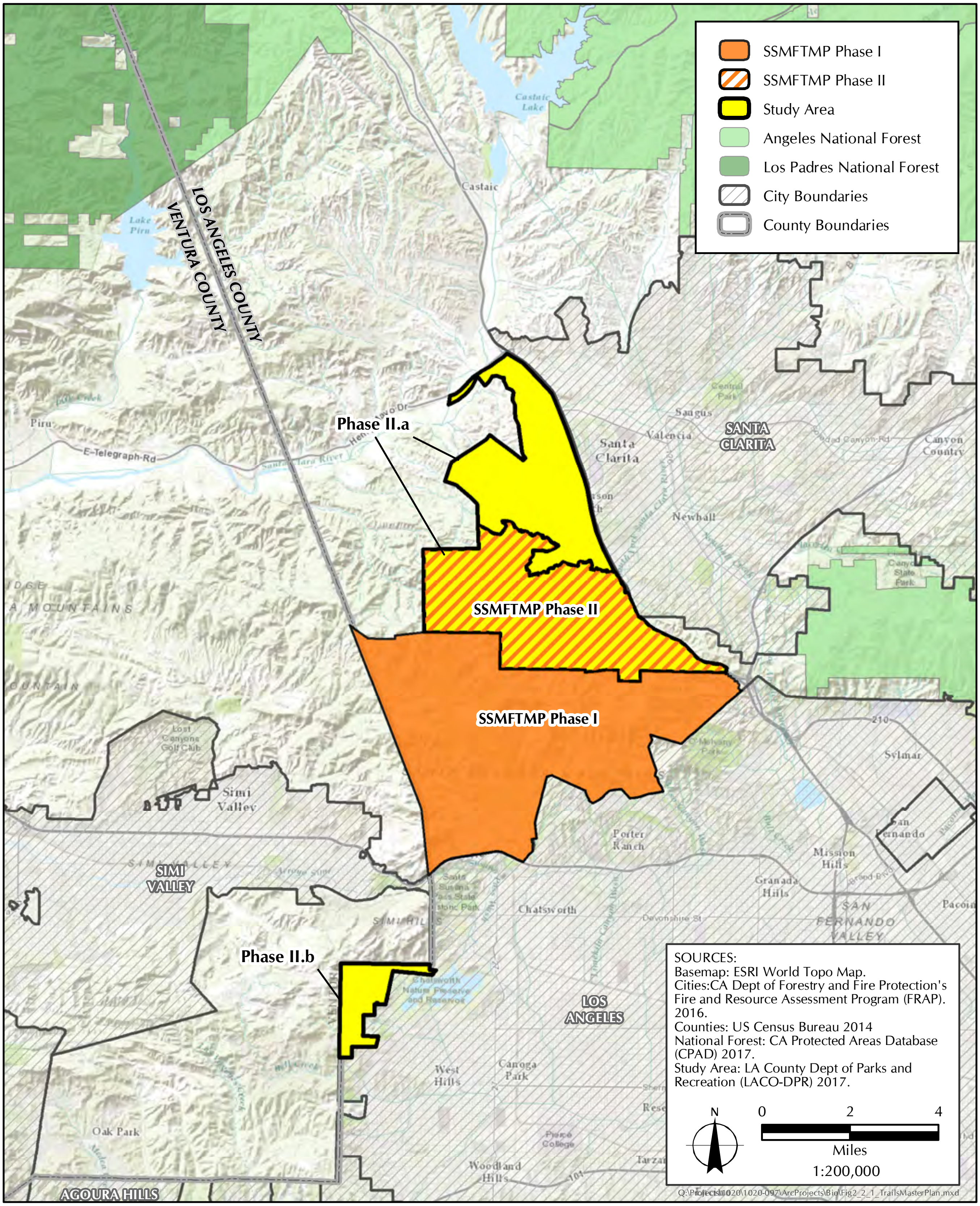


FIGURE 2.2-1

Trails Master Plan Location

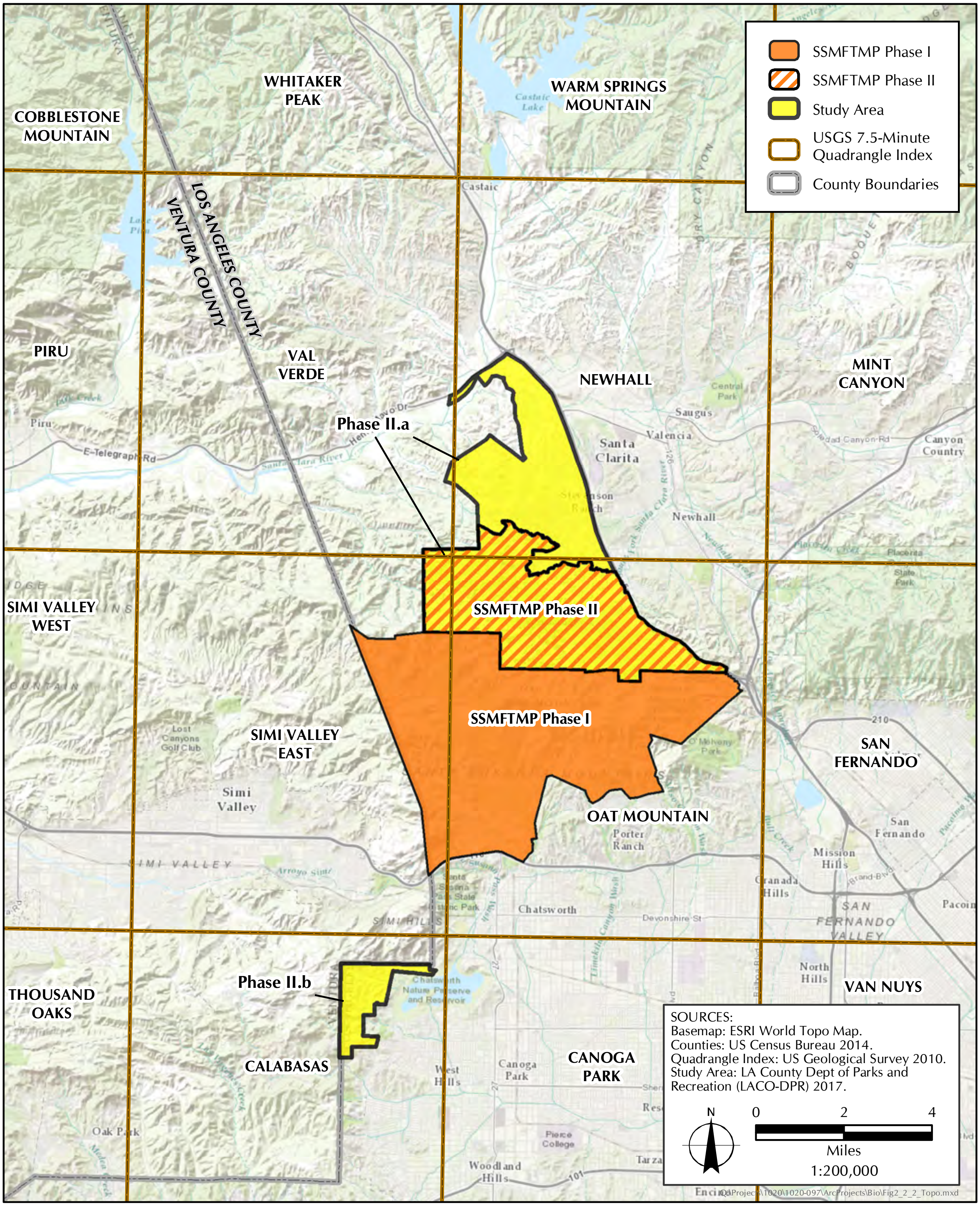


FIGURE 2.2-2

Topographic Map with USGS 7.5 Minute Quadrangle Index

Phase II.a. The Phase II.a area is an approximately 22-square-mile area located in the north-facing slopes of the Santa Susana Mountains and the Santa Clarita Valley. Phase II.a is composed of generally mountainous and valley terrain that abuts Henry Mayo Drive (State Route [SR] 126) to the north, the Interstate-5 freeway to the east, Phase I of the SSMFTMP Area to the south, and the Newhall Ranch Specific Plan Area to the west (see Figure 2.2-1). The Phase II.a area, which is located in the County of Los Angeles Fifth Supervisorial District, includes a portion (Phase II) of the SSMFTMP Area. The community of Stevenson Ranch and Six Flags Magic Mountain are located within the Phase II.a area. The elevation of the Phase II.b area ranges from 946 feet above mean sea level (MSL) within the Santa Clara River near SR-126, to 2,889 feet above MSL in Santa Clarita Woodlands Park between Dewitt Canyon and Towsley Canyon. Sand Rock Peak (2,511 feet above MSL) is located within the northwestern portion of the Phase II.a area.

Phase II.b. The Phase II.b area is an approximately 2-square-mile area located in the foothills of the Santa Monica Mountains, including Bell Canyon, Dayton Canyon, and Woolsey Canyon, west of the San Fernando Valley. The Phase II.b area, which is also located in the County of Los Angeles Fifth Supervisorial District, is composed of generally mountainous and valley terrain that abuts Ventura County to the north and west and the City of Los Angeles to the east and south (see Figure 2.2-1). The elevation of the Phase II.b area ranges from 895 feet above MSL at the northeastern corner of the Phase II.b area near Chatsworth Reservoir, to 1,867 feet above MSL near the northwestern corner of the Phase II.b area. There are no named peaks within the Phase II.b area.

Topography

The Trails Master Plan is located in the U.S. Geological Survey (7.5-minute series, Newhall, Oat Mountain, Simi Valley East, Calabasas, and Val Verde, California, topographic quadrangles, and includes portions of Township 2 North, Range 16 West (San Bernardino Baseline and Meridian [SBB&M]); Sections 6 and 7, Township 2 North, Range 17 West (SBB&M), Sections 1, 2, 11, and 12; Township 3 North, Range 16 West (SBB&M), Sections 4–10, 13–24, and 26–34; and Township 3 North, Range 17 West (SBB&M), Sections 1, 2, 11–15, 22–27, and 34–36. Phase I of the Trails Master Plan is located on the USGS 7.5-minute series Simi Valley East and Oat Mountain topographic quadrangles. Phase II of the Trails Master Plan is located on the Val Verde, Newhall, Simi Valley East (Santa Susana), Oat Mountain, and Calabasas topographic quadrangles (see Figure 2.2-2).

Situated along the southern flanks of the Santa Susana Mountains, the topography of the Trails Master Plan is characterized by a series of southwest draining canyons that are separated by steep-sloped and narrow ridge tops. The Trails Master Plan has elevations that range from 946 to 3,400 feet above MSL. The Trails Master Plan Area encompasses a distinct portion of the existing trail/unpaved/paved road system in the hills above (north of) the eastern San Fernando Valley. Some trails exist formally (e.g., national, state, and county parks) or have been defined less formally by public input, past usage, and aerial photograph interpretation (Figure 2.2-3, *Trails Master Plan Area Geology*; Figure 2.2-4, *Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation*).

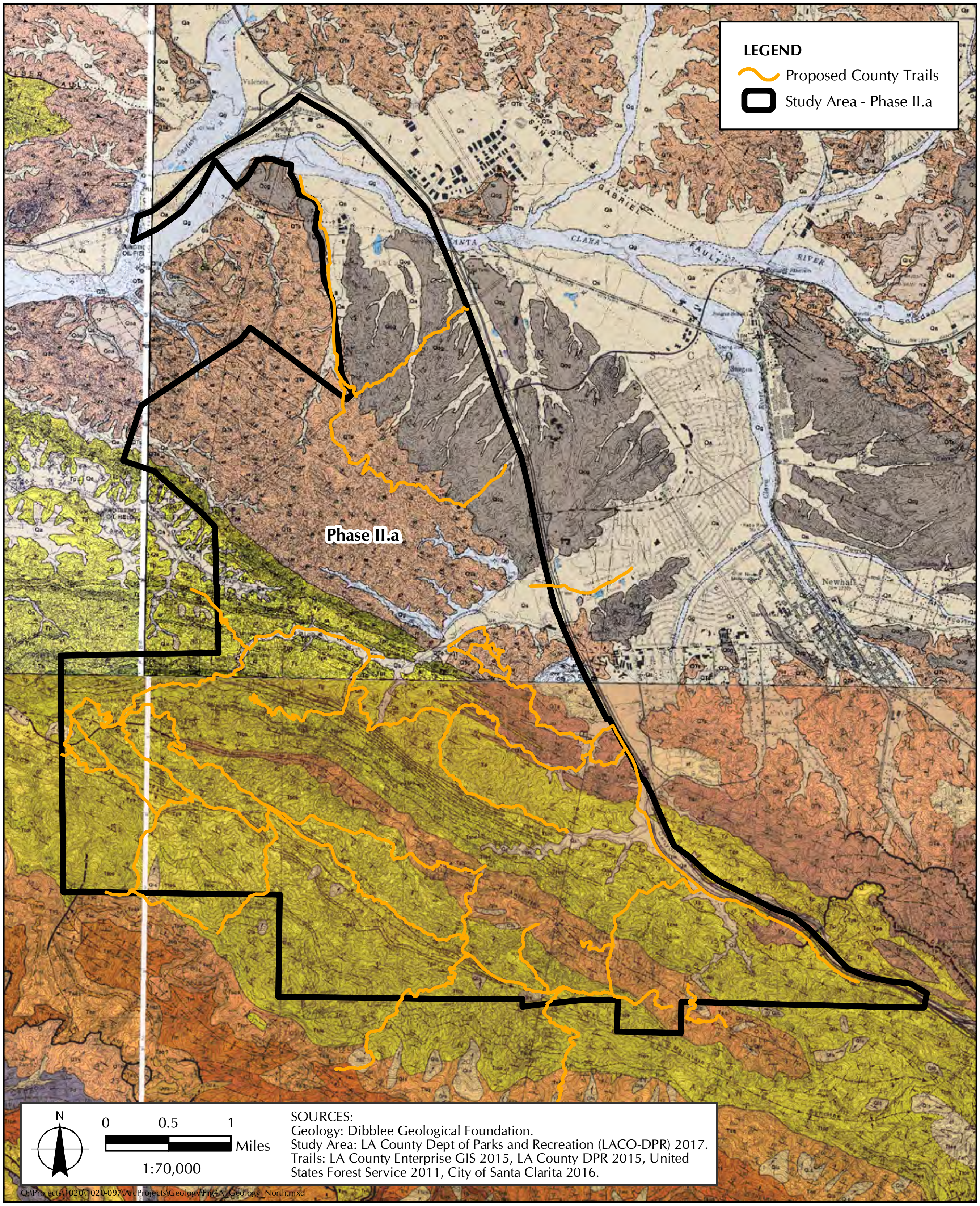


FIGURE 2.2-3a

Trails Master Plan Area Geology North

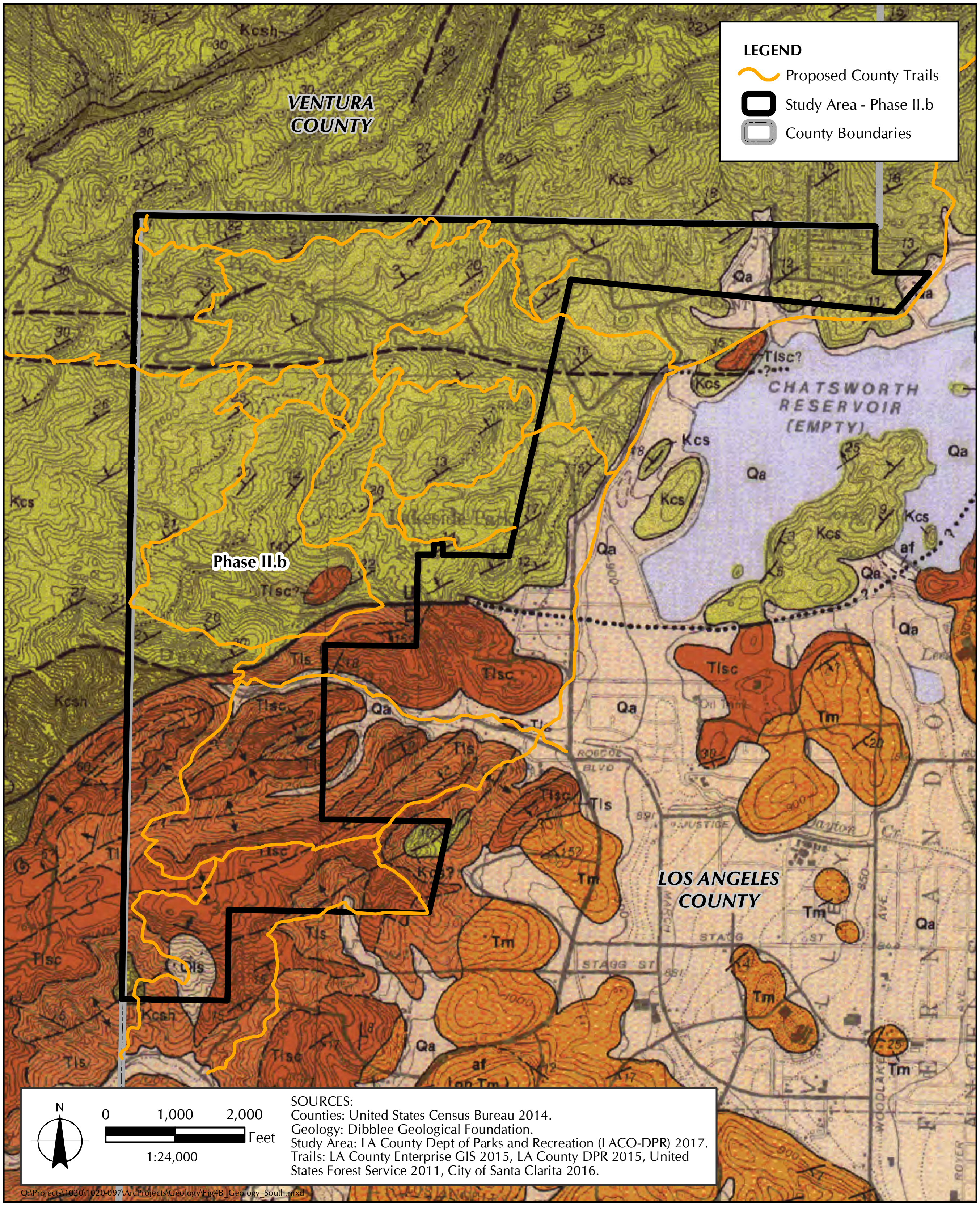


FIGURE 2.2-3b

Trails Master Plan Area Geology South

CALABASAS MAP (DF-37)

LEGEND

af
Qa

SURFICIAL SEDIMENTS

af *Artificial cut and fill*
Qa *Alluvium: gravel, sand and clay of valley areas, includes gravel of stream channels, gravel and sand of alluvial fans, and slope wash; undissected to slightly dissected*

Qls

LANDSLIDE DEBRIS

Qoa

OLDER SURFICIAL SEDIMENTS

Qoa *Dissected alluvial gravel, sand and clay*

— UNCONFORMITY —

Tush Tust Tuss Tud

UNNAMED SHALE AND SANDSTONE

(Upper part of Modelo Formation of Hoots 1931; Soper 1938; Durrell 1954; A.E.G. maps 1982; Modelo Formation of Weber 1984; Modelo and Santa Margarita Formations of Truex and Hall 1969; Trurex 1976; equivalent to Sisquoc Shale of Dibblee 1989; in Ventura vasin
Marine clastic; and biogenic; late Miocene age (Mohnian-"Delmontian" Stage)

Tust *Light gray fine grained sandstone and minor siltstone [Towsley (?) Sandstone of Weber 1984] at Laskey Mesa*
Tush *Light gray claystone and siltstone, moderately to vaguely bedded; crumbly where weathered*
Tud *Light gray, white-weathering diatomaceous shale, thin-bedded, soft, semi-punky*
Tuss *Light gray to tan sandstone, friable, vaguely bedded*

Tm Tmss Tmcg

MONTEREY FORMATION

(Lower part Modelo Formatin of Hoots 1931; Soper 1938; Durrell 1954; A.E.G. maps 1982; Modelo Formation of Yerkes and Campbell 1979; Weber 1984; Modelo-Monterey and lower Monterey Formation of Truex and Hall 1969, Trurex 1976; ; equivalent to Monterey Formation of Dibblee 1989, in Ventura basin)
Marine, biogenic and clastic; middle and late Miocene age [late (?) Luisian and Mohnian Stages]

Tm *Gray-brown, white weathering siliceous shale, thin bedded, moderately hard with platy fracture; includes soft fissile diatomaceous shale, hard, brittle, cherty shale, and few layers of hard, yellow-weathering calcareous concretions or lenses*
Tmss *Light gray to tan, semi-friable bedded sandstone*
Tmcg *Gray cobble conglomerate of mostly granitic detritus in sandstone matrix*

Tls Tlsc

DETRITAL SEDIMENTS OF LINDERO CANYON

(Included in Topanga Formation of Weber 1984; unconformable on Chatsworth Formation; best exposed in Lindero Canyon, Thousand Oaks quadrangle; may be equivalent to upper Topanga Formation of Durrell 1954, or Calabasas Formation of Yerkes and Campbell 1989
Marine transgressive clastic; middle Miocene age [Luisian (?) Stage]

Tls *Light gray to nearly white massive sandstone, semi-friable, locally conglomeratic*
Tlsc *Light gray calcareous sandstone, massive to crudely bedded, with calcite veins; includes gray conglomerate composed of cobbles of metavolcanic, granitic, and quartzitic rocks and of sandstone derived from Chatsworth Formation; sparsely fossiliferous*

Holocene ? Pleistocene

QUATERNARY

CENOZOIC

— UNCONFORMITY —

Ttuc Ttus Ttucg

UPPER TOPANGA FORMATION

(Of Durrell 1954; Topanga Formation of Soper 1938; Truex and Hall 1969; Truex 1976; Weber 1984; Calabasas Formation of Yerkes and Campbell 1979, 1980)
Marine clastic; middle Miocene age (Luisian Stage)

Ttuc *Gray claystone, bedded; crumbly with ellipsoidal fracture*
Ttus *Light gray sandstone, semi-friable, thick bedded*
Ttucg *Gray conglomerate of cobbles of granitic rocks, sandstone, and volcanic rocks in sandstone matrix*

Tcvab Tcvb Tcva

CONEJO VOLCANICS

(Of Taliaferro 1924; Yerkes and Campbell 1979; 1980; Weber 1984; middle Topanga Formation of Soper 1938; Durrell 1954; Topanga Volcanics of Truex and Hall 1969; Truex 1976)
Extrusive volcanic flows and volcaniclastic rocks; middle Miocene age

Tcvab *Andesitic breccia-conglomerate, composed of subangular to subrounded cobbles and boulders of light pinkish gray andesitic rocks in andesitic detrital matrix, moderately sorted, bedded; deposited as epiclastic (reworked) breccias*
Tcva *Andesitic breccia, brown, massive to crudely bedded autoclastic flow breccia and some mud-flow (laharic) breccias*
Tcvb *Basaltic flows and flow-breccias: dark gray to dark brown, composed of basaltic to basaltic-andesitic rocks, crudely bedded, includes some reworked breccias of basaltic detritus; moderately coherent; at Mullholland Highway gray-black, massive, fine grained basalt, weakly coherent where weathered, includes hyaloclastic basaltic breccia, massive to crudely bedded*

db

DIABASE

db *Black; fine grained diabase or basalt, intrusive as sills in* **Ttls**

Ttls Ttlc

LOWER TOPANGA FORMATION

Of Durrell 1954; Topanga Formation of Soper 1938; Truex and Hall 1969; Weber 1984; Topanga Canyon Formation of Yerkes and Campbell 1979, 1980)
Marine transgressive clastic; early and middle Miocene age [Saucesian-Relizian (?) Stage]

Ttls *Light gray to tan sandstone, coherent, thick bedded*
Ttlc *Gray micaceous clay shale; crumbly with ellipsoidal fracture where weathered*

Tsp

SESPE FORMATION

Non-marine; primarily Oligocene age
Not exposed in quadrangle, but present in subsurface (see cross section) in southern part of area and exposed just south of this quadrangle

Tll
Tllg

LLAJAS FORMATION

(Of Cushman and McMasters 1936; Stipp 1943; Squires and Filewicz 1983)
Marine clastic; middle Eocene age (Domengine and Capay molluscan Stages)

Tll *Gray micaceous claystone and siltstone, crumbly with ellipsoidal fracture where weathered*
Tllg *Gray to brown cobble conglomerate of granitic, metavolcanic and quartzitic detritus in sandstone matrix; includes some brown sandstone strata*

Miocene Oligocene Eocene

TERTIARY

Tsu Tsus Tsuv Tsi

SANTA SUSANA FORMATION

(Of Cushman and McMasters 1936; Stipp 1943; Squires and Filewicz 1983)
Marine and non-marine (?) clastic; lower Eocene and Paleocene ages
(Meganos and Martinez molluscan Stages)

Tsu *Gray micaceous claystone and siltstone, few minor thin sandstone beds*
Tsus *Tan coherent fine grained sandstone; locally contains thin shell-beds and calcareous concretions*
Tsuv *Las Virgenes Sandstone Member: tan semi-friable bedded sandstone, locally pebbly*
Tsi *Simi Conglomerate Member: gray to brown cobble conglomerate with smooth cobbles of quartzite, metavolcanic and granitic rocks in sandstone matrix that locally includes thin lenses of red clay; marine or non-marine (?)*

Kcs Kcg Kcsh

CHATSWORTH FORMATION

(Of Colburn et al. 1981; Weber 1984; "Chico Formation of Sage 1971)
Marine clastic; late Cretaceous age (Maastrichtian and Campanian Stages)

Kcs *Light gray to light brown sandstone, hard, coherent arkosic, micaceous, mostly medium grained, in thick strata separated by thin parings of siltstone*
Kcg *Gray conglomerate of cobbles of metavolcanic and granitic detritus in hard sandstone matrix*
Kcsh *Gray clay shale, crumbly with ellipsoidal fracture where weathered; includes some thin sandstone strata in western area*

? Paleocene

Upper CRETACEOUS MESOZOIC

FIGURE 2.2-4
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

NEWHALL MAP (DF-56)

LEGEND

af
Qg
Qa

SURFICIAL SEDIMENTS

af *Artificial cut and fill; includes areas of grading and/or development (updated from Treiman 1986, 1987a)*
Qg *Gravel and sand of major stream channels*
Qa *Alluvial gravel, sand and clay of valley areas*

Qls

LANDSLIDE DEBRIS

Does not include small landslides caused by 1994 Northridge earthquake (shown in Harp and Jibson 1995)

Qls *Landslide debris*

Qoa
Qog

OLDER SURFICIAL SEDIMENTS

Unconsolidated alluvial sediments deposited by streams; late Pleistocene age

Qoa *Low terrace remnants of alluvial gravel and sand*
Qog *Alluvial fan and high terrace deposits of gravel and sand; detritus of mostly crystalline basement rocks and some of Tertiary rocks; assigned to Pacoima Formation (of Oakeshott 1958) by Telman 1986, 1987a*

— *UNCONFORMITY* —

QTs
Tsr

SAUGUS FORMATION

(Of Kew 1924; Winterer and Durham 1962)
Nonmarine fluviatile, weakly indurated; Pliocene and Pleistocene age

QTs *Light gray to light reddish brown pebble-cobble conglomerate, sandstone and minor siltstone; conglomerate composed of granitic, gneissic, metavolcanic, quartzitic, gabbroic and anothositic detritus in friable sandy matrix, bedded; deposited by westward flowing streams; probably mostly of Pleistocene age*
Tsr *Sunshine Ranch member of Treiman 1987b, (differentiated only in cross-section B-B') same as* **QTs**, *but includes more interbedded greenish siltstone; grades westward into unit* **Tpc** *of Pico Formation*

Holocene
?
Pleistocene
?
QUATERNARY
?

— *UNCONFORMITY* —

(Northeast of San Gabriel fault)

Tpc
Tps
Tp

PICO FORMATION

(Of Kew 1924; Winterer and Durham 1962)
Marine clastic; weakly lithified; Pliocene age

Tpc *North of Potrero and Pico Canyons, tan to light brown, friable, medium to coarse grained sandstone and pebble-cobble conglomerate, in places hard, calcareous, brown, with molluscan shell fragments south of Potrero Canyon*
Tps *Light gray to tan, semi-friable sandstone, medium to fine grained, massive to bedded*
Tp *Gray to light gray micaceous siltstone/claystone, vaguely bedded; includes few thin sandstone layers*

Ttos
Tto
Ttoc

TOWSLEY FORMATION

(Of Winterer and Durham 1962; Stitt 1986)
(Mostly in subsurface: top exposed only at southwest corner of quadrangle)
Marine clastic; late Miocene (?) and early Pliocene age

Ttos *Mostly light gray sandstone; inclues some gray micaceous claystone*
Ttoc *Gray micaceous silty claystone and siltstone*
Tto *Undivided, in cross-sections*

Tmo

MIOCENE UNDIFFERENTIATED

(In subsurface only; "Modelo Formation" correlation with exposed lithologic units uncertain, may be equivalent to Towsley, Sisquoc and Monterey Formations of areas to west) marine clastic; Mohnian and "Delmontian" Stages, late Miocene age

Tmo *Dark gray micaceous claystone, shale and light gray sandstone, includes conglomerate at Honor Rancho oil field*

Tc

CASTAIC FORMATION

(Of Crowell 1954; Stitt 1986); northeast of San Gabriel Fault
Marine clastic; late Miocene age (Mohnian - "Delmontian" Stage)

Tc *Gray micaceous clay shale, bedded; includes thin layers of light gray to tan sandstone*

Tmc

MINT CANYON FORMATION

(Of Kew 1923, 1924); northeast of San Gabriel Fault
Nonmarine clastic; middle Miocene age, Barstovian to Clarendonian vertebrate Stages (Durham et al 1954)

Tmc *Light gray to pinkish-gray to tan, fine grained sandstone, locally pebbly and interbedded reddish to greenish-gray siltstone and claystone; base not exposed in quadrangle*

— *UNCONFORMITY* —

bc

BASEMENT COMPLEX

bc *In subsurface only: granitic rocks and biotite-actinolite schist encountered in some deep exploratory wells in eastern area of quadrangle*

Pliocene
?
Miocene
TERTIARY
CENOZOIC
PRE-TERTIARY

FIGURE 2.2-4
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

OAT MOUNTAIN AND NORTH 1/2 CANOGA PARK MAP (DF-36)

LEGEND

af
Qa Qg

SURFICIAL SEDIMENTS
Unconsolidated alluvial deposits; generally undissected
af *artificial cut and fill*
Qg *gravel and sand of major stream channels*
Qa *alluvial gravel, sand and clay of valley and floodplain areas*

Qls

LANDSLIDE DEBRIS

Qos
Qoa

OLDER SURFICIAL SEDIMENTS
Dissected, weakly consolidated alluvial deposits
Qos *older sandy alluvium, including slope wash, derived from Chatsworth Formation* (**Kcs**)
Qoa *older alluvium composed largely of angular pebble-size fragments of Miocene shale and some of sandstone* (**Tm, Tsq, and Ttos**) *in light gray to tan silty matrix in part indurated by calcareous caliche; crudely bedded to massive; about 200 ft (60m) thick; blends northward upslope in Browns Canyon drainage area into old debris-flow landslides* (**Qls**)*; slightly deformed and much dissected where elevated; but at Horse Flats top surface of deposition preserved; late Pleistocene age; mapped as slope wash, older alluvium, and Saugus Formation (upper member) by Barrows 1975; Evans and Miller 1978; and Saul 1979; probably in places equivalent to Pacoima Formation of Oakeshott 1958; Barrows et al. 1975; and Dibblee 1991*

— *UNCONFORMITY* —

QTs
Ts Tsr

SAUGUS FORMATION
Mostly terrestrial, weakly consolidated; Pleistocene and Pliocene age
QTs *light gray to brown pebble-cobble conglomerate, sandstone and lesser amounts of grayish to reddish brown, soft siltstone/claystone; conglomerate composed of granitic, gneissic, metavolcanic, quartzitic, gabbroic and anorthositic detritus in sandy matrix; deposited by westward-flowing streams; Pleistocene age; south of Santa Susana fault mapped as middle member of Saugus Formation by Barrows et al. 1975, Evans and Miller 1978, and Saul 1979 [in adjacent San Fernando quadrangle (Dibblee 1991)* **QTs** *west of Elsmere Canyon should be shown as* **Ts**]
Ts *(in Newhall area) similar to* **QTs**, *but correlative in age with units* **Tsr** *and* **Tps** *in part; probably Pliocene age*
Tsr *Sunshine Ranch Member (of Hazzard 1940, in Treiman 1987; Barrows et al. 1974; Evans and Miller 1978; and Saul 1979; type area extends eastward from lower Aliso Canyon to Van Norman Reservoir, Hazzard 1940); terrestrial deposits similar to* **QTs**, *but south of Santa Susana fault composed largely of more indurated greenish gray claystone, siltstone and fine grained sandstone, and contains in lower part brackish marine layers of oyster shells; in exposures northwestward from San Fernando Pass, consists mostly of interbedded conglomerate and fine grained sediments that locally contain few thin layers of peat, unit intertongues westward into* **Tps**; *mostly Pliocene age*

Holocene ? Pleistocene ? ?
QUATERNARY

Tps
Tp Tpg

PICO FORMATION
Marine clastic; mostly Pliocene age
Tps *south of Santa Susana fault: Pico sandstone (included in Saugus Formation by Kew 1924; Pico Formatioin by Butler 1977, Lant 1977, Yeats 1979; Pico and Saugus Formatioins by Evans and Miller 1978) mostly light gray to nearly white, soft friable sandstone, locally pebbly, contains abundant whole and fragmented bivalve shells west of Browns Canyon; deposited under marine to lagoonal conditions; grades upward into terrestrial Saugus Formation; unconformable on Miocene formations*
Tpg *conglomerate in lower Limekiln Canyon: gray massive conglomerate of cobbles of granitic and metavolcanic rocks in sandstone matrix; nonmarine (?), unconformable on Monterey Shale* (**Tml**), *overlain by Saugus Formation*
Tp *and* **Tps** *north of Santa Susana fault: Pico Formation of Kew 1924, Winterer and Durham 1958, 1962;* **Tps** *mostly light gray semi-friable sandstone, locally pebbly; upper beds contain bivalve shell fragments; intertongues into Saugus Formations* (**Ts**); **Tp** *mostly gray micaceous siltstone-claystone, bedded to massive, includes few thin sandstone layers*

Ttos Ttoc

TOWSLEY FORMATIOIN
Marine clastic; early Pliocene age (Repettian Stage) and possibly latest Miocene ("Delmontian Stage")
Ttos *light gray to tan coherent to semi-friable sandstone, medium grained to locally gritty and pebbly, bedded; includes minor micaceous siltstone; grades laterally northward into Saugus Formation* (**Ts**) *in San Fernando Pass area*
Ttoc *gray micaceous silty claystone and siltstone; minor sandstone*

Tsq Tsqs

SISQUOC SHALE
(Included in Modelo Formation by Kew 1924; Winterer and Durham 1958, 1962; Saul 1979; same lithologic unit as Sisquoc Formation in northern Ventura basin) marine clastic; late Miocene age (Mohnian to "Delmontian" Stage)
Tsq *dark gray to brownish gray clay shale, bleaches to light gray; crumbly with spheroidal to sub-platy fracture, gypsiferous in fractures, some layers contain large tan dolomitic concretions; includes some thin interbedded semi-siliceous layers; about 1000 ft (300 m) thick*
Tsqs *light gray coherent to semi-friable sandstone*

Tm
Tml

MONTEREY SHALE
(Modelo Formation of Kew 1924; Winterer and Durham 1958, 1962; Barrows et al. 1974; Evans and Miller 1978; Saul 1979; same lithologic unit as Monterey Shale of northern Ventura basin); marine biogenic; nearly 2000 ft. (610m) thick north of Santa Susana fault, very thin south of it; middle and late Miocene age
Tm *upper part: thin bedded siliceous shale, dark gray brown but weathers cream-white, hard, platy, brittle, porcelaneous, locally cherty, closely fractured, some layers fissile, about 1500 ft (485m) thick; middle and late Miocene age (mostly Mohnian Stage); south of Santa Susana fault: soft, white weathering thin-bedded, fissile diatomaceous semi-siliceous shale*
Tml *lower part: thin-bedded, fissile semi-siliceous shale to soft shaly claystone, dark brown, weathers cream white; includes some calcareous shale, and thin tan-weathering hard dolomite strata that are increasingly abundant upward, unit as thick as 500 ft (150m); middle Miocene age (Luisian-Relizian Stage)*

Pliocene ? ? Miocene
TERTIARY
CENOZOIC

Tlsc

DETRITAL SEDIMENTS OF LINDERO CANYON
(Included in Topanga Formation of Weber 1984; unconformable on Chatsworth Formation; best exposed in Lindero Canyon, Thousand Oaks quadrangle) marine transgressive clastic; Miocene age [Luisian (?) Stage]
Tlsc *crudely bedded brown to gray conglomerate composed of cobbles of metavolcanic, granitic and quartzitic rocks, and of sandstone derived from Chatsworth Formation; sparsely fossiliferous; contains minor interbeds of light gray calcareous sandstone*

Ttus Tb
Ttls

TOPANGA FORMATION
(Of Yeats 1979; Topanga Group of Saul 1979) marine transgressive clastic; middle Miocene age
Ttus *upper sandstone: light gray to white semi-friable, locally pebbly, massive to vaguely bedded; about 150 ft (45m) thick*
Tb *basalt flow (or diabase sill?); black, massive fine grained weakly coherent where weathered, present north of Santa Susana fault only; probably correlative with Conejo Volcanics to west*
Ttls *lower sandstone: light gray to tan, semi-friable to somewhat hard, massive to vaguely bedded; as thick as 600 ft (180m), base unexposed; present north of Santa Susana fault only*

— *UNCONFORMITY* —

Tll
Tllg

LLAJAS FORMATION
Marine clastic; middle Eocene age
Tll *gray micaceous claystone-siltstone and some interbeds of light gray to tan soft sansdstone*
Tllg *basal cobble conglomerate as thick as 50 ft (17m) with cobbles of granitic, metavolcanic and quartzitic rocks*

Tsu
Tsi

SANTA SUSANA FORMATION
Mostly marine clastic; Paleocene age
Tsu *dark gray micaceous claystone, crumbly with ellipsoidal fracture; includes few thin sandstone layers*
Tsi *Simi Conglomerate Member: gray to brown cobble conglomerate with smooth rounded cobbles up to 1 ft (1/3m) in diameter of pinkish-gray quartzite, metavolcanic and granitic rocks in gray sandstone matrix; possibly in part nonmarine, deposited as fan delta*

Kcsh
Kcs

CHATSWORTH FORMATION
(Of Colburn et al. 1981; "Chico" Formation of Kew 1924; Evans and Miller 1978) marine clastic; late Cretaceous age (Maestrichtian and Campanian Stages)
Kcsh *gray micaceous shale and siltstone; includes some sandstone strata; included in Martinez Formation (Paleocene) by Evans and Miller 1978*
Kcs *light gray to light brown, hard, thick bedded sandstone; locally gritty; includes few thin layers of micaceous siltstone; base not exposed*

Eocene ? Paleocene Upper
CRETACEOUS
MESOZOIC

FIGURE 2.2-4
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

SANTA SUSANA MAP (DF-38)

LEGEND

af
Qa Qg

SURFICIAL SEDIMENTS

Unconsolidated alluvial deposits; generally undissected

af *Artificial cut and fill*
Qg *Gravel and sand of major stream channels*
Qa *Alluvial gravel, sand and clay of valley and floodplain areas*

Qls

LANDSLIDE DEBRIS

Qoa Qos

OLDER SURFICIAL SEDIMENTS

Dissected, weakly consolidated alluvial deposits

Qos *Older sandy alluvium, including slope wash, derived from Chatsworth Formation* (**Kcs**)
Qoa *Older alluvial gravel, sand and silt/clay; in areas south of Santa Susana fault composed of sub-angular detritus of Miocene shale and sandstone* (**Tm**, **Tsq** *and* **Ttos**)

— *UNCONFORMITY* —

QTs

SAUGUS FORMATION

(Of Kew 1924), non-marine fluviatile; Pleistocene and Pliocene (?) age

QTs *Weakly consolidated light gray pebble conglomerate and sandstone composed of pebbles and few cobbles of granitic, gneissic, metavolcanic, quartzitic, gabbroic and anorthositic detritus in sandy matrix; includes minor interbeds of light greenish to light reddish silty claystone; unconformity at base near Santa Susana fault*

Tp Tps

PICO FORMATION

Marine clastic; mostly Pliocene age

Tps *South of Santa Susana fault: Pico sandstone (included in Saugus Formation by Kew 1924; White 1983; in Fernando Formation by Whaley and Ricketts 1975; Yeats 1979; in Pico Formation by Butler 1977; Hanson 1981; Yeats 1987); regressive near-shore facies of Pico Formation; mostly soft, friable, nearly white, medium to coarse grained sandstone, locally pebbly and cross-bedded, contains many bivalve shells, especially in hard calcareous shell reefs, and local shell coquina; deposited in shallow marine to lagoonal conditions (White 1983); grades upward into terrestrial Saugus Formation; unconformable on Monterey Shale and older formations; not everywhere present*
Tp *North of Santa Susana fault (Pico Formation of Kew 1924, Winterer and Durham 1958, 1962); mostly soft gray micaceous siltstone-claystone; includes thin layers of light gray to tan sandstone; conformable on Towsley Formation*

Holocene ? Pleistocene ? Pliocene
QUATERNARY ?

Ttos Ttoc

TOWSLEY FORMATION

(Of Winterer and Durham 1958), marine clastic; early Pliocene age (Repettian Stage) and possibly latest Miocene ("Delmontian Stage")

Ttos *Light gray to tan coherent to semi-friable sandstone, medium grained to locally gritty and pebbly, bedded; includes minor micaceous siltstone*
Ttoc *Gray micaceous silty claystone and siltstone; minor sandstone*

Tsq Tsqs

SISQUOC SHALE

(Included in Modelo Formation by Kew 1924; Winterer and Durham 1958, 1962; Whaley and Ricketts 1975; Butler 1977; same lithologic unit as Sisquoc Formation in northern Ventura basin) marine clastic; late Miocene age (Mohnian to "Delmontian" Stage)

Tsq *Dark gray to brownish gray clay shale, bleaches to light gray; crumbly with ellipsoidal to sub-platy fracture, gypsiferous in fractures, includes some thin bedded semi-siliceous layers; some layers contain large tan dolomitic concretions*
Tsqs *Light gray coherent to semi-friable sandstone*

Tm
Tml

MONTEREY SHALE

(Modelo Formation of Kew 1924; Winterer and Durham 1958, 1962; Yeats 1987; Butler 1977; same lithologic unit as Monterey Shale of northern Ventura basin) marine biogenic; middle and late Miocene age

Tm *Upper part north of Santa Susana fault: thin bedded platy siliceous shale, dark gray-brown but weathers cream-white, hard, platy, brittle, porcelaneous, locally cherty, closely fractured, some layers fissile, about 1500 ft (500m) thick; middle and late Miocene age (mostly Mohnian Stage); south of Santa Susana fault: white weathering, soft, punky to fissile, thin-bedded, semi-siliceous shale, with diatom debris and fish scales; about 600 ft (180m) thick, middle and late Miocene age (Mohnian-Luisian Stage)*
Tml *Lower part: thin-bedded, soft, fissile, clayey to calcareous shale about 150-200 ft (45-60m) thick; middle Miocene age (Luisian Stage, Clarke 1983); grades upward into* **Tm**

Ttus

UPPER TOPANGA SANDSTONE

(Calabasas Formation of Squires 1983; Fritsche et al. 1983) marine transgressive clastic; middle Miocene age

Ttus *Soft friable, massive, nearly white sandstone; up to 200 ft (60m) thick*

? Miocene
CENOZOIC

— *UNCONFORMITY* —

bi

INTRUSIVE ROCKS

bi *Black basaltic dike or sill (?) of probable Miocene age; intrusive into Santa Susana Formation* (**Tsu**)

Tsp

SESPE FORMATION

Non-marine fluviatile; Oligocene and late Eocene age

Tsp *Predominantly semi-friable bedded sandstone, light gray, tan to pink, locally pebbly and cross-bedded; includes interbeds of variegated maroon-red and greenish micaceous claystone, mostly in middle part; locally includes conglomerate of scattered pebbles and cobbles of granitic, metavolcanic and quartzitic rocks in sandstone matrix; deposited by westward-flowing streams (Taylor 1983)*

Tll Tllg

LLAJAS FORMATION

(Of Squires 1983; Meganos Formation of Kew 1924), marine clastic; middle Eocene age

Tll *Gray micaceous claystone-siltstone and light gray to tan, soft to semi-friable sandstone, mostly fine grained; locally with large concretions; commonly fossiliferous; claystone predominates south of Simi Valley; sandstone predominates in Las Llajas Canyon area*
Tllg *Basal cobble conglomerate, gray to brown, composed of cobbles of granitic, metavolcanic and quartzitic rocks in sandy matrix*

Tsu Tsus
Tsuv
Tsi

SANTA SUSANA FORMATION

(Martinez Formation of Kew 1924), mostly marine clastic; Paleocene age

Tsu *Dark gray micaceous clay shale, crumbly with ellipsoidal fracture; includes siltstone and thin sandstone strata*
Tsus *Light gray to tan sandstone*
Tsuv *Las Virgenes Sandstone Member: light gray to light brown sandstone; includes some cobble conglomerate locally*
Tsi *Simi Conglomerate Member: gray to brown cobble conglomerate of smooth rounded cobbles up to 1 ft (1/3m) in diameter of pinkish-gray quartzite, metavolcanic and granitic rocks in gray sandstone matrix; possibly in part non-marine, deposited as fan delta*

Kcs Kcsh

CHATSWORTH FORMATION

(Of Colburn et al. 1981; "Chico" Formation of Kew 1924), marine clastic; late Cretaceous age

Kcsh *Gray micaceous clay shale*
Kcs *Light gray to light brown, hard, thick bedded sandstone; locally gritty; includes few thin layers of micaceous siltstone: base not exposed in this quadrangle*

? Oligocene ? Eocene Paleocene
TERTIARY
Upper
CRETACEOUS
MESOZOIC

FIGURE 2.2-4
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

SIMI MAP (DF-39)

LEGEND

af
Qa Qg

SURFICIAL SEDIMENTS
Unconsolidated alluvial deposits; generally undissected

af *Artificial cut and fill*
Qg *Gravel and sand of major stream channels*
Qa *Alluvial gravel, sand and clay of valley and floodplain areas*

Qls

LANDSLIDE DEBRIS
In northern areas derived mostly from Monterey Shale (Tm)

Qoa

OLDER SURFICIAL SEDIMENTS
Dissected, weakly consolidated alluvial deposits

Qoa *Older alluvial gravel, sand and silt/clay; composed largely of detritus derived from formations within quadrangle*

— UNCONFORMITY —

QTs QTsv

SAUGUS FORMATION
(Of Kew 1924), non-marine fluviatile; Pleistocene and Pliocene (?) age

QTs *Weakly consolidated light gray pebble conglomerate and sandstone composed of pebbles of small cobbles, mostly of granitic rocks and few of gneiss, metavolcanic rocks, quartzite, anorthosite, gabbro, and Tertiary volcanic rocks (Conejo Volcanics?), in soft sandy matrix; includes minor gray soft micaceous siltstone-claystone; unconformity at base in Moorpark area*
QTsv *Southwest corner of quadrangle only: crudely bedded to massive brown breccia-conglomerate composed of andesitic-basaltic, angular to subrounded detritus of Conejo Volcanics, and a few clasts of Monterey Shale locally*

QTlp

LOS POSAS SAND
(Of Pressler 1929), shallow marine regressive; probably early Pleistocene and possibly late Pliocene age

QTlp *Weakly indurated light gray to tan sand; locally contains molluscan shelf fragments; grades upward into Saugus Formation; about 70 ft (22m) thick near Tierra Rejada Valley; unconformity at base*

Holocene ? Pleistocene ? ? ? ?
QUATERNARY

Tps

PICO SANDSTONE
(Included in Pico Formation of Kew 1924; Fernando Formation by Whaley and Ricketts 1975, Yeats 1979; lower Saugus Formation by White 1983; similar to and possibly in part correlative with Los Posas Sand of Dibblee and Ehrenspeck 1990); shallow marine and lagoonal clastic; mostly Pliocene age

Tps *Light gray, tan to nearly white, soft friable sandstone, medium to coarse grained, cross-bedded, commonly pebbly with numerous smooth rounded pebbles of quartzite and some metavolcanic and granitic rocks; locally fossiliferous with bivalve seashells, locally contains calcareous shell reefs; grades westward through finer sandstone into soft gray siltstone (Tp/Tps) in Moorepark Quadrangle, grades upward into Saugus Formation (QTs)*

Tsq

SISQUOC SHALE
(Included in Modelo Formation by Kew 1924; Whaley and Ricketts 1975, Yeats 1979, 1983, 1987; same lithologic unit as Sisquoc Shale in northern Ventura basin), marine clastic and biogenic; late Miocene age (Mohnian Stage in this quadrangle)

Tsq *Dark gray to brownish gray clay shale, weathers light gray; some layers contain large, tan dolomitic concretions; includes some white-weathering, thin bedded, diatomaceous semi-siliceous shale*

Tm
Tml

MONTEREY SHALE
(Modelo Formation of Kew 1924; Canter 1973, Whaley and Ricketts 1975, Yeats 1979, 1983, 1987; same lithologic unit as Monterey Shale of northern Ventura basin) marine biogenic; middle and late Miocene age (Luisian and Mohnian Stages)

Tm *Upper part: thin-bedded platy to fissile siliceous shale, dark gray-brown, but weathers cream-white; in Oak Ridge area, in large part hard, platy brittle, porcelaneous, locally cherty, closely fractured; about 1500 ft (485m) thick; about 1200 ft (360m) thick on Big Mountain*
Tml *Lower part: thin-bedded, soft, fissile, clayey to calcareous shale; about 150 ft (45m) thick on Oak Ridge, up to 100 ft (30m) on Big Mountain; middle Miocene (Luisian) age (Clark 1983)*

Pliocene
CENOZOIC

Tts Ttus Tcvb Ttlc Ttls

TOPANGA FORMATION
(Vaqueros Formation of Kew 1924; Vaqueros-Topanga Formation of Whaley and Ricketts 1975); marine transgressive clastic; early to middle Miocene age (Zemorrian, Saucesian, and Relizian Stages)

Tts *Undivided sandstone, semi-friable, light gray to tan, massive to vaguely bedded; sparsely fossiliferous in places*
Ttus *Upper Topanga Sandstone, similar to* **Tts***; correlated with Calabasas Formation (of Yerkes and Campbell 1979) in Santa Monica Mountains by Fritsche et al. 1983; middle Miocene age (Luisian and Relizian Stages)*
Tcvb *Conejo Volcanics: thin wedge of basalt south of Big Mountain (see below)*
Ttls *Lower Topanga Sandstone, similar to* **Tts***; early Miocene age (Saucesian-Zemorrian Stage); includes Vaqueros Formation (of Kew 1924, Fritsche 1983)*
Ttlc *Sandstone similar to* **Ttls***, but includes interbeds of soft gray micaceous siltstone*

Tcva Tcvb bi

CONEJO VOLCANICS
(Of Taliaferro 1924; Yerkes and Campbell 1979)
Submarine to subaerial extrusive volcanic rocks; middle Miocene age

Tcva *Predominantly andesitic-basaltic flows and breccias: gray, maroon-gray and brown aphanitic to slightly porphyritic rocks, vaguely stratified, flows range from platy to massive coherent but much fractured; deposited as flows and flow breccias; contain some epiclastic volcanic sediments and minor reddish, scoriaceous pyroclastic (?) horizons; probably emplaced subaerially*
Tcvb *Mostly basaltic rocks: gray-black to olive-brown, weathering brown, fine grained, composed of mafic minerals and plagioclase feldspar, vaguely bedded to massive, altered, crumbly and much fractured, locally vessicular, emplaced as flows and flow breccias, and in part as submarine flows, hyaloclastic breccias and marine tuffaceous sediments; fossiliferous (oyster) sandstone at base locally*
bi *Black intrusive basaltic to andesitic dikes at base of, or within Conejo Volcanics*

Tsp

SESPE FORMATION
Non-marine fluviatile; Oligocene and late Eocene age

Tsp *Predominantly semi-friable bedded sandstone, light gray, tan to pink, locally pebbly and cross-bedded; includes interbeds of variegated maroon-red and greenish micaceous claystone, mostly in middle part; locally includes conglomerate of scattered pebbles and cobbles of granitic, metavolcanic and quartzitic rocks in sandstone matrix; about 5300 ft (1650m) thick; deposited by westward-flowing streams (Taylor 1983)*

Tll

LLAJAS FORMATION
(Of Cushman and McMasters 1936; Meganos Formation of Kew 1924)
Marine clastic; middle Eocene age

Tll *Gray micaceous claystone and siltstone; only uppermost part exposed at southeast corner of quadrangle*

Miocene ? Oligocene Eocene
TERTIARY

FIGURE 2.2-4
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

VAL VERDE MAP (DF-50)

LEGEND

af
Qg
Qa

SURFICIAL SEDIMENTS

af *Artificial cut and fill*
Qg *Gravel and sand of major stream channels*
Qa *Alluvuial gravel, sand and silt of valley and floodplain areas*

Qls

LANDSLIDE DEBRIS

Qoa

OLDER DISSECTED SURFICIAL SEDIMENTS

Qoa *Older alluvial gravel, sand, and silt/clay*

— *UNCONFORMITY* —

QTs

SAUGUS FORMATION
(of Kew 1924, Winterer and Durham 1962, Yeats et al. 1985)
Nonmarine fluviatile, weakly consolidated; Pliocene(?) and Pleistocene ages; lower part intertongues westward into Pico Formation

QTs *Slightly indurated, light gray, pebble conglomerate, sandstone and claystone, most pebbles are of granitic rocks*

Tp Tps Tpsg Tpc

PICO FORMATION
(Of Kew 1924; Winterer and Durham 1962, Weber 1973, Yeats et al. 1985, Stitt 1986; upper part intertongues eastward into Saugus Formation)
Marine; mostly Pliocene age

Tp *Light gray, vaguely bedded, soft, micaceous claystone and siltstone; minor thin sandstones*
Tps *Tan, semi-friable sandstone, locally pebbly*
Tpsg *Light gray to tan, massive sandstone and pebble conglomerate of mostly granitic detritus in westernmost exposures only*
Tpc *Gray, cobble conglomerate of mostly granitic and metavolcanic clasts in clayey sandstone matrix in south area*

Holocene
?
Pleistocene
?
Pliocene
QUATERNARY

'ey

Ttos Ttoc Ttog

TOWSLEY FORMATION
(Of Winterer and Durham 1962, Yeats et al. 1985, Stitt 1986; in south area included in Modelo Formation by Kew 1924, but in northwest area included by him in Pico Formation; probably correlative with lowest part of Pico Formation of areas west; in south area gradational into both Pico and Sisquoc Formations; type area - Towsley Canyon, Oat Mountain quadrangle)
Marine clastic; late Miocene to early Pliocene ages (Mohnian, "Delmontian" and Repettian Stages)

Ttos *In south area mostly light gray to tan, bedded, semi-coherent sandstone, locally pebbly, includes thin interbeds of silty shale*
Ttoc *In northwest area crumbly, gray, micaceous clay shale to siltstone; in south area includes thin strata of sandstone*
Ttog *(Hasley Conglomerate Member of Stitt 1986) basal gray conglomerate of rounded cobbles and pebbles of mostly granitic rocks, some of metavolcanic rocks in semi-coherent sandy matrix; not present in south area*

— *DISCONFORMITY* —
in northwest area

Tc

CASTAIC FORMATION
Marine; late Miocene age (Mohnian Stage), probably correlative with Sisquoc Formation

Tc *Gray clay shale with thin sandstone beds; northeast of San Gabriel fault only*

Tsq

SISQUOC FORMATION
(Included in Modelo Formation by Eldridge and Arnold 1907, Kew 1924; Bailey and Jahns 1954, Winterer and Durham 1962, Weber 1973, Yeats et al. 1985, Stitt 1986; Sisquoc Formation of Dibblee 1991)
Marine; late Miocene age (Mohnian-"Delmontian" Stage)

Tsq *Gray-brown, crumbly, micaceous clay shale to siltstone, in part somewhat siliceous, bedded; contains some dolomitic lenses*

Tm Tmss

MONTEREY SHALE
(Modelo Formation of Eldridge and Arnold 1907, Kew 1924, Bailey and Jahns 1954, Winterer and Durham 1962, Weber 1973, Yeats et al. 1985, Stitt 1986; Monterey Formation of Dibblee 1991)
Marine; late Miocene age (Mohnian Stage)

Tm *White-weathering, thin bedded, platy, siliceous to soft, fissle, semi-siliceous shale; contains thin calcareous beds*
Tmss *Tan, semifriable sandstone with thin interbeds of silty shale*

? ?
Miocene
TERTIARY
CENOZOIC

FIGURE 2.2-4
Geologic Map Explanation Unit Descriptions, Symbols, and Age Correlation

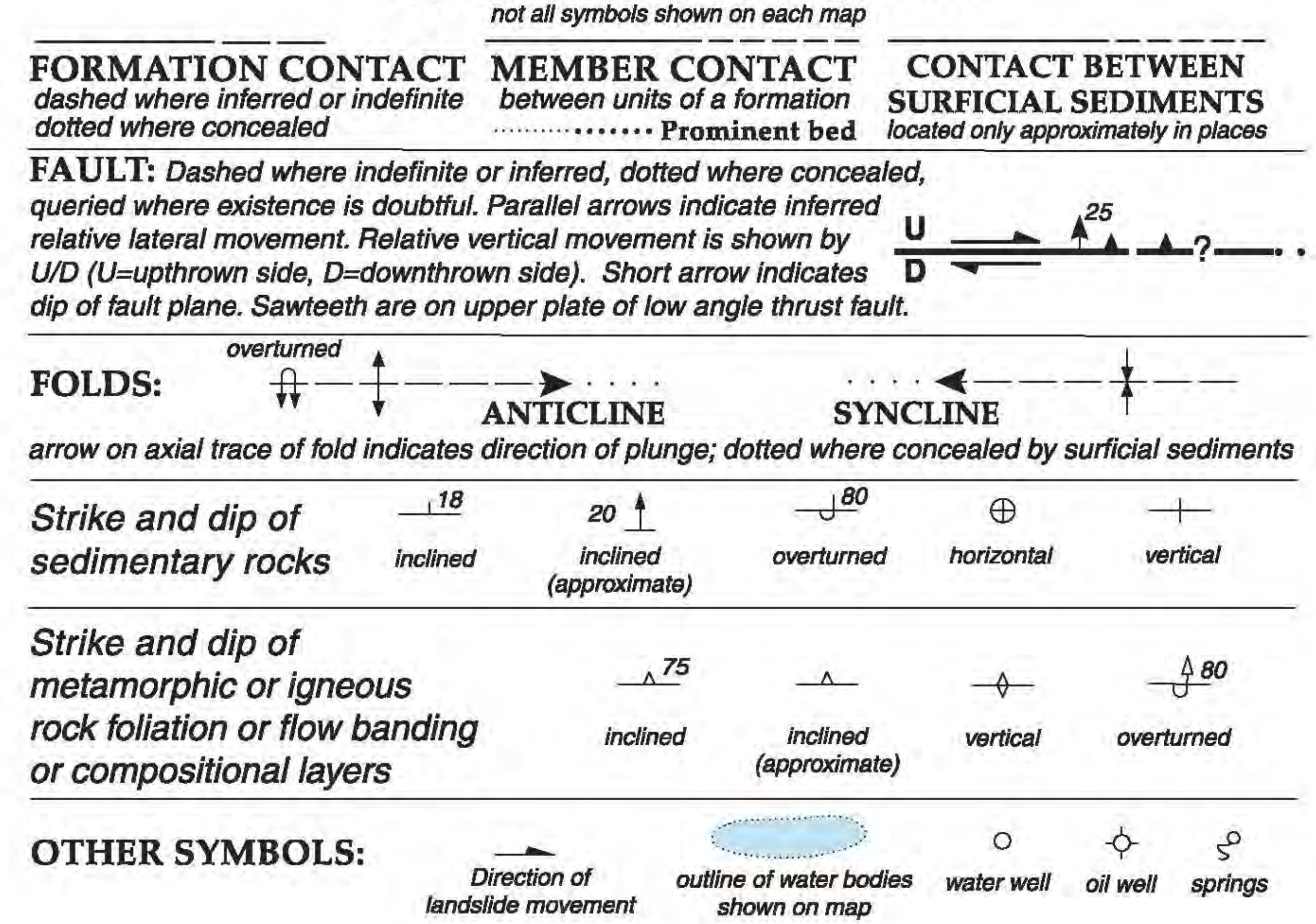
AGE CORRELATION CHART

AGE		ma	EPOCH		STAGE
CENOZOIC	QUAT.	.01	HOLOCENE		"HALLIAN"
			PLEISTOCENE		"HALLIAN" ? — — — ? WHEELERIAN
	TERTIARY	1.6	PLIOCENE	LATE	VENTURIAN
				EARLY	REPETTIAN
		5.3	MIOCENE	LATE	"DELMONTIAN" ? — — — ? MOHNIAN
		9.5		MIDDLE	LUISIAN
		16		EARLY	RELIZIAN, SAUCESIAN
		24	OLIGOCENE		ZEMORRIAN
		38	EOCENE	LATE	REFUGIAN, NARIZIAN
				MIDDLE	ULATISIAN
				EARLY	PENUTIAN
		56	PALEOCENE		BULITIAN, YNEZIAN
MESOZOIC		65	CRETACEOUS		
		138	JURASSIC		
		205	TRIASSIC		
		250	PALEOZOIC		
		570	PRECAMBRIAN		
		4000+			

Radiometric ages, in millions of years (ma), are from current geological literature. Time relationships between California provincial microfaunal stages and epochs are subject to continued revision and refinement, as indicated by dashed and/or queried lines. (Neogene stages are adapted mostly from Micropaleo Consultants, Inc., 1989). Partitions between stages and epochs are diagrammatic and not to scale.

GEOLOGIC SYMBOLS

not all symbols shown on each map



2.3 PROJECT SUMMARY

The SSMTMP-PII would guide future trail development and recommend improvements to existing trails. The Trails Master Plan would provide trail users and local populations with seamless transitions throughout the proposed study area to trails of adjacent jurisdictions and prime destinations within and adjacent to the study area. The goals of the plan are to:

1. Develop a complete multi-use trail system connecting user groups and local populations to desired recreation destinations and experiences, with seamless transitions to the trails of adjacent jurisdictions, compatibility with adjacent land uses and environmental resources, and a safe and sustainable design that is consistent with the County of Los Angeles Trails Manual.

2. Develop a recreational trail system that supports low-intensity use, including mountain biking, equestrian use, and hiking, to accommodate the population increase anticipated in the Santa Clarita Valley Planning Area and San Fernando Valley Planning Area through the 2035 planning horizon consistent with the Parks and Recreation Element of the Los Angeles County General Plan 2035.

The overall work efforts would include a trails master plan and associated CEQA documentation. Individual trail alignments would be developed at a later phase of this project, which is intended to provide a trail planning framework for the study area.

The SSMTMP-PII involves approximately 70 miles of proposed new multi-use trails in the Santa Clarita Valley Planning Area and San Fernando Valley Planning Area (Figure 2.3-1, *Existing and Proposed Trails*). The trails would be multi-use and range from 3 to 11 feet wide based on site conditions, with adequate space for combined pedestrian, equestrian, and mountain biking use, in accordance with the County Trails Manual guidelines (Table 2.3-1, *County Trail Types*). The proposed trails would provide connections to the proposed Rim of the Valley Trail, trails in the City of Los Angeles, trails in the City of Santa Clarita, and trails in the Newhall Ranch Specific Plan, and trails within other jurisdictions as identified in the Trails Master Plan. There are no existing County trails within the Phase II.b area.

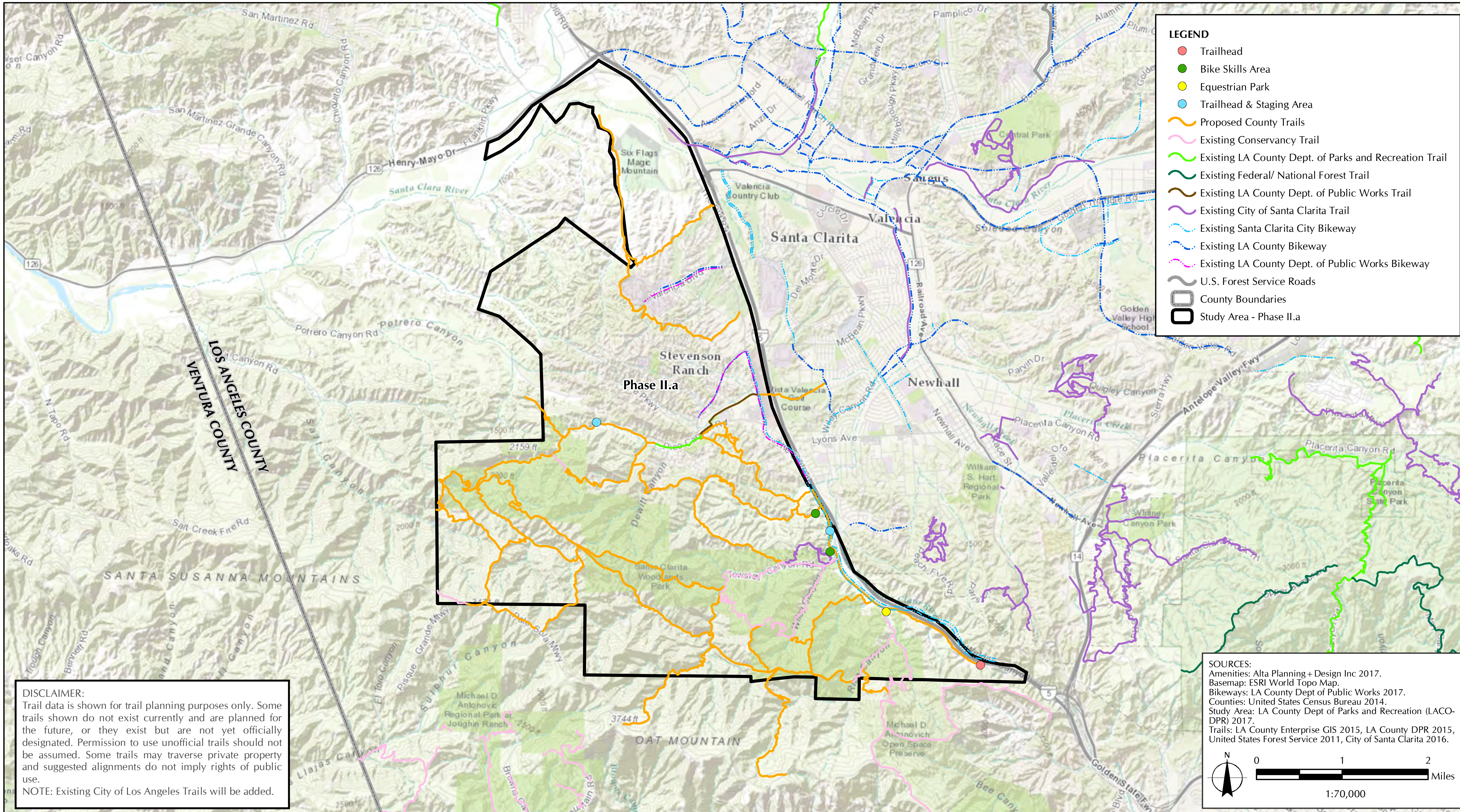
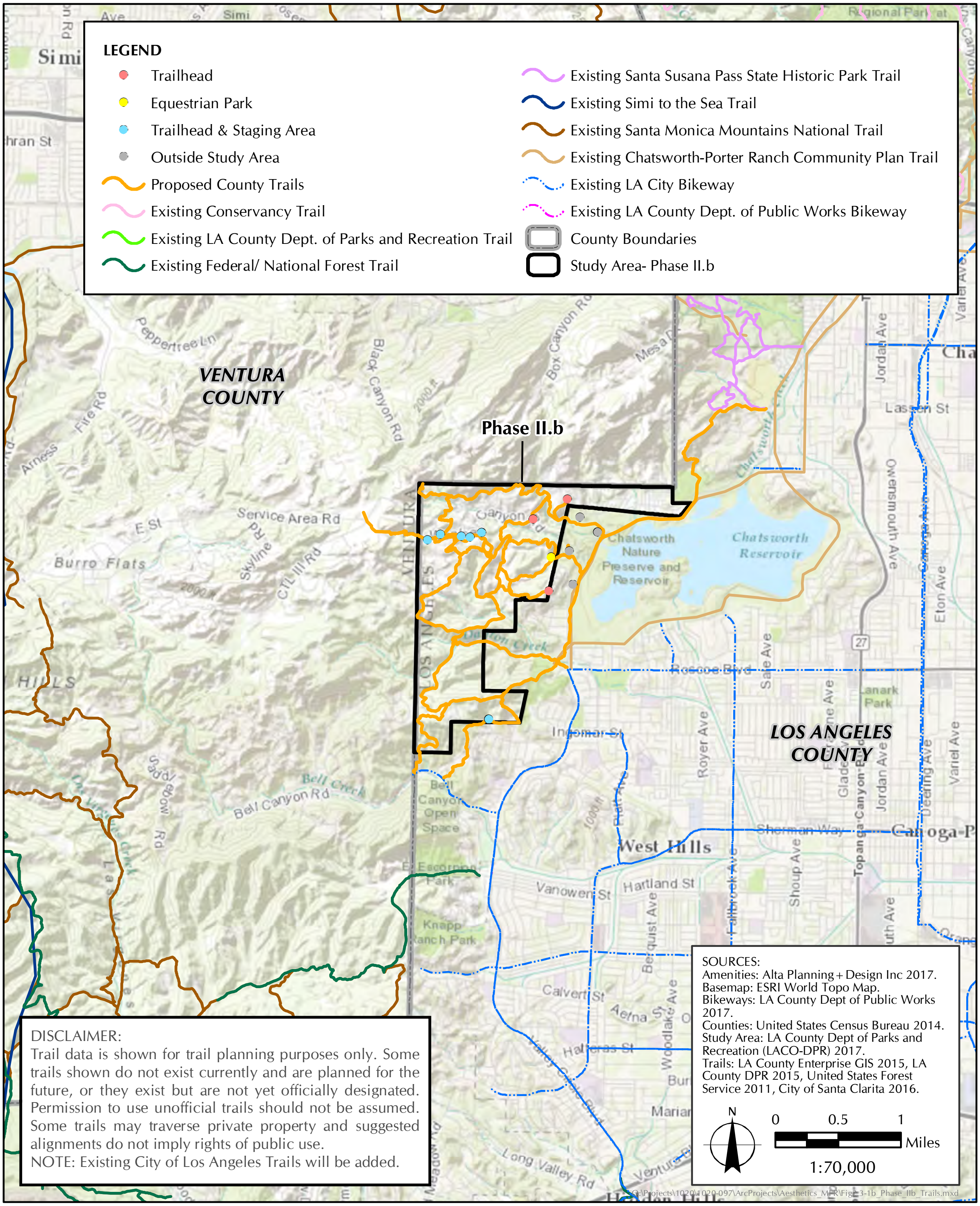


FIGURE 2.3-1a

Existing and Proposed Trails (Phase II.a)



DISCLAIMER:
Trail data is shown for trail planning purposes only. Some trails shown do not exist currently and are planned for the future, or they exist but are not yet officially designated. Permission to use unofficial trails should not be assumed. Some trails may traverse private property and suggested alignments do not imply rights of public use.
NOTE: Existing City of Los Angeles Trails will be added.

SOURCES:
Amenities: Alta Planning + Design Inc 2017.
Basemap: ESRI World Topo Map.
Bikeways: LA County Dept of Public Works 2017.
Counties: United States Census Bureau 2014.
Study Area: LA County Dept of Parks and Recreation (LACO-DPR) 2017.
Trails: LA County Enterprise GIS 2015, LA County DPR 2015, United States Forest Service 2011, City of Santa Clarita 2016.

FIGURE 2.3-1b

Existing and Proposed Trails (Phase II.b)

TABLE 2.3-1
COUNTY TRAIL TYPES

Trail Type	Tread / Trail Width[1]	Intensity of Use[1]	Impact[1]	Surface Type[1,2]	Trail Grade[2]	Outslope[2]
Urban Pedestrian Trail[2]	10–11 feet	High	High	Asphalt*; Crusher fines*; Decomposed granite	< 5% < 8% for < 100 feet (ft) of trail with rail	2%
Recreational Trailway[2]	8–10 feet	High	High	Natural surface	< 5% < 8% for < 100 ft < 12% for < 50 ft.	2% < 4%
Natural Trail 1[1]	7–10 feet	High	Medium	Natural surface	< 5% < 8% for < 150 ft < 12% for < 50 ft.	2% < 4%
Natural Trail 2[1]	5–8 feet	Medium to high	Low	Natural surface	< 5% < 8% for < 100 ft < 12% for < 50 ft.	2% < 4%
Natural Trail 3[1]	2–3 feet	Low	Minimal	Natural surface	< 5% < 8% for < 200 ft < 12 % for < 50 ft < 15% for < 20 ft	2% < 5%

NOTE: *Asphalt and crusher fines used in trail surfaces cannot be road based and cannot contain toxic chemicals.
SOURCES:
[1] County of Los Angeles Department of Parks and Recreation. [Adopted 17 May 2011] Revised June 2013. *County of Los Angeles Trails Manual*. Available at: https://trails.lacounty.gov/Files/Documents/69/LA%20County%20Trails%20Manual%20%28Revised%2006-20-13%29.compressed.pdf
[2] County of Los Angeles Department of Parks and Recreation. Adopted October 2016. *Castaic Area Multi-Use Trails Plan*. Prepared by Alta Planning+Design in association with Sapphos Environmental, Inc. Available at: https://trails.lacounty.gov/Files/Documents/124/Castaic%20Area%20MUTP%20-%20FINAL.pdf

The SSMTMP-PII identifies up to 20 potential locations for proposed facilities, including 4 trailheads, 2 bike skills areas, 2 equestrian parks, 8 trailhead and staging areas, and 4 additional trailheads within the City of Los Angeles that would need to be developed by the City of Los Angeles (see Figure 2.3-1). As the recommended City of Los Angeles trailheads would not be developed under jurisdiction of the County, this Report considers the 16 proposed facilities located within the SSMTMP-PII area.

SECTION 3.0
REGULATORY FRAMEWORK

3.1 FEDERAL

Federal Regulations

The model building code that is predominantly adopted in the United States is the International Building Code (IBC) from the International Code Council (ICC), a nongovernmental organization. The ICC produces other model codes such as the International Residential Code (IRC). The IBC and its companion ICC documents form the basis of the building codes in most states and have been adopted by local governments within all states.

The National Earthquake Hazards Reduction Program (NEHRP) supports the development of seismic provisions in building codes. The NEHRP's "Recommended Provision for Seismic Regulations for New Buildings and Other Structures" presents state of the art earthquake engineering research and practices in a form that is usable by the engineering community and provides a nationally applicable resource document for all model codes and standards. The *2015 NEHRP Provisions* have adopted by reference the American Structural Engineers Association (ASCE) / Structural Engineering Institute (SEI) standard ASCE/SEI 7-10: Minimum Design Loads for New Buildings and Other Structures as the baseline.[1] A 2014 series of National Seismic Hazard Maps by the USGS shows the severity of expected earthquake shaking for a particular level of probability; for example, levels of earthquake shaking that have a 2-in-100 chance of being exceeded in a 50-year period. The time period of 50 years is commonly used because it represents a typical building lifetime, while the 2 percent probability level is usually considered an acceptable hazard level for the building codes. Maps also show seismic shaking levels using a number of different measures that apply to designing earthquake-resistant buildings of different heights, which respond to different frequencies of ground motion.

3.2 STATE

State Regulations

Building Codes

Development in the State of California is governed by the 2016 California Building Code. These regulations include provisions for site work, demolition, and construction, which include excavation and grading, as well as provisions for foundations, retaining walls, and expansive and compressible soils. The 2017 County of Los Angeles Building Code amendments are based on the 2016 CBC and the 2015 IBC. Building regulations are adopted by reference and incorporated into Title 26 of the Los Angeles County Code as Sections 119.1.2 through 119.1.14, respectively of Chapter 1 of Title 26 of the Los Angeles County Code. Standard residential, commercial, and light industrial construction is governed by the CBC, which the County may amend. The 2016 CBC

[1] Federal Emergency Management Agency. 2015. 2015 NEHRP Provisions. Washington, DC.

(defined in CCR Part 2 of Title 24 of the California Administrative Code) includes additions to the previous building code that make it more stringent, particularly with regard to seismic and earthquake conditions for critical structures such as essential facilities, public schools, and hospitals.

The Los Angeles County Building Official may require an engineering geology and/or soils engineering report when the Building Official believes they are essential for the evaluation of the safety of the site. Either or both reports shall discuss hazard from landslide, settlement, or slippage and shall make a finding regarding the potential effects of the proposed work on stability outside the SMMTMP-PII area.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Geologic Hazards Zone Act was enacted by the State of California in 1972 to address the hazard and damage caused by surface fault rupture during an earthquake. The act has been amended 10 times and renamed the Alquist-Priolo Earthquake Fault Zoning Act, effective January 1, 1994. The act, revised in 2007, defines an active fault as one that has had surface displacements within Holocene time (about the last 11,000 years). Initially, faults were defined in the Alquist-Priolo Act as "potentially active," and were zoned if they showed evidence of surface displacement during Quaternary time (last 1.6 million years). Beginning in 1977, evidence of Quaternary surface displacement was no longer used as a criterion for zoning. Since 1975, the State of California defined the terms "sufficiently active" and "well defined" for application in zoning faults. These two terms constitute the present criteria used by the State Geologist in determining if a given fault should be zoned under the Alquist-Priolo Act and are defined as follows:

> Sufficiently active - A fault is deemed sufficiently active if there is evidence of Holocene surface displacement along one or more of its segments or branches. Holocene surface displacement may be directly observable or inferred; it need not be present everywhere along a fault to qualify that fault for zoning.
>
> Well-defined - A fault is considered well-defined if its trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The fault may be identified by direct observation or by indirect methods (e.g., geomorphic evidence; Appendix C). The critical consideration is that the fault, or some part of it, can be located in the field with sufficient precision and confidence to indicate that the required site specific investigations would meet with some success.

The act requires the State Geologist to establish earthquake fault zones (EFZs) along known active faults in the state. Cities and counties that include EFZs are responsible to regulate most development projects within the EFZs, as described in the act, but may enact regulations that are more stringent. Certain smaller residential developments can be exempt. The San Gabriel fault is zoned in a portion of the Trails Master Plan Area.

Seismic Hazards Mapping Act

The Seismic Hazard Mapping Act (SHMA) of 1990 was enacted, in part, to address seismic hazards not included in the Alquist-Priolo Act, including strong ground shaking, landslides, and liquefaction. Under this act, the State Geologist is assigned the responsibility of identifying and mapping seismic hazards zones.

The State of California Geologic Survey (CGS) has also adopted seismic design provisions in Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, on March 13, 1997 (revised 2008). The CGS provides guidance with regard to seismic hazards under the Seismic Hazards Mapping Act; seismic hazard zones are to be identified and mapped to assist local governments in planning and development purposes. The intent of this publication is to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, as well as other hazards caused by earthquakes. Lead agencies with the authority to approve development projects shall ensure the following:

> The geotechnical report shall be prepared by a registered civil engineer [practicing the in field of geotechnical engineering] or certified engineering geologist, having competence in the field of seismic hazard evaluation and mitigation. The geotechnical report shall contain site-specific evaluations of the seismic hazard affecting the project, and shall identify portions of the project site containing seismic hazards. The report shall also identify any known off-site seismic hazards that could adversely affect the site in the event of an earthquake.
>
> Prior to approving the project, the lead agency shall independently review the geotechnical report to determine the adequacy of the hazard evaluation and proposed mitigation measures and to determine the requirements of Section 3724(a) above, are satisfied. Such reviews shall be conducted by a certified engineering geologist or registered civil engineer, having competence in the field of seismic hazard evaluation and mitigation.

The County and City of Los Angeles have been mapped pursuant to the SHMA, and there are zones of required investigation for liquefaction and earthquake-induced landslide hazards in and adjacent to the SSMTMP-PII area (Figure 3.2-1, *Earthquake-Induced Landslides and Liquefaction*).

Natural Hazards Disclosure Act

The Natural Hazards Disclosure Act (effective June 1, 1998), requires "that sellers of real property and their agents provide prospective buyers with a 'Natural Hazard Disclosure Statement' when the property being sold lies within one or more state-mapped hazard areas, including a Seismic Hazard Zone." The SHMA specifies two ways in which this disclosure can be made: "In all transactions that are subject to Section 1103 of the Civil Code, the disclosure required by subdivision (a) of this section shall be provided by either of the following means:

1) The Local Option Real Estate Transfer Disclosure Statement as provided in Section 1102.6a of the Civil Code
2) The Natural Hazard Disclosure Statement as provided in Section 1103.2 of the Civil Code"

The Local Option Real Estate Disclosure Statement can be substituted for the Natural Hazards Disclosure Statement if it contains substantially the same information and substantially the same warning as the Natural Hazards Disclosure Statement. Both the APEFZ Act and the SHMA require that real estate agents, or sellers of real estate acting without an agent, disclose to prospective

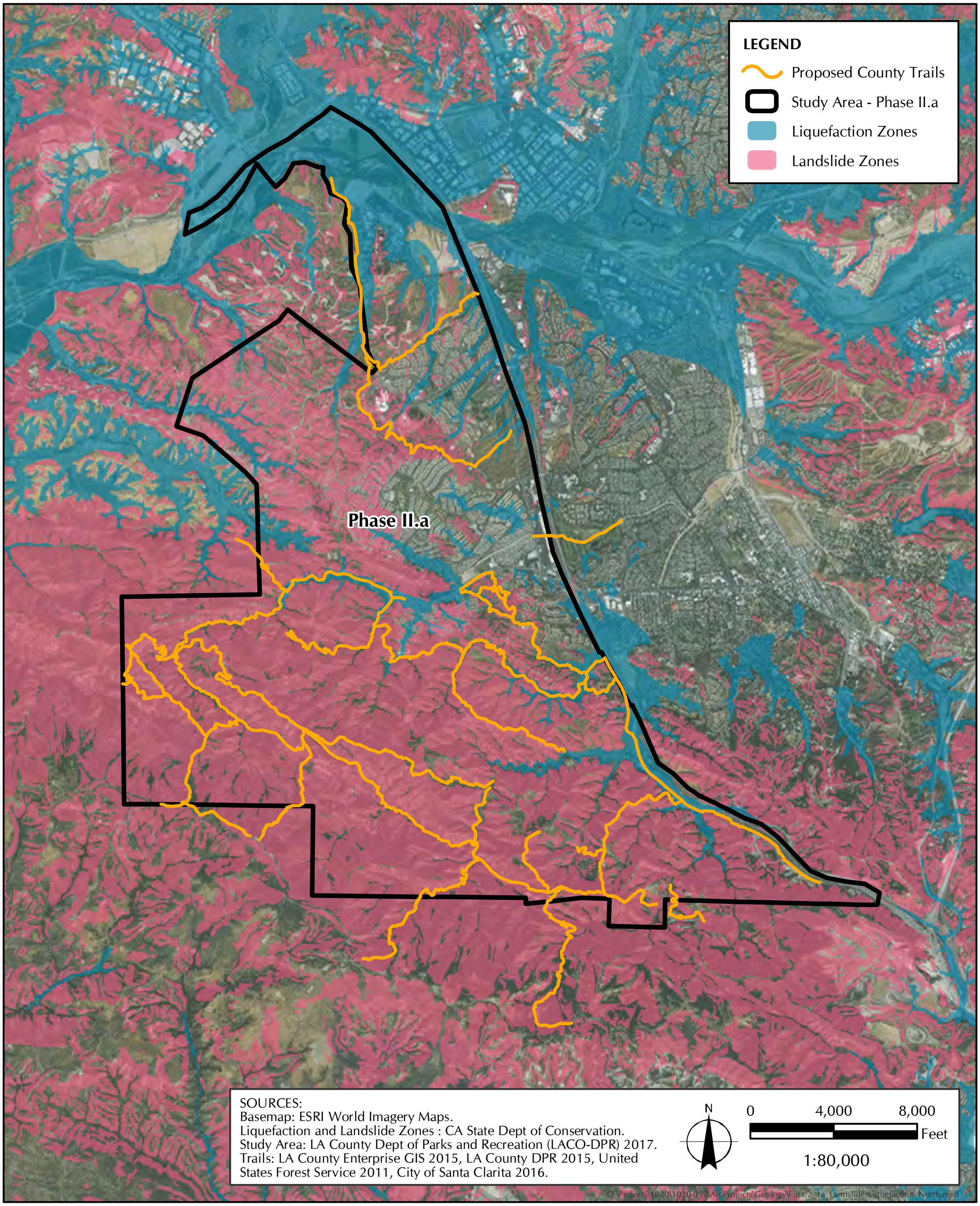


FIGURE 3.2-1a

Earthquake-Induced Landslide and Liquefaction Map North

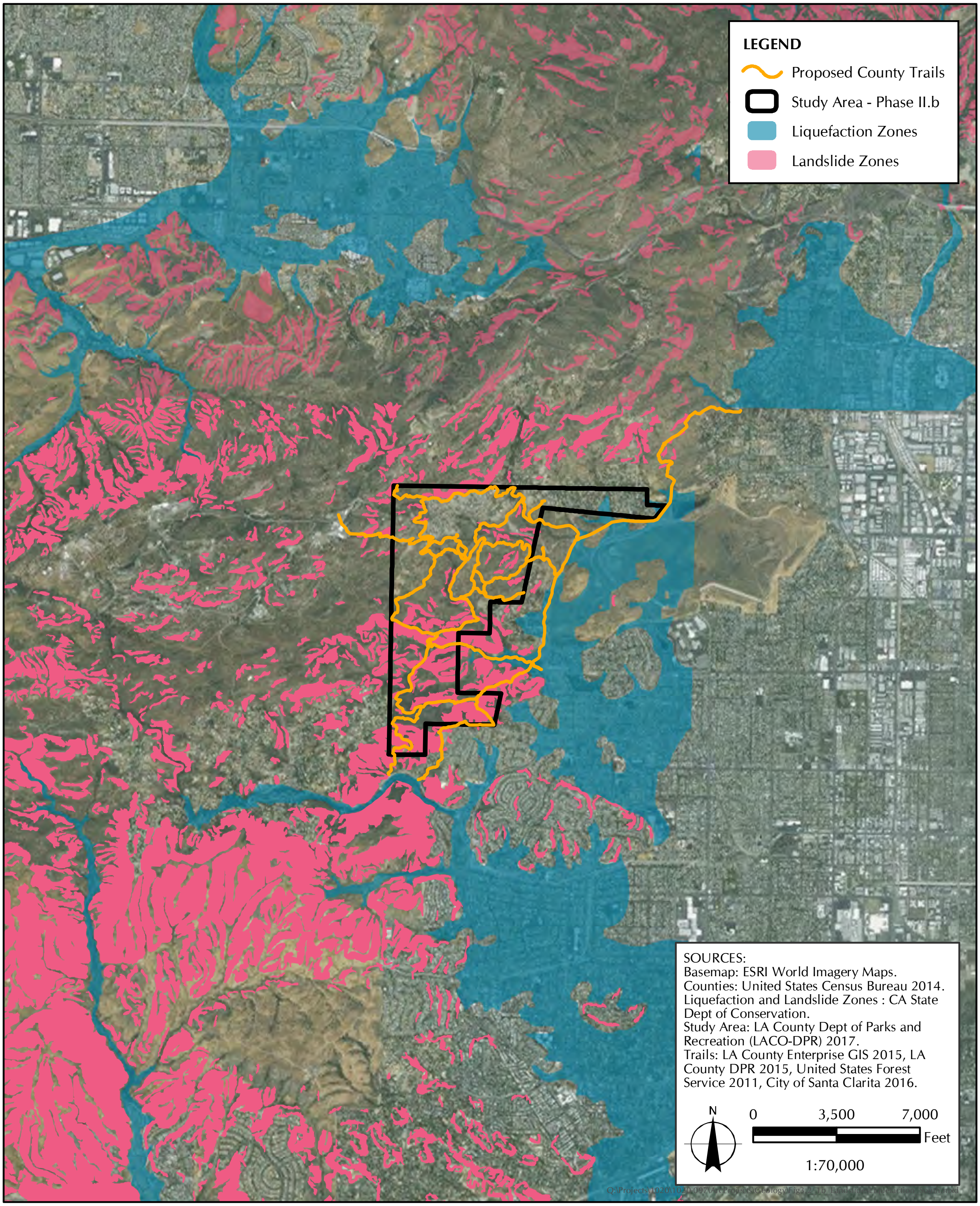


FIGURE 3.2-1b

Earthquake-Induced Landslide and Liquefaction Map South buyers that the property is located in an APEFZ or SHMZ. There are APEFZ and SHMZ hazards within the SSMTMP-PII area.

California Environmental Quality Act (CEQA)

CEQA ensures that local agencies consider and review the environmental impacts of projects within their jurisdictions. CEQA requires that an environmental document (e.g., Environmental Impact Report [EIR] or Mitigated Negative Declaration [MND]) be prepared for projects that are judged in an Initial Study (IS) to have potentially significant effects on the environment and that these effects are disclosed to the public through an open public review process. Environmental documents (IS, MND, EIR) must consider and analyze, as deemed appropriate, geologic, soil, and seismic hazards. If impacts are considered potentially significant, recommendations for mitigation measures/monitoring are made to prevent or minimize environmental damage by reducing geologic and seismic hazards to less than significant. This allows early public review of development projects and provides lead agencies the authority to regulate development projects in the early stages of planning.

CEQA provides guidance during issuance of permits and approval of projects, and applies to all discretionary projects proposed to be conducted or approved by a California public agency, including private projects requiring discretionary government approval.

Los Angeles County has its 1987 "Environmental Document Reporting Procedures and Guidelines"[2] that are considered for CEQA analysis of trails projects and related developments. The materials associated with the procedures and guidelines were updated December 15, 2016.

2015 California Supreme Court CEQA Ruling

In 2015, the California Supreme Court,[3] in *California Building Industry Association v. Bay Area Air Quality Management District*, held that "CEQA generally does not require an analysis of how existing environmental conditions would impact a project's future use of residents."

The revised thresholds are intended to comply with this decision, which held that an impact from the existing environment to the project including future users and/or residents, is not an impact for the purposes for CEQA. However, if the project exacerbates existing conditions that already exist, that impact must be assessed, including how it might affect future users and/or residents of the project.

This ruling provided for several exceptions to the general rule where an analysis of the project on the environment is warranted, including if the project would exacerbate existing environmental hazards (e.g., exposing hazardous waste that is currently buried).

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[2] County of Los Angeles. 2017. Environmental Document Reporting Procedures and Guidelines. Available at: http://planning.lacounty.gov/view/ceqa_guidelines

[3] California Building Industry Association v. Bay Area Air Quality Management District. 62 Cal. 4th 369, Case No. S213478 (2015).

3.3 LOCAL

County of Los Angeles

General Plan Safety Element

California State Law (Government Code 65300) requires that each city and county prepare and adopt a comprehensive, long-term general plan for its physical development. It must contain seven mandatory elements including land use, circulation, housing, conservation, open space, noise, and safety. California Government Code Section 65302.g requires that a general plan contain a "safety element for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mud slides and landslides; subsidence and other geologic hazards known to the legislative body; flooding; and wild land and urban fires." The existing 2014 public review draft updates the adopted 1990 Los Angeles County Safety Element; the safety element outlines the above issues and covers the Trails Master Plan Area. In October 2015 Los Angeles County updated its General Plan through 2035. Proposed activities within the SSMTMP-PII area must consider the public health and safety, as well as the safety of County facilities developed in the context of the currently applicable Safety Element.

General Plan Hillside Management Areas and Hillside Design Guidelines

The Hillside Management Areas (HMAs)[4] are defined in the HMA Ordinance in General Plan specifically for the Santa Susana Mountains. Within HMAs there are designated significant primary and secondary ridgelines many of which cross proposed trails within the SSMTMP-PII area. Hillside Design Guidelines have been established that are divided into five major design categories containing a variety of sensitive hillside design measures and a corresponding checklist. One of the categories is Grading and Facilities which has 12 items in the checklist (2.1 through 2.12). Most of these measures would apply more directly to developments with grading disturbance over a somewhat contiguous area (e.g., several acres for residential or commercial uses) and having facilities/buildings within the disturbed areas. These measures could be applied to trails.

County of Los Angeles Trails Manual

The County Trails Manual[5] outlines various issues affecting trail feasibility (Section 2.5) including geology and soils. Factors include soil erosion, earthquake faults, geologic formation characteristics, slope stability, landslides, and slope gradient. These factors can also affect design methods, construction techniques, and trail maintenance. The stated purpose of the County Trails Manual is:

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[4] County of Los Angeles. 2015. Los Angeles County General Plan 2035. Hillside Management. Available at: http://planning.lacounty.gov/assets/upl/project/gp_2035_2015-FIG_9-8_hillside_management_areas.pdf

[5] County of Los Angeles Department of Parks and Recreation. [Adopted 17 May 2011] Revised June 2013. County of Los Angeles Trails Manual. Available at: https://trails.lacounty.gov/Files/Documents/69/LA%20County%20Trails%20Manual%20%28Revised%2006-20-13%29.compressed.pdf

> to provide guidance to County departments, specifically LACO-DPR, that interface with trail planning, design, development, and maintenance of hiking, equestrian, and mountain biking recreational trails, while addressing physical and social constraints and opportunities associated with the diverse topographic and social conditions that occur in the unincorporated territory of the County. LACO-DPR would use the planning process delineated in the Trails Manual in considering the development of future trails.

The County Trails Manual also defines trail alignment feasibility as follows:

> A "feasible" alignment would not require substantial engineering specifications or review. A "feasible, but constrained" alignment would require increased excavation, grading, installation of a bridge, drainage, and erosion control, leading to design modifications to trail specifications. An "infeasible" alignment is one that physically could not be constructed using standard design engineering constraints are based on geology and soils parameters for the proposed project site.

SECTION 4.0
METHODS

This section describes the methods employed in the characterization and evaluation of geology and soils in the SSMTMP-PII area.

The evaluation of the potential for the proposed project to result in impacts to geology and soils was undertaken in accordance with the DPR's Environmental Checklist Form and Appendix G of the State CEQA Guidelines, considering these key variables: rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure (e.g., liquefaction and landslides), substantial soil erosion or the loss of topsoil, unstable geologic unit or soil (e.g., landslide, lateral spreading, subsidence, liquefaction, or ground collapse), expansive soil, and soils incapable of adequately supporting the disposal of wastewater.

This environmental analysis was performed using existing published information. No new studies or analyses were conducted, and no site- or area-specific studies (within or immediately adjacent to the SSMTMP-PII area) were used for this programmatic level evaluation.

SECTION 5.0
RESULTS

This section provides the characterization and evaluation of the potential for the proposed project to affect, or be affected by, geology and soils conditions within the SSMTMP-PII area. The results described in this section provide the substantial evidence required to address the CEQA scope of analysis, related to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure (e.g., liquefaction and landslides), substantial soil erosion or the loss of topsoil, unstable geologic unit or soil (e.g., landslide, lateral spreading, subsidence, liquefaction, or ground collapse), expansive soil, and soils incapable of adequately supporting the disposal of wastewater.

5.1 EXISTING CONDITIONS

5.1.1 Earthquake Fault Rupture

Faulting, Earthquakes, and Ground Shaking Potential

Plate tectonics and the forces that cause these plates to move within the earth's crust affect all of Southern California geology and seismicity. Faults are formed at the plate boundaries and other stress points within tectonic plates. Faults adjacent to, within, and beneath the County and City of Los Angeles and San Fernando Valley areas may be classified as inactive, potentially active, or active. Figure 5.1.1-1, *Regional Fault Map*, identifies faults in the region.[6] Faults classified as inactive (no demonstrated movement in the past 2 million years) are of no present concern as earthquake sources and are not discussed further. Potentially active faults (green) show evidence of Quaternary movement and may be possible earthquake sources, but no data are known to demonstrate conclusively Holocene (within the past 10,000–1,200 years) fault movement. Active faults (orange and red [historically active]) are of most concern for earthquake generation and fault rupture potential since they have documented Holocene fault movement or are clearly associated with historic seismicity. Alquist-Priolo Earthquake Fault Zone (APEFZ) Maps delineate active faults and potentially active faults considered by the State to be "sufficiently active" and "well-defined." Fault Rupture Study Areas (FRSAs) are defined by the City of Los Angeles in addition to the APEFZs where fault rupture potential is less well known than required for the APEFZ designation process.

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[6] California Geological Survey. 2010. 2010 Fault Activity Map of California. Available at: http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html

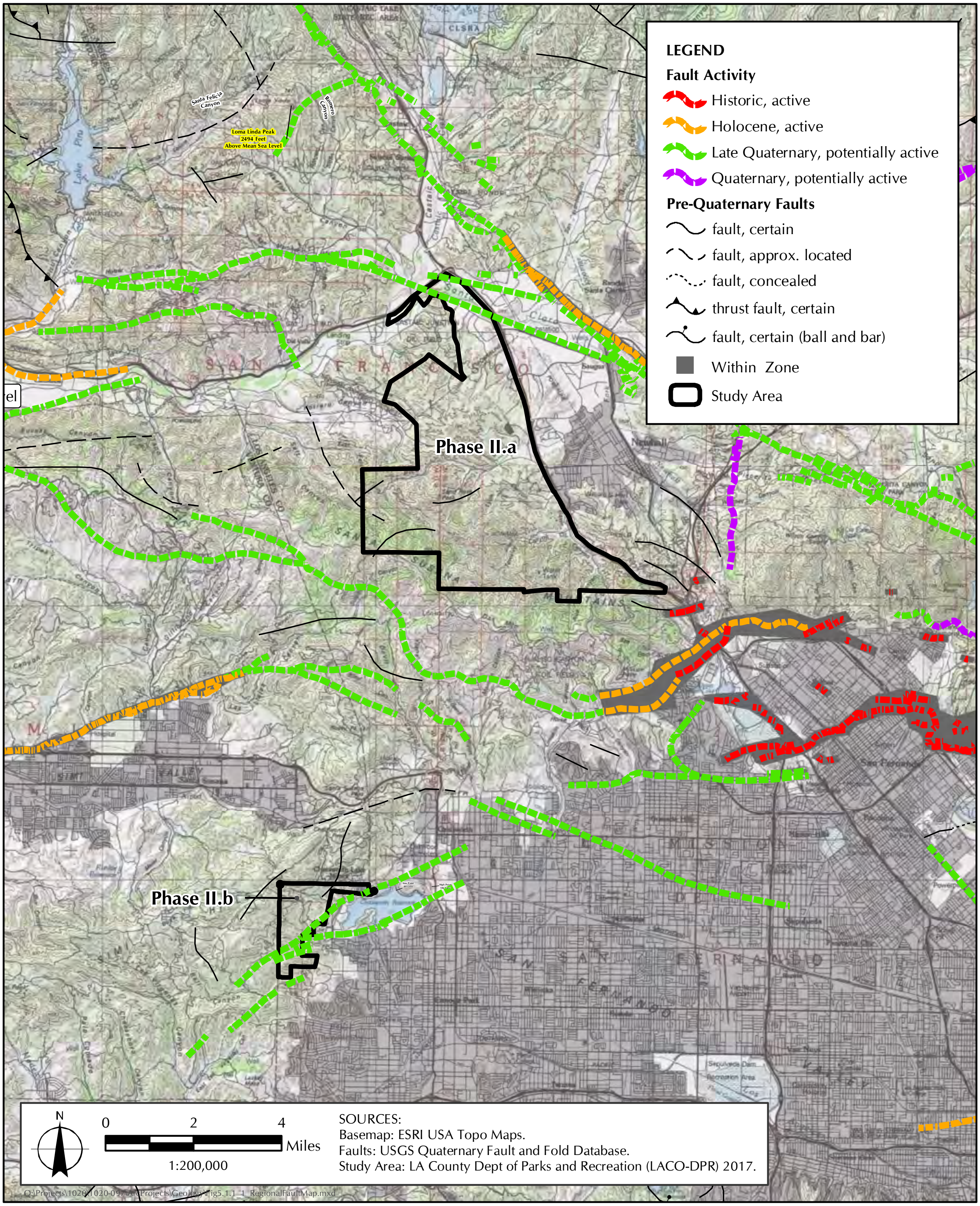

FIGURE 5.1.1-1

Regional Fault Map

Numerous regional and local faults contribute to the strong earthquake ground shaking potential for the SSMTMP-PII area. Faults along which rocks slip horizontally past one another are strike slip faults (e.g., San Andreas, San Jacinto, Elsinore, Newport-Inglewood), while mainly vertical movement is found along normal, as well as reverse and thrust faults (e.g. Oak Ridge, San Cayetano/Holser/Del Valle, Santa Susana, Sierra Madre-San Fernando, Santa Monica-Hollywood, Palos Verdes, Raymond, Verdugo). Abrupt movements along faults cause earthquakes deep in the crust and may result in subsurface fault rupture, surface deformation (folding), or differential uplift along buried (blind) thrust faults (e.g., Northridge Hills, Puente Hills, and Elysian Park). Mountains built by these processes include the Transverse Ranges (Santa Susana-Santa Monica-San Gabriel-San Bernardino) and the Peninsular Ranges (Santa Ana Mountains-San Joaquin Hills-Palos Verdes Hills-Signal Hill). This seismotectonic setting has been a part of the evolution of the Los Angeles County landscape for the past 5 million years or so.

Surface faults of most concern for the SSMTMP-PII area with respect to strong ground shaking are the San Fernando, Oak Ridge, San Cayetano/Holser/Del Valle, San Gabriel, Simi-Santa Rosa, and San Andreas faults. Other smaller faults are of lesser concern due to their lower likelihood of independently generating moderate to large earthquakes. Because they are buried, there remains more uncertainty with regard to the earthquake characteristics of blind thrust faults. The San Cayetano/Holser/Del Valle faults (not mapped by Dibblee) pass through the extreme northern portion of the SSMTMP-PII area. The potential for earthquake activity and ground rupture, though possible, are not likely for the San Cayetano/Holser/Del Valle faults (see Figure 5.1.1-1).

The San Gabriel and San Cayetano/Holser faults are the only fault zones of concern to the SSMTMP-PII area with regard to ground rupture. The fault zones within or very near the proposed SSMTMP-PII area, which are considered as potential ground rupture or earthquake ground shaking hazards, are discussed briefly below.

San Cayetano/Holser/Del Valle Fault Zone. The San Cayetano is a north-dipping reverse/thrust fault, is approximately 45 kilometers long, has a seismic slip rate of between 1.3 and 9 millimeters (mm)/year, ruptured less than 5,000 years ago, and is capable of producing a magnitude (M) 6.5 to 7.3 earthquake. The fault lies west of the SSMTMP-PII area and appears to merge with the Holser and Del Valle faults, the former being just within the SSMTMP-PII area.

The Del Valle and Holser faults appear to be eastward extensions of the San Cayetano fault. The Del Valle fault trends eastward from the Los Angeles-Ventura County line and turns southward before crossing San Martinez Grande Canyon. The eastward-trending part of the fault trace is a southward dipping reverse fault and the southward-trending part is thought to be a tear fault. To the north of the Del Valle the Holser fault is a southward dipping that can be traced to Castaic Valley, is inferred to intersect the San Gabriel fault, and is considered an active fault trace.[7] The Holser fault is also a north dipping reverse fault and is approximately 20 kilometers long. An average slip rate Holser fault is 0.4 mm per year (+/–0.4 mm), and future earthquake of 6.5 are estimated for this fault zone.[8]

[7] County of Los Angeles. 2015. Los Angeles County General Plan 2035. Hillside Management. Available at: http://planning.lacounty.gov/assets/upl/project/gp_2035_2015-FIG_9-8_hillside_management_areas.pdf

[8] California Geological Survey. July 2017. Peak Ground Acceleration Map – 10% Probability of Being Exceeded in 50

Chatsworth Reservoir. Gravity, aeromagnetic and seismic reflection data (the Los Angeles Region Seismic Experiment II[9] suggests that the Chatsworth Reservoir fault may be the western boundary of the San Fernando Valley basin sediments. Dibblee compiled previous mapping and shows two faults extending northeast from Chatsworth Reservoir through the Phase II.b area. The northerly fault appears to coincide roughly with the northwest edge of Chatsworth Reservoir. The southern projection of the fault does not exactly match the trend of the FRSA defined by the City of Los Angeles;[10] however, it does project through an area where historically high groundwater contours[11] show an anomalous change in depth, becoming deeper (from 10 to 90 feet deep) over a relatively short distance. It appears that the Baldwin et al.[12] Chatsworth fault location does fit more closely the trend of the FRSA.

Santa Susana Fault. The Santa Susana fault lies near the base of the Santa Susana and San Gabriel Mountains west and south of the SSMTMP-PII area just north of the 210 Freeway and south of the SSMTMP-PII area from near the I-5/SR-14 intersection on the east. The Santa Susana is a possible earthquake source; it includes three subsections separated by lateral thrust fault ramps, although there is little evidence that these segments are seismogenically separate. Toward its east end, the fault zone overlaps the San Fernando fault zone and on the west extends toward the south-dipping Oak Ridge fault. The fault offsets Late-Quaternary older alluvium and terrace deposits. It is poorly expressed due to the low angle of the fault and widespread landslides. Topographic contrasts may have as much to do with juxtaposition of contrasting bedrock types as with fault displacement.

San Fernando Fault. Mapped San Fernando faults within the APEFZ lie immediately southeast of the SMMTMP-PII area. The San Fernando fault (also divided by some into the San Fernando, Mission Wells, and Reservoir fault segments) ruptured most significantly in the 1971 San Fernando earthquake. The overall ratio of horizontal to vertical movement across the San Fernando fault zone in the 1971 earthquake was 1.9:1.39 (horizontal:vertical) and the maximum oblique displacement was 2.4 meters (7.9 feet). Based on the 1971 USGS[13] report, vertical movement within limited areas appears to have been greater in magnitude for bedrock sites (1 meter/3.3 feet), less for older alluvium sites (0.5 meter/1.6 feet), and substantially less for younger alluvium sites (0.06 meter/2+ inches).

Years (July 2017). Available at: http://www.consrv.ca.gov/CGS/rghm/psha/pga.htm#PGA

[9] Langenheim V., A. Griscom, R. Jachens, and T. Hildenbrand. 2000. Preliminary Potential-Field Constraints on the Geometry of the San Fernando Basin Southern California. USGS OFR 00-219.

[10] City of Los Angeles. Adopted 26 November 1996. Safety Element of the Los Angeles City General Plan.

[11] California Division of Mines and Geology. [1997]. Revised 2001. Seismic Hazard Evaluation of the Calabasas 7.5-minute Quadrangle, Los Angeles County, California. California Department of Conservation, Division of Mines and Geology Open-File Report 006.

[12] Baldwin, J.N., Kelson, K.I., and Randolph, C.E. 2000. Late Quaternary Fold Deformation along the Northridge Hills Fault, Northridge, California: Deformation Coincident with Past Northridge Blind Thrust Earthquakes and Other Nearby Structures: Seismol. Geological Society of America Bulletin 90:629-642.

[13] U.S. Geological Survey. 1971. The San Fernando, California, Earthquake of February 9, 1971. A Preliminary Report Published Jointly by the U.S. Geological Survey and the National Oceanic and Atmospheric Administration Professional Paper 733.

Northridge Hills Fault. The 2010 State fault map (Figure 5.1.1-1) shows the western end of the Northridge Hills fault southwest of the SSMTMP-PII area; the fault is not shown by Dibblee.[14] The 1990 Los Angeles General Plan Safety Element (Plate 1) shows the fault continuing northwest away from the SSMTMP-PII area to where it might connect with the Simi fault. Baldwin and others[15] performed a paleoseismic evaluation of the Northridge Hills fault nearer the center of the fault's trend in the community of Northridge. They describe the Northridge Hills fault as fault-propagation fold above an underlying blind thrust fault dipping northward at about 45 degrees based on previous work; the fault is considered potentially active. This means that the fault has not yet broken the ground to the surface, but could cause local uplift, tilting, and ground deformation.

Mission Hills Fault. The Mission Hills fault is similarly north dipping, but is not known to be linked to the San Fernando fault zone and may well be linked to the Verdugo fault. The San Fernando fault experienced surface rupture and the Mission Hills fault experienced related ground disturbance affects during the M6.6 1971 San Fernando earthquake. Less is known about the Mission Hills fault, which lies just south of the western portion of the San Fernando fault, but for purposes of this study, it is considered potentially active. It was associated with ground cracking, suggested by Holzer and others[16] to be secondary faulting that occurred during the 1994 M6.7 Northridge earthquake along Balboa Boulevard between Rinaldi and Lorilard Streets. It is believed that the Mission Hills fault is connected in the subsurface to the Verdugo fault and may be associated with the Devonshire fault as shown by Dibblee.

San Gabriel Fault. The San Gabriel fault zone is a right-lateral strike slip fault that traces a long arcuate path through the Transverse ranges. It is at least 72 kilometers long. Several echelon strands, in zones up to 0.5 kilometer wide, comprise this fault zone, which crosses the SSMTMP-PII area. Both Late Quaternary (between Newhall and Big Tujunga Canyon) and Holocene (near Castaic) fault offsets have been documented along various segments.[17] The A-P fault zone portion of the San Gabriel fault passes to the east of the proposed Phase II.a SSMTMP-PII area located between Castaic Valley and San Francisquito Canyon.[18] An average slip rate of 1 to 5 mm per year is estimated by the Southern California Earthquake Center,[19] and the fault is capable of an M7.2 earthquake.

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[14] California Geological Survey. 2010. 2010 Fault Activity Map of California. Available at: http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html

[15] Baldwin, J.N., Kelson, K.I., and Randolph, C.E. 2000. Late Quaternary Fold Deformation along the Northridge Hills Fault, Northridge, California: Deformation Coincident with Past Northridge Blind Thrust Earthquakes and Other Nearby Structures: Seismol. Geological Society of America Bulletin 90:629-642.

[16] Holzer, T. L., M. J. Bennett, D. J. Ponti, and J. C. Tinsley. 1999. Liquefaction and Soil Failure during the 1994 Northridge Earthquake. JGGE 125 (6): 438–52.

[17] Ziony, J.I., and Yerkes, R.F. 1985. Evaluating Earthquake and Surface-Faulting Potential. In Evaluating Earthquake Hazards in the Los Angeles Region, USGS Professional Paper 1360, pp. 43-91.

[18] California Geological Survey. 1995. Revised Official Map, Alquist-Priolo Earthquake Fault Zones, 7.5-minute series Newhall topographic quadrangle, Los Angeles County, California, California Division of Mines and Geology.

[19] Southern California Earthquake Center. 2010. Website. Available at: www.scec.org

Oak Ridge Fault. A westward extension from the San Cayetano is the active Oak Ridge fault (not shown on Figure 5.1.1-1), a south-dipping reverse/thrust fault concealed beneath Santa Clara River alluvium approximately. The fault is approximately 90 kilometers long, has a seismic slip rate of between 3.5 and 6 mm per year, and is believe to be capable of producing an M6.5 to 7.5 earthquake. The Oak Ridge fault continues offshore to the west with associated seismicity, while to the east Holocene surface rupture is found between the towns of Bardsdale and Fillmore. The SCEC 2017 "Historical Earthquakes and Significant Faults Map in Southern California" shows the Oak Ridge fault along the north side of the Santa Clara River.

San Andreas Fault Zone (Mojave and 1857 Rupture Segments). The San Andreas fault zone is considered the boundary between two major crustal plates (Pacific and North American). Historic earthquakes along the San Andreas fault zone have caused extensive surface rupture and major damage to structures and engineered facilities. The San Andreas fault zone (Mojave and 1857 Rupture segments) is located about 13 miles northeast of the site. The overall fault zone trends generally northwest for almost the entire length of California, from Cape Mendocino south to beyond the Mexican border. These two segments of the fault are approximately 103 and 345 kilometers long, respectively, extending north from Cajon Pass. Past work estimated the recurrence interval for an M8.0 earthquake along the entire fault zone is between 50 and 200 years, and a 140- to 200-year recurrence interval for major (M7.0 to 7.9) to great (M8.0 or larger) earthquakes along the southern fault zone segment. The 1857 M8.0 Fort Tejon earthquake was the last "great" earthquake along the San Andreas fault zone near Southern California. An average slip rate of about 30 mm per year (+/– 7 mm) and a future earthquake magnitude range of 7.4 and 7.8 for the Mojave and 1857 Rupture segments of the San Andreas fault are estimated by the CGS.[20]

Verdugo Fault. The northwest-southeast trending Verdugo fault is the major bounding structure of the east San Fernando Valley and is considered active, although not within an APEFZ. Weber and others[21] reported possible fault scarps 6 to 10 feet high in Holocene-Late Pleistocene-age deposits in the Burbank area. Southeast of the SSMTMP-PII area in Sun Valley, Weber and others report minor fault offset 130 feet deep in sand and gravel pit deposits. The Verdugo fault may turn to the west and merge with the Mission Hills fault.[22,23]

Sierra Madre-San Fernando Fault. The Sierra Madre-San Fernando fault zone trends nearly east-west through the southern Transverse Ranges; the fault nearly enters the SSMTMP-PII area at its southeast corner. The San Fernando segment is about 18 kilometers long and is one of five major strands comprising the overall Sierra Madre fault zone. The site is approximately 12 miles northwest of this fault zone. This segment of the fault zone is the source of the 1971 M6.6 San Fernando earthquake. An average slip rate of 1 to 3 mm per year and a future earthquake

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[20] California Geological Survey. July 2017. Peak Ground Acceleration Map – 10% Probability of Being Exceeded in 50 Years (July 2017). Available at: http://www.consrv.ca.gov/CGS/rghm/psha/pga.htm#PGA.

[21] Weber, F.H., et al. 1980. Earthquake Hazards Associated with the Verdugo-Eagle Rock and Benedict Canyon Fault Zones, Los Angeles County, California. California Division of Mines and Geology Open File Report 80-10.

[22] Langenheim V., A. Griscom, R. Jachens, and T. Hildenbrand. 2000. Preliminary Potential-Field Constraints on the Geometry of the San Fernando Basin Southern California. USGS OFR 00-219.

[23] California Geological Survey. 2010. 2010 Fault Activity Map of California. Available at: http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html

magnitude range of 6.7 for the San Fernando segment of the Sierra Madre fault zone are estimated by the CGS[24] for this A-P fault zone.

Simi-Santa Rosa Fault Zone. The North and South Simi faults within the Simi-Santa Rosa fault zone west of the SSMTMP-PII area are characterized by moderate to high-angle north-dipping reverse faults that probably also have a left-lateral component of displacement.[25] This zone extends for 40 kilometers from near Camarillo on the west in an east-northeast direction within the southern California Transverse Ranges and shows evidence of continued Quaternary activity. The fault displays compressional features, but in the eastern half of the section near the SSMTMP-PII area a left-lateral component of displacement may be more predominant. The Simi fault generally has a high dip angle (up to 90°). It is associated with shallower reverse and thrust faults with local south dips related to inferred flower structure and backthrusts.

Surface Faulting/Ground Rupture Hazard

The anticipated (average) amount of surface fault rupture on any given fault trace for the maximum earthquake can be inferred from measurements of offsets caused by past earthquakes. In general, these estimates range from zero to about one foot for magnitudes under M6.0, and from 1 foot to 10 feet or more for magnitudes between M6.0 and 7.5. Many variables affect the amount of surface rupture, including the depth of the earthquake hypocenter where the strain energy is released. Site-specific study is normally conducted to refine such estimates for a fault segment at a given project site.

The most recent earthquake with clearly defined surface rupture is the 1971 San Fernando earthquake that had roughly 3 to 6 feet of vertical and lesser horizontal surface displacements. An estimate of the potential range of displacements for the San Cayetano/Holser/Del Valle faults could be made based on site-specific analysis. Lacking such analysis, the San Fernando earthquake offsets could be considered representative of the active reverse faults within and very near the SSMTMP-PII area. In addition, smaller disruptions from co-seismic uplift, ground tilting, and ground disturbance, similar to that associated with the Mission Hills fault in the 1994 Northridge earthquake, could result, for example on the Chatsworth Reservoir and Northridge Hills faults.

Using the estimated earthquakes for Holser and Del Valle faults suggests a potential for 3 to 6 feet of vertical and lesser horizontal surface displacements. An estimate of the range of displacements for the nearby San Gabriel fault would be larger, potentially as much as 10 to 20 feet. Lacking specific analysis, these offsets are considered representative of similar active reverse faults and strike slip faults in the vicinity of the SSMTMP-PII area. In addition, smaller disruptions from co-seismic uplift, ground tilting, and ground disturbance could result.

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[24] California Geological Survey. July 2017. Peak Ground Acceleration Map – 10% Probability of Being Exceeded in 50 Years (July 2017). Available at: http://www.consrv.ca.gov/CGS/rghm/psha/pga.htm#PGA

[25] Treiman, J.A. 1998. Simi-Santa Rosa Fault Zone in the Moorpark, Newbury Park, Simi Valley East, Simi Valley West, and Thousand Oaks Quadrangles, Ventura County, California. California Division of Mines and Geology Fault Evaluation Report FER-244.

5.1.2 Seismic Ground Shaking

Earthquakes and Potential Ground Shaking

Numerous earthquakes have occurred in historic time in the Southern California region. Historic events are both pre-instrumental (all information is very approximate) and instrumental events. The primary earthquakes associated with the Northridge Hills and San Fernando faults are the 1994 magnitude 6.7 and 1971 magnitude 6.6 events, respectively. Clearly, older pre-instrumental events are based on written accounts that may not be very accurate with regard to location and magnitude.

The SSMTMP-PII area is very near the Verdugo fault, the San Fernando fault, the Northridge Hills fault, and crossed by the Holser fault, part of the Oak Ridge/San Cayetano fault system. A review of estimates from seismic hazard mapping for California[26] indicates that the peak ground acceleration (PGA--what is experienced by a particle on the ground) with a 10 percent chance that this acceleration may be exceeded within a 50-year period for the SSMTMP-PII area, ranges from approximately 0.5g (g = the force of gravity) to 0.6g considering three ground conditions (firm rock, soft rock, and alluvium).

Violent shaking occurs not only next to the earthquake's epicenter, but for many miles in all directions. The Modified Mercalli Intensity (MMI) Scale is a qualitative scale of how earthquakes are felt by people and how they affect buildings. It is a 12-point scale ranging from Intensity I, which is rarely felt by people, to Intensity XII, where damage to structures is total and objects are thrown into the air. An acceleration of 0.35 to 0.65g corresponds roughly to an intensity of VIII on the MMI Scale.[27] Several earthquakes in the region within the last 200 years are estimated to have caused Intensity VIII ground shaking on the site. In an Intensity VIII earthquake damage is slight in specially designed structures; ordinary substantial buildings are damaged considerably and partially collapse; and damage is great in poorly built structures. Historic earthquakes in the region estimated to have caused significant ground shaking on the site include the M7.5 1952 Kern County/Tehachapi Earthquake, the M6.6 1971 Sylmar Earthquake, and the M6.7 1994 Northridge Earthquake.

Based on the fault discussed above and a review of estimates from seismic hazard mapping for California[28] the SSMTMP-PII area peak ground acceleration (PGA; what is experienced by a particle on the ground) with a 10 percent chance that this acceleration may be exceeded within a 50-year period for the central portion of the SSMTMP-PII area, is approximately 0.52g (g = the force of gravity) considering typical soft bedrock ground conditions of the area.

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[26] California Geological Survey. July 2017. Peak Ground Acceleration Map – 10% Probability of Being Exceeded in 50 Years (July 2017). Available at: http://www.consrv.ca.gov/CGS/rghm/psha/pga.htm#PGA

[27] Wald, D.J., Heaton, T.H., and Kanamori, H. August 1999. Relationships between Peak Ground Acceleration, Peak Ground Velocity, and Modified Mercalli Intensity in California. Earthquake Spectra 15: 3.

[28] California Geological Survey. July 2017. Peak Ground Acceleration Map – 10% Probability of Being Exceeded in 50 Years (July 2017). Available at: http://www.consrv.ca.gov/CGS/rghm/psha/pga.htm#PGA.

5.1.3 Seismic Related Ground Failure/Liquefaction

Liquefaction

Liquefaction occurs when saturated, cohesionless (low relative density) materials (usually sand or silty sand) are transformed from a solid to a near liquid state. This phenomenon occurs when moderate to severe seismic ground shaking causes pore-water pressure to increase. The expected level of ground shaking in the SSMTMP-PII area is high enough to initiate liquefaction. Liquefaction can cause overlying structures (e.g., bridges, buildings, storage tanks) to settle non-uniformly, and buried structures (e.g., fuel tanks, pipelines) to float. In either situation, severe damage to the structure is highly likely.

In addition to sufficiently high seismic shaking levels, the two other key conditions conducive to liquefaction, shallow groundwater, and cohesionless sands are potentially present within several portions of the SSMTMP-PII area. It is generally considered that there is a low potential (although there may be some) for liquefaction where water is greater than about 40 feet below the ground surface; there is a very high potential where less than 10 feet.

Various maps show potential liquefaction areas in the SSMTMP-PII area.[29,30,31,32,33,34] The representation of liquefaction potential presented on Figure 3.2-1 considers the maps prepared by the CDMG (green shading); the line designating liquefaction areas corresponds to the 40-foot groundwater depth contour. For Phase II.b, there is only a very small area where Box Canyon enters Chatsworth Reservoir. For Phase II.a, the liquefaction area is extensive on the north within the Santa Clara River floodplain and the broad unnamed canyons north to the river and east toward the valley occupied by I-5. Phase II liquefaction areas are concentrated in the prominent canyons, for example, Potrero, Pico, Wickham, Dewitt, Lyon, Gavin, Towsley, and a few smaller unnamed canyons.

5.1.4 Landslides

Earthquake Induced Landslides

Most (an estimated 80 percent to 90 percent) of the mountains and hills of the SSMTMP-PII area are potential earthquake-induced landslide areas. These areas correspond to bedrock and to a lesser

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[29] California Division of Mines and Geology. 7 April 1997. Seismic Hazard Zone Map—Simi Valley East Quadrangle, 1:24000.

[30] California Division of Mines and Geology. 1 February 1998. Seismic Hazard Zone Map—Newhall Quadrangle, 1:24000.

[31] California Division of Mines and Geology. 1 February 1998. Seismic Hazard Zone Map—Oat Mountain Quadrangle, 1:24000.

[32] California Division of Mines and Geology. 7 November 2001. Seismic Hazard Zone Map—Calabasas Quadrangle, 1:24000.

[33] California Division of Mines and Geology. 20 December 2002. Seismic Hazard Zone Map—Val Verde Quadrangle, 1:24000.

[34] City of Los Angeles. Adopted 26 November 1996. Safety Element of the Los Angeles City General Plan.

extent older alluvium with steep slopes (see Figure 3.2-1). Landslide movement along bedding planes within these formations, as rocks dislodged from exposures on steep slopes, or as surficial failures of weathered rock and soil/colluvium could cause rock masses to dislocate and damage overlying facilities, and facilities nearby and down slope from these bedrock and older alluvium areas.

5.1.5 Soil Erosion/Loss of Topsoil

Mudflow

The City of Los Angeles General Plan Safety Element classifies low hill areas adjacent to and within the SSMTMP-PII area as Hillside Areas that are more prone to slope instability than the flatter valley floor areas. The Hillside Areas encompass the area south of the SR-118 through Phase II.b and Chatsworth Reservoir. Mudflows (also debris flows) develop when saturated, loose surface materials (e.g., soil, colluvium/slope wash, and weathered bedrock formations) in hillside areas become unstable and, due to gravitational forces, slide down the hillside slopes. Although mudflow events would be uncommon and no specific mudflows have been mapped within the SSMTMP-PII area, the steep topography in the soil- and colluvium-covered bedrock terrain may generate mud- or debris-flows that could enter the SSMTMP-PII area from the Hillside Areas.

5.1.6 Stability of Geologic Unit/Soil

Geologic Units/Structure - Northeastern San Fernando Valley

Geologic Units. The SSMTMP-PII area is located at the northeastern edge of the San Fernando Valley and within the foothills of the Santa Susana Mountains. This portion of the Santa Susana Mountains rises locally to approximately 3,747 feet (unnamed peak) and the northeast base of the mountains in the SSMTMP-PII area is at an elevation of approximately 1,300 feet adjacent to the I-5 within Gavin Canyon Chatsworth Reservoir[35,36,37,38,39] (see Figure 2.2-2). The Santa Susana Mountains and adjacent San Fernando Valley are underlain by a thick (several thousand feet) sequence of Tertiary and Mesozoic age sedimentary bedrock overlain by younger and older alluvial deposits (Table 5.1.6-1, *Approximate Trail Lengths within Each Geologic Unit for All Phases*). From oldest to youngest, these bedrock formations include the Chatsworth (map symbol Kcs), Lindero Canyon (Tls and Tlsc), Sisquoc (Tsq), Towsley (Ttoc and Ttos), Pico (Tp and Tps), and Saugus (Ts, Tsr, and QTs) Formations that are underlain by crystalline basement not exposed at the ground surface.[40,41,42,43,44] Each bedrock formation is comprised of rock layers alternating between

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[35] U.S. Geological Survey. 1967. 7.5-minute series Calabasas topographic quadrangle, Los Angeles County, California.

[36] U.S. Geological Survey. 1969. 7.5-minute series Oat Mountain topographic quadrangle, Los Angeles County, California.

[37] U.S. Geological Survey. 1969. 7.5-minute series Simi Valley East topographic quadrangle, Los Angeles County, California.

[38] U.S. Geological Survey. 1995. 7.5-minute series Val Verde topographic quadrangle, Los Angeles County, California.

[39] U.S. Geological Survey. 1995. 7.5-minute series Newhall topographic quadrangle, Los Angeles County, California.

[40] Dibblee, T.W.m and H.E. Ehrenspeck. 1992. Geologic Map of the Oat Mountain and Canoga Park (north1/2) Quadrangles, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-36, scale 1:24,000.

sandstone, conglomerate, and siltstone. Figure 2.2-3 shows the bedrock and surficial geologic units across the SSMTMP-PII area, and Figure 2.2-4 provides the explanation and unit descriptions. Table 5.1.6-1 provides a relationship between the geologic units present, the geologic units physical characteristics, the length of the proposed trails within each unit, and the percentage of the total trail length within each geologic unit. This information can be used for estimating the level of accommodation in the design of the project facilities due to the characteristics of each geologic unit. For example, the Towsley Formation comprises approximately 27 percent, is associated with landslides and possible unstable bedding, and contains clay-rich units that may be expansive and cause other concerns for trail construction.

TABLE 5.1.6-1
APPROXIMATE TRAIL LENGTHS WITHIN EACH GEOLOGIC UNIT FOR ALL PHASES

Formation Name (Map Symbol) (Age)	Estimated Trail in Each Formation		Formation Description (Very Rough Percentage of Aerial Coverage of Each Formation within the Multi-Use Trails Area)
	Length in Miles (+/–10%)	Percent of Total Trails*	
Alluvium (Qa/Qg) and Artificial fill (af) (Holocene)	13.81	19.6	Gravel and sand, generally loose to medium dense; the overall length for this formation is ≤25%
Landslide Deposits (Qls) (Holocene)	1.54	2.2	Variable depending upon the underlying bedrock formation, generally siltstone, sandstone, and claystone/shale (≤1% based on Dibblee and others; CDMG maps show ≤15%)
Older Dissected Surficial Sediments (Qog) (Pleistocene)	1.74	2.5	Gravel with sand (≤1%)
Saugus Formation (QTs) (Pleistocene-Pliocene)	4.29	6.1	Light gray pebble conglomerate, sandstone, and minor siltstone (includes a small percentage of claystone) (≤35%)
Saugus Formation (Ts/Tsr) (Pliocene)	1.39	2.0	Light gray pebble conglomerate, sandstone, and minor siltstone (includes a small percentage of claystone) (≤35%)
Pico Formation (Tp/Tps) (Pliocene)	6.75	8.9	Gray siltstone and claystone, crumbly and light gray to tan sandstone, fine to medium grained and thickly bedded (≤25%)
Towsley Formation (Ttos/Tpc/Ttoc) (Pliocene-Miocene)	21.55	30.1	Gray claystone and siltstone, vaguely bedded, crumbly and a basal gray conglomerate with rounded cobbles (≤10%)

[41] Dibblee, T.W. 1992. Geologic Map of the Calabasas Quadrangle, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-37, scale 1:24,000.

[42] Dibblee, T.W. and H.E. Ehrenspeck. 1992. Geologic Map of the Simi Quadrangle, Ventura County, California, Dibblee Foundation Map DF-39, scale 1:24,000.

[43] Dibblee, T.W. and H.E. Ehrenspeck. 1993. Geologic Map of the Val Verde Quadrangle, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-50, scale 1:24,000.

[44] Dibblee, T.W. and H.E. Ehrenspeck. 1996. Geologic Map of the Newhall Quadrangle, Los Angeles County, California, Dibblee Foundation Map DF-56, scale 1:24,000.

TABLE 5.1.6-1
APPROXIMATE TRAIL LENGTHS WITHIN EACH GEOLOGIC UNIT FOR ALL PHASES

Formation Name (Map Symbol) (Age)	Estimated Trail in Each Formation		Formation Description (Very Rough Percentage of Aerial Coverage of Each Formation within the Multi-Use Trails Area)
	Length in Miles (+/–10%)	Percent of Total Trails*	
Sisquoc Shale(Tsq)(Late Miocene)	3.64	5.2	Tsq Dark gray to brownish gray clay shale, bleaches to light gray; crumbly with ellipsoidal to sub-platy fracture, gypsiferous in fractures, includes some thin bedded semi-siliceous layers; some layers contain large tan dolomitic concretions
Monterey Shale(Tm/Tml)(Middle and Late Miocene)	0.26	0.4	Tm upper part: thin bedded siliceous shale, dark gray brown but weathers cream-white, hard, platy, brittle, porcelaneous, locally chart); closely fractured, some layers fissile, about 1500 ft (485m) thick; middle and late Miocene age (mostly Mohnian Stage); south of Santa Susana fault: soft, white weathering thin-bedded fissile diatomaceous semi-siliceous shale Tml lower part: thin-bedded, fissile semi-siliceous shale to soft shaly claystone, dark brown, weathers cream white; includes some calcareous shale, and thin tan-weathering hard dolomite strata that are increasingly abundant upward, unit as thick as 500 ft (150m); middle Miocene age (Luisian-Relizian Stage)
Chatsworth Formation (Kcs,Kcsh)(Late Cretacous)	12.92	18.4	Kcs Light gray to light brown sandstone, hard, coherent arkosic, micaceous, mostly medium grained, In thick strata separated by thin parings of siltstone Kcsh Gray clay shale, crumbly with ellipsoidal fracture where weathered; includes some thin sandstone strata In western area
Detrital Sediments of Lindero Canyon (Tls/Tlsc)(Miocene)	4.35	6.2	Light gray to nearly white massive sandstone, semi-friable, locally conglomeratic Tlec Light gray calcareous sandstone, massive to crudely bedded, with calcite veins; Includes gray conglomerate composed of cobbles of metavolcanic, granitic, and quartzitic rocks and of sandstone derived from Chatsworth Formation; sparsely fossiliferous

NOTE: * Does not sum to 100 due to rounding.

Quaternary (Holocene through early Pleistocene) alluvial fan and younger bedrock deposits (Saugus Formation-QTs) cover the Tertiary bedrock formations. Holocene alluvial deposits (Qa and Qg) cover a relatively small portion of the SSMTMP-PII area at the base of the mountains and in the bottom of canyons. Older alluvial deposits (Qog) cover a relatively large area between the valley floor and the steeper mountains. These alluvial deposits consist predominantly of sand, silt, and gravel/boulders, along with smaller amounts of clay-rich materials. Landslide deposits (Qls) are scattered across the SSMTMP-PII area and consist of unstable bedrock formations listed above.

Geologic Structure. Geologic structure includes folding, tilting, and faulting of the geologic units. These portions of the Santa Susana Mountains are tectonically active and have been subject to these structural effects for tens of millions of years. Therefore, the geologic structure is very complex with numerous faults (discussed below), fractures, and disturbed bedrock layers. Bedding orientation and angles are controlled by two major northwest-southeast trending anticlinal (up fold) and synclinal (down fold) structures, the Pico anticline and the Oat Mountain syncline. Bedding dip angles range from very shallow (less than 20 degrees), into and out-of-slope, to vertical (90 degrees) and overturned. Due to the recent nature of tectonic activity, even the older Pleistocene portions of the Saugus Formation unit are folded and faulted. Often fault zones form crushed zones of bedrock that is weaker than the unfaulted materials.

SSMTMP-PII Area Geology Conditions

Based on a review of available documents describing the geology of the SSMTMP-PII area, it is underlain by (1) younger Quaternary-age (Holocene) alluvium/surficial sediments (map symbol af, Qa and Qg), (2) landslide deposits (Qls-Holocene), (3) older Quaternary-age (Holocene-Pleistocene) alluvium/surficial sediments (Qog), (4) Quaternary-age-age (Pleistocene) softer bedrock formations (QTs), (5) Tertiary-age hard to very hard sedimentary bedrock formations, and (6) an older (Cretaceous) hard to very hard sedimentary bedrock formation[45,46,47,48,49] (Table 4.1-1; see Figures 2.2-3 and 2.2-4). The young alluvium and landslide deposits make up less than less than 1 percent of the SSMTMP-PII area, while older alluvium and soft bedrock comprise upwards of 10 percent of the deposits, with the Tertiary and Cretaceous harder bedrock formations making up the remaining approximately 80 to 90 percent of the SSMTMP-PII area.

All geologic formations are covered by some thickness of unmapped soil and colluvium that can range from several inches to several feet. Some soils within the SSMTMP-PII area have been modified and disturbed by grading and earthmoving associated with development; however, most soils are undisturbed in the SSMTMP-PII area. Available soil maps and reports suggest that most soil materials in the SSMTMP-PII area are sand, clay, and silt, with much smaller amounts of gravel. Although a small percentage of artificial fill (af) is found in the SSMTMP-PII area associated with man-made structures, roadways, and the I-5, one larger area deposit is found at the southeast corner of the Phase II.a area where it covers QTs present in the lower hillside areas.

The geologic units are described briefly below from youngest through oldest formations. This analysis uses unit names and symbols are from Dibblee's maps as noted above (see Figure 2.2-4). The California Division of Mines and Geology (CDMG; currently California Geological Survey [CGS]) seismic hazard reports[50,51,52,53,54] have detail in their subdivision of the surficial/alluvial formations and uses different symbols for some units.

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[45] Dibblee, T.W. and H.E. Ehrenspeck. 1992. Geologic Map of the Oat Mountain and Canoga Park (north1/2)Quadrangles, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-36, scale 1:24,000.

[46] Dibblee, T.W. 1992. Geologic Map of the Calabasas Quadrangle, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-37, scale 1:24,000.

[47] Dibblee, T.W. and H.E. Ehrenspeck. 1992. Geologic Map of the Simi Quadrangle, Ventura County, California, Dibblee Foundation Map DF-39, scale 1:24,000.

[48] Dibblee, T.W. and H.E. Ehrenspeck. 1993. Geologic Map of the Val Verde Quadrangle, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-50, scale 1:24,000.

[49] Dibblee, T.W. and H.E. Ehrenspeck, H. E. 1996. Geologic Map of the Newhall Quadrangle, Los Angeles County, California, Dibblee Foundation Map DF-56, scale 1:24,000.

[50] California Division of Mines and Geology. [1997] Revised 2001. Seismic Hazard Evaluation of the 7.5-minute series Calabasas topographic quadrangle, Los Angeles County, California, California Department of Conservation, Division of Mines and Geology Open-File Report 006.

The proposed trails would be developed in man-made artificial fill and 10 natural geologic formations as described by Dibblee and cited below (see Table 5.1.6-1). The artificial fill and younger/older alluvial formations would generally have poorer geotechnical characteristics relative to stability and foundation suitability. These comprise roughly 20 percent of the total trail lengths. Bedrock formations would generally have good to excellent geotechnical characteristics relative to trail surfaces, cut slopes, and foundation suitability. On the other hand, bedrock can be subject to expansive soils, rockfall, difficult excavation, and bedding plane slope instability. Bedrock formations comprise roughly 80 percent of the total trail lengths. Landslide deposits associated with bedrock comprise less than 1 percent of the trail lengths.

Quaternary Formations

af – Artificial Fill. Artificial fill is found along the I-5 Freeway in one large subdivision in the mid-eastern portion of the Phase II.a area, as well as in some canyon bottoms, and along roads and trails where grading was necessary for construction. These fills may be engineered and compacted to modern standards or may be undocumented with unknown properties. In general, it can be expected that the engineered fill materials would be predominantly sand, silt, and fine gravel due to the ease of compaction. Locally present undocumented fills may contain larger materials (cobble, boulders) and trash (organic matter, metal, concrete, wood, etc.). These materials would not be suitable for use in future trails development projects. None of the proposed staging areas or skills parks are located within the artificial fill area. Currently it is estimated that none of the proposed trails lies within artificial fill (Table 5.1.6-1).

Qls – Landslide Deposits (Holocene). Landslide deposits are present, but not abundant, within the SSMTMP-PII area bedrock formations and are considered unstable masses (see Figures 2.2-3 and 2.2-4). These deposits result from mass movements of bedrock materials down slope due to some or all of (1) out-of-slope bedding planes, (2) weak materials properties, and (3) steep slopes. Dibblee[55,56,57,58,59] shows numerous landslides with the Saugus, Pico, and Towsley Formations

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[51] California Division of Mines and Geology. 1997. Seismic Hazard Evaluation of the 7.5-minute series Newhall topographic quadrangle, Los Angeles County, California, California Department of Conservation, Division of Mines and Geology Open-File Report 97-11.

[52] California Division of Mines and Geology. [1997]. Revised 2001. Seismic Hazard Zone Report for the 7.5-minute series Oat Mountain topographic quadrangle, Los Angeles County, California, California Department of Conservation, Division of Mines and Geology Seismic Hazard Zone Report 005.

[53] California Division of Mines and Geology. [1997]. Revised 2001. Seismic Hazard Zone Report for the 7.5-minute series Simi Valley West and Simi Valley East topographic quadrangles, Ventura and Los Angeles Counties, California, California Department of Conservation, Division of Mines and Geology Seismic Hazard Zone Report 002.

[54] California Division of Mines and Geology. 2002. Seismic Hazard Zone Report for the 7.5-minute series Val Verde topographic quadrangle, Los Angeles and Ventura Counties, California, California Department of Conservation, Division of Mines and Geology Seismic Hazard Zone Report 076.

[55] Dibblee, T.W. and H.E. Ehrenspeck. 1992. Geologic Map of the Oat Mountain and Canoga Park (north1/2) Quadrangles, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-36, scale 1:24,000.

[56] Dibblee, T.W. 1992. Geologic Map of the Calabasas Quadrangle, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-37, scale 1:24,000.

[57] Dibblee, T.W. and H.E. Ehrenspeck. 1992. Geologic Map of the Simi Quadrangle, Ventura County, California, Dibblee

primarily in the Phase II.a area as described below. Many of these landslide masses have their upper areas located immediately below prominent ridgelines. In addition, the CDMG seismic hazard report maps referenced above show landslides from various sources and indicate a much greater number than Dibblee (Figure 5.1.6-1, *Hydrology Map*). Since the sources vary, there is not complete agreement between the two maps. We assume the greater number of landslides for planning purposes (Table 5.1.6-1).

Figure 5.1.6-1 shows landslides scattered across Phase II.a and intersect with (or pass very near) several proposed trails south of Pico Canyon and one trail north of Pico Canyon in the Saugus Formation. The southernmost trail within the Phase II.b area appears to cross a landslide at the western edge of the area in the Lindero Canyon Formation. None of the six proposed staging areas or skills parks is located within mapped landslides in the Phase II.a or II.b areas.

Qa and Qg – Young Alluvial Deposits (Holocene). The Qa deposits occur within the larger canyons extending north and west within the SSMTMP-PII area (e.g., Potrero, Pico, Lyons, Rice, Towsley, East, Gavin, and extensions from Pico and unnamed tributary canyons to the Santa Clara River in the Phase II.a area). The map view of these deposits (see Figure 5.1.6-1) is typically an irregular linear ribbon, some of which pass beneath portions of each SSMTMP-PII area. Qa and Qg deposits generally consist of unconsolidated bouldery, cobbley, gravelly, sandy, or silty alluvial deposits within active and recently active alluvial channels/fans. Qa and Qg loose to medium dense, subject to erosion, and generally poorly suited for foundations and retaining structures. Phase II.b area has limited deposits (Table 5.1.6-1). A substantial portion of the trail segments in the Phase II.a area north of McBean Parkway are located within young alluvial deposits in an unnamed canyon. South of McBean Parkway trails are within mainly alluvium in portions of Pico, Towsley, East, Wiley, and Gavin Canyons. Within the Phase II.b area, there are a few areas with trails in younger alluvial deposits. Three of the six proposed Phase II.a staging areas or skills parks are located within mapped younger alluvial deposits and none within the Phase II.b area.

Qog – Older Alluvial Deposits (Late-Middle Pleistocene). Qog is an undifferentiated older alluvial fan deposit derived from the Saugus Formation (see Figure 5.1.6-1) in a large portion of the northeastern portion of the Phase II.a area adjacent to the I-5.[60] Qog consists largely of alluvial fan and high terrace deposits of gravel and sand crystalline basement rocks and the Saugus Formation (QTs). Alluvial fan surfaces can show moderately to well-developed pedogenic soils. None of the proposed staging areas or skills parks are located within the older alluvial deposits area in Phase II.a. As shown in Table 5.1.6-1, a small portion of the proposed trails in the Phase II.a area lie within the older alluvial deposits.

Foundation Map DF-39, scale 1:24,000.

[58] Dibblee, T.W. and H.E. Ehrenspeck. 1993. Geologic Map of the Val Verde Quadrangle, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-50, scale 1:24,000.

[59] Dibblee, T.W. and H.E. Ehrenspeck. 1996. Geologic Map of the Newhall Quadrangle, Los Angeles County, California, Dibblee Foundation Map DF-56, scale 1:24,000.

[60] Dibblee, T. W., and Ehrenspeck, H. E. 1996. Geologic Map of the Newhall Quadrangle, Los Angeles County, California, Dibblee Foundation Map DF-56, scale 1:24,000.

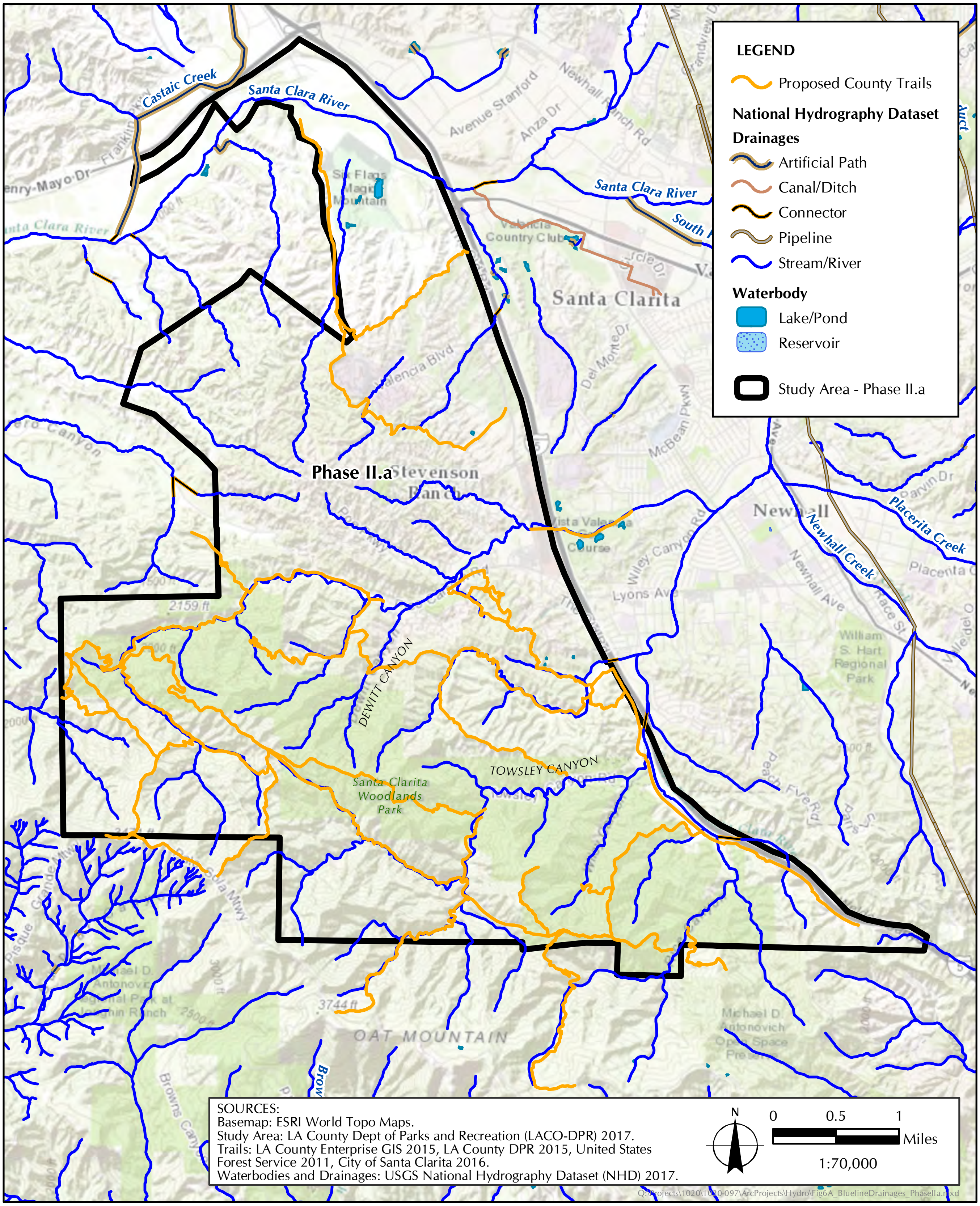

FIGURE 5.1.6-1a

Hydrology Map North

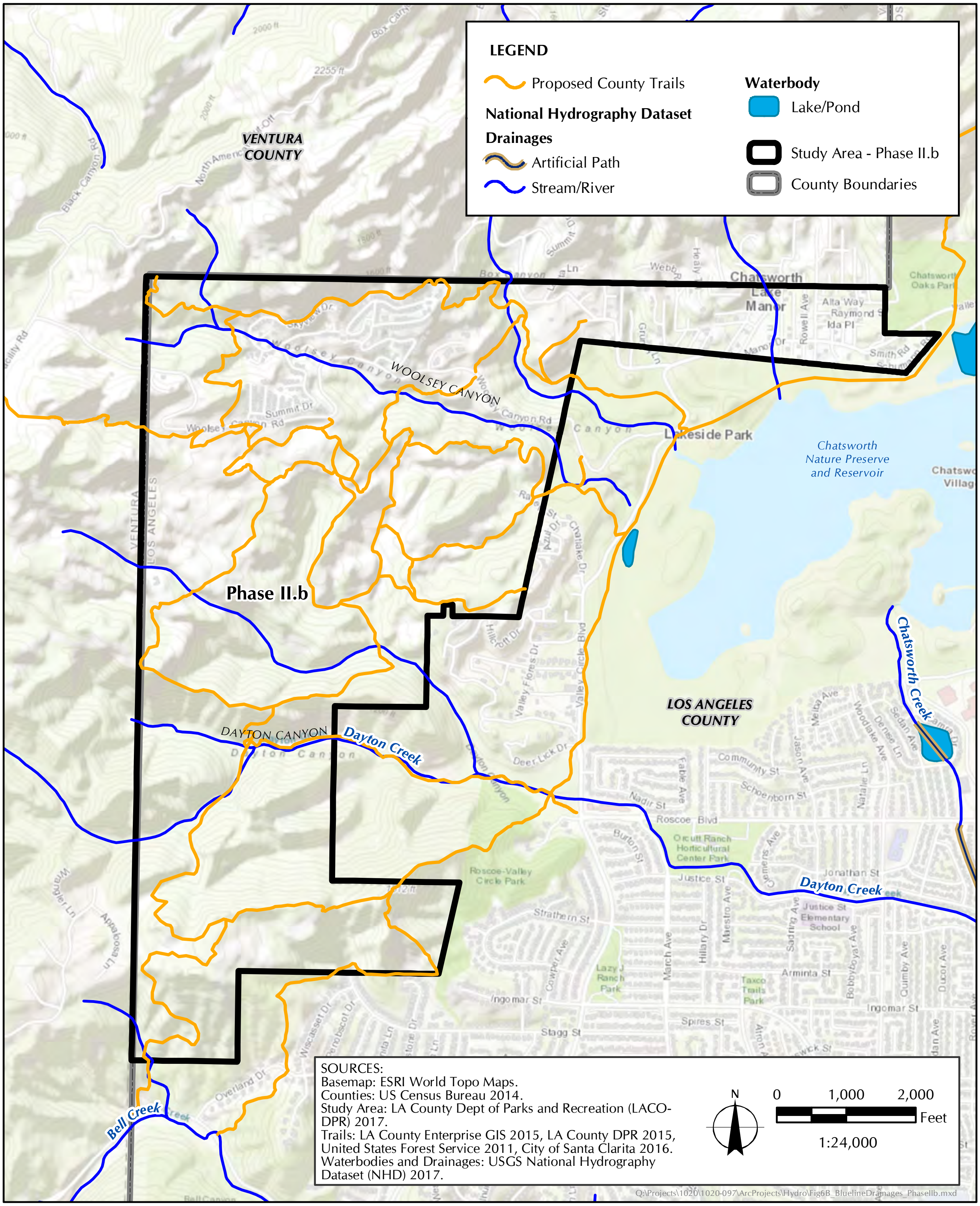

FIGURE 5.1.6-1b

Hydrology Map South

QTs-Saugus Formation (Early Pleistocene-Late Pliocene). QTs (Saugus Formation) is found in extensive exposures in the northwest portion of the Phase II.a area associated with Qog as described above, and adjacent to I-5 at Pico Canyon (see Figure 5.1.6-1). The formation consists of light gray and reddish brown slightly consolidated, poorly sorted, coarse-grained, cross-bedded sandstone and pebble conglomerate with minor amounts of soft siltstone overlying Pico Formation (Tp—discussed below). None of the proposed staging areas or skills parks is located within the Saugus Formation (QTs) and as shown in Table 5.1.6-1, less than 8 percent of the proposed trails in the Phase II.a lie within the Saugus Formation deposits.

Tertiary Bedrock Formations

Ts and Tsr – Saugus Formation and Sunshine Ranch Member (Upper Pliocene). The Sunshine Ranch Member (Tsr) of the Saugus Formation is found in a fairly limited area in the east-central portion of the Phase II.a areas extending west from I-5 (see Figure 5.1.6-1). The Tsr consists of fine-grained pebbly to cobbley conglomerate, and greenish-gray claystone and siltstone. The Saugus Formation (Ts) is found in a very limited area along the southeast boundary of Phase II.a where it is crossed by I-5 and is similar in composition to QTs. Due to the limited nature of the Saugus Formation (Tsr) exposures east of Towsley Canyon to the I-5, only a small percentage of the proposed trails are planned within this formation (Table 5.1.6-1) and one of the proposed skills parks is located within the Saugus Formation (Tsr) in the Phase II.a area.

Tp and Tps – Pico Formation (Pliocene). Tp and Tps consist of white to light gray poorly cemented semi-friable fine- to very fine-grained sandstone and some gray bedded to massive micaceous claystone-siltstone (Tp). It is found associated with Towsley Formation (Ttoc described below), and is exposed both in the northeast edge and along the axis of an anticline trending northwest through the south and western portions of the Phase II.a area (see Figure 5.1.6-1). A very substantial portion of the trail segments in the Phase II.a area south of McBean Parkway are located within Pico Formation bedrock (Table 5.1.6-1). One of the six proposed Phase II.a trailhead and staging areas is located within Pico Formation (and possibly some younger alluvium) in the Potrero-Pico Canyon area.

Ttos and Ttoc – Towsley Formation (Early Pliocene – Late Miocene). The Towsley Formation (Ttos/Ttoc) is the most prevalent bedrock formation in the Phase II.a area and underlies most of the central and southern portions of the area (see Figure 5.1.6-1). Ttoc consists of predominantly gray to brown thin-bedded micaceous claystone and siltstone, and contains minor interbeds of very fine-grained to coarse-grained sandstone. It is found in relatively narrow bands in the south and southcentral portions of the Phase II.a area. Ttos, the more extensive of the two members, consists of light gray and tan poorly to moderately cemented fine-grained sandstone with interbeds of pebbly sandstone, coarse-grained sandstone, and minor siltstone. The Towsley Formation, along with to the Pico Formation, underlies a substantial portion of the trail segments in the Phase II.a area south of McBean Parkway (Table 5.1.6-1). None of the six proposed Phase II.a trailhead and staging areas is located within Towsley Formation.

Tsq – Sisquoc Formation (Miocene). The Sisquoc Formation (Tsq) is exposed along the axis of the Pico Anticline trending northwest through the southcentral portion of the Phase II.a area (see Figure 5.1.6-1). Sisquoc Formation consists of a dark gray to brownish gray clay-rich shale that weathers to gravel- and cobble-size rock fragments. The Newhall oil field within the Phase II.a area is located along this axis. The Sisquoc Formation has a relatively limited exposure in the Phase II.a area, although a number of trails meet along the ridge adding more than would be expected from the limited exposure of this formation (Table 5.1.6-1). None of the proposed staging areas or skills parks is located within the Sisquoc Formation.

Tls/Tlsc – Detrital Sediments in Lindero Canyon (Lindero Canyon Formation - Miocene). The Lindero Canyon Formation (Tls) consists of light gray to white massive sandstone that is semi-friable and locally contains conglomerate. Tls is exposed over approximately 11 percent of the southern one half of the Phase II.b area (see Figure 5.1.6-1). Tlsc is approximately 8 percent of this area and is composed of light gray calcareous sandstone that is massive to poorly bedded with gray conglomerate that is sparsely fossiliferous. Tls/Tlsc is exposed mainly south of Dayton Canyon. Within the southern one-third of the Phase II.b area two connected trail segments overlie the Lindero Canyon Formation, about evenly divided between the two members (Table 5.1.6-1). One proposed access area is underlain by Tlsc (and possibly some younger alluvium) along the southern boundary line.

Kcs – Chatsworth Formation (Upper Cretaceous). The Chatsworth Formation consists of a sandstone unit (Kcs) and very minor exposures of a shale unit (Kcsh). The shale is gray micaceous shale with siltstone and minor sandstone interbeds. Kcs is widespread in the upper roughly two-thirds of the Phase II.b area and consists of light gray to light brown medium grained sandstone that is hard, thick bedded, and contains minor layers of siltstone. The Chatsworth Formation underlies the trail segments in the upper two-thirds of the Phase II.b area north of Dayton Canyon (see Figure 5.1.6-1; Table 5.1.6-1). Nine of the 10 proposed Phase II.b access areas, trailhead and staging areas, and equestrian parks are located within Chatsworth Formation.

USDA Soil Classifications

There are nearly 60 U.S. Department of Agriculture (USDA) soil classification types within the SSMTMP-PII area.[61] Considering only those soils comprising more than 1 percent of the SSMTMP-PII area (representing over 90 percent of the area) reduces the number of soils (Table 5.1.6-2, *Approximate Trail Lengths/Miles within Soil Unit Class*).

The USDA website can provide general ratings (limitations and no limitations) for trail suitability are based on the properties of each soil type that affect trafficability and erodibility. The properties are "stoniness," depth to a water table, ponding, flooding, slope, and the texture of the surface layer. An erosion factor K is provided to indicate the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. The estimates are modified by the presence of rock fragments. In general, the SSMTMP-PII area soils indicate substantial trail related limitations due to slope and the soil texture.

[61] U.S. Department of Agriculture. Accessed 28 July 2017. Online Web Soil Surveys. Available at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/survey/

TABLE 5.1.6-2
APPROXIMATE TRAIL LENGTHS/MILES WITHIN SOIL UNIT CLASSES

Soil Class Description	Estimated Trail Length/Miles in Each Soil Class		Total Trail Length in Miles in Each Soil Class
	Phase II.a	Phase II.b	
Anacapa sandy loam, 2 to 9 percent slopes total		0.19	0.19
Badland total		0.71	0.71
Balcom silty clay loam, 15 to 30 percent slopes, MLRA 20 total		0.17	0.17
Castaic and Saugus soils, 30 to 65 percent slopes, severely eroded total	3.62		3.62
Castaic-Balcom silty clay loams, 30 to 50 percent slopes total	1.78		1.78
Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded total	6.44		6.44
Chualar-Urban land complex, 2 to 9 percent slopes total		2.06	2.06
Gaviota rocky sandy loam, 30 to 50 percent slopes, eroded total	15.44		15.44
Gaviota sandy loam, 30 to 50 percent slopes, warm MAAT, MLRA 20 total		2.87	2.87
Gaviota sandy loam, 9 to 30 percent slopes, MLRA 20 total		0.49	0.49
Gazos clay loam, 30 to 50 percent slopes total	3.34		3.34
Gazos silty clay loam, 15 to 30 percent slopes total	0.18	0.16	0.34
Hanford sandy loam, 0 to 2 percent slopes total	0.01		0.01
Hanford sandy loam, 2 to 9 percent slopes total	0.63		0.63
Metz loam, 2 to 5 percent slopes total	0.06		0.06
Millsholm rocky loam, 30 to 50 percent slopes, eroded total	7.89		7.89
Mocho loam, 0 to 2 percent slopes total	0.16		0.16
Ojai-Zamora loams, 15 to 30 percent slopes total	0.33		0.33
Riverwash total	0.06		0.06
Rock outcrop-Gaviota complex, 30 to 75 percent slopes, warm MAAT, MLRA 20 total		11.95	11.95
Saugus loam, 15 to 30 percent slopes total		0.49	0.49
Saugus loam, 30 to 50 percent slopes total	3.23		3.23
Saugus loam, 30 to 50 percent slopes, eroded total	1.51		1.51
Sedimentary rock land total		0.60	0.60
Sorrento loam, 2 to 5 percent slopes total	0.44		0.44
Xerorthents, 0 to 30 percent slopes total		0.22	0.22
Yolo loam, 2 to 9 percent slopes total	2.98		2.98
Yolo loam, fan piedmont, 0 to 9 percent slopes, MLRA 20 total	1.416		1.416
(Blank) total	0.47	0.28	0.75
Grand Total	**49.99**	**20.19**	**70.18**

NOTE: Numbers are rounded down to two decimal places.

Oil Fields

Portions of the SSMTMP-PII area overlie State-designated oil fields. These are from north to south the Castaic Junction, Newhall-Potrero, Lyons Canyon, and Newhall Oil Fields (Figure 5.1.6-2, *Oil Wells Map*). This portion of the Santa Susana Mountains/Santa Clara River Valley has a long history of oil and gas exploration and some subsequent development. The first wells in the area were drilled in the early 1900s. Most attempts to find commercial crude oil reserves were unsuccessful and wells that were not economical were plugged and abandoned. Unsuccessful exploratory holes were abandoned as "dry holes." It is possible that not all wells and dry holes within the SSMTMP-PII area were documented during the early development history, and also that some were not properly abandoned. Also, wells are not confined to within the designated oil field boundaries.

Figure 5.1.6-2 shows the approximate outline of the designated administrative oil field boundaries and the classifications of wells associated with each oil field. Within the designated Castaic Junction Oil Field boundaries (Phase II.a area), all wells are designated as plugged (not active). The Newhall-Potrero Oil Field (Phase II.a and Phase II areas) have mostly plugged wells, but two are inactive and four are active. Lyons Canyon has only plugged wells. Newhall is the largest field with five separately designated oil fields, no active wells, and with over a hundred plugged and buried wells depicted by the State Division of Oil, Gas, and Geothermal Resources.[62]

Each of these oil fields is associated with structural features (e.g., anticlines or elongated domes) that trap petroleum and related compounds (crude oil and natural gas). Although some minor surface subsidence and ground settlement may have occurred related to oil extraction, its distribution across a broad area is likely to have limited its potential effects and no substantial effects are known to have occurred. Similarly, the potential for future surface subsidence effects from oil extraction is considered very low.

Wells are classified as active, buried, inactive, new, plugged, and unknown. Most of the wells are plugged, and the second most common are inactive. There are a few unknown, buried, and new wells. Abandoned wells and dry holes (inactive and plugged) can represent potential hazards for areas with nearby buildings and occupants. Prior to regulations, many early wells and dry holes were plugged with telephone poles, railroad ties, or other debris before being buried. These holes represent potential vertical migration pathways for crude oil, methane, H_2S, and other compounds. In undeveloped areas, these holes may be an attractive nuisance that could pose a risk from these contaminants for nearby areas. DOGGR regulates drilling and abandonment of wells and dry holes. DOGGR regulations evolved over time to address problems and hazards identified in older wells. As a result, there are fewer problems associated with recently plugged wells and dry holes. Nevertheless, even when a well is plugged in accordance with DOGGR regulations, leaks can occur later.

[62] California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR). 2001. Oil Field Maps W1-1, W1-2, 253, and 254.

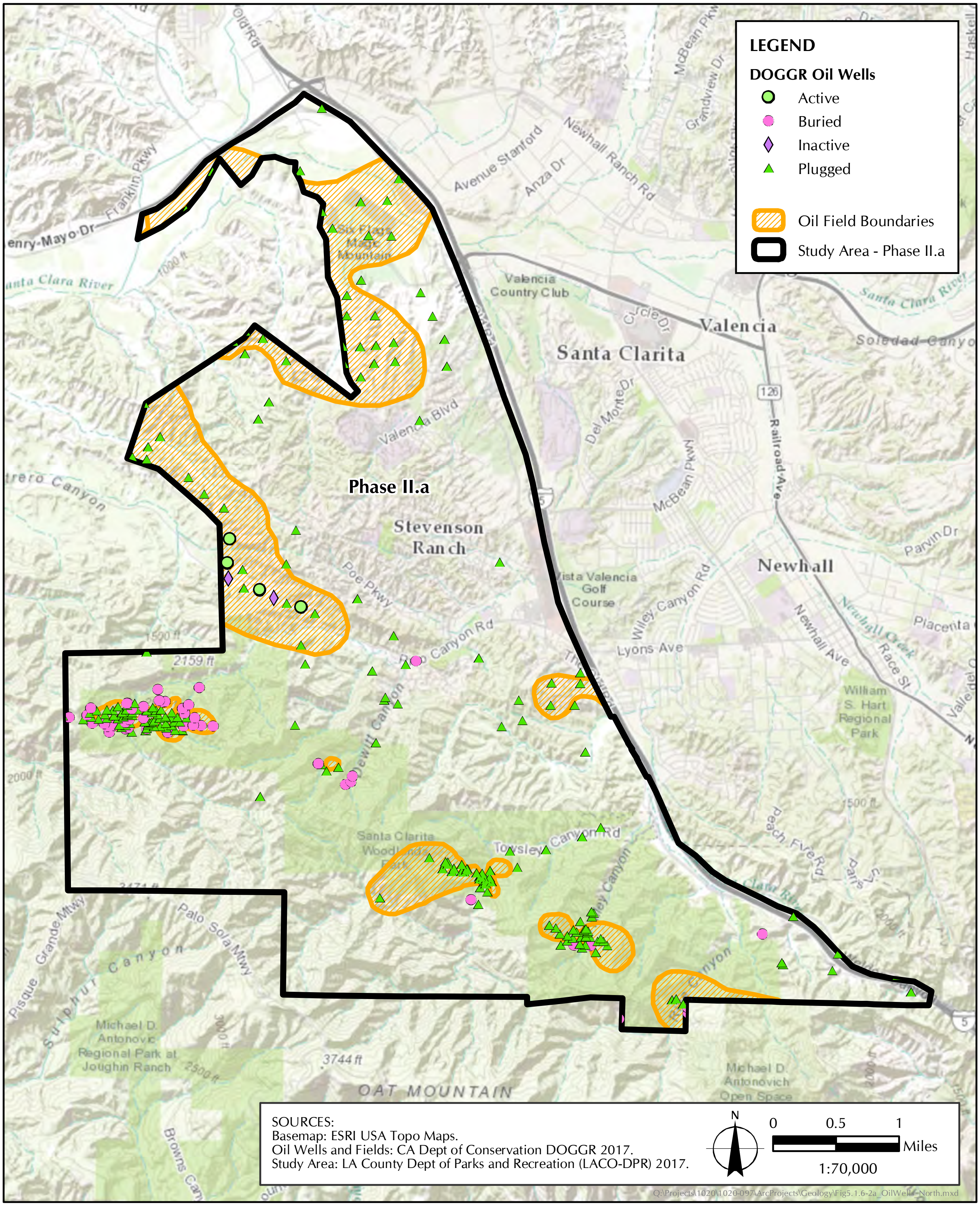

FIGURE 5.1.6-2a

Oil Wells Map North

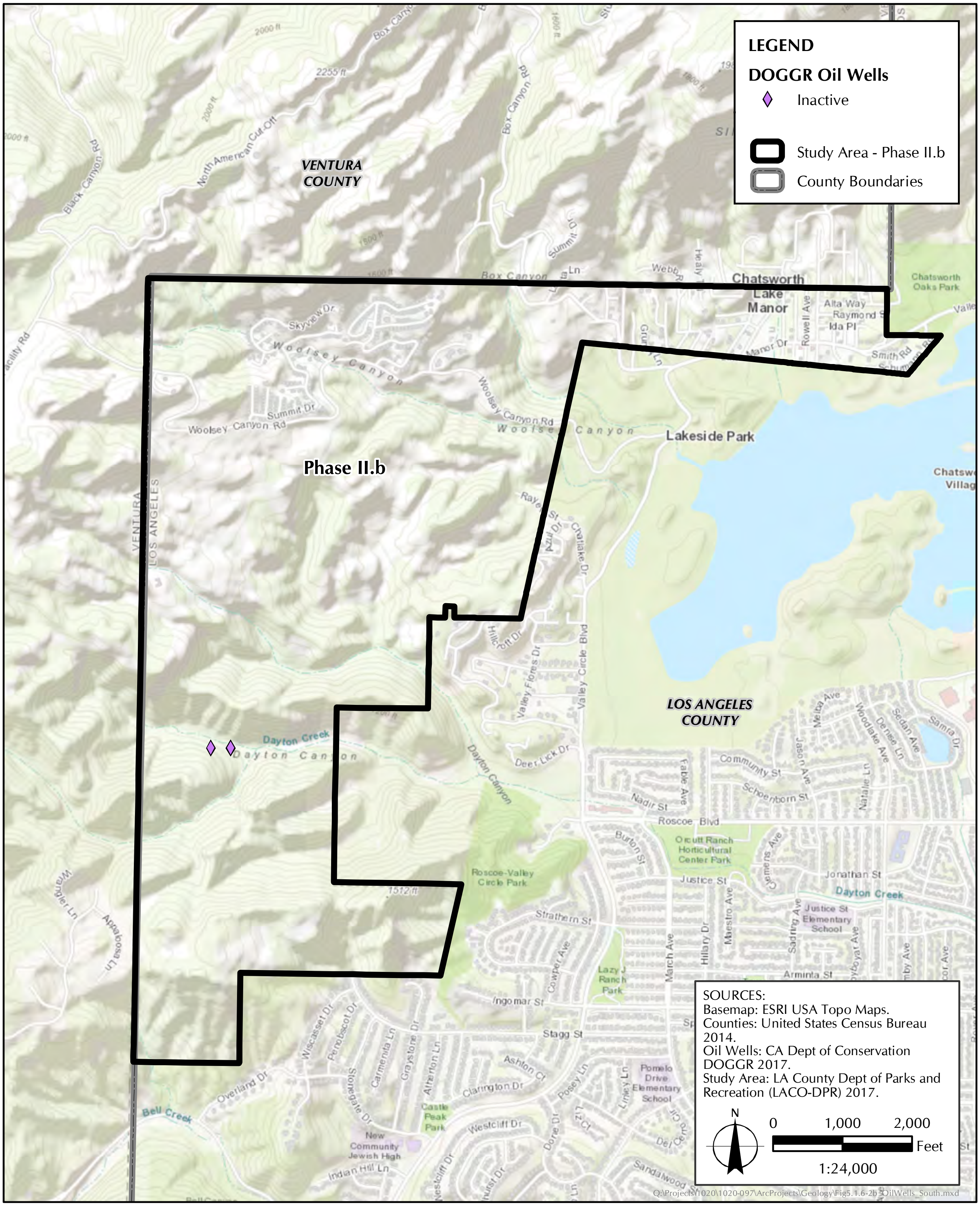

FIGURE 5.1.6-2b

Oil Wells Map South

Other forms of surface subsidence/settlement may occur in the SSMTMP-PII area if it is found to have soil susceptible to expansion/contraction (very clay-rich soils) and possibly hydroconsolidation (fine-grained granular soils). When present, moderate to high expansion indices indicate that there is a substantial amount of clay in the soils and repeated episodes of wetting and drying would cause distress to structures in contact with such soils. Consolidation (and long-term settlement) is most prominent in clay-rich and silt-rich soils, resulting from loading pressure created by overlying structures, including buildings or artificial fill. This added weight could collapse internal void spaces within the soils, causing overlying structures to settle, and possible damage. This consolidation and settlement can be much more dramatic under severe seismic shaking (dynamic settlement). Hydroconsolidation would also lead to settlement, but includes the addition of water into the soil structure causing more rapid and more substantial settlements.

5.1.7 Expansive Soil

Surface Subsidence and Settlement

Other surface subsidence/settlement may occur in the SSMTMP-PII area if it is found to have soil susceptible to expansion/contraction (very clay-rich soils) and possibly hydroconsolidation (fine-grained granular soils). When present, moderate to high expansion indices indicate that there is a substantial amount of clay in the soils and repeated episodes of wetting and drying would cause distress to structures in contact with such soils. Consolidation (and long-term settlement) is most prominent in clay-rich and silt-rich soils, resulting from loading pressure created by overlying structures, including buildings or artificial fill. This added weight could collapse internal void spaces within the soils, causing overlying structures to settle, and possible damage. This consolidation and settlement can be much more dramatic under severe seismic shaking (dynamic settlement). Hydroconsolidation would also lead to settlement, but includes the addition of water into the soil structure causing more rapid and more substantial settlements. Based on the generally clayey nature of the surface soils, it is concluded that expansion indices should be moderate to high. Non-engineered artificial fill and younger alluvial deposits are likely poorly consolidated and could be subject to hydroconsolidation.

5.1.8 Capability of Soils to Support Wastewater Treatment Systems

Groundwater

The vast majority of the SSMTMP-PII area is underlain by bedrock formations that store and transmit groundwater in permeable sedimentary beds such as sandstone, conglomerate, and siltstone, and through fractures caused by faulting, uplift, and folding of these older units. The bedrock "aquifers" usually produce springs and seeps in the hillsides and higher canyon areas or discharge into the larger canyon alluviual materials. In the larger drainages alluvial sand, gravel, and silt store and transmit water laterally down gradient toward the Santa Clara River and the San Fernando Valley. In the broader valley areas a complex system of alternating aquifers (highly permeable sand and gravel beds) and aquicludes (relatively low permeability sediments with a high proportion of clay and silt) characterizes the geology underlying the Santa Clara River and San Fernando Valleys. In some parts of the San Fernando Valley groundwater basin, aquicludes are discontinuous and "leaky," allowing groundwater to move upward or downward through/around them, depending on local conditions. Due to this leakage, precipitation, and surface water infiltration, localized perched water zones may accumulate above the regional groundwater level.

Historically highest (not necessarily present) groundwater depths are summarized by the CDMG[63,64,65,66,67] in studies to evaluate the liquefaction potential in the SSMTMP-PII area; these data do not continue into the bedrock or narrower canyon alluvial areas. Water levels in the SSMTMP-PII area vary generally between zero and 25 feet, but predominantly are around 10 feet deep. The Phase II.b alluvial areas appear to have had groundwater depth of <10 feet. In the Phase II.a area groundwater at the far north varies from zero at the Santa Clara River to ~10 feet in the adjacent flood plains and lower canyons, while at the mouth of Pico Canyon depths have been 55 to 75 feet deep. Phase II has some wells in Gavin Canyon with no groundwater contours, but groundwater is expected to be less than 50 feet deep due to liquefaction potential. These data do not preclude the possibility that some localized shallow "perched" groundwater could be encountered in areas immediately adjacent to the Holser fault. It is most likely that "perched" water zones would be associated with springs or seeps, and occurrences of water in these areas would be seasonal. Such occurrences would not likely be significant on ridgelines.

It is understood that trail-related facilities would include restrooms that would rely on natural soil seepage and infiltration potential. The alluvial/existing drainage areas would nearly all have groundwater in the 10- to 20-foot depth range suggesting that local contamination of seepage could reach the groundwater surface. Bedrock and older alluvial deposits are elevated above the existing drainages with groundwater correspondingly deeper or not present at all due to the low material permeabilities. Restroom facilities should be planned in locations away from the existing drainages and at elevations several tens of feet above these drainage elevations.

5.1.9 Conflicts with Hillside Management Area Ordinance or Hillside Design Standards

Topography, Slopes, and Major Drainage Courses

The SSMTMP-PII area is covered by five U.S. Geological Survey 15-minute quadrangle maps; these are the Calabasas,[68] Oat Mountain,[69] Simi Valley East,[70] Val Verde,[71] and Newhall[72] maps. Surface

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[63] California Division of Mines and Geology. [1997] Revised 2001. Seismic Hazard Evaluation of the 7.5-minute series Calabasas topographic quadrangle, Los Angeles County, California, California Department of Conservation, Division of Mines and Geology Open-File Report 006.

[64] California Division of Mines and Geology. 1997. Seismic Hazard Evaluation of the 7.5-minute series Newhall topographic quadrangle, Los Angeles County, California, California Department of Conservation, Division of Mines and Geology Open-File Report 97-11.

[65] California Division of Mines and Geology. [1997] Revised 2001. Seismic Hazard Zone Report for the 7.5-minute series Oat Mountain quadrangle, Los Angeles County, California, California Department of Conservation, Division of Mines and Geology Seismic Hazard Zone Report 005.

[66] California Division of Mines and Geology. [1997] Revised 2001. Seismic Hazard Zone Report for the 7.5-minute series Simi Valley West and Simi Valley East topographic quadrangles, Ventura and Los Angeles Counties, California, California Department of Conservation, Division of Mines and Geology Seismic Hazard Zone Report 002.

[67] California Division of Mines and Geology. 2002. Seismic Hazard Zone Report for the 7.5-minute series Val Verde quadrangle, Los Angeles and Ventura Counties, California, California Department of Conservation, Division of Mines and Geology Seismic Hazard Zone Report 076.

[68] U.S. Geological Survey. 1967. 7.5-minute series Calabasas topographic quadrangle, Los Angeles County, California.

[69] U.S. Geological Survey. 1969. 7.5-minute series Oat Mountain topographic quadrangle, Los Angeles County,

elevations in the overall Phase II areas range from approximately 3,430 feet above MSL at the southwest portion of Phase II.a to approximately 896 feet above MSL along the north edge of Chatsworth Reservoir in Phase II.b, and 920 feet above MSL at the far north adjacent to the Santa Clara River. The main drainages receiving runoff from the SSMTMP-PII area include the Santa Clara River, which receives drainage from Phase II.a, Gavin Canyon along the east edge of Phase II, and Chatsworth Reservoir at the east edge of Phase II.b. These drainages are shown on Figure 5.1.6-1 in the SSMTMP-PII area. The high and low elevations within each area are as follows (Table 5.1.9-1, *Approximate High and Low Elevations within Phase II.a and II.b Areas*):

TABLE 5.1.9-1
APPROXIMATE HIGH AND LOW ELEVATIONS

Phase II Sub-Area	Approximate Elevation (above mean sea level)	
	High	Low
Phase II.a	3,431 feet	946 feet
Phase II.b	1,877 feet	896 feet
SSMTMP-PII area	**3,431 feet**	**896 feet**

Each of the major and secondary canyons has corresponding ridgelines separating the adjacent canyons. Many of these ridgelines have been classified as significant primary or secondary ridgeline within the Hillside Management Area defined by the County of Los Angeles.[73] Ground surface slopes in the SSMTMP-PII are relatively steep, with most greater than 20 percent in the upper elevation hills and mountains and approximately 1 percent reaching greater than 40 percent adjacent to ridges. Slopes in the lowest foothills immediately adjacent to the mountains, in canyons, valley and active drainages designated above are generally less than 20 percent and predominantly less than 6 percent. Sensitive hillside design measures (2.1 through 2.12) would be applied to the trail and facilities (e.g., restrooms) designs to minimize the impact on the ridgelines.

Within the SSMTMP-PII area, most drainage areas form relatively narrow canyons at higher elevations and transition to the broader floodplains. With regard to drainage area size[74,75] the larger drainages in the SSMTMP-PII area are: for Phase II.a, the Santa Clara River and unnamed north-flowing drainages; for Phase II Potrero, Pico, Towsley, Lyon, Rice and Gavin; and for Phase II.b Box, Woolsey, Dayton, and Bell (see Figure 2.2-2 and Figure 5.1.6-1).

California.

[70] U.S. Geological Survey. 1969. 7.5-minute series Simi Valley East topographic quadrangle, Los Angeles County, California.

[71] U.S. Geological Survey. 1995. 7.5-minute series Val Verde topographic quadrangle, Los Angeles County, California.

[72] U.S. Geological Survey. 1995. 7.5-minute series Newhall topographic quadrangle, Los Angeles County, California.

[73] County of Los Angeles. 2015. Los Angeles County General Plan 2035. Hillside Management. Available at: http://planning.lacounty.gov/assets/upl/project/gp_2035_2015-FIG_9-8_hillside_management_areas.pdf

[74] U.S. Geological Survey 1995. 7.5-minute series Val Verde topographic quadrangle, Los Angeles County, California.

[75] U.S. Geological Survey. 1995. 7.5-minute series Newhall topographic quadrangle, Los Angeles County, California.

5.2 IMPACT ANALYSIS

The following issue areas (Sections 5.1.1–5.1.9) are consistent with the County DPR Environmental Checklist Form and Appendix G of the State CEQA Guidelines for geology and soils. In accordance with the *California Building Industry Association v. Bay Area Air Quality Management District* decision discussed above (Section 3.2), a project would have a significant impact related to geology and soils if it would result in any of the following impacts for future users or residents on the project site:

a) Exacerbate existing hazardous conditions by bringing people or structures into areas that are susceptible to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    i. 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 based on other substantial evidence of a known fault? Refer to Division of Mines and Geology (now the California Geological Survey) Special Publication 42.
    ii. Strong seismic ground shaking
    iii. Seismic-related ground failure, including liquefaction
    iv. Landslides
b) Result in substantial soil erosion or the loss of topsoil
c) 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 on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse caused in whole or in part by the project's exacerbation of the existing environmental conditions.
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property caused in whole or in part by the project exacerbating the expansive soil conditions.
e) Have 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.

In addition, the County Trails Manual sets forth a process for analyzing the feasibility of each trail segment and this process should be followed. It indicates:

> This analysis sets forth a process for assessing the feasibility of accommodating multi-use trails on a case-by-case basis. Further, for this analysis, a geological ranking system should be developed to evaluate the geological conditions of each trail segment. The ranking system should utilize collected geologic information, including geologic formations, streams and drainage crossings, earthquake-induced landslide areas, and the surface gradients (slope).

5.2.1 Fault Rupture

The proposed project would result in less than significant impacts in regard to exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault. Therefore, no mitigation measures would be required. Although the SSMTMP-PII area is not located within a designated Alquist-Priolo zone, the Holser fault segment of the San Cayetano/Holser/Del Valle fault is of concern to the SSMTMP-PII area with regard to ground rupture. Active and potentially active faults may be sources of large earthquakes that would produce severe ground shaking within the SSMTMP-PII area. Severe shaking from a large earthquake on the Holser fault centered near the Phase II.a area could cause ground rupture that would be very destructive to narrow ridgelines and steep slopes, causing severe cracking and slope failures. Therefore, the potential for such an event is very low, and the proposed project would not exacerbate existing fault hazard conditions. Any facilities that may be habitable for extended periods should not be built over or within 50 feet of any known or suspected active fault traces and should be built in accordance with the then applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.2.2 Strong Seismic Ground Shaking

The proposed project would result in less than significant impacts in regard to exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking. Therefore, no mitigation measures would be required. The San Andreas, San Gabriel and San Cayetano/Holser/Del Valle faults are fault zones of most concern to the SSMTMP-PII area with regard to strong seismic ground shaking as a result of the potential for M6 to 8+ events. Active and potentially active faults may be sources of large earthquakes that would produce severe ground shaking within the SSMTMP-PII area. Local active strike-slip, reverse and thrust faults (e.g. San Fernando, Oak Ridge, San Cayetano/Holser/Del Valle, San Gabriel, and San Andreas faults) and more distant buried (blind) thrust faults (e.g., Northridge Hills, Puente Hills, and Elysian Park) have this potential as well. Severe shaking can be very destructive to narrow ridgelines and steep slopes, causing severe cracking and slope failures. Therefore, the potential for strong seismic ground shaking does exist. However, the proposed project would not exacerbate these existing seismic-related hazard conditions, assuming any project-related grading and/or construction is conducted in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.2.3 Seismic-Related Ground Failure, Including Liquefaction and Lateral Spreading

The proposed project would result in less than significant impacts in regard to exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure. Therefore, no mitigation measures would be required. The expected level of ground shaking in the SSMTMP-PII area is high enough to initiate liquefaction in non-bedrock areas with groundwater less than 40 feet deep in cohesionless sands as a result of expected high seismic shaking levels. Therefore, the potential for seismic-related ground failure, including liquefaction and lateral spreading, does exist. However, the proposed project would not exacerbate these existing seismic-related hazard conditions, assuming any project-related grading and/or construction is conducted in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.2.4 Landslides

The proposed project would result in less than significant impacts in regard to exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides. Therefore, no mitigation measures would be required. An estimated 80 to 90 percent of the mountains and hills of the SSMTMP-PII area are potential earthquake-induced landslide areas. These areas correspond to bedrock and to a lesser extent older alluvium with steep slopes. Landslide movement may occur along bedding planes within these formations, as rocks dislodged from exposures on steep slopes, or as surficial failures of weathered rock and soil/colluvium. Such movement could cause rock masses to dislocate and damage overlying facilities, and facilities nearby and downslope from these bedrock and older alluvium areas. Therefore, the potential for landslide movement within the SSMTMP-PII area does exist. However, the proposed project would not exacerbate these existing landslide features or potentially unstable bedding plane hazard conditions, assuming any project-related grading and/or construction is conducted in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.2.5 Substantial Soil Erosion or the Loss of Topsoil

The proposed project would result in less than significant impacts in regard to substantial soil erosion or the loss of topsoil. Therefore, no mitigation measures would be required. The SSMTMP-PII area has numerous primary and secondary drainages. Within the SSMTMP-PII area, most drainage areas form relatively narrow canyons at higher elevations and transition to the broader floodplains. In the Phase II.b area this is true where Box Canyon enters Chatsworth Reservoir. For Phase II.a, the liquefaction area is extensive on the north within the Santa Clara River floodplain and the broad unnamed canyons north to the river and east toward the valley occupied by I-5. Phase II liquefaction areas are concentrated in the prominent canyons, for example, Potrero, Pico, Wickham, Dewitt, Lyon, Gavin, Towsley, and a few smaller unnamed canyons. All eventually empty into north draining canyons, such as Gavin Canyon, and then to the Santa Clara River. Therefore, the potential for soil erosion and loss of topsoil within the SSMTMP-PII area does exist. However, the proposed project would not exacerbate these existing soil conditions, assuming any project related grading and/or construction is conducted in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.2.6 Unstable Geologic or Soil Unit

The proposed project would result in less than significant impacts in regard to being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project. Landslide and liquefaction potential are the most significant potential hazards. Therefore, no mitigation measures would be required. Oil field activity in the SSMTMP-PII area could lead to local subsidence that could manifest as cracks and areas of ground settlement. However, due to the likely limited extent of trails in these areas, to the years over which pumping has already occurred and to the relatively low level of oil extraction, this would have a minimal impact. Affected areas can be repaired to level ground and eliminate ground cracks that may form. As a result, the proposed project may result in trails or facilities that may 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 on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse, possibly requiring specific project design features. Therefore, the potential for unstable geologic units and soils within the SSMTMP-PII area does exist. However, the proposed project would not exacerbate these existing seismic-related hazard conditions, assuming any project-related grading and/or construction is conducted in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.2.7 Expansive Soil

The proposed project would result in less than significant impacts in regard to being located on expansive soil. Therefore, no mitigation measures would be required. The proposed project may result in the placement of trails or structures in areas of expansive soil. Surface subsidence/settlement may occur in the SSMTMP-PII area where it is found to have soil susceptible to expansion/contraction (very clay-rich soils) and possibly hydroconsolidation (fine-grained granular soils). When present, moderate to high expansion indices indicate that there is a substantial amount of clay in the soils and repeated episodes of wetting and drying would cause distress to structures in contact with such soils. As a result, specific project design features could be required. Therefore, the potential for expansive soils within the SSMTMP-PII area does exist. However, the proposed project would not exacerbate these existing seismic-related hazard conditions, assuming any project-related grading and/or construction is conducted in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.2.8 Onsite Wastewater Treatment Systems

The proposed project would result in less than significant impacts in regard to the capability of soils to adequately support the use of onsite wastewater treatment systems where sewers are not available for the disposal of wastewater. Therefore, no mitigation measures would be required. All proposed restrooms and any other areas where wastewater would be generated are within sanitation districts and thus would be connected to sanitary sewer lines. The proposed project may result in having soils incapable of adequately supporting the use of onsite wastewater treatment systems where sewers are not available for the disposal of wastewater. The proposed project plans for restroom facilities at trailheads that may require siting within soil types that would not support onsite water treatment systems, thus requiring specific project design features. Therefore, the potential for having soils incapable of adequately supporting the use of onsite wastewater treatment systems within the SSMTMP-PII area does exist. However, the proposed project would not exacerbate these existing seismic-related hazard conditions, assuming any project-related grading and/or construction is conducted in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.2.9 Hillside Management Area Ordinance

The proposed project would result in less than significant impacts in regard to conflicts with the Hillside Management Area Ordinance or hillside design standards in the County General Plan. Therefore, no mitigation measures would be required. The Los Angeles County Hillside Management Ordinance applies to areas greater than 25 percent slope. Of the total of approximately 14,808-acre study area, approximately 11 acres, or <1 percent of the total study area, consists of slopes greater than 25 percent. Portions of proposed recreational trails may cross through the areas with a greater than 25 percent slope. Trails that cross through these areas would be subject to the requirements and design standards of the Hillside Management Ordinance and hillside design standards in the Conservation and Open Space element of the General Plan. Specifically, sensitive hillside design measures (2.1 through 2.12) would be applied to the trail and facilities (e.g., restrooms). Further, the Hillside Management Ordinance requires that all new development in areas over 25 percent obtain a conditional use permit as part of the entitlement process. Therefore, the proposed project would not result in. Therefore, the potential for conflict with the Hillside Management Area Ordinance or the hillside design standards in the Conservation and Open Space Element of the County's General Plan within the SSMTMP-PII area does exist. However, the proposed project would not be in violation, assuming any project-related grading and/or construction is conducted in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual.

5.3 PROJECT DESIGN FEATURES

The project would not require mitigation measures if all project design features are implemented for all project elements associated with ground disturbing activities and with trail construction and/or improvements based on necessary geotechnical and geologic studies in accordance with the applicable Los Angeles County and State of California Building Codes, and the guidelines set forth in the County Trails Manual. The County Trails Manual, in particular Chapter 4.0, *Trail Design*, describes project design features that, with proper implementation, would serve to avoid, minimize, or substantially reduce impacts due to geology and soils.

5.3.1 Faulting and Earthquakes, Seismic Ground Shaking, Liquefaction/Seismic-Related Ground Failure, and Landslides

Although the SSMTMP area is not located within a designated Alquist-Priolo zone, the Holser fault segment of the San Cayetano/Holser/Del Valle fault could experience ground rupture and related ground disturbance. It is possible that fault movement of a few inches to several feet could occur with potential M6.0 to 7.0 events. Project design should not allow any facilities that may be habitable for extended periods to be built over or within 50 feet of the active or potentially fault traces in the Phase II.a area adjacent to the Holser fault and the Phase II.b area adjacent to the Chatsworth fault. Project maintenance should consider fault displacement and severe cracking in these areas as post-earthquake maintenance issues.

Active and potentially active faults (red, orange, and green) may be sources of large earthquakes (M6.0 to 7.0) that would produce severe ground shaking within the SSMTMP-PII area. Local active strike-slip, reverse and thrust faults (e.g. San Fernando, Oak Ridge, San Cayetano/Holser/Del Valle, San Gabriel, and San Andreas faults) and more distant buried (blind) thrust faults (e.g., Northridge Hills, Puente Hills, and Elysian Park) have this potential. Severe shaking can be very destructive to narrow ridgelines and steep slopes, causing severe cracking and slope failures. Project maintenance should consider severe ground shaking affects in these areas as post-earthquake maintenance issues.

The expected level of ground shaking in the SSMTMP-PII area is high enough to initiate liquefaction as a result of expected high seismic shaking levels, areas of shallow groundwater, and cohesionless sands. As a result, in liquefaction prone areas (alluvial valley and floodplains), the proposed project may experience seismic-related ground failure, including settlement, liquefaction, and lateral spreading. Any significant structures planned within or immediately adjacent to a potential liquefaction should be evaluated with a geotechnical study to define the potential hazards. Appropriate recommendations would be made possibly including:

- Avoidance of the area
- Special foundations (piles or reinforced mats)

An estimated 80 to 90 percent of the mountains and hills of the SSMTMP-PII area are potential earthquake-induced landslide areas. These areas correspond to bedrock and to a lesser extent older alluvium with steep slopes. Landslide movement may occur along bedding planes within these formations, as rocks dislodged from exposures on steep slopes, or as surficial failures of weathered rock and soil/colluvium. Such movement could cause rock masses to dislocate and damage overlying facilities and facilities nearby and downslope from these bedrock and older alluvium areas. As a result, the proposed project design within areas of potential seismically induced landslides should be evaluated with a geotechnical study to define the potential hazards. Appropriate recommendations would be made possibly including:

- Avoidance of the area
- Up slope and down slope retaining structures
- Rock fences

5.3.2 Substantial Soil Erosion or the Loss of Topsoil

The proposed project could result in soil erosion or the loss of topsoil. The SSMTMP-PII area has numerous primary and secondary drainages as discussed above. Project design should consider the affects of any significant structures or facilities that would block, divert, or accentuate change to an existing drainage and as such cause potential soil erosion or loss of topsoil. A geotechnical study may be performed to define the potential soil erosion risks and provide specific design recommendations to avoid or minimize affects possibly including:

- Engineered swales,
- Culverts, and
- Catchment basins.

5.3.3 Unstable Geologic or Soil Unit

The proposed project could be constructed on or near a geologic unit or soil that is unstable, or that would become unstable as a result of the project. Based on a review of available documents describing the geology of the SSMTMP-PII area, it is underlain by (1) younger Quaternary-age artificial fill/alluvium/surficial sediments (map symbols af, Qa and Qg, (2) landslide deposits (Qls), (3) older alluvium/surficial sediments (Qog), (4) Quaternary-age soft bedrock formations (QTs), (5) Tertiary-age hard to very hard sedimentary bedrock formations, and (6) an older hard to very hard sedimentary bedrock formation.[76,77,78,79,80] Artificial fill may be present in selected areas not yet mapped. With this large variation in geologic units, the relative difficulty of excavation, the suitability for safe trail or roadway surfaces, the stability of construction slopes, and the suitability of excavated materials for use as backfill would also vary. It is believed that all units except artificial fill and young alluvium should meet minimum requirements for the items listed. Potentially unstable areas should be evaluated with a geotechnical study to define the unstable

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[76] Dibblee, T.W. and H.E. Ehrenspeck. 1992. Geologic Map of the Oat Mountain and Canoga Park (north1/2) Quadrangles, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-36, scale 1:24,000.

[77] Dibblee, T.W. 1992. Geologic Map of the Calabasas Quadrangle, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-37, scale 1:24,000.

[78] Dibblee, T.W. and H.E. Ehrenspeck. 1992. Geologic Map of the Simi Quadrangle, Ventura County, California, Dibblee Foundation Map DF-39, scale 1:24,000.

[79] Dibblee, T.W. and H.E. Ehrenspeck. 1993. Geologic Map of the Val Verde Quadrangle, Los Angeles and Ventura Counties, California, Dibblee Foundation Map DF-50, scale 1:24,000.

[80] Dibblee, T.W. and H.E. Ehrenspeck. 1996. Geologic Map of the Newhall Quadrangle, Los Angeles County, California, Dibblee Foundation Map DF-56, scale 1:24,000.

areas and to provide appropriate design recommendations would be made to avoid affects from unstable areas possibly including:

- Avoidance of the area
- Up slope and down slope retaining structures
- Rock fences

Geologic structure includes folding, tilting, and faulting of the geologic units. The geologic structure is very complex with numerous faults, folds, fractures and disturbed bedrock layers with bedding (dip) angles range from very shallow (less than 20 degrees), into and out of slope, to vertical (90 degrees). This indicates that the orientation and height of natural slopes would control in many cases the preferred trail path and gradient, that is, certain orientations and heights may exposed unfavorable bedding, fault features, and fracture planes that may render a slope unstable and, therefore, unsafe. It is expected that most proposed graded slopes would not be extensive in height or width so that this project-induced slope stability concern should be limited. However, a geotechnical study should be performed to define these unfavorable conditions and necessary design and construct stabilization features to overcome these potential instabilities possibly including:

- Avoidance of the area
- Reduced slope angle
- Retaining structure
- Slope reorientation

5.3.4 Expansive Soil

The proposed project trails or structures would be in part constructed in areas of expansive soil. When present, moderate to high expansion indices indicate that there is a substantial amount of clay in the soils and repeated episodes of wetting and drying could cause distress to structures in contact with such soils. A geotechnical study should be performed to define these unfavorable conditions and the necessary facility design and construct measures possibly including:

- Avoidance of the area
- Use non-expansive materials

5.3.5 Groundwater/Wastewater and Landslides/Mudflows

The proposed project could encounter soils incapable of adequately supporting the use of onsite wastewater treatment systems where sewers are not available for the disposal of wastewater. The vast majority of the SSMTMP-PII area is underlain by bedrock formations that store and transmit groundwater in permeable sedimentary beds such as sandstone, conglomerate, and siltstone and through fractures caused by faulting, uplift, and folding of these older units. This flow can produce springs and seeps in the hillsides and higher canyon areas or discharge into the larger canyon alluvial materials. Where sewers are available at such facilities no project design considerations are required for the disposal of wastewater. In other areas design and location of restroom facilities should consider groundwater depth and proximity to potentially shallow groundwater in existing drainages, as well as soils incapable of adequately supporting the use of onsite wastewater treatment systems. A geotechnical study should be performed to define these unsuitable conditions and the necessary wastewater disposal facility design and construction measures possibly including:

- Avoidance of the area
- Septic systems

Mapped landslides are common throughout the SSMTMP-PII area and the steeper slopes are subject to mudflows and earthquake-induced slope failures. Areas where landslides are mapped provide the most concern for suitability and could affect design and construction. The project design for trails, roadways, and facilities should consider avoidance of theses areas as the most prudent option. For potential mudflow areas project design should consider:

- Avoidance of the area
- Up slope and down slope retaining structures
- Upslope structures/fences to capture or deflect the debris

5.3.6 Oil Fields and Wells

Portions of the SSMTMP-PII area overlie state-designated oil fields, specifically the Castaic Junction, Newhall-Potrero, Lyons Canyon, and Newhall Oil Fields, that have plugged (abandoned) wells, active and inactive wells, and buried wells. Prior to regulations, many early wells and dry holes were plugged with telephone poles, railroad ties, or other debris before being buried. These holes represent potential vertical migration pathways for crude oil, methane, H_2S, and other compounds. It is likely, due to the open space nature of the proposed project, that there would be limited opportunity for exposure to the named hazards. In undeveloped areas, these holes may be an attractive nuisance that could pose a risk from these contaminants for nearby areas. However, it would be advisable to avoid these oil field areas and as part of the project design to provide signage warning of the dangers. An appropriate technical study should be performed in oil field well areas to define trail- and facility-specific concerns for consideration in project design measures possibly including:

- Avoidance of the area
- Warning signs
- Fencing around problem areas
- Re-plug/abandon problems wells

5.3.7 Hillside Management Area Ordinance and Hillside Design Standards (Topography, Slopes, Significant Ridgelines, and Major Drainage Courses

The Los Angeles County Hillside Management Ordinance applies to areas greater than 25 percent slope. Of the total of approximately 14,808-acre study area, approximately 11 acres, or less than 1 percent of the total study area consists of slopes greater than 25 percent. Ground surface slopes in the SSMTMP-PII area are relatively steep with most greater than 20 percent in the upper elevation hills and mountains, reaching greater than 40 percent adjacent to ridges. Slopes in the lowest foothills immediately adjacent to the mountains, in canyons, valley and active drainages designated above are generally less than 20 percent and predominantly less than 6 percent. Portions of proposed recreational trails may cross through the areas with a greater than 25 percent slope. As a result, trails that cross through these areas would be subject to the requirements and design standards of the Hillside Management Ordinance and hillside design standards in the Conservation and Open Space element of the General Plan. Specifically, sensitive hillside design measures (2.1 through 2.12) would be applied to the trail and facilities (e.g., restrooms). Further, the Hillside Management Ordinance requires that all new development in areas over 25 percent obtain a conditional use permit as part of the entitlement process. Therefore, compliance with existing regulations would not result in conflict with the Hillside Management Area Ordinance or the hillside design standards in the Conservation and Open Space Element of the County's General Plan.

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APPENDIX A
1:24,000 SCALE USGS TOPOGRAPHIC MAPS

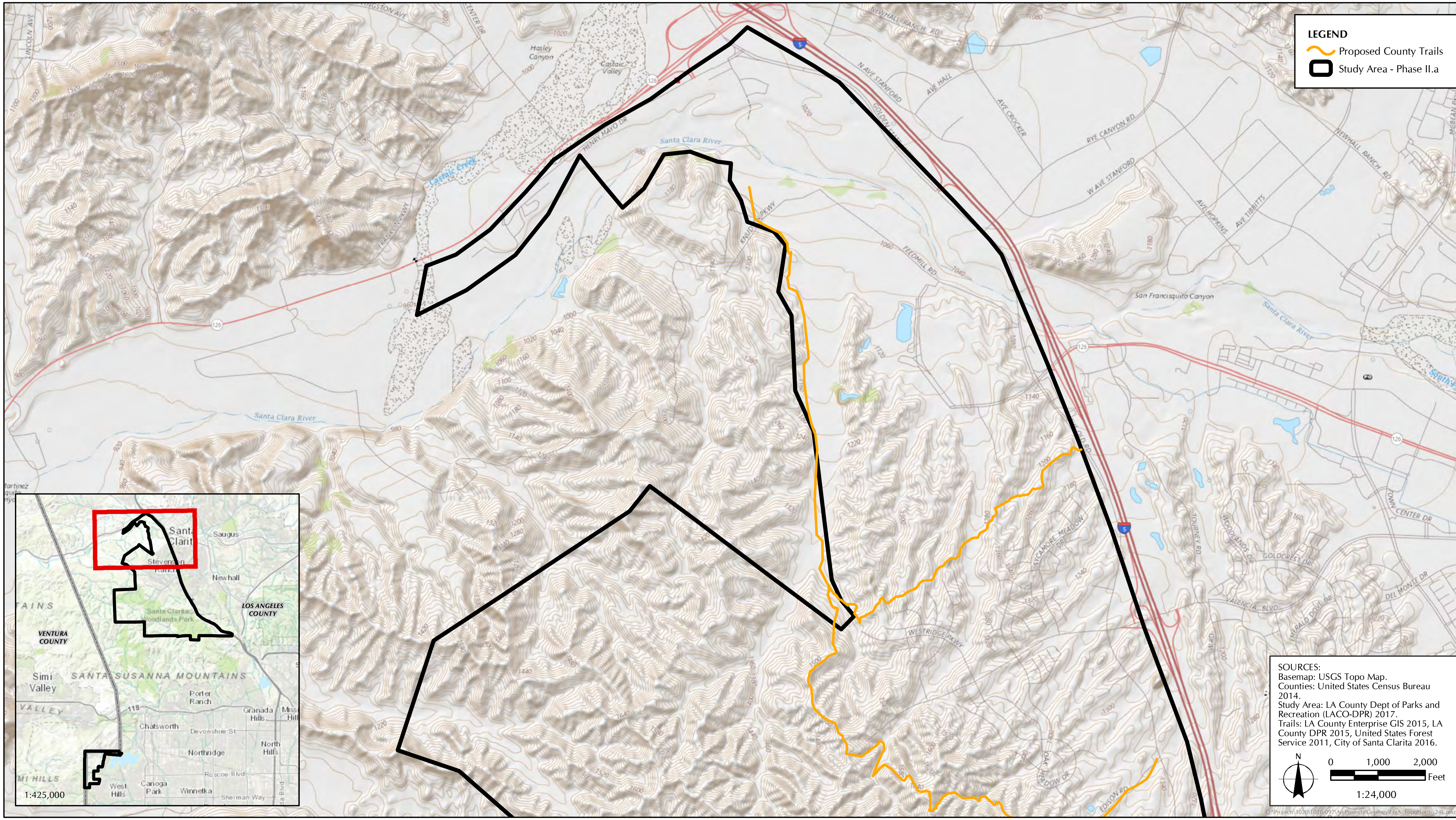

FIGURE A-1

1:24,000 Scale USGS Topographic Map North

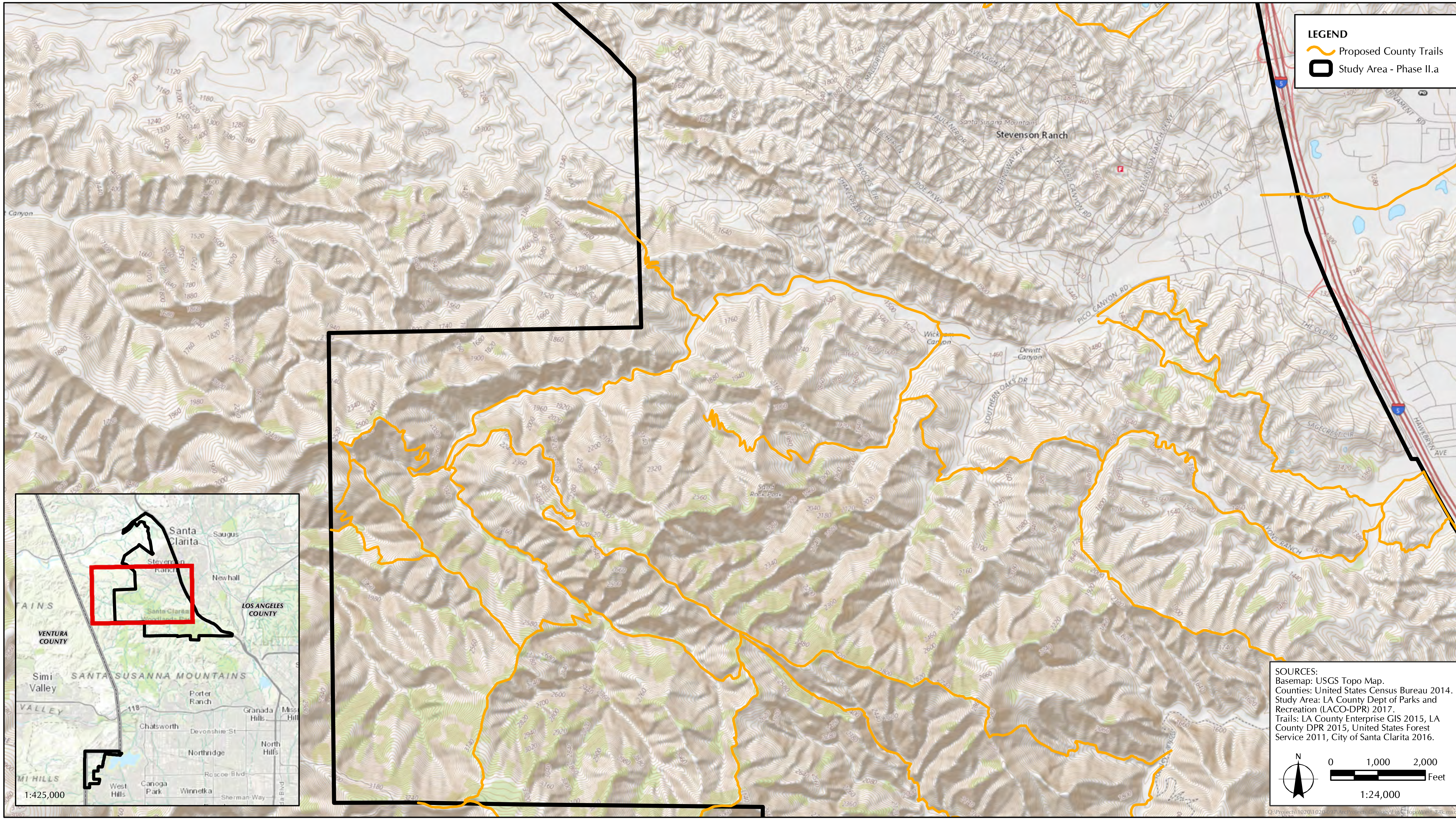

FIGURE A-2

1:24,000 Scale USGS Topographic Map West

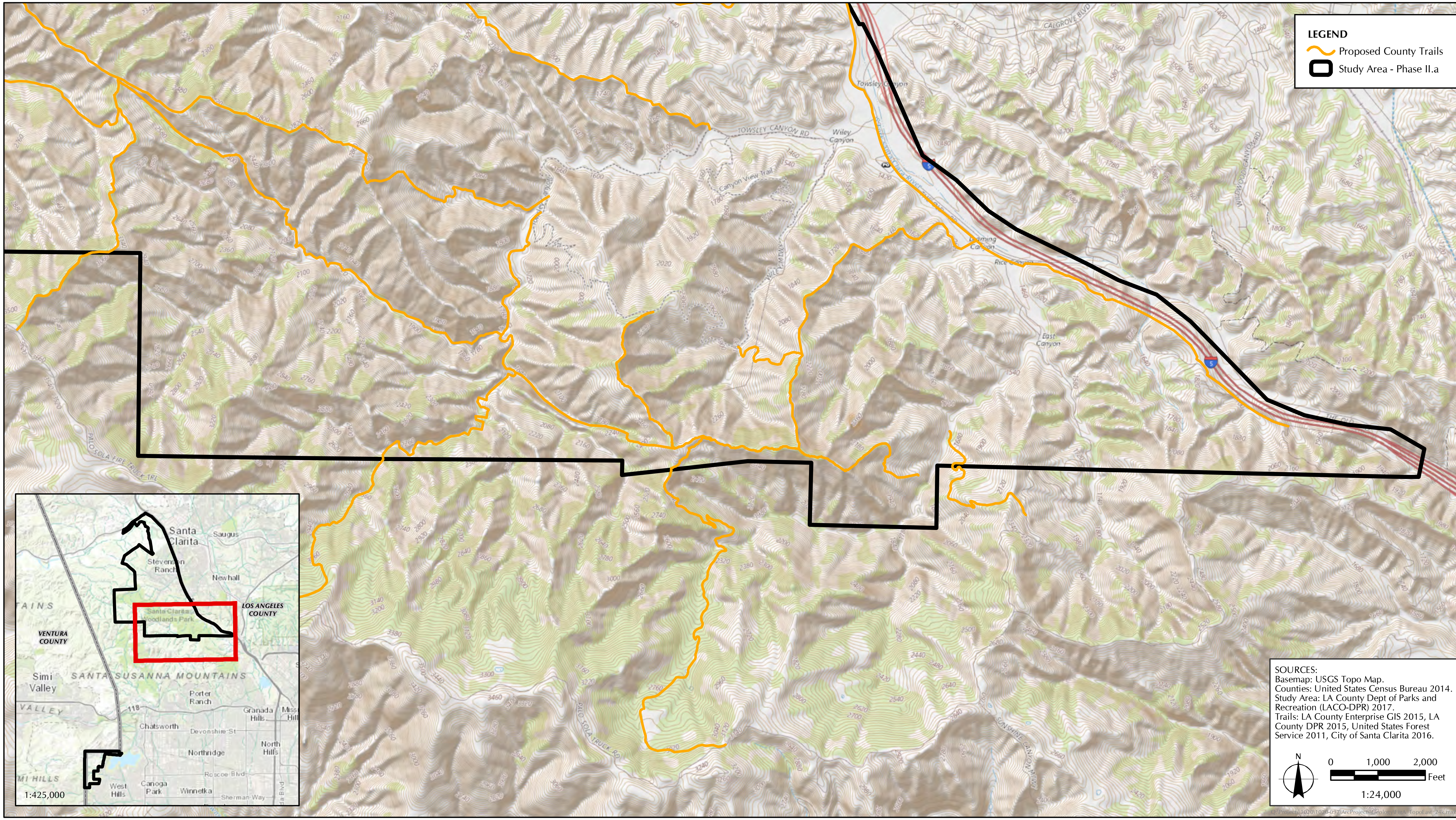

FIGURE A-3

1:24,000 Scale USGS Topographic Map East

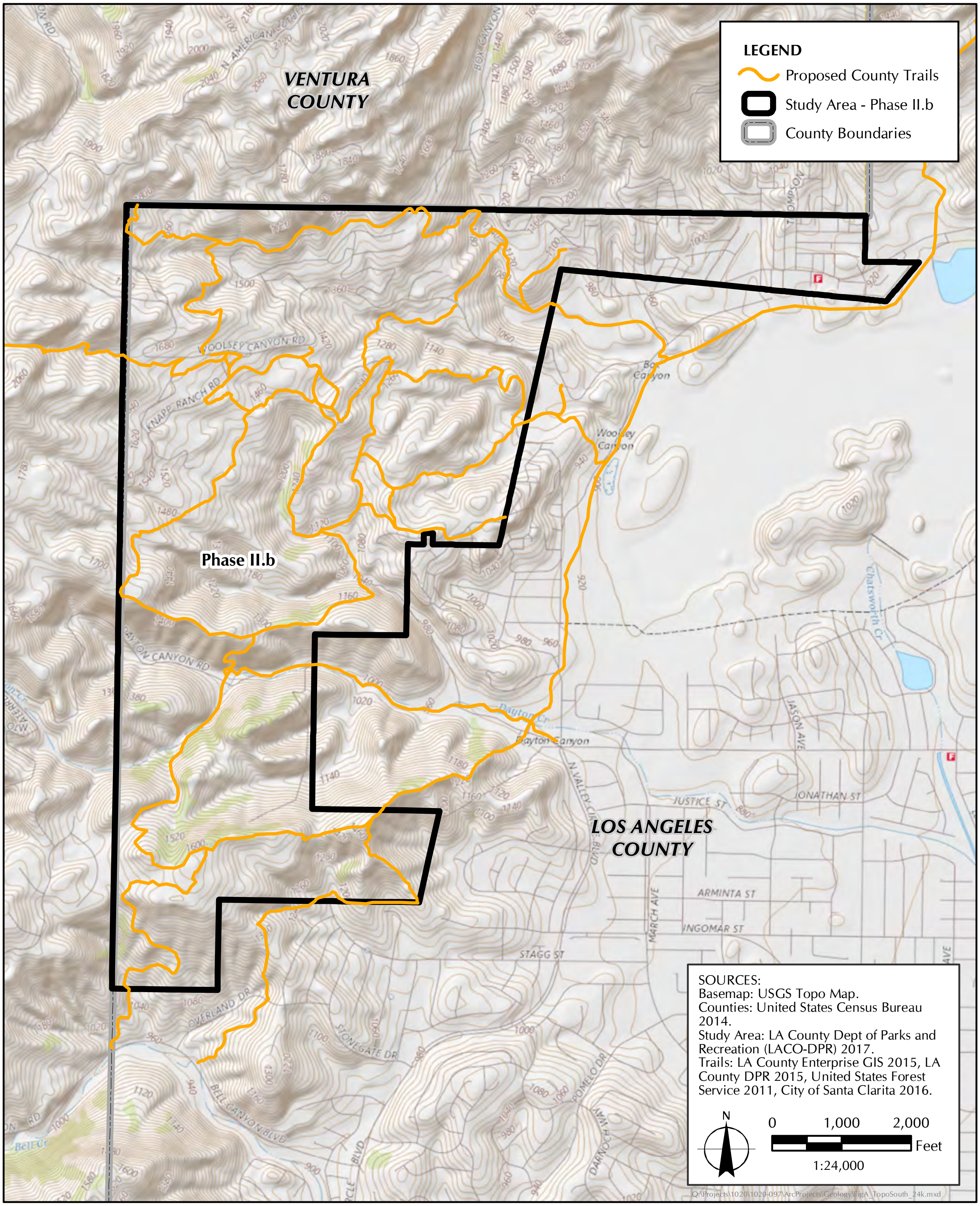

FIGURE A-4

1:24,000 Scale USGS Topographic Map South

The soils information below was extracted from a full report for all soils within the Castaic Multi-Use Trails Area. Only those predominant soils with greater than 4 percent areal coverage (~80% of all soils present) were selected for presentation here.

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group are found in the National Engineering Handbook, Chapter 7 issued May 2007 (http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria are now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters; respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx? content=17757.wba).

Map Unit Symbol and Soil Name (Approximate % of Trails Area)	% of Map Unit	Hydrologic Group	Depth	USDA Texture	Classification		Fragments		Percentage Passing Sieve Number				Liquid Limit	Plasticity Index
					Unified	AASHTO	> 10 Inches	3–10 Inches	4	10	40	200		
CmE—Castaic-Balcom silty clay loams, 15 to 30 percent slopes (4.2%)														
Castaic	50	C	0-9	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			9-26	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			26-30	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
Balcom	40	C	0-10	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-85-95	65-75-85	40-45-50	10-15-20
			10-28	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-85-95	65-75-85	40-45-50	10-15-20
			28-32	Weathered bedrock	—	—	—	—	—	—	—	—	—	—

Map Unit Symbol and Soil Name (Approximate % of Trails Area)	% of Map Unit	Hydrologic Group	Depth	USDA Texture	Classification		Fragments		Percentage Passing Sieve Number				Liquid Limit	Plasticity Index
					Unified	AASHTO	> 10 Inches	3–10 Inches	4	10	40	200		
			In				*Pct*	*Pct*					*Pct*	
CmF—Castaic-Balcom silty clay loams, 30 to 50 percent slopes (11.9%)														
Castaic	50	C	0-11	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			11-28	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			28-32	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
Balcom	40	C	0-10	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-85-95	65-75-85	40-45-50	10-15-20
			10-28	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-85-95	65-75-85	40-45-50	10-15-20
			28-32	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
CmF2—Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded (14.5%)														
Castaic	50	C	0-9	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			9-26	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			26-30	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
Balcom	40	C	0-7	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-85-95	65-75-85	40-45-50	10-15-20
			7-25	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-85-95	65-75-85	40-45-50	10-15-20
			25-29	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
			In				*Pct*	*Pct*					*Pct*	

Map Unit Symbol and Soil Name (Approximate % of Trails Area)	% of Map Unit	Hydrologic Group	Depth	USDA Texture	Classification		Fragments		Percentage Passing Sieve Number				Liquid Limit	Plasticity Index
					Unified	AASHTO	> 10 Inches	3–10 Inches	4	10	40	200		
CmG2—Castaic- Balcom silty clay loams, 50 to 65 percent slopes, eroded (4.7%)														
Castaic	50	C	0-9	Silty clay loam	ML	A-7	0-0-0	0-0-0	95-98-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			9-26	Silty clay loam	ML	A-7	0-0-0	0-0-0	95-98-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			26-30	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
Balcom	40	C	0-7	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-85-95	65-75-85	40-45-50	10-15-20
			7-25	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-85-95	65-75-85	40-45-50	10-15-20
			25-29	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
CnG3—Castaic and Saugus soils, 30 to 65 percent slopes, severely eroded (8.4%)														
Castaic	45	C	0-9	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			9-26	Silty clay loam	ML	A-7	0-0-0	0-0-0	90-95-100	85-90-95	70-83-95	65-75-85	40-45-50	10-15-20
			26-30	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
Saugus	35	B	0-8	Loam	SM	A-2	0-0-0	0-0-0	80-90-100	75-80-85	45-55-65	20-28-35	0-0 -0	NP
			8-40	Loam, sandy loam	SM	A-2	0-0-0	0-0-0	80-90-100	75-80-85	45-55-65	20-28-35	0-0 -0	NP
			40-44	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
			In				*Pct*	*Pct*					*Pct*	
HcC—Hanford sandy loam, 2 to 9 percent slopes (4.9%)														
Hanford	85	A	0-8	Sandy loam	SM	A-2, A-4	0-0-0	0-0-0	85-93-100	75-88-100	50-63-75	25-38-50	20-25-30	NP-3 -5
			8-70	Fine sandy loam, sandy loam	SM	A-2, A-4	0-0-0	0-0-0	85-93-100	75-88-100	50-63-75	25-38-50	20-25-30	NP-3 -5

Map Unit Symbol and Soil Name (Approximate % of Trails Area)	% of Map Unit	Hydrologic Group	Depth	USDA Texture	Classification		Fragments		Percentage Passing Sieve Number				Liquid Limit	Plasticity Index
					Unified	AASHTO	> 10 Inches	3–10 Inches	4	10	40	200		
MhF2—Millsholm rocky loam, 30 to 50 percent slopes, eroded (5.2%)														
Millsholm	85	D	0-16	Loam	CL-ML, ML	A-4	0-0-0	0-0-0	80-90-100	75-88-100	70-83-95	50-63-75	25-30-35	5-8 -10
			16-20	Unweathered bedrock	—	—	—	—	—	—	—	—	—	—
ScF2—Saugus loam, 30 to 50 percent slopes, eroded (24.2%)														
Saugus	85	B	0-15	Loam	SM	A-2, A-4	0-0-0	0-0-0	90-95-100	85-90-95	45-55-65	25-38-50	0-0-0	NP
			15-42	Loam, sandy loam	SM	A-2, A-4	0-0-0	0-0-0	90-95-100	85-90-95	45-55-65	25-38-50	0-0-0	NP
			42-46	Weathered bedrock	—	—	—	—	—	—	—	—	—	—

Appendix F

Hydrology and Water Quality Technical Report

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN – PHASE II

Hydrology and Water Quality Technical Report

Prepared for:

County of Los Angeles
Department of Parks and Recreation
510 S. Vermont Ave.
Los Angeles, CA 90020

Prepared by:

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November 2, 2017

SECTION ES
EXECUTIVE SUMMARY

This Hydrology and Water Quality Technical Report addresses potential impacts to hydrology and water quality that could result from proposed work associated with the Santa Susana Mountains Trails Master Plan (Trails Master Plan), including Phase II (SSMTMP-PII), located within unincorporated Los Angeles County, California. This study is based on the results of the records and archival research and map review conducted by Sapphos Environmental, Inc. Construction, recreational use, and maintenance activities associated with the proposed project would have the potential to result in impacts to hydrology and water quality, but these impacts would be reduced to below the level of significance with the incorporation of mitigation measures. Impacts on hydrology and water quality were evaluated in relation to the thresholds articulated in Appendix G of the California Environmental Quality Act Guidelines (State CEQA Guidelines) and the County of Los Angeles Department of Parks and Recreation's Environmental Checklist Form.

Water Quality Standards and Discharge Requirements

Construction or maintenance of trails that require grading in excess of 1 acre have the potential to violate water quality standards, particularly in relation to total dissolved sediments and be subject to the Construction General Permit. Impacts would be reduced to below the level of significance through preparation and implementation, of a Stormwater Pollution Prevention Plan (SWPPP). In addition, construction or maintenance of trails that require grading in a Significant Ecological Area (SEA) have the potential to violate water quality standards in a manner that would be deleterious for native fish and wildlife. Impacts would be reduced to below the level of significance through compliance with the County's Low Impact Development (LID) ordinance, requiring the use of two Best Management Practices (BMPs). Implementation of BMPs, required pursuant to the County's LID Ordinance, would be expected to reduce impacts to below the level of significance.

Groundwater Recharge Areas

The proposed project would result in no impacts to groundwater recharge or groundwater quality. The depth to groundwater within the Santa Clara River Valley Groundwater Basin has been reported at 10 to 100 feet below the ground surface in the SSMTMP-PII project area. The near surface grading required to accommodate new trails and improvements to existing trails would not impact the groundwater recharge areas.

Natural Drainages in Relation to Erosion and Flood Conveyance

The discharge of dredged or fill materials into wetlands and waters of the United States or the alteration of a natural drainage subject to the jurisdiction of the U.S. Army Corps of Engineers and/or subject to the jurisdiction of the California Department of Fish and Wildlife would have the potential to result in or erosion of compromise the natural flood conveyance functions, constituting a significant impact. Conformance with the mitigation measures required to use a Nationwide Permit, or obtain an individual permit under Section 404 of the Clean Water Act, or a Lake and Streambed Alteration Agreement under Section 1600 of the State Fish and Game Code, would reduce impacts to below the level of significance. Impacts would be further reduced through compliance with the County's LID ordinance.

Increase Habitat for Mosquitoes and Other Vectors that Transmit Diseases

The proposed project would result in no impacts related to increasing habitat for mosquitoes or other vectors that transmit diseases. The proposed project would not add water features or create conditions in which standing water would accumulate or that would increase habitat for mosquitoes and other vectors that transmit diseases such as the West Nile virus and result in increased pesticide use. Additionally, Los Angeles County has a "pack it in...pack it out" policy. This common saying is a simple yet effective way to get hikers to take their trash home with them.

Stormwater Drainage Systems

There would be no anticipated impact to existing stormwater drainage systems. The proposed project would be required to be designed in accordance with the recommendations of the County Trails Manual, including the use of erosion control devices. The proposed project would consist of primarily natural pervious surfaces and would not be expected to increase stormwater runoff.

Generate Construction or Post-Construction Runoff that would Violate Applicable Stormwater NPDES Permits or Otherwise Significantly affect Surface Water or Groundwater Quality

The proposed project would not generate construction or post-construction runoff that would violated existing National Pollutant Discharge Elimination System (NPDES) permits or otherwise significant affect surface water or groundwater quality. The proposed project would be required to be designed in accordance with the recommendations of the County Trails Manual. Impacts would be reduced to below the level of significance through preparation and implementation of a SWPPP and through compliance with the County's LID ordinance.

Conflicts with the Los Angeles County Low Impact Development Ordinance

Procedures from the County's LID Standards Manual would be followed to determine the difference in the proposed project's pre- and post-development runoff volumes and potential pollutant loads. All development would occur in compliance with the County's LID Ordinance.

Water Quality

Construction or maintenance of trails that require grading in excess of 1 acre have the potential to violate water quality standards, particularly in relation to total dissolved sediments and be subject to General Construction Permit. Impacts would be reduced to below the level of significance through preparation, and implementation, of a Stormwater Pollution Prevention Plan (SWPPP). There is one impaired water body within the proposed project study area: the Santa Clara River (in the Phase II.a. area). Recreation is an allowable use pursuant to the Basin Plan; therefore, the proposed project would be consistent with the Basin Plan.

Use Onsite Wastewater Treatment Systems in Areas with Known Geological Limitations

The proposed project would result in no impacts related to the use of onsite wastewater treatment systems in areas of known geological systems. The proposed project would not use onsite wastewater treatment systems.

Place Housing within a 100-Year Flood Hazard Area

The proposed project would have no impacts related to placing housing with a 100-year flood hazard area. The proposed project would not include the construction of new or relocation of existing housing.

Seiche, Tsunami, or Mudflows

The proposed project would not place structures in areas subject to inundation by seiche or tsunami. Although mudflow events likely would be relatively uncommon, the steep topography in the soil- and colluvium-covered bedrock terrain may generate mud- or debris-flows that could enter the project area from the hillside areas. However, the proposed project would be required to be designed in accordance with the recommendations of the County Trails Manual, which would reduce impacts to below the level of significance.

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SECTION 1.0
INTRODUCTION

This Hydrology and Water Quality Technical Report has been prepared to support the County of Los Angeles (County) Department of Parks and Recreation (DPR) in the development of Phase II of the Santa Susana Mountains Trails Master Plan (SSMTMP), located within unincorporated Los Angeles County, California. This report is based on archival research for the entire Trails Master Plan study area. In accordance with CEQA, this report presents the results of these efforts and provides a programmatic impact analysis and mitigation recommendations related to hydrology and water quality within the study area. While this report focuses on Phase II, it incorporates updated information for the Phase I study area.

1.1 CEQA COMPLIANCE

The County of Los Angeles Department of Parks and Recreation (DPR) proposes to complete the SSMTMP-PII, ultimately to amend the Parks and Recreation Element of the Los Angeles County General Plan 2035 (County General Plan) to include the SSMTMP-PII, which would guide future trail development and recommend improvements to existing trails. The proposed project would ultimately result in the construction and use of trails in public and private lands, some of which may involve the expenditure of public funds, and thus constitutes a project pursuant to the California Environmental Quality Act (CEQA). These trails would be located in the unincorporated territory of Los Angeles County; therefore, the County would be the Lead Agency pursuant to CEQA.

1.2 PURPOSE

The purpose of the Hydrology and Water Quality Technical Report is to support the County in development of a Master Plan that would minimize the impacts on the surrounding community. It is understood that the County expects to move forward with Phase II of the Trails Master Plan and seeks funding for construction, operation, and maintenance of the Trails Master Plan. This technical report provides the requisite information related to hydrology and water quality to support the County's decision-making process in relation to the Trails Master Plan. The evaluation of the proposed project's potential to result in significant impacts to hydrology and water quality was undertaken in accordance with Appendix G of the CEQA Guidelines, the County DPR Environmental Checklist Form, and the County General Plan. The analysis contained herein for Phase II can be extrapolated to assess the potential for the larger Trails Master Plan to result in significant impacts to hydrology and water quality as currently conceived by the County.

1.3 INTENDED AUDIENCE

This report provides information for consideration by DPR and the design team, Alta Planning + Design, engaged in the development of the SSMTMP-PII. The substantial evidence will be available for the responsible and trustee agencies, and the public, including property owners during circulation of the draft environmental document for public review. Ultimately, the Hydrology and Water Quality Technical Report will be used by the County Board of Supervisors to support their decision-making process related to the SSMTMP-PII. The technical report will also inform the County and private parties in the ultimate development, operation, and maintenance of trails in the plan area.

1.4 SCOPE

In May 2015, the County adopted the first phase of the Santa Susana Mountains Trails Master Plan (SSMFTMP), which involved the extension of the 35.7 miles of existing County-, City-, and Conservancy-managed trails in the Phase I and Phase II study areas by approximately 35.9 miles with 22 proposed trail segments, for a total of approximately 71.5 miles of trails within the SSMFTMP Area. In 2017, the County initiated planning efforts for further development of the Phase II study area, which has been expanded to Phase II.a and II.b. This technical report provides the requisite information related to hydrology and water quality to support the County's decision-making process in relation to the proposed project: regulatory framework; methods; existing conditions; thresholds of significance; and the consideration of the potential for direct, indirect, and cumulative impacts. This assessment is based on literature and database review to determine impacts to hydrology and water quality within or adjacent to the project area. The County of Los Angeles Trails Manual was consulted for best management practices which would be required . As the proposed project is a plan, the analysis was conducted a programmatic level of detail, consistent with the provisions of the State CEQA Guidelines.

1.5 WORKING DEFINITIONS

There are a number of technical terms used in the characterization of baseline conditions and assessment of the potential for the project to affect hydrology and water quality.

General Construction Activity Storm Water Permit: Where the U.S. Environmental Protection Agency (EPA) is the permitting authority, or in California acting through the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs), construction stormwater discharges are almost all regulated under the Construction General Permit (CGP), that requires compliance with effluent limits and other permit requirements, such as the development of a Storm Water Pollution Prevention Plan (SWPPP). Construction operators intending to seek coverage under General Construction Activity Storm Water Permit must submit a Notice of Intent (NOI) certifying that they have met the permit's eligibility conditions and that they will comply with the permit's effluent limits and other requirements.

Impaired Waters: Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDLs) for these waters.

Los Angeles Regional Water Quality Control Board (LA-RWQCB): The LARWQCB is one of nine statewide regional boards. The LA-RWQCB protects ground and surface water quality in the Los Angeles Region, including the coastal watersheds of Los Angeles and Ventura Counties, along with very small portions of Kern and Santa Barbara Counties. In order to carry out its mission "to preserve and enhance water quality in the Los Angeles Region for the benefit of present and future generations," the LA-RWQCB conducts a broad range of activities to protect ground and surface waters under its jurisdiction, including the development of the 303(d) list for impaired water bodies

Mudflow: Mudflows result from the downslope movement of soil and/or rock under the influence of gravity.

Non-Point Source Runoff: Runoff that occurs on surfaces before reaching a channel is also called a nonpoint source. If a nonpoint source contains man-made contaminants, the runoff is called nonpoint source pollution. A land area that produces runoff that drains to a common point is called a drainage basin. When runoff flows along the ground, it can pick up soil contaminants including, but not limited to petroleum, pesticides, or fertilizers that become nonpoint source pollution.

Runoff: Runoff is the water flow that occurs when the soil is infiltrated to full capacity and excess water from rain, meltwater, or other sources flows over the land. This is a major component of the water cycle, and the primary agent in water erosion. In addition to causing erosion and pollution, surface runoff in urban areas is a primary cause of urban flooding which can result in property damage, damp and mold in basements, and street flooding.

Safe Yield Limits: Safe yield limits define the amount of groundwater that can be extracted from a basin without causing negative long-term effects on the basin.

Seiche: A seiche is an oscillation of a body of water in an enclosed or semi-enclosed basin, such as a reservoir, harbor, lake, or storage tank.

State Water Resources Control Board: The federal Clean Water Act (CWA) is administered and enforced by the SWRCB, which develops regulations to implement water-quality control programs mandated at the federal and state levels. To implement these programs, California has nine RWQCBs.

Storm Water and Stormwater Runoff: Stormwater runoff is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land or impervious surfaces (e.g., paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated. The term *storm water* is used when employed by the cited source of information. In all other instances, *stormwater* is used, consistent with the provision of Appendix G of the State CEQA Guidelines and as defined by the EPA.

Stormwater Best Management Practices (BMPs): As defined by the California Stormwater Quality Association (CASQA), Stormwater BMPs include schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent, eliminate, or reduce the amount of pollution that reaches the receiving waters.

Stormwater Pollution Prevention Plan (SWPPP): A plan that provides site specific BMPs for sediment and erosion control. Typically, these plans are part of an overall design that details procedures to be followed during various phases of construction. This is required by a federal regulation governing stormwater runoff from active construction sites that are more than one acre in area, pursuant to the CGP.

Total Maximum Daily Loads (TMDLs): Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop TMDLs that calculate the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.

Tsunami: A tsunami is a great sea wave produced by a significant undersea disturbance.

Urban Water Management Plan: As defined by the SWRCB, Urban Water Management Plans (UWMPs) are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves more than 3,000 or more connections is required to assess the reliability of its water sources over a 38-year planning horizon considering normal, dry, and multiple dry years. This assessment is to be included in its UWMP, which are to be prepared every five years and submitted to the Department of Water Resources (DWR). DWR then reviews the submitted plans to make sure they have completed the requirements identified in the UWMP Act (Division 6 Part 2.6 of the Water Code §10610–10656).

Water Resources Plans (WRP): A WRP provides a comprehensive overview of water resources and demands in the region; an overview of the water resources portfolio, or available resources; the approach used for forecasting water demand; recommendations for demand management and strategy for meeting long-term resources needs, including a plan of action for times of declared shortages. A WRP will normally include a discussion of the environmental issues that will influence future supply and demand.

Waters of the United States: Surface waters such as navigable waters and their tributaries, all interstate waters and their tributaries, natural lakes, all wetlands adjacent to other waters, and all impoundments of these waters, as defined by the CWA.

2.1 PROJECT LOCATION

The County adopted the SSMFTMP in May 2015, which proposed trails within a Phase I study area in the San Fernando Valley and a Phase II study area in the Santa Clarita Valley.[1] Phase II is the northerly part of the plan area. In 2017, the County initiated planning efforts for further development of the Phase II study area, which has been expanded to Phase II.a and II.b. The Trails Master Plan (approximately 49 square miles, inclusive of Phase I) is located north and west of the San Fernando Valley in the Santa Susana Mountains, in the western portion of the unincorporated area of the County of Los Angeles (Figure 2.1-1, *Regional Vicinity Map*). The Santa Susana Mountains are centrally located in the Transverse Ranges, a group of east-west trending mountains paralleling the Pacific Ocean between Santa Barbara and San Diego Counties.

2.2 TRAILS MASTER PLAN STUDY AREA

The SSMTMP-PII is the second phase of the previously approved SSMFTMP. The Trails Master Plan is located in the U.S. Geological Survey (USGS) 7.5-minute series, Newhall, Oat Mountain, Simi Valley East, and Val Verde, California, topographic quadrangles.

Phase I Area. Phase I of the Trails Master Plan is located on the USGS 7.5-minute series Simi Valley East and Oat Mountain topographic quadrangles. The northern boundary of the Trails Master Plan – Phase I, as described in the SSMFTMP approved in May 2015, is defined by the southern limits of the County's Newhall Ranch Specific Plan Area and the northern limits of the proposed Santa Susana Mountains / Simi Hills Significant Ecological Area (SEA). The southern boundary is defined by the northern limit of the City of Los Angeles. The eastern boundary is defined by U.S. Interstate 5 (I-5). The western boundary is defined by the corporate boundary between Los Angeles and Ventura Counties (Figure 2.2-1, *Trails Master Plan Location*). The SSMFTMP is divided into two subareas or phases (see Figure 2.2-1). Phase I is the Northwest San Fernando Valley Study Area, and Phase II is the Southwest Santa Clarita Valley Study Area. Phase I includes 16,038.1 acres (25.1 square miles); the northern boundary is defined by the northern limits of the Los Angeles County Oat Mountain Planning Area, the southern boundary is defined by the northern limit of the City of Los Angeles, the eastern boundary is defined by the I-5 freeway, and the western boundary is defined by the boundary between Los Angeles and Ventura Counties.

Phase II Area. Phase II from the SSMFTMP includes 8,084.4 acres (12.6 square miles). The northern boundary is defined by the northern limits of the proposed Santa Susana Mountains / Simi Hills SEA. The southern boundary is defined by the southern limits of the proposed Santa Susana Mountains / Simi Hills SEA. The eastern boundary is defined by the I-5 freeway. The western boundary is defined by the southern and eastern boundaries of the Newhall Ranch Specific Plan area.

[1] County of Los Angeles Department of Parks and Recreation. May 2015. *Santa Susana Mountains Final Trails Master Plan*. Available at: https://trails.lacounty.gov/Documents

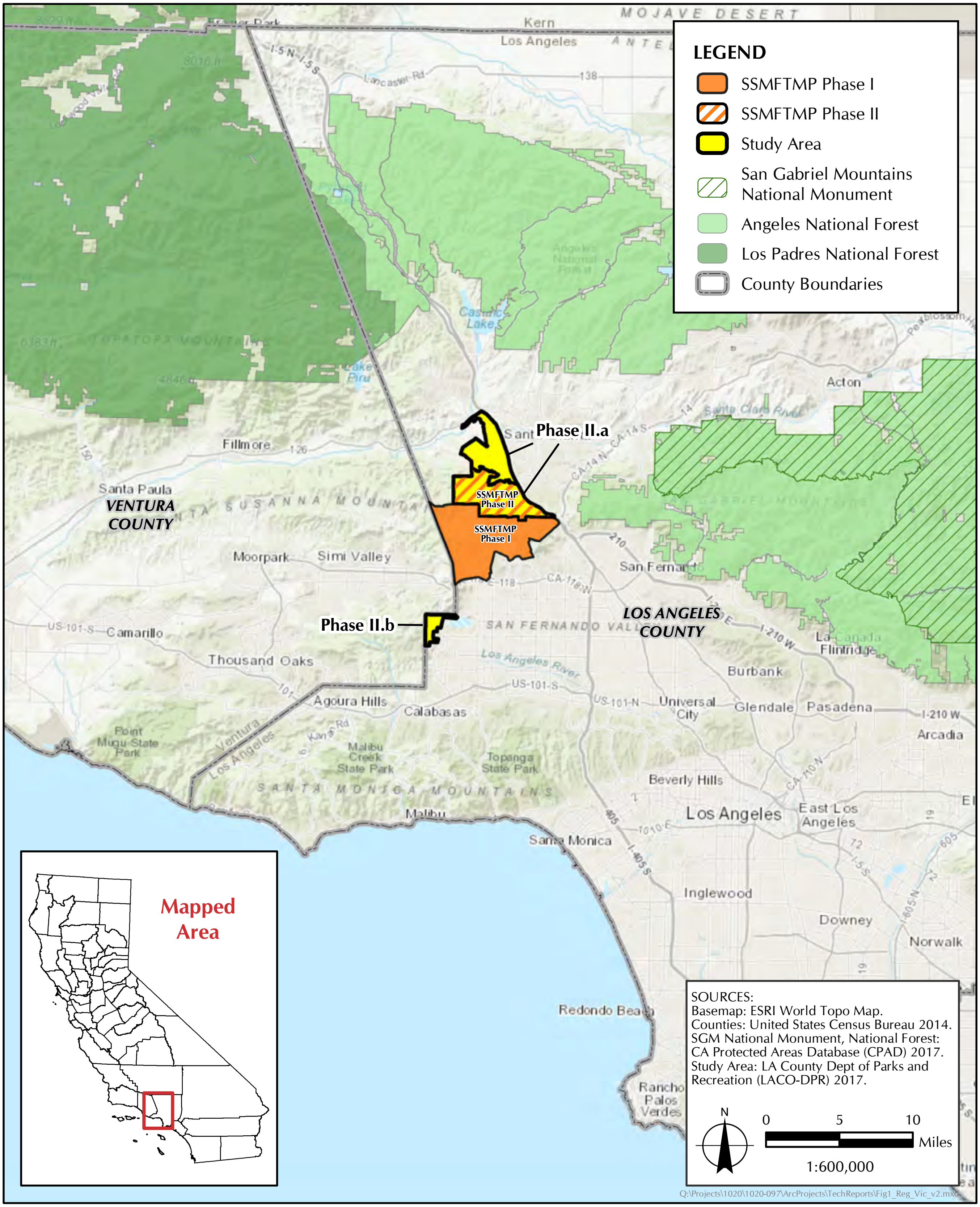

FIGURE 2.1-1
Regional Vicinity Map

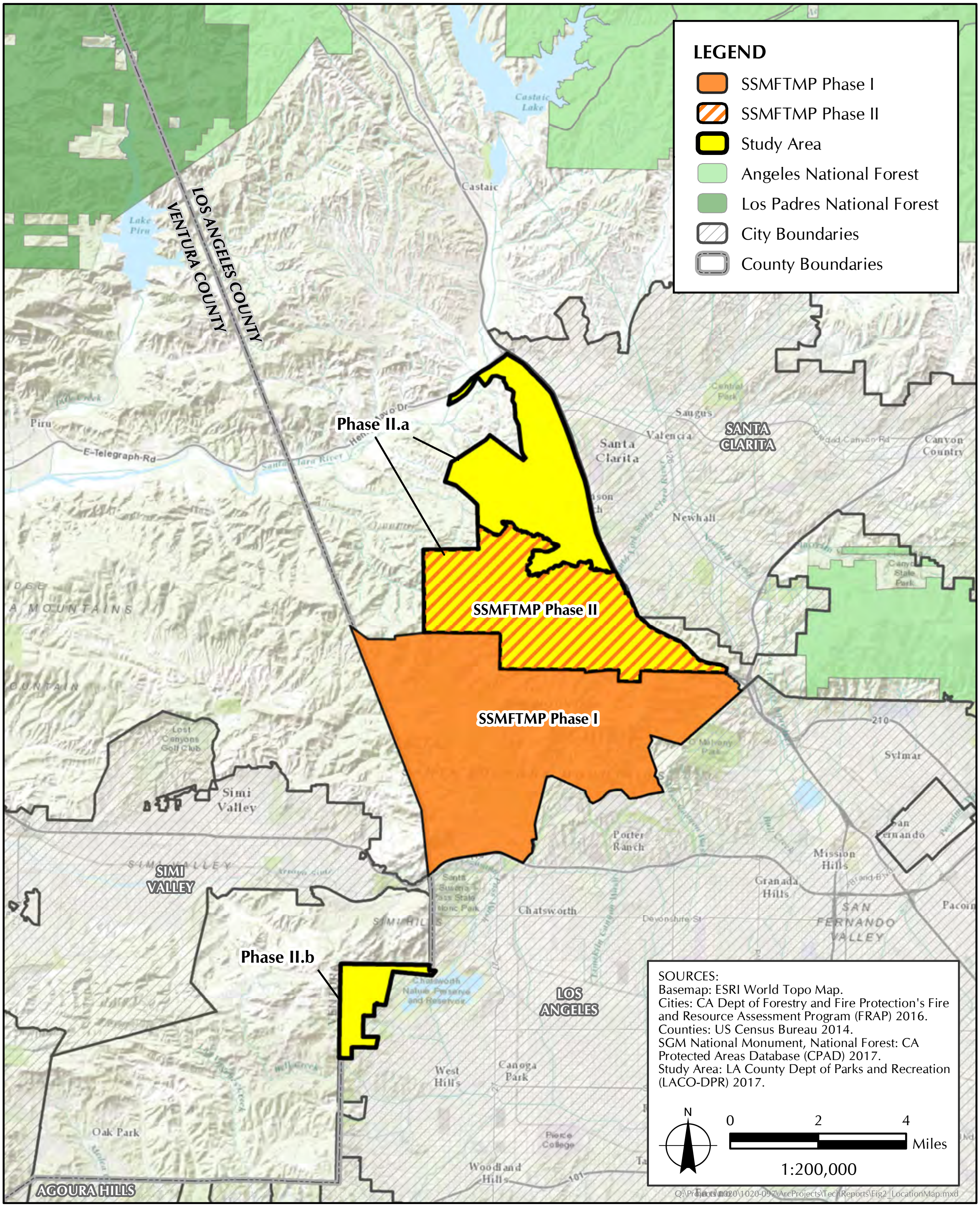

FIGURE 2.2-1

Trails Master Plan Location

The Trails Master Plan – Phase II has been expanded beyond the spatial extents of Phase II in the SSMFTMP and divided into two subareas. The Phase II.a area is an approximately 22-square-mile area located in the north-facing slopes of the Santa Susana Mountains and the Santa Clarita Valley that is bound by Henry Mayo Drive (State Route [SR] 126) to the north, the I-5 freeway to the east, Phase I of the adopted SSMFTMP Area to the south, and the Newhall Ranch Specific Plan Area to the west. The Phase II.b area is an approximately 2-square-mile area located in the foothills of the Santa Monica Mountains, including Bell Canyon, Dayton Canyon, and Woolsey Canyon, west of the San Fernando Valley, which is bound by Ventura County to the north and west and the city of Los Angeles to the east and south. The expanded Phase II of the Trails Master Plan is located on the Val Verde, Newhall, Simi Valley East (Santa Susana), Oat Mountain, and Calabasas topographic quadrangles (Figure 2.2-2, *Topographic Map with USGS 7.5-minute Quadrangle Index*). Situated along the southern flanks of the Santa Susana Mountains, the topography of the Trails Master Plan is characterized by a series of southwest draining canyons that are separated by steep-sloped and narrow ridge tops.

Topography. The Trails Master Plan is located in the U.S. Geological Survey (USGS) 7.5-minute series, Newhall, Oat Mountain, Simi Valley East, and Val Verde, California, topographic quadrangles[2,3] and includes portions of Township 2 North, Range 16 West (San Bernardino Baseline and Meridian [SBB&M]); Sections 6 and 7, Township 2 North, Range 17 West (SBB&M), Sections 1, 2, 11, and 12; Township 3 North, Range 16 West (SBB&M), Sections 4–10, 13–24, and 26–34; and Township 3 North, Range 17 West (SBB&M), Sections 1, 2, 11–15, 22–27, and 34–36 (Figure 2.2-2, *Topographic Map with USGS 7.5-minute Quadrangle Index*). Phase I of the Trails Master Plan is located on the USGS 7.5-minute series Simi Valley East and Oat Mountain topographic quadrangles. Phase II of the Trails Master Plan is located on the Val Verde, Newhall, Simi Valley East (Santa Susana), Oat Mountain, and Calabasas topographic quadrangles. Situated along the southern flanks of the Santa Susana Mountains, the topography of the Trails Master Plan is characterized by a series of southwest draining canyons that are separated by steep-sloped and narrow ridge tops. The Trails Master Plan has elevations that range from 946 to 3,430 feet above mean sea level (msl). Vegetation in the area is characterized by a Sage and Chaparral plant communities with scattered yucca plants. Although small areas of exposed bedrock are seen along the trail corridor, much of the proposed project area is characterized by thick vegetative coverage, which is particularly dense in the canyon bottoms and at lower elevations.

[2] U.S. Geological Survey. 1969. 7.5-Minute Series, Oat Mountain, California, Topographic Quadrangle. Scale 1:24,000. Reston, VA.

[3] U.S. Geological Survey. 1969. 7.5-Minute Series, Willow Springs, California, Topographic Quadrangle. Reston, VA.

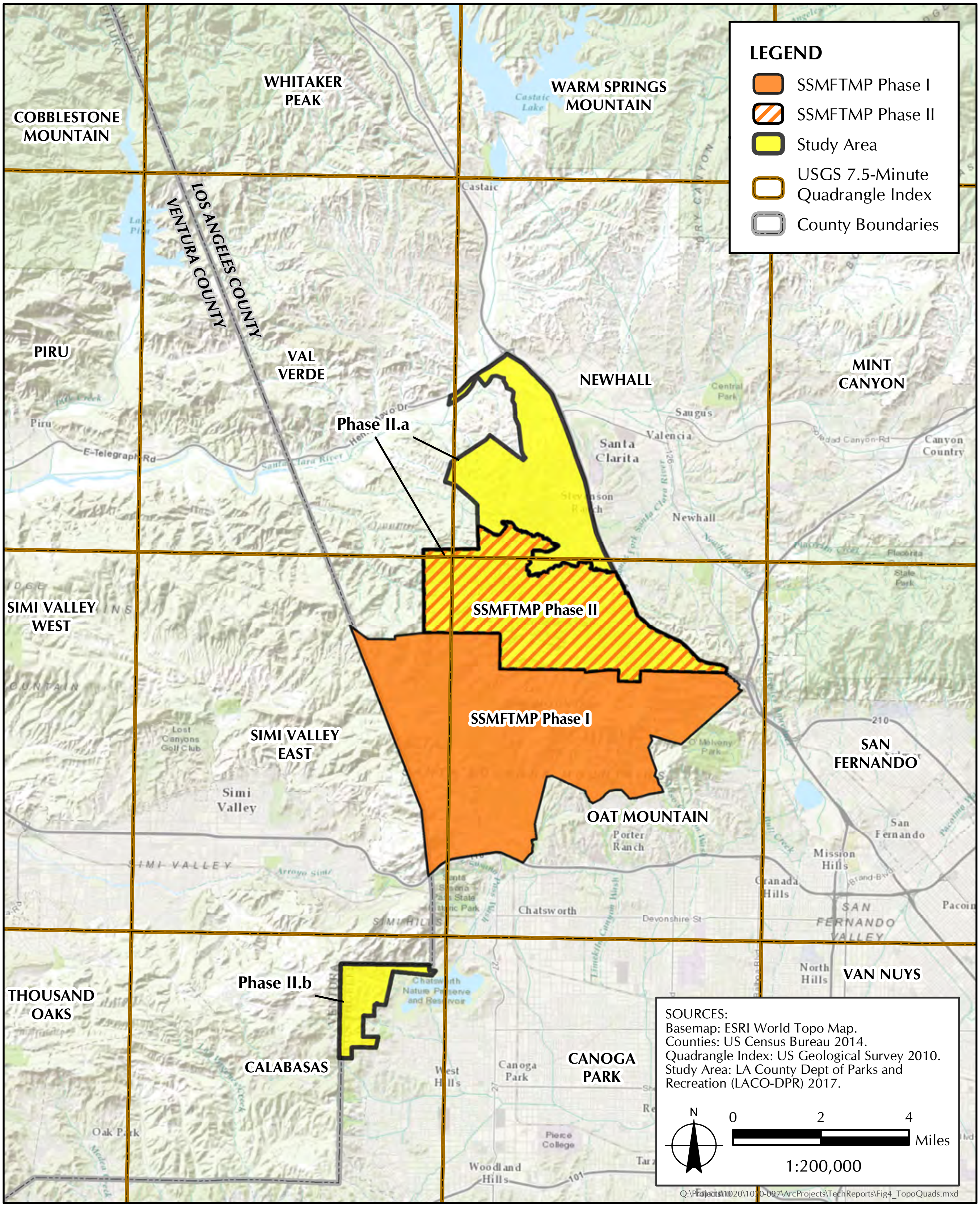

FIGURE 2.2-2

Topographic Map with USGS 7.5 Minute Quadrangle Index

2.3 PROJECT SUMMARY

The SSMTMP-PII would guide future trail development and recommend improvements to existing trails. The Trails Master Plan will provide trail users and local populations with seamless transitions throughout the proposed study area to trails of adjacent jurisdictions and prime destinations within and adjacent to the study area. The goals of the plan are to:

1. Develop a complete multi-use trail system connecting user groups and local populations to desired recreation destinations and experiences, with seamless transitions to the trails of adjacent jurisdictions, compatibility with adjacent land uses and environmental resources, and a safe and sustainable design that is consistent with the County of Los Angeles Trails Manual.

2. Develop a recreational trail system that supports low-intensity use, including mountain biking, equestrian use, and hiking, to accommodate the population increase anticipated in the Santa Clarita Valley Planning Area and San Fernando Valley Planning Area through the 2035 planning horizon consistent with the Parks and Recreation Element of the Los Angeles County General Plan 2035.

The overall work efforts include a trails master plan and associated CEQA documentation. Individual trail alignments would be developed at a later phase of this project, which is intended to provide a trail planning framework for the study area.

SECTION 3.0
REGULATORY FRAMEWORK

3.1 FEDERAL

Clean Water Act

The Clean Water Act (CWA)was enacted to restore and maintain the chemical, physical, and biological integrity of the nation's waters by regulating point and non-point pollution sources, providing assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintaining the integrity of wetlands. This includes the creation of the National Pollutant Discharge Elimination System (NPDES), a program that requires states to establish discharge standards specific to water bodies.

Section 401 of the CWA established the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under the CWA, the EPA has implemented pollution control programs such as setting wastewater standards for surface waters. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit is obtained. The EPA's NPDES permit program controls these discharges. Point sources are discrete conveyances such as pipes or manmade ditches. In California, Section 401 of the CWA is administered and enforced by the SWRCB, which develops regulations to implement water-quality control programs mandated at the federal and state levels. To implement these programs, California has nine RWQCBs. The Trails Master Plan Study Area is located within the jurisdiction of the LA- RWQCB.

Section 404 of the CWA establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. The U.S. Army Corps of Engineers (USACE) administers the day-to-day program, including individual permit decisions and jurisdictional determinations; develops policy and guidance; and enforces Section 404 provisions.

Section 303(d) of the CWA requires states to identify and establish a list of water bodies for which technology-based NPDES effluent limitations required by the CWA are not stringent enough to attain and maintain applicable water quality standards. Those water bodies on the 303(d) list are termed "impaired water bodies." For each impaired water body, states are required to develop a TMDL, which is the pollutant limit a water body can receive and still attain water quality standards. Any pollution above the maximum TMDL has to be "budgeted," meaning that the residual pollution is allocated for reduction among the various sources of the pollutant in order to regain the beneficial uses of the water body.

3.2 STATE

Section 1600 of the State Fish and Game Code

The California Department of Fish and Wildlife (CDFW) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. To meet this responsibility, the Fish and Game Code (Section 1602) requires an entity to notify CDFW of any proposed activity that may substantially modify a river, stream, or lake. Notification is required by any person, business, state, or local government agency, or public utility that proposes an activity that will:

- Substantially divert or obstruct the natural flow of any river, stream or lake
- Substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake
- Deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake

The notification requirement applies to any work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel. This includes ephemeral streams, desert washes, and watercourses with a subsurface flow. It may also apply to work undertaken within the flood plain of a body of water. If CDFW determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement is required. The Agreement includes reasonable conditions necessary to protect those resources and must comply with CEQA. The entity may proceed with the activity in accordance with the final Agreement.

California Porter-Cologne Water Quality Act

This state law provides a comprehensive water quality management system for the protection of California waters. Porter-Cologne designated the SWRCB as the ultimate authority over state water rights and water quality policy and also established the nine RWQCBs to oversee water quality on a day-to-day basis at the local/regional level, including preparation and implementation of Water Quality Control Plans (Basin Plans).

The Basin Plans contain water quality standards that are the basis for each RWQCBs' regulatory programs. The water quality standards consist of up to 24 designated beneficial uses (e.g., municipal and domestic supply, wildlife habitat, recreation, and groundwater recharge) for individual surface water bodies and groundwater, as well as the water quality objectives to be maintained or attained to protect those beneficial uses. The Basin Plans also contain waste discharge prohibitions and other implementation measures to achieve water quality objectives. Water quality control measures include TMDLs required by the federal CWA.

3.3 LOCAL

Water Quality Control Plan for the Los Angeles Region

The LA-RWQCB has prepared a Basin Plan for the Los Angeles Region, which includes the Coastal Watersheds of Los Angeles and Ventura Counties. The first essentially complete Basin Plan, which was established under the requirements of California's 1969 Porter-Cologne Water Quality Control Act (Section 13000 [Water Quality] et seq. of the California Water Code), was adopted in 1975 and revised in 1984. The latest version was adopted in 1994.

The LA-RWQCB is involved is the regulation of a number of activities that are relevant to the Trails Master Plan including:

- Prepares, monitors compliance with, and enforces Waste Discharge Requirements, including NPDES Permits
- Implements and enforces local storm water control efforts
- Enforces water quality laws, regulations, and waste discharge requirements

Storm water discharges that are composed entirely of runoff from qualifying construction activities may require regulation under the General Construction Activity Storm Water Permit issued by the

SWRCB. Construction activities that qualify include clearing, grading, excavation, reconstruction, and dredge-and-fill activities that result in the disturbance of at least 1 acre and less than 5 acres of total land area.

Los Angeles County General Plan 2035

The Trails Master Plan Study Area is located within unincorporated Los Angeles County and is subject to the County of Los Angeles General Plan 2035.

<u>Goal C/NR 5: Protected and useable local surface water resources.</u>

- **Policy C/NR 5.1:** Support the LID [Low Impact Development] philosophy, which seeks to plan and design public and private development with hydrologic sensitivity, including limits to straightening and channelizing natural flow paths, removal of vegetative cover, compaction of soils, and distribution of naturalistic BMPs at regional, neighborhood, and parcel-level scales.
- **Policy C/NR 5.2:** Require compliance by all County departments with adopted Municipal Separate Storm Sewer System (MS4), General Construction, and point source NPDES permits.
- **Policy C/NR 5.3:** Actively engage with stakeholders in the formulation and implementation of surface water preservation and restoration plans, including plans to improve impaired surface water bodies by retrofitting tributary watersheds with LID types of BMPs.
- **Policy C/NR 5.4:** Actively engage in implementing all approved Enhanced Watershed Management Programs/Watershed Management Programs and Coordinated Integrated Monitoring Programs/Integrated Monitoring Programs or other County-involved TMDL implementation and monitoring plans.
- **Policy C/NR 5.5:** Manage the placement and use of septic systems in order to protect nearby surface water bodies.
- **Policy C/NR 5.6:** Minimize point and non-point source water pollution.
- **Policy C/NR 5.7:** Actively support the design of new and retrofit of existing infrastructure to accommodate watershed protection goals, such as roadway, railway, bridge, and other—particularly—tributary street and greenway interface points with channelized waterways.

<u>Goal C/NR 6: Protected and usable local groundwater resources.</u>

- **Policy C/NR 6.1:** Support the LID philosophy, which incorporates distributed, post-construction parcel-level stormwater infiltration as part of new development.
- **Policy C/NR 6.2**: Protect natural groundwater recharge areas and regional spreading grounds.
- **Policy C/NR 6.3:** Actively engage in stakeholder efforts to disperse rainwater and stormwater infiltration BMPs at regional, neighborhood, infrastructure, and parcel-level scales.
- **Policy C/NR 6.4:** Manage the placement and use of septic systems in order to protect high groundwater.
- **Policy C/NR 6.5:** Prevent stormwater infiltration where inappropriate and unsafe, such as in areas with high seasonal groundwater, on hazardous slopes, within 100 feet of drinking water wells, and in contaminated soils.

Goal C/NR 7: Protected and healthy watersheds.

- **Policy C/NR 7.1:** Support the LID philosophy, which mimics the natural hydrologic cycle using undeveloped conditions as a base, in public and private land use planning and development design.
- **Policy C/NR 7.2:** Support the preservation, restoration and strategic acquisition of available land for open space to preserve watershed uplands, natural streams, drainage paths, wetlands, and rivers, which are necessary for the healthy function of watersheds.
- **Policy C/NR 7.3:** Actively engage with stakeholders to incorporate the LID philosophy in the preparation and implementation of watershed and river master plans, ecosystem restoration projects, and other related natural resource conservation aims, and support the implementation of existing efforts, including Watershed Management Programs and Enhanced Watershed Management Programs.
- **Policy C/NR 7.4:** Promote the development of multi-use regional facilities for stormwater quality improvement, groundwater recharge, detention/attenuation, flood management, retaining non-stormwater runoff, and other compatible uses.

Goal S 2: An effective regulatory system that prevents or minimizes personal injury, loss of life, and property.

- **Policy S 2.1:** Discourage development in the County's Flood Hazard Zones.
- **Policy S 2.2:** Discourage development from locating downslope from aqueducts.
- **Policy S 2.3:** Consider climate change adaptation strategies in flood and inundation hazard planning.
- **Policy S 2.4:** Ensure that developments located within the County's Flood Hazard Zones are sited and designed to avoid isolation from essential services and facilities in the event of flooding.
- **Policy S 2.5:** Ensure that the mitigation of flood related property damage and loss limits impacts to biological and other resources.
- **Policy S 2.6:** Work cooperatively with public agencies with responsibility for flood protection, and with stakeholders in planning for flood and inundation hazards.
- **Policy S 2.7:** Locate essential public facilities, such as hospitals and fire stations, outside of Flood Hazard Zones, where feasible.

Los Angeles County Flood Control Act

This act was adopted by the state legislature in 1915. The act established the Los Angeles County Flood Control District (LACFCD) and empowered it to provide flood protection, water conservation, recreation, and aesthetic enhancement within its boundaries. The LACFCD is governed, as a separate entity, by the County of Los Angeles Board of Supervisors. In 1985, the responsibilities and authority vested in the LACFCD were transferred to the County of Los Angeles Department of Public Works.

Los Angeles County Trails Manual

The County Trails Manual is a guidance document for the County which outlines various issues affecting trail feasibility (Section 2.5), including hydrology and water quality. Factors include soil erosion, surface runoff, flooding, slope gradient, and water quality. These factors can also affect design methods, construction techniques, and trail maintenance. The stated purpose of the County Trails Manual is

> "to provide guidance to County departments, specifically Los Angeles County Department of Parks and Recreation (LACO-DPR), that interface with trail planning, design, development, and maintenance of hiking, equestrian, and mountain biking recreational trails, while addressing physical and social constraints and opportunities associated with the diverse topographic and social conditions that occur in the unincorporated territory of the County. LACO-DPR will use the planning process delineated in the Trails Manual in considering the development of future trails."

Santa Clarita Valley Area Plan

The Phase I and Phase II.a. areas of the Trails Master Plan Study Area are located within the unincorporated portion of the Santa Clarita Valley and subject to the 2012 Santa Clarita Valley Area Plan. Relevant guiding principles stated in the Santa Clarita Valley Area Plan include:

<u>Environmental Resources.</u>

- **11.** New development shall be designed to improve energy efficiency, reducing energy and natural resource consumption by such techniques as ... capture of storm runoff on-site, ... native and drought-tolerant landscape.

<u>Objective LU-7.3: Protect surface and ground water quality through design of development sites and drainage improvements.</u>

- **Policy LU-7.3.1:** Promote the use of permeable paving materials to allow infiltration of surface water into the water table.
- **Policy LU-7.3.2:** Maintain stormwater runoff onsite by directing drainage into rain gardens, natural landscaped swales, rain barrels, permeable areas and use of drainage areas as design elements, where feasible and reasonable.
- **Policy LU-7.3.3:** Seek methods to decrease impermeable site area where reasonable and feasible, in order to reduce stormwater runoff and increase groundwater infiltration, including use of shared parking and other means as appropriate.
- **Policy LU-7.3.4:** Implement best management practices for erosion control throughout the construction and development process
- **Policy LU-7.3.5:** Limit development within flood-prone areas to minimize down-stream impacts.
- **Policy LU-7.3.6:** Support emerging methods and technologies for the on-site capture, treatment, and infiltration of stormwater and greywater, and amend the County Code to allow these methods and technologies when they are proven to be safe and feasible.

Los Angeles County Low Impact Development Ordinance (L.A. County Code, Title 12, Ch. 12.84)

The project is in the County of Los Angeles and subject to Low Impact Development standards outlined in L.A. County Code, Title 12, Chapter 12.84. The purpose of the standards is:

- To lessen the adverse impacts of stormwater runoff from development and urban runoff on natural drainage systems, receiving waters and other water bodies.
- Minimize pollutant loadings from impervious surfaces by requiring development projects to incorporate proper designed, technically appropriate BMPs and other LID strategies.
- Minimize erosion and other hydrologic impacts on natural drainage systems by requiring development projects to incorporate properly designed, technically appropriated hydromodification control development principles and technologies.

The LID standards of this chapter include:

- Mimic undeveloped stormwater runoff rates and volumes in any storm event up to and including the Capital Flood.
- Prevent pollutants of concern from leaving the development site in stormwater as the result of storms, up to and including a Water Quality Design Storm Event.
- Minimize hydromodification impacts to natural drainage systems.

SECTION 4.0
METHODS

This report assesses the inherent hydrology and water quality conditions of the proposed project area based on a desktop analysis. This assessment is based on archival research for the entire Trails Master Plan Study Area. In accordance with CEQA, this Hydrology and Water Quality Technical Report presents the results of these efforts and provides a programmatic impact analysis and mitigation recommendations related to hydrology and water quality within the Trails Master Plan Study Area. While this report focuses on Phase II, it incorporates updated information for the Phase I study area. Information used in the preparation of this report was derived from a Class I literature review, including published and gray literature, and spatial analysis based on geographic information system data.

The potential for trails constructed within the proposed project study area, to result in impacts related to hydrology and water quality was analyzed in relation to the questions in Appendix G of the California Environmental Quality Act Guidelines (State CEQA Guidelines) and the County of Los Angeles Department of Parks and Recreation's Environmental Checklist Form. Trails constructed within the study area would be considered to have a significant impact to hydrology and water quality when the potential for any one of the following thresholds occurs:

- Violate any water quality standards or waste discharge requirements?
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?
- Add water features or create conditions in which standing water can accumulate that could increase habitat for mosquitoes and other vectors that transmit diseases such as the West Nile virus and result in increased pesticide use?
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?
- Generate construction or post-construction runoff that would violate applicable stormwater NPDES permits or otherwise significantly affect surface water or groundwater quality?Conflict with the Los Angeles County Low Impact Development Ordinance (L.A. County Code, Title 12, Ch. 12.84)?

- Result in point or nonpoint source pollutant discharges into State Water Resources Control Board-designated Areas of Special Biological Significance?

- Use onsite wastewater treatment systems in areas with known geological limitations (e.g. high groundwater) or in close proximity to surface water (including, but not limited to, streams, lakes, and drainage course)?

- Otherwise substantially degrade water quality?

- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, or within a floodway or floodplain?

- Place structures, which would impede or redirect flood flows, within a 100-year flood hazard area, floodway, or floodplain?

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

- Place structures in areas subject to inundation by seiche, tsunami, or mudflow?

5.1 EXISTING CONDITIONS

Surface Water

Rainfall in the Trails Master Plan Study Area drains to three major watersheds: Los Angeles River, Santa Clara River, and Calleguas Creek (Figure 5.1-1, *Blue Line Drainages and Surface Water Quality*). All are within the South Coast Hydrological Region and under the jurisdiction of the LARWQCB.

Surface Water Quality

The Trails Master Plan Area is located within the Basin Plan for the LARWQCB. The development and implementation of the Basin Plan is a requirement under the federal CWA and is a resource for the use of water and/or discharge of wastewater within the LARWQCB boundaries, as well as providing valuable information to the public about local water quality issues. The Basin Plan is designed to preserve and enhance water quality and protect the beneficial uses of all regional waters. Specifically, the Basin Plan (1) designates beneficial uses for surface and ground waters, (2) sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy, and (3) describes implementation programs to protect all waters in the region. In addition, the Basin Plan incorporates (by reference) all applicable state and regional board plans and policies and other pertinent water quality policies and regulations. A TMDL is a regulatory term in the federal CWA, describing a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. Alternatively, TMDL is an allocation of that water pollutant deemed acceptable to the subject receiving waters. The Basin Plan set TMDLs for bacteria, nutrients, trash, and metals for the Los Angeles River; bacteria, trash, chloride, nutrients, and salts for the Santa Clara River; and nutrients, toxics, metals, and salts for Calleguas Creek (Table 5.1-1, *Los Angeles River, Santa Clara River, and Calleguas Creek TMDLs*).

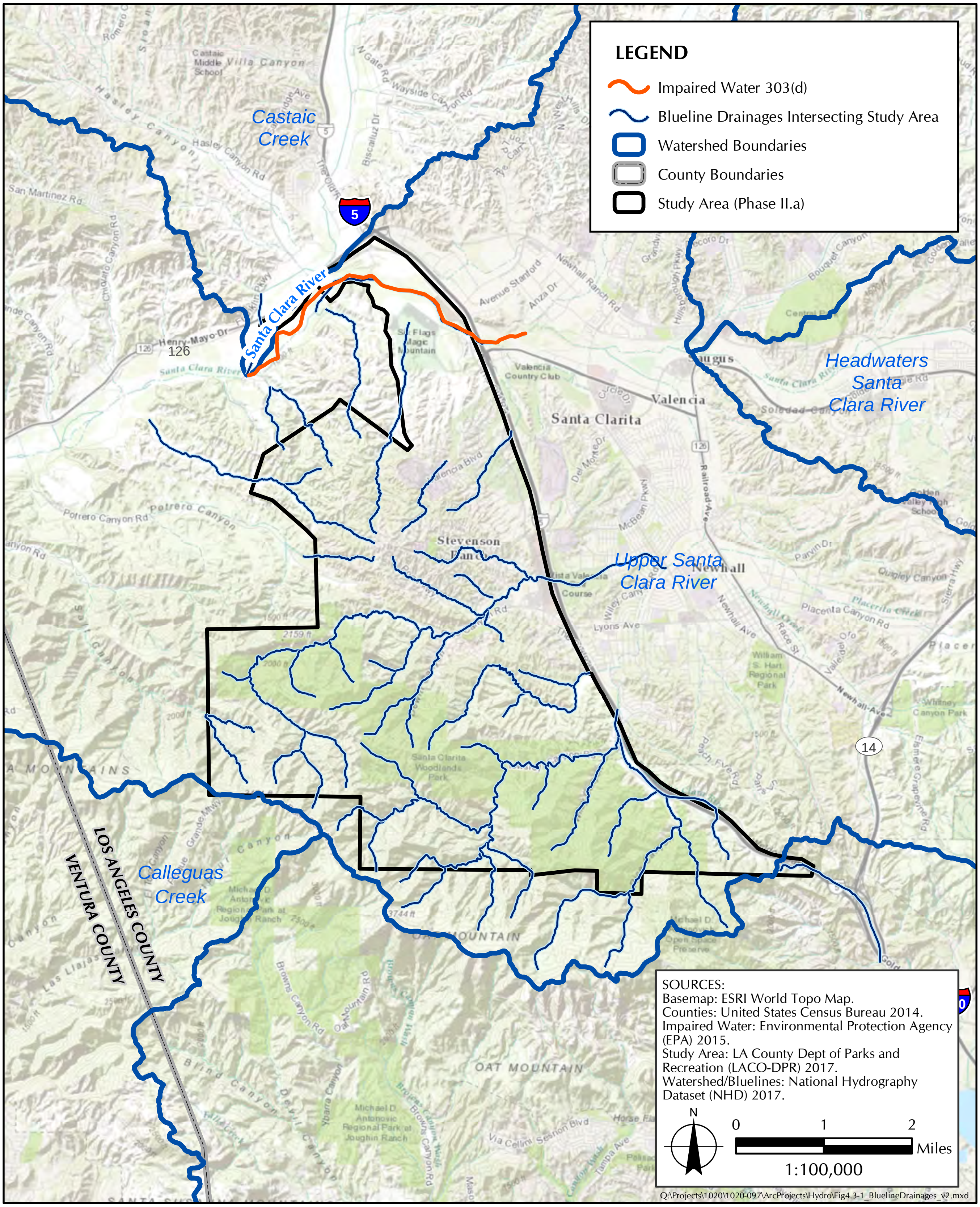

FIGURE 5.1-1A

Blue Line Drainages and Surface Water Quality

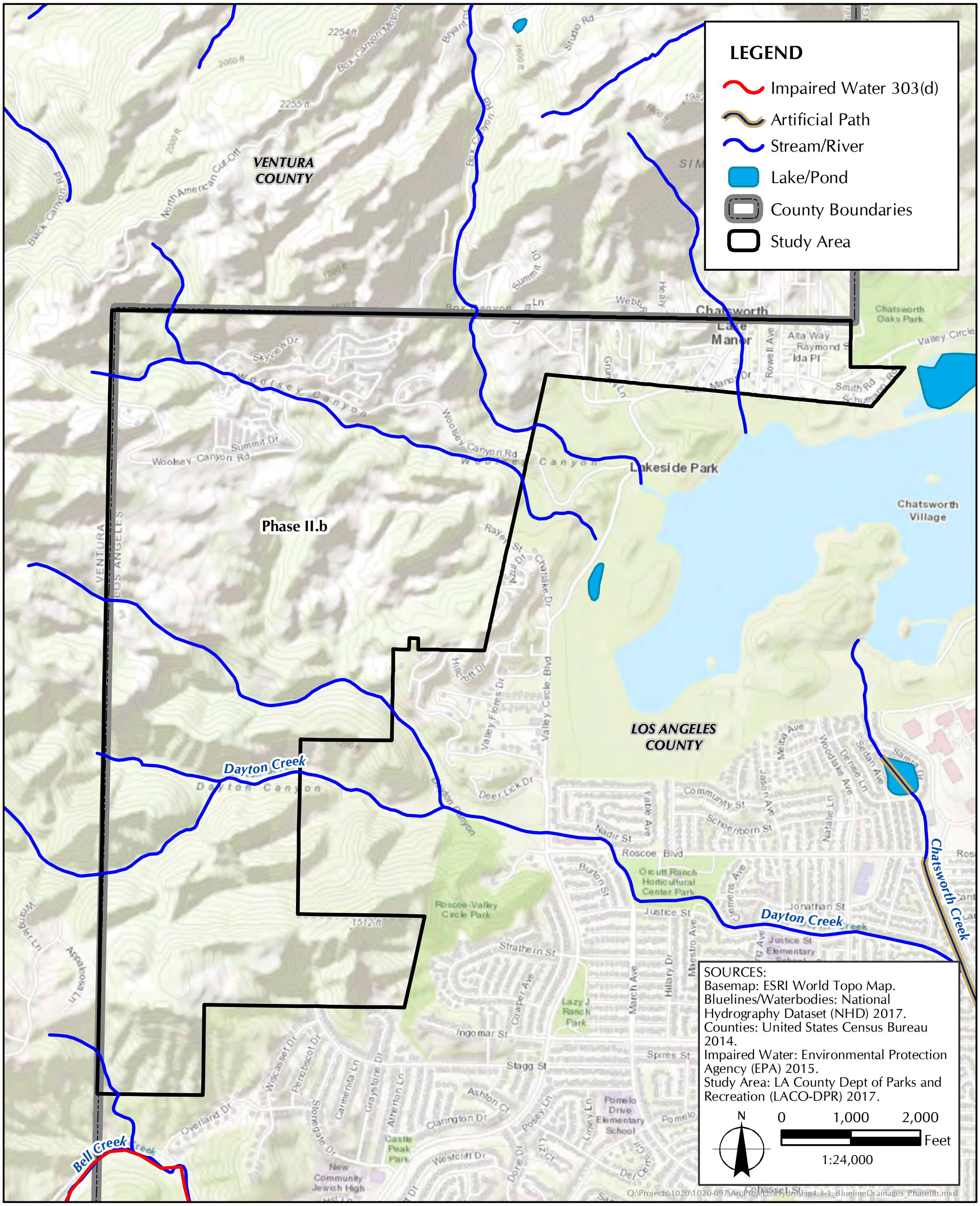

FIGURE 5.1-1B

Blue Line Drainages and Surface Water Quality

TABLE 5.1-1
LOS ANGELES RIVER, SANTA CLARA RIVER, AND CALLEGUAS CREEK TMDLs

	Resolution No.	Watershed	Pollutant	Resolution Name	Status
Los Angeles River					
1	R12-010	Los Angeles River	Nutrients	Reconsideration of Los Angeles River Nitrogen and Related Effects TMDL to Incorporate Site-Specific Objectives for Ammonia	Approved by Regional Board on Dec. 6, 2012
2	R10-007	Los Angeles River	Bacteria	Los Angeles River Bacteria TMDL	TMDL in Effect on Mar. 23, 2012
3	R10-003	Los Angeles River	Metals	Reconsideration of Los Angeles River Metals TMDL	TMDL in Effect on Nov. 3, 2011
4	2007-014	Los Angeles River	Metals	Los Angeles Metals TMDL	TMDL in Effect on Oct. 29, 2008
5	2007-012	Los Angeles River	Trash	Trash TMDL for the Los Angeles River Watershed	TMDL in Effect on Sep. 23, 2008
6	2006-013	Los Angeles River	Trash	Proposed Resolution to set aside the Los Angeles River Trash TMDL	TMDL in Effect on Jul. 17, 2006
7	2003-016	Los Angeles River	Nutrients	Los Angeles River Nutrient TMDL (Revision of Interim WLAs)	TMDL in Effect on Sep. 27, 2004
8	2003-009	Los Angeles River	Nutrients	Los Angeles River Nutrients TMDL	TMDL in Effect on Mar. 23, 2004
9	2001-013	Los Angeles River	Trash	Los Angeles River Trash TMDL	TMDL in Effect on Aug. 28, 2002
Santa Clara River					
1	R10-006	Santa Clara River	Bacteria	Santa Clara River Bacteria TMDL	TMDL in Effect on Mar. 21, 2012
2	2008-012	Santa Clara River	Chloride	Reconsideration of the Upper Santa Clara River Chloride TMDL Implementation Plan & Revise Chloride WQ Objectives	TMDL in Effect on Apr. 6, 2010
3	2007-009	Santa Clara River	Trash	Lake Elizabeth, Munz Lake, Lake Hughes Trash TMDL	TMDL in Effect on Mar. 6, 2008
4	2006-016	Santa Clara River	Salts	Upper Santa Clara River Chloride TMDL Implementation Plan Re-Consideration	TMDL in Effect on Jun. 12, 2008
5	2004-004	Santa Clara River	Salts	Upper Santa Clara River Chloride TMDL	TMDL in Effect on May 4, 2005
6	2003-011	Santa Clara River	Nutrients	Santa Clara River Nutrients TMDL	TMDL in Effect on Mar. 23, 2004
Calleguas Creek					
1	2008-009	Calleguas Creek	Nutrients	Revision of WLAs for Calleguas Creek Nitrogen TMDL	TMDL in Effect on Oct. 15, 2009
2	2007-016	Calleguas Creek	Salts	Calleguas Creek Watershed Salts TMDL	TMDL in Effect on Dec. 2, 2008
3	2007-007	Calleguas Creek	Trash	Revolon Slough & Beardsley Wash Trash TMDL	TMDL in Effect on Mar. 6, 2008
4	2006-012	Calleguas Creek	Metals	Calleguas Creek Watershed Metals TMDL	TMDL in Effect on Mar. 26, 2007
5	2005-010	Calleguas Creek	Toxics	Calleguas Creek OC Pesticides & PCBs TMDL	TMDL in Effect on Mar. 24, 2006

TABLE 5.1-1
LOS ANGELES RIVER, SANTA CLARA RIVER, AND CALLEGUAS CREEK TMDLs

	Resolution No.	Watershed	Pollutant	Resolution Name	Status
6	2005-009	Calleguas Creek	Toxicity	Calleguas Creek Toxicity TMDL	TMDL in Effect on Mar. 24, 2006
7	2002-017	Calleguas Creek	Nutrients	Calleguas Creek Nitrogen TMDL	TMDL in Effect on Jul. 16, 2003

Groundwater

Groundwater resources have not been developed in the Trails Master Plan Area, but groundwater production occurs in both adjacent valleys: the San Fernando Valley to the south and the Santa Clara River Valley to the north.

The San Fernando Valley supplements drinking water supply for the City of Los Angeles.[4] The San Fernando groundwater basin was adjudicated in 1979 and includes the water-bearing sediments beneath the San Fernando Valley, Tujunga Valley, Browns Canyon, and the alluvial areas surrounding the Verdugo Mountains near La Crescenta and Eagle Rock. Depth to groundwater in the San Fernando Basin typically ranges from approximately 24 to 400 feet.[5]

The Santa Clara River Valley East Groundwater Basin to the north of the Trails Master Plan Area is an important groundwater source, and groundwater from two subbasins is the largest source of water in the Santa Clarita region.[6] Depth to groundwater above the basin ranges from 10 to 50 feet in the areas nearest the Trails Master Plan Area.[7]

Phase II.a

The Santa Clara River Valley Groundwater Basin is within the Phase II.a area (Figure 5.1-2, *Groundwater Basins*). Newhall County Water District (NCWD), the Santa Clarita Water Division of CLWA (SCWD), and Valencia Water Company (VWC) provide groundwater and imported water to portions of the City of Santa Clarita and unincorporated communities in Los Angeles County. There is one water wholesaler, Castaic Lake Water Agency, and several water retailers. There are rural areas where the supply comes from private wells. The water supply source in the Santa Clarita Valley is diverse. There are two sources of local groundwater, accounting for roughly half of the local supply. Those two sources are the alluvium and the Saugus Formation.

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[4] Metropolitan Water District of Southern California, 2007. Groundwater Assessment Study Report Number 1308

[5] Department of Water Resources. 2003. California's Groundwater, Bulletin 118. Update 2003.

[6] Department of Water Resources. 2009. California Water Plan Update 2009 South Coast Integrated Water Management Volume 3 Regional Reports. Bulletin 160-09.

[7] Department of Water Resources. 2003. California's Groundwater, Bulletin 118. Update 2003.

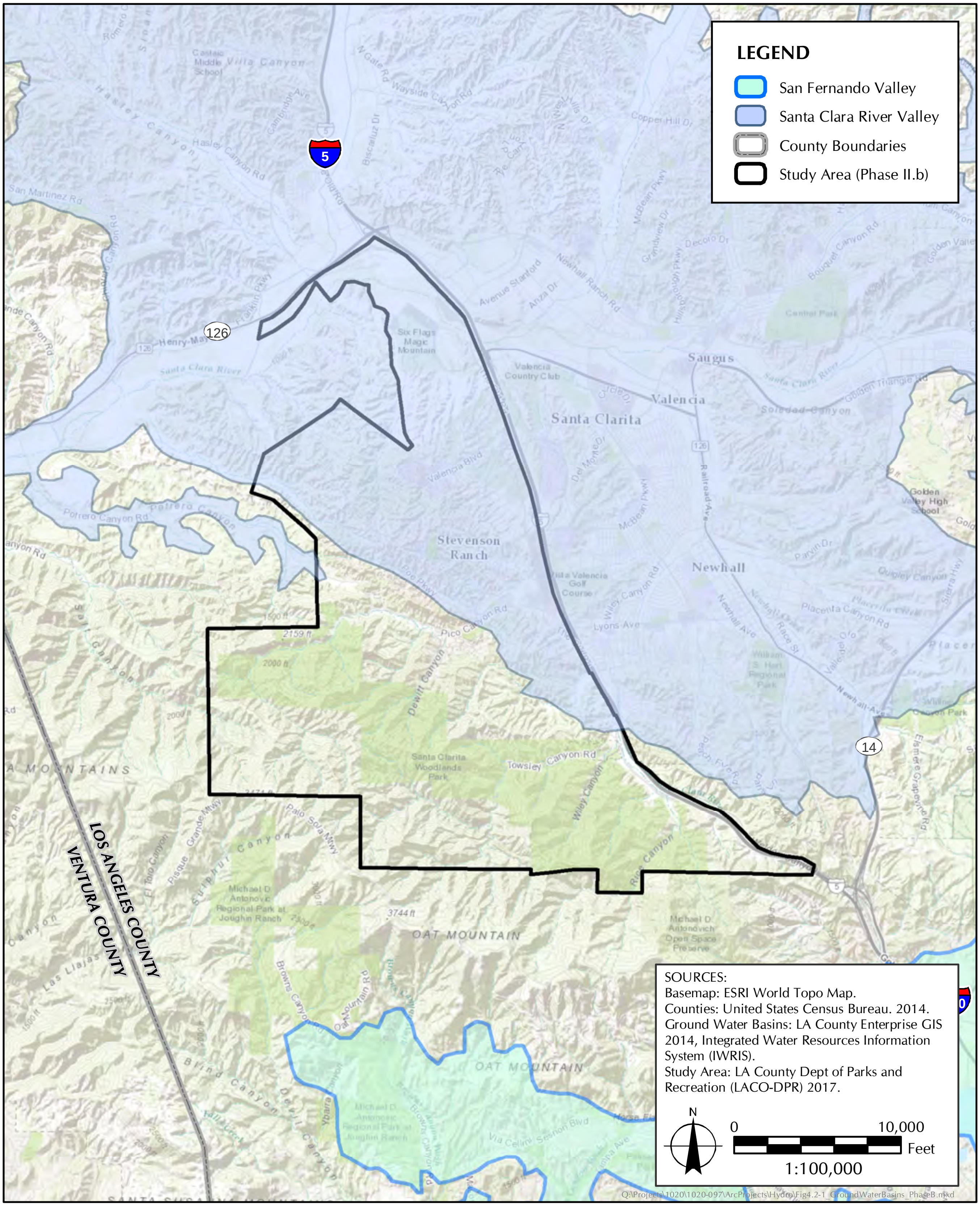

FIGURE 5.1-2A

Groundwater Basins

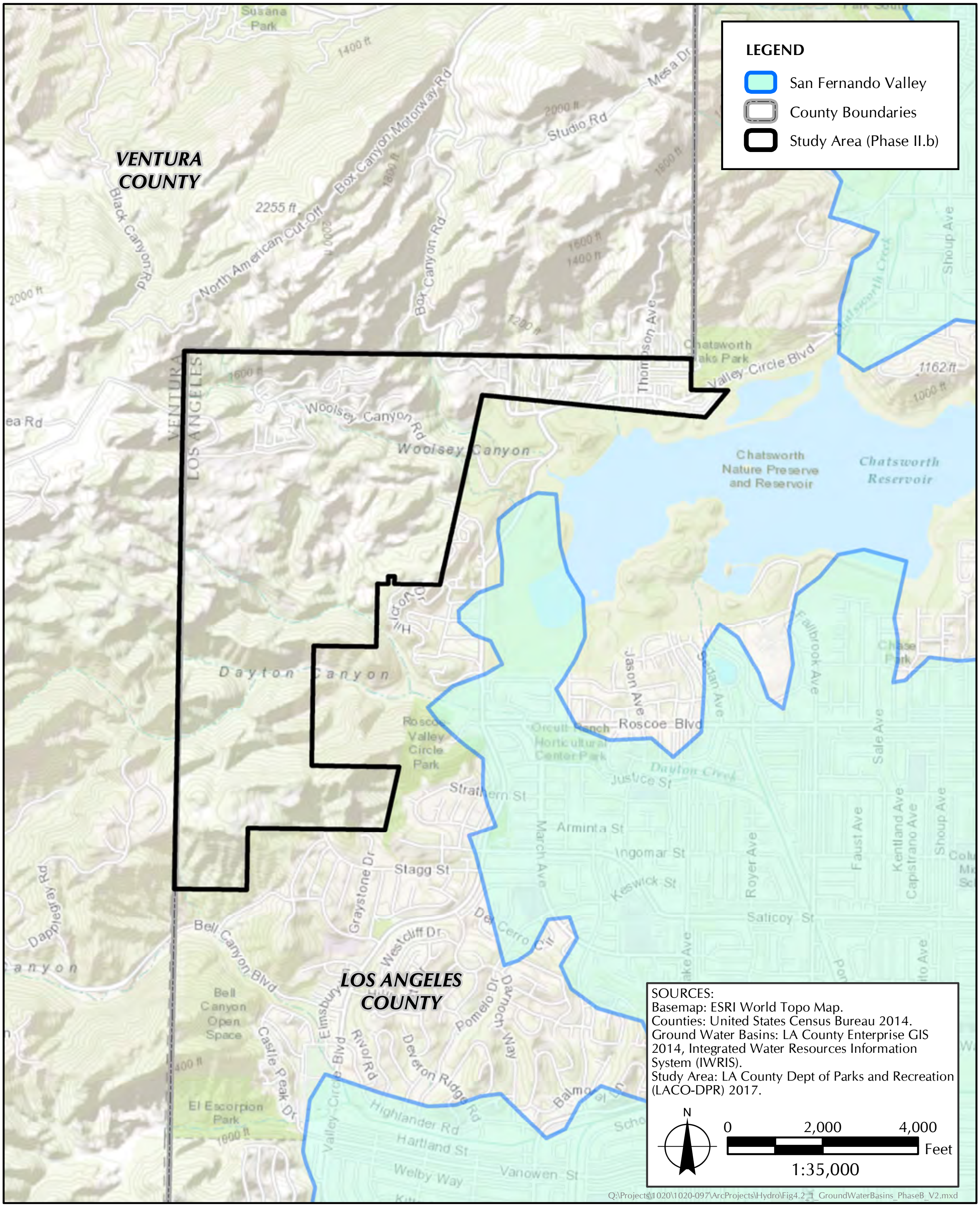

FIGURE 5.1-2B

Groundwater Basins

Pumping from the alluvium in a given year is governed by local hydrologic conditions in the eastern Santa Clara River watershed. Pumping ranges between 30,000 and 40,000 acre-feet per year (AFY) during normal and above-normal rainfall years. However, due to hydrogeologic constraints in the eastern part of the subbasin, pumping is reduced to between 30,000 and 35,000 AFY during locally dry years. Pumping from the Saugus Formation in a given year is tied directly to the availability of other water supplies, particularly from the State Water Project (SWP). During average year conditions within the SWP system, Saugus pumping ranges between 7,500 and 15,000 AFY. Planned dry-year pumping from the Saugus Formation ranges between 15,000 and 25,000 AFY during a drought year and can increase to between 21,000 and 25,000 AFY if SWP deliveries are reduced for two consecutive years and between 21,000 and 35,000 AFY if SWP deliveries are reduced for three consecutive years. Such high pumping would be followed by periods of reduced (average-year) pumping, at rates between 7,500 and 15,000 AFY, to further enhance the effectiveness of natural recharge processes that would recover water.[8]

Phase II.b

There are no groundwater basins within the Phase II.b area. The nearest groundwater basin is the San Fernando Valley Groundwater Basin (Figure 5.1-2).

Existing Drainage Pattern

Surface elevations related to drainages in the Trails Master Plan Area range from approximately 3,700 feet above MSL at Lookout Peak in the Oat Mountain ridge area to approximately 1,100 feet above MSL where the Santa Susana Mountains meet the San Fernando Valley floor at Browns Canyon Wash. The Oat Mountain ridgeline is oriented primarily northwest-southeast, and the canyons originate on the face of the ridge and drain either toward the south and southwest on the south-facing slopes, or to the northeast or north on the north-facing slopes.

Phase II.a

Drainage patterns in the Phase II.a study area go north to the Upper Santa Clara River watershed. The Santa Clara River Watershed (Watershed) consists of approximately 1,634 square miles and contains the upper reaches of the Santa Clara River. This river, which is the largest natural river remaining in Southern California, travels through two counties: Los Angeles and Ventura. The Upper Basin of the Santa Clara River is bounded by the San Gabriel Mountains to the south and southeast, the Santa Susana Mountains to the southwest, the Transverse Ranges to the northeast, the Sierra Pelona Mountains to the east, and the Ventura County Line to the west. The Phase II.a area encompasses the City of Santa Clarita, the unincorporated communities of Castaic, Stevenson Ranch, West Ranch, Agua Dulce, and Acton, as well as portions of the Angeles National Forest.[9] There are existing stormdrains in the unincorporated Los Angeles County area of Stevenson Ranch. The Upper Santa Clara River Enhanced Watershed Management Program Group (USCR EWMP Group), which includes the City of Santa Clarity, Los Angeles County, and Los Angeles County Flood Control District, collaboratively developed an Enhanced Watershed Management Program (EWMP) to comply with requirements in their Municipal Separate Storm Sewer System (MS4) Permit.[10] The EWMP allows collaboration among agencies on multi-benefit regional projects to

[8] Upper Santa Clara River Watershed Management Group. February 2016. Enhanced Watershed Management Program.

[9] Upper Santa Clara River Regional Water Management Plan. February 2014.

[10] Upper Santa Clara River Watershed Management Group. February 2016. Enhanced Watershed Management Program.

retain both non-stormwater and stormwater runoff, as well as to facilitate flood control and increase water supply. The permit requires the identification of strategies, control measures, and BMPs, collectively referred to in the permit as Watershed Control Measures (WCMs), which could be implemented individually or collectively at the watershed-scale to comply with water quality objectives. The EWMP incorporates existing and planned stormwater BMPs, and also includes evaluations of additional potential control measures. Two overarching categories of BMPs are included in the EWMP:

- Structural BMPs that retain, divert or treat stormwater and/or non-stormwater, and include low-impact development (LID), green streets/green infrastructure, and regional BMPs.
- Institutional BMPs that encompass the Minimum Control Measures (MCMs) outlined in the Permit, other non-structural BMP's, and any other source control measures.

Phase II.b

Bell Creek (also known as Escorpión Creek) passes through the Phase II.b. study area. It is a 10-mile-long tributary of the Los Angeles River, and flows through the Simi Hills of Ventura County and the San Fernando Valley of Los Angeles County and City, in Southern California. It then flows as a creek southeast through Bell Canyon (the community and geographic feature), Bell Canyon Park, and El Escorpión Park in a natural streambed. It then is altered to flow in a concrete channel. Moore Creek joins in from the west, and then it flows east, channelized through West Hills, where it is joined by the South Fork and South Branches of the same name and by Dayton Creek. Then it goes through Canoga Park to join Arroyo Calabasas (Calabasas Creek) and becomes the Los Angeles River.[11]

Precipitation and Floods

Rainfall in the Trails Master Plan Area primarily occurs during late fall through early spring (the official season is October 15 through May 15). The average annual rainfall in the San Fernando Valley immediately south of the Trails Master Plan Area is 17.7 inches. The San Fernando Valley received 25.2 inches of precipitation in the measuring year 2010–2011, approximately 42 percent more than its normal seasonal average. In the Santa Clara region, the average annual rainfall is slightly less at 17.1 inches.[12]

Flooding hazards are directly related to precipitation (rainfall) intensity and duration. Other contributing factors to flooding include the regional topography, type and extent of vegetation coverage, amount of impermeable surfaces, local slope characteristics, and available drainage facilities. Discharge during rainfall events in the Trails Master Plan Area tends to be rapid due to the steep terrain. High-intensity rainfalls, in combination with alluvial soils, sparse vegetation, erosion, and steep gradients, can result in significant debris-laden flash floods.

[11] U.S. Geological Survey. Accessed 16 March 2011. National Hydrography Dataset high-resolution flowline data. The National Map Archived 2012-04-05 at WebCite.

[12] County of Los Angeles. 2012. http://www.laalmanac.com/weather/we13.php

Flood Control Systems

The County of Los Angeles Department of Public Works maintains flood channel and debris basins between the Trails Master Plan Area and the confluences with the main stem of the Los Angeles River. The debris basins nearest the Trails Master Plan Area are the Limekiln Debris Basin (capacity 172,000 cubic yards) and Aliso Debris Basin (capacity 42,000 cubic yards) that capture debris before it flows to the Los Angeles River, and Greensbriar Debris Basin (capacity 44,500 cubic yards) that captures debris prior to it entering the Santa Clara River.[13]

In addition, the Department of Public Works utilizes a sediment placement site (SPS) near Browns Canyon for the placement of the sediment removed from the cleanout of the debris basins, reservoirs, and spreading facilities maintained by the County. Of an original capacity of 405,000 cubic yards at the Browns Canyon SPS, approximately 60,000 cubic yards of capacity remains).[14]

Additionally, the Los Angeles County Flood Control district operates a runoff station, F92C, at Santa Clara River at Old Road Bridge.[15]

100 Year Floodplain

The Federal Emergency Management Agency (FEMA) maps flood risk areas within the United States as part of the National Flood Insurance Program (NFIP). The NFIP is a federal program that allows property owners in areas of participating communities to purchase insurance against possible loss due to flooding. There are six canyons within the Trails Master Plan Area that have mapped 100-year floodplains, indicating these areas have a 1 percent chance of flooding in any given year (shown on Figure 5.1-3, *FEMA Special Flood Hazard Areas*). These canyons all drain towards the Santa Clara River and include portions of Rice Canyon, Towsley Canyon, Gavin Canyon, Lyon Canyon, and Pico Canyon. Additionally, Potrero Canyon is within the Phase II.a. area, and also drains to the Santa Clara River. There are no flood risk areas within the Phase II.b. area.

Levees or Dams

Castaic Dam is an embankment dam in northern Los Angeles County, California, near the rural unincorporated community of Castaic, located in the northern part of Los Angeles County, California. Although located on Castaic Creek, a major tributary of the Santa Clara River, Castaic Creek provides little of its water. The lake is the terminus of the West Branch of the California Aqueduct, part of the State Water Project. The dam was built by the California Department of Water Resources and construction was completed in 1973. The lake has a capacity of 325,000 acre-feet (401,000,000 square meters) and stores drinking water for the western portion of the Greater Los Angeles Area.

[13] County of Los Angeles. April 2012. The Los Angeles County Flood Control District Draft Sediment Management Strategic Plan 2012 – 2032. Department of Public Works.

[14] County of Los Angeles. August 2012. Hydrologic Report 2010–2011. Department of Public Works Water Resources Division.

[15] See http://egisgcx.isd.lacounty.gov/dpw/m/?viewer=fcs

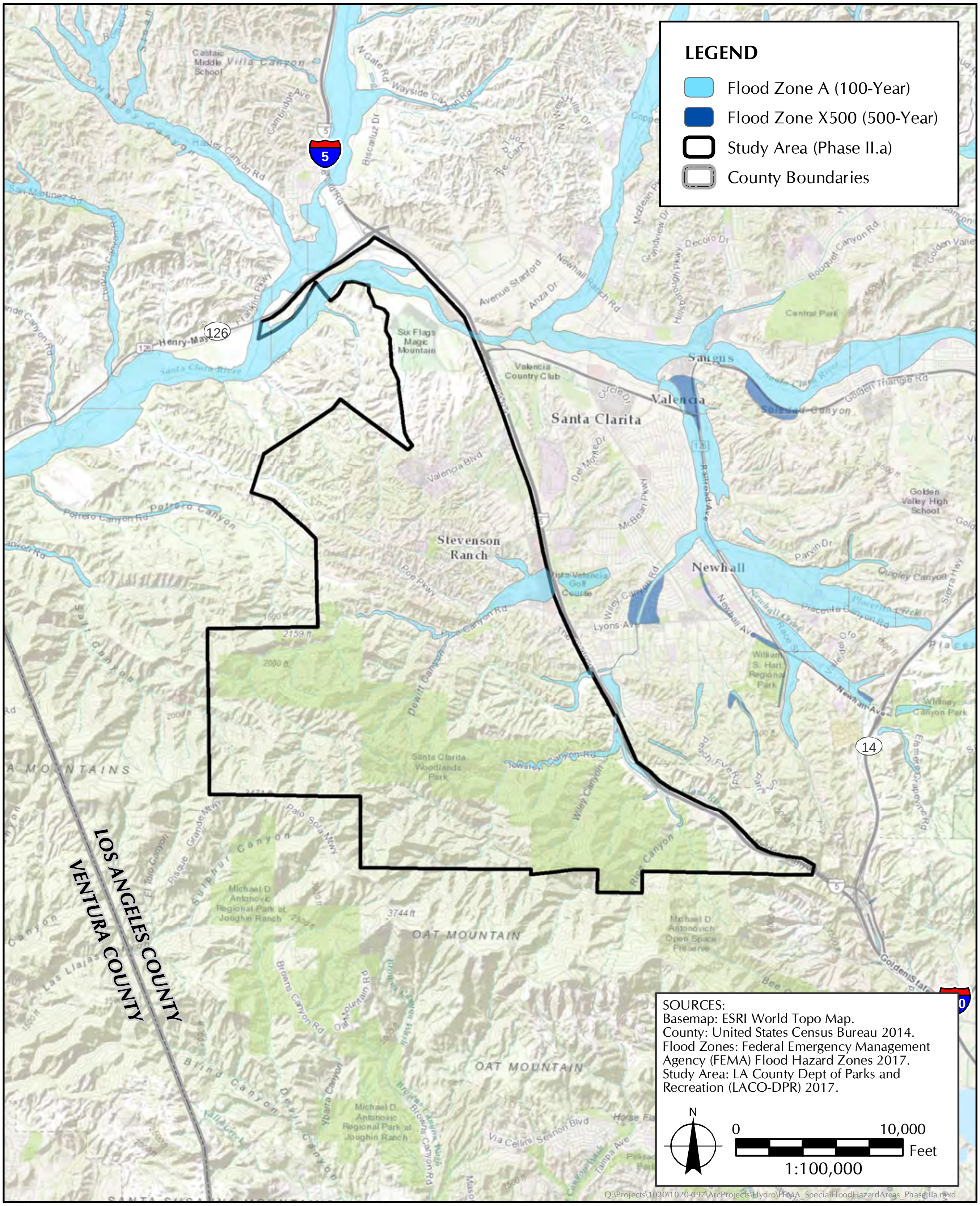

FIGURE 5.1-3A

FEMA Special Flood Hazard Areas

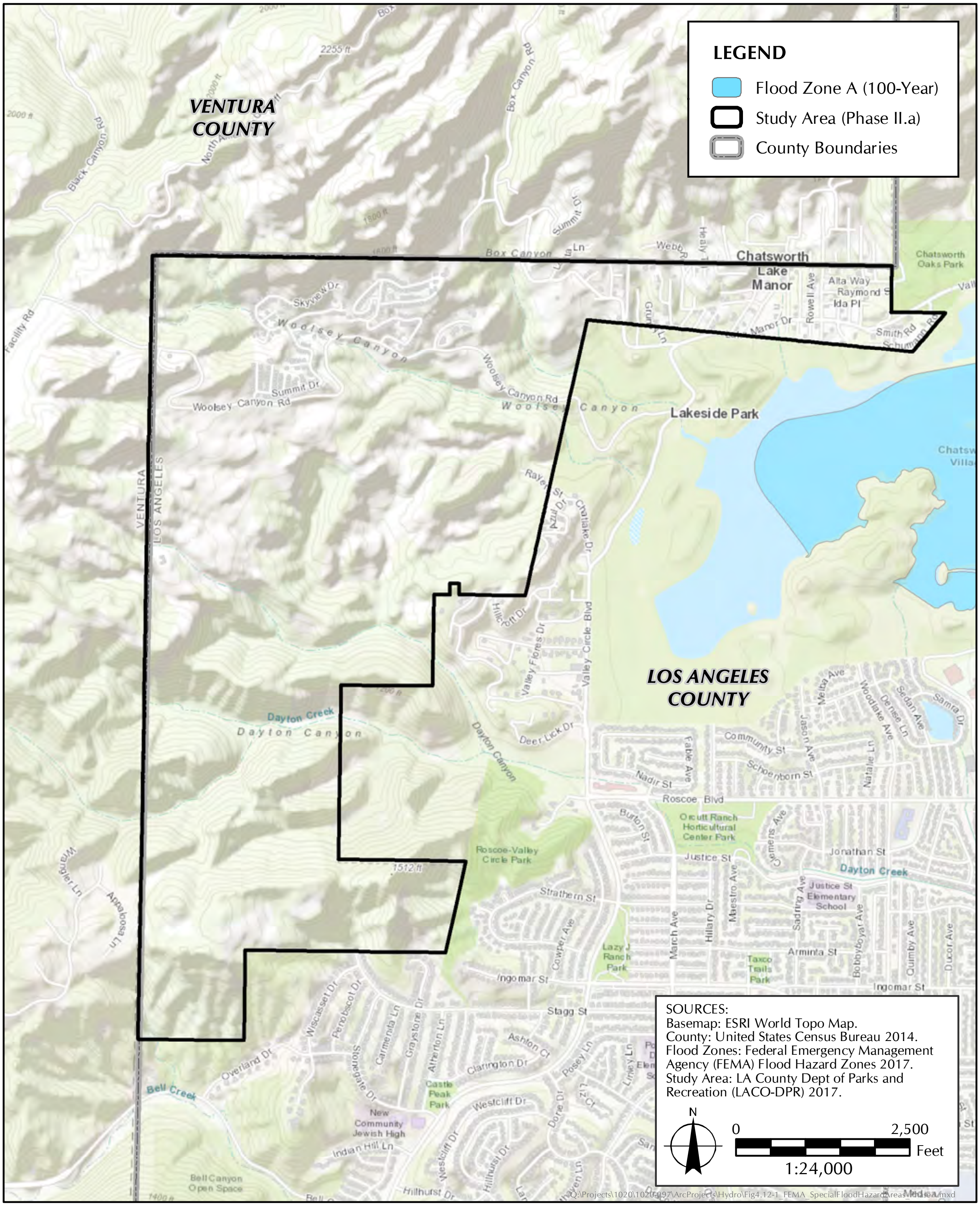

FIGURE 5.1-3B

FEMA Special Flood Hazard Areas

Seiche and Tsunami or Mudflows

A seiche is a standing wave in an enclosed or partially enclosed body of water that is triggered by a seismic event or by the constant blowing wind from the same direction over a period of time. There are no bodies of water that can produce a seiche in the Trails Master Plan Area.

A tsunami is a series of water waves caused by the displacement of a large volume of water in the ocean that have the potential to cause damage at shorelines. Earthquakes, volcanic eruptions, landslides, glacier carvings, meteorite impacts and other disturbances above or below water can cause tsunamis. There is no risk of tsunami in the Trails Master Plan Area.

Mudflows (also debris flows) develop when saturated, loose surface materials (e.g., soil, colluvium, and weathered bedrock formations) in hillside areas become unstable and, due to gravitational forces, slide down the hillside slopes. Although mudflow events likely would be relatively uncommon, the steep topography in the soil- and colluvium-covered bedrock terrain may generate mud- or debris-flows that could enter the project area.[16]

5.2 IMPACT ANALYSIS

The potential for the proposed project to result in impacts related to hydrology and water quality was analyzed in relation to the questions in Appendix G of the State CEQA Guidelines[17] and the County of Los Angeles Department of Parks and Recreation's Environmental Checklist Form. Would the project:

- Violate any water quality standards or waste discharge requirements?
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?
- Add water features or create conditions in which standing water can accumulate that could increase habitat for mosquitoes and other vectors that transmit diseases such as the West Nile virus and result in increased pesticide use?

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[16] City of Los Angeles Department of City Planning. November 1996. Safety Element of the City of Los Angeles General Plan.

[17] *California Code of Regulations*, Title 14, Division 6, Chapter 3, Sections 15000–15387, Appendix G.

- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

- Generate construction or post-construction runoff that would violate applicable stormwater NPDES permits or otherwise significantly affect surface water or groundwater quality?
- Conflict with the Los Angeles County Low Impact Development_Ordinance (L.A. County Code, Title 12, Ch. 12.84)?

- Result in point or nonpoint source pollutant discharges into State Water Resources Control Board-designated Areas of Special Biological Significance?

- Use onsite wastewater treatment systems in areas with known geological limitations (e.g. high groundwater) or in close proximity to surface water (including, but not limited to, streams, lakes, and drainage course)?

- Otherwise substantially degrade water quality?

- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, or within a floodway or floodplain?

- Place structures, which would impede or redirect flood flows, within a 100-year flood hazard area, floodway, or floodplain?

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

- Place structures in areas subject to inundation by seiche, tsunami, or mudflow?

Violate any water quality standards or waste discharge requirements?

Where grading is required to construct the trail improvements is in excess of 1 acre, it would be subject to Construction General Permit and require preparation of a SWPPP. Additionally, grading that occurs in the vicinity of an SEA may be subject to stormwater controls at the discretion of the County Building Department when disturbance is less than an acre. Most of the main drainages in the proposed project area are classified on USGS topographic maps as blue-line streams, indicating that under certain conditions the streams convey water flows. A blue-line stream would be classified as either a positive or negative control point for planning the path of a new trail. In some instances, blue-line streams can be identified as negative control points because the stream can pose a hazard to users or cause excessive damage to natural resources. However, blue-line streams can also provide access to water bodies where the Basin Plan identifies the water body as being suitable for body contact recreation or the water body provides an important visual or aesthetic experience, and the blue-line stream would then be considered a positive control point. Impacts would be reduced to below the level of significance through compliance with the County's Low Impact Development (LID) ordinance, requiring the use of two Best Management Practices (BMPs). Furthermore, all trail amenities would be designed, constructed, and maintained in accordance with the recommendations of the County Trails Manual. Therefore, impacts would be less than significant, and mitigation would not be required.

Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Depth to groundwater has been reported at 24 to 100 feet below the ground surface from the limited investigations that have been undertaken in the Trails Master Plan Area and should not be an issue for near surface grading required to accommodate new trails and improvements to existing trails. Construction water would be hauled to the site or delivered from the nearest source of domestic water supplies. The project does not include the development or use of groundwater wells.

Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

Construction activities associated with trail development would include excavation, grading, and construction of trails and small structures at trailheads and trail staging areas. These construction activities have the potential to occur within and adjacent to state and federal wetlands and or waters of the United States on-site. Impacts would include disruption of streams and wetlands as new trails are developed and dredge and fill activities associated with trail development. The discharge of dredged or fill materials in to wetlands and "waters of the United States" would be subject to the jurisdiction of the USACE pursuant to Section 404 of the CWA and would require a Water Quality Certification or Waiver of Water Quality Certification from the LARWQCB. It is possible that the work could be authorized pursuant to one of the preauthorized Nationwide Permits. The alteration of any water of the State would be subject to the jurisdiction of the CDFW pursuant to Section 1600 of the State Fish and Game Code. Conformance with the mitigation measures required to use a Nationwide Permit, or obtain an individual permit under Section 404 of the Clean Water Act, or a Lake and Streambed Alteration Agreement under Section 1600 of the State Fish and Game Code, would reduce impacts to below the level of significance. Impacts would be further reduced through compliance with the County's LID ordinance. Therefore, impacts would be less than significant, and mitigation would not be required.

Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Construction activities associated with trail development would include excavation, grading, and construction of trails and small structures at trailheads and trail staging areas. These construction activities have the potential to occur within and adjacent to state and federal wetlands and or waters of the United States on-site. Impacts would include disruption of streams and wetlands as new trails are developed and dredge and fill activities associated with trail development. The discharge of dredged or fill materials in to wetlands and waters of the United States would be subject to the jurisdiction of the USACE pursuant to Section 404 of the CWA and would require a Water Quality Certification or Waiver of Water Quality Certification from the LARWQCB. It is possible that the work could be authorized pursuant to one of the pre-authorized Nationwide Permits. The alteration of any water of the State would be subject to the jurisdiction of the CDFW pursuant to Section 1600 of the State Fish and Game Code. Conformance with the mitigation measures required to use a Nationwide Permit, or obtain an individual permit under Section 404 of the Clean Water Act, or a Lake and Streambed Alteration Agreement under Section 1600 of the State Fish and Game Code, would reduce impacts to below the level of significance. Impacts would be further reduced through compliance with the County's LID ordinance. Therefore, impacts would be less than significant, and mitigation would not be required.

Add water features or create conditions in which standing water can accumulate that could increase habitat for mosquitoes and other vectors that transmit diseases such as the West Nile virus and result in increased pesticide use?

The proposed project would result in no impacts related to increasing habitat for mosquitoes or other vectors that transmit diseases. The proposed project would not add water features or create conditions in which standing water would accumulate or that would increase habitat for mosquitoes and other vectors that transmit diseases such as the West Nile virus and result in increased pesticide use. Additionally, Los Angeles County has a "pack it in…pack it out" policy. This common saying is a simple yet effective way to get hikers to take their trash home with them. Furthermore, all trail amenities would be designed in accordance with the recommendations of the County Trails Manual. Therefore, there would be no impact, and mitigation would not be required.

Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

The proposed project would not create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff. Most of the jurisdiction areas are ephemeral areas that can be crossed without engineered solutions. The proposed project would not include the construction of stormdrains. Procedures from the County's Low Impact Development (LID) Standards Manual would be followed to determine the difference in the proposed project's pre- and post-development runoff volumes and potential pollutant loads. Therefore, there would be no impact, and mitigation would not be required.

Generate construction or post-construction runoff that would violate applicable stormwater NPDES permits or otherwise significantly affect surface water or groundwater quality?

Procedures from the County's LID Standards Manual would be followed to determine the difference in the proposed project's pre- and post-development runoff volumes and potential pollutant loads. Where grading is required to construct the trail improvements is in excess of 1 acre, it would be subject to General Construction Permit and require preparation of a SWPPP. Additionally, grading that occurs in the vicinity of an SEA may be subject to storm water controls at the discretion of the County Building Department when disturbance is less than an acre. Therefore, impacts would be less than significant, and mitigation would not be required.

Conflict with the Los Angeles County Low Impact Development Ordinance (L.A. County Code, Title 12, Ch. 12.84)?

The County's LID Standards Manual requires developments to manage stormwater runoff. Developments are categorized as Designated or Non-Designated. The proposed project is considered new development located in or directly adjacent to or discharging directly to an SEA, as defined in Section 22.08.190 of Title 22 of the LID Development Standards, which will discharge stormwater runoff that is likely to impact a sensitive biological species or habitat and create 2,500 square feet or more of impervious surface area. The County's LID ordinance does not require a specific reduction in pollutant discharges. BMPs listed for Non-Designated Projects are not required to meet a specific pollutant load reduction or to retain a specified amount of runoff. They are only intended to reduce a development's pollutant load, but not necessarily to reduce all pollutant loads to a pre-development condition. Development of the proposed project would result in an increase of pollutant discharges. Procedures from the County's LID Standards Manual would be followed to determine the difference in the proposed project's pre- and post-development runoff volumes and potential pollutant loads. All development would occur in compliance with the County's LID Ordinance. Therefore, there would be no impact, and mitigation would not be required.

Result in point or nonpoint source pollutant discharges into State Water Resources Control Board–designated Areas of Special Biological Significance?

The proposed project would result in no impact to hydrology and water quality regarding resulting in a point or nonpoint pollutant discharge into State Water Resources Control Board (SWRCB)-designated Areas of Special Biological Significance. Areas of special biological significance (ASBS) "are a subset of state water quality protection areas, and require special protection as determined by the State Water Board pursuant to the California Ocean Plan...." (emphasis added). The Ocean Plan states that: "Waste shall not be discharged to areas designated as being of special biological significance. Discharges shall be located a sufficient distance from such designated areas to assure maintenance of natural water quality conditions in these areas." This absolute discharge prohibition in the Ocean Plan applies unless an "exception" is granted.[18] The closest area of ASBS is Area 24, Laguna Point to Latigo Point.[19] There are no Areas of Special Biological Significance within the study area, and drainages within the study area are not tributaries into Areas of Special Biological Significance. Therefore, impacts would be less than significant, and mitigation would not be required.

Use onsite wastewater treatment systems in areas with known geological limitations (e.g. high groundwater) or in close proximity to surface water (including, but not limited to, streams, lakes, and drainage course)?

The proposed project would not use onsite wastewater treatment systems in areas with known geological limitations or in close proximity to surface water. Therefore, impacts would be less than significant, and mitigation would not be required.

Otherwise substantially degrade water quality?

The Santa Clara River is an impaired water body within the Phase II.a boundary (see Figure 5.1-1). Where grading is required to construct the trail improvements in excess of 1 acre, it would be subject to the General Construction Permit and require preparation of a SWPPP. Additionally, grading that occurs in the vicinity of an SEA may be subject to storm water controls at the discretion of the County Building Department when disturbance is less than an acre. Furthermore, all trail amenities would be designed, constructed, and maintained in accordance with the

[18] State Water Resources Control Board. 21 February 2012. ASBS Program Final Environmental Impact Report. Pp. 6–7.

[19] State Water Resources Control Board. Accessed 19 October 2017. Map of California's Areas of Special Biological Significance. Available at: https://www.waterboards.ca.gov/water_issues/programs/ocean/asbs_map.shtml

recommendations of the County Trails Manual. Therefore, impacts would be less than significant, and mitigation would not be required.

Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, or within a floodway or floodplain?

The proposed project would have no impacts related to placing housing with a 100-year flood hazard area. The proposed project would not include the construction of new or relocation of existing housing.

Place structures, which would impeded or redirect flood flows, within a 100-year flood hazard area, floodway, or floodplain?

The proposed project would result in less than significant impacts to hydrology and water quality regarding placing structures within a 100-year flood hazard area. There are six canyons within the project study area that have mapped 100-year floodplains, indicating these areas have a 1 percent chance of flooding in any given year (see Figure 5.1-3, *FEMA Special Flood Hazard Areas*, in Appendix F). These canyons all drain towards the Santa Clara River and include portions of Rice Canyon, Towsley Canyon, Gavin Canyon, Lyon Canyon, and Pico Canyon. Additionally, Potrero Canyon is within the Phase II.a area, and also drains to the Santa Clara River. There are no flood risk areas within the Phase II.b area. The proposed project would include the construction of new or relocation of existing structures. However, the proposed structures would be required to be designed, constructed, and maintained in accordance with the recommendations of the County Trails Manual, which would reduce impacts to below the level of significance. Therefore, impacts would be less than significant, and mitigation would not be required.

Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

The proposed project would result in less than significant impacts to hydrology and water quality regarding exposing people or structures to risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam. The project area is near the Castaic Dam. The Castaic Dam is an embankment dam in northern Los Angeles County, California, near the rural unincorporated community of Castaic, located in the northern part of Los Angeles County, California. The dam was built by the California Department of Water Resources and construction was completed in 1973. The lake has a capacity of 325,000 acre-feet (401,000,000 square meters) and stores drinking water for the western portion of the Greater Los Angeles Area. The distance from Castaic Dam to the Phase II.a area is 5.2 miles south; the distance from Castaic Dam to Phase II.b area is 19.3 miles south; the distance from Castaic Dam to the nearest proposed trail corridor (segment ESC1 of "Entrada to Santa Clara River" trail corridor) is 5.8 miles south. Floods that could result from failure of the Castaic Dam could expose people or structures to a significant risk of loss, injury or death involving flooding. However, the proposed project would not substantially affect this risk. Furthermore, all trail amenities would be designed in accordance with the recommendations of the County Trails Manual. Therefore, impacts would be less than significant, and mitigation would not be required.

Place structures in areas subject to inundation by seiche, tsunami, or mudflow?

The proposed project would not place structures in areas subject to inundation by seiche or tsunami. The project area is approximately 12 miles from a tsunami zone. Mudflows (also debris flows) develop when saturated, loose surface materials (e.g., soil, colluvium, and weathered bedrock formations) in hillside areas become unstable and, due to gravitational forces, slide down the hillside slopes. Although mudflow events likely would be relatively uncommon, the steep topography in the soil- and colluvium-covered bedrock terrain may generate mud- or debris-flows that could enter the project area from the hillside areas. However, the proposed project would be required to be designed in accordance with the recommendations of the County Trails Manual, which would reduce impacts to below the level of significance.

5.3 MITIGATION RECOMMENDATIONS

No mitigation measures would be required.

Level of Significance after Mitigation

Impacts to hydrology and water quality would be less than significant.

SECTION 6.0
REFERENCES

California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000–15387, Appendix G.

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Appendix G

Noise Technical Report

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN – PHASE II

NOISE TECHNICAL REPORT

PREPARED FOR:

COUNTY OF LOS ANGELES
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NOVEMBER 2, 2017

This Noise Technical Report documents the results of the noise evaluation that was undertaken in support of the proposed Santa Susana Mountains Trails Master Plan – Phase II (SSMPMP-PII, or proposed project). Based on the results of the noise monitoring and modelling conducted by Sapphos Environmental, Inc. in June 2017, the location of sensitive receptors, and construction and operation activities associated with the proposed project, there would be no anticipated significant impacts related to the construction, operation, or maintenance of the proposed trail elements related to exceeding the standard for ambient noise established by the County of Los Angeles Noise Ordinance or as a result of the exposure of sensitive receptors to excessive noise or ground-borne vibration, a substantial permanent increase in ambient noise levels, a substantial temporary increase in noise levels, or exposure to excessive noise from public or private airports for people residing or working in new structures. All impacts related to noise and vibration from construction, operation, and maintenance of trails would be avoided by complying with the County Noise Ordinance by limiting construction and maintenance activities to 7:00 a.m. to 7:00 p.m. on weekdays and Saturdays, and prohibiting work on federal holidays and Sundays, along with limiting noise levels to below 75 dBA for mobile equipment and 60 dBA for stationary equipment at sensitive receptor locations through the use of noise-attenuating barriers, baffles, or blankets.

The evaluation identified 510 parcels with potentially sensitive receptors (primarily residential land uses) within 251 feet of the proposed trail alignments in the northeast portion of the Phase II.a study area in the Stevenson Ranch community of Santa Clarita Valley, California; and the northern and southwest portion of the Phase II.b study area near the Canoga Park, Chatsworth, and West Hills communities of the City of Los Angeles, California. The results of the noise monitoring and modeling demonstrated that, when compared to trail operations and maintenance, trail construction activities generate the greatest increases in ambient noise levels and that a separation of a minimum of 251 feet between construction and the nearest sensitive receptor is sufficient to avoid significant impacts to ambient noise levels and sensitive receptors. Impacts to sensitive receptors within 251 feet would be avoided through the use of noise-attenuating barriers, baffles, or blankets.

The proposed project would not result in noise impacts in relation to exposure to persons residing or working near airports to excessive noise levels. The proposed project area is not located within 2 miles of an airport land use area. There are no public or private airports within 2 miles of the proposed project area. The proposed project study area is sufficiently removed from public and private airports to protect workers engaged in construction or maintenance of the trails from exposure to excessive noise levels. Similarly, recreational users would not be exposed to excessive noise levels from an airport.

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SECTION 1.0
INTRODUCTION

This Noise Technical Report provides the County of Los Angeles (County) with the substantial evidence used to make a determination that there would be no anticipated significant impacts related to the construction, operation, or maintenance of the proposed Santa Susana Mountains Trails Master Plan – Phase II (SSMTMP-PII or proposed project). All impacts related to noise and vibration from construction, operation, and maintenance of trails would be avoided by complying with the County Noise Ordinance by limiting construction and maintenance activities to 7:00 a.m. to 7:00 p.m. on weekdays and Saturdays, and prohibiting work on federal holidays and Sundays, along with limiting noise levels to below 75 A-weighted decibels (dBA) for mobile equipment and 60 dBA for stationary equipment at sensitive receptor locations.

1.1 CEQA COMPLIANCE

The County of Los Angeles Department of Parks and Recreation (DPR) proposes to complete the SSMTMP-PII, ultimately to amend the Parks and Recreation Element of the Los Angeles County General Plan 2035 (County General Plan) to include the SSMTMP-PII, which would guide future trail development and recommend improvements to existing trails. The proposed project would ultimately result in the construction and use of trails in public and private lands, some of which may involve the expenditure of public funds, and thus constitutes a project pursuant to the California Environmental Quality Act (CEQA). These trails would be located in the unincorporated territory of Los Angeles County; therefore, the County would be the Lead Agency pursuant to CEQA.

1.2 PURPOSE

The purpose of the Noise Technical Report is to support the County in development of a Master Plan that would minimize the impacts on the surrounding community. It is understood that the County expects to move forward with Phase II of the Trails Master Plan and seeks funding for construction, operation, and maintenance of the Trails Master Plan. This Noise Technical Report provides the requisite information related to noise impacts to support the County's decision-making process in relation to the Trails Master Plan. The evaluation of Phase II of the Trails Master Plan to result in significant impacts to noise was undertaken in accordance with Appendix G of the State of California Environmental Quality Act (CEQA) Guidelines and the Los Angeles County General Plan 2035. The analysis contained herein for Phase II can be extrapolated to assess the potential for the larger Trails Master Plan to result in significant impacts to noise as currently conceived by the County.

1.3 INTENDED AUDIENCE

This Noise Technical Report provides information for consideration by DPR and the design team, Alta Planning+Design, engaged in the development of the proposed project. The substantial evidence will be available for the responsible and trustee agencies, and the public, including property owners, during circulation of the draft environmental document for public review. Ultimately, the Noise Technical Report will be used by the County Board of Supervisors to support their decision-making process related to the proposed project. The Noise Technical Report will also inform the County and private parties in the ultimate development, operation, and maintenance of trails in the plan area.

1.4 SCOPE

In May 2015, the County adopted the first phase of the Santa Susana Mountains Trails Master Plan (SSMFTMP), which involved the extension of the 35.7 miles of existing County-, City-, and Conservancy-managed trails in the Phase I and Phase II study areas by approximately 35.9 miles with 22 proposed trail segments, for a total of approximately 71.5 miles of trails. In 2017, the County initiated planning efforts for further development of the Phase II study area, which has been expanded to Phase II.a and II.b. This assessment is based on a review of the Noise Element of the Los Angeles County General Plan 2035, Los Angeles County Municipal Code, the Santa Clarita Valley Area Plan, and the Santa Clarita City Municipal Code as well as a site survey performed to measure and record baseline data to characterize noise levels within the proposed project area.

1.5 TECHNICAL TERMINOLOGY

Sensitive Receptors. Areas with noise-sensitive receptors are locations in which the presence of unwanted sound could adversely affect or disrupt activities associated with the land use at the specified location. Land uses such as residences, schools, libraries, churches, and hospitals are generally more sensitive to noise than industrial and commercial land uses. These particular locations are considered to be noise-sensitive receptors. Baseline data are collected at the locations of existing noise-sensitive receptors to determine the ambient noise levels and if noise from the implementation of the proposed plan would result in significant increases to these levels.

Noise Characteristics. Noise is defined as unwanted sound (Table 1.5-1, *Definitions*). The human response to environmental noise is subjective and varies considerably from individual to individual. The effects of noise can range from interference with sleep, concentration, and communication, to the causation of physiological and psychological stress, and, at the highest intensity levels, hearing loss.

TABLE 1.5-1
DEFINITIONS

dBA	A-weighted decibels (dBA) are an expression of the relative loudness of sounds in air as perceived by the human ear. In the A-weighted system, the decibel values of sounds at low frequencies are reduced compared with unweighted decibels, in which no correction is made for audio frequency.
L_{eq}	The equivalent-continuous sound (L_{eq}) is the level of a constant sound, expressed in decibels (dB), which in a given time period ($T = T_2 - T_1$) has the same energy as a time varying sound.
CNEL	The Community Noise Equivalent Level (CNEL) is the average sound level over a 24-hour period, with a penalty of 5 dB added between the hours of 7:00 p.m. and 10:00 p.m., and a penalty of 10 dB added for the nighttime hours between 10:00 p.m. and 7:00 a.m. These increases account for reduced ambient noise levels during these time periods and increased human sensitivity to noise during the quieter periods of the day.
Ambient noise	The level of the total noise in an area.
Point source	A single identifiable, localized source of noise.
Sensitive receptors	Sensitive receptors include, but are not limited to, hospitals, schools, daycare facilities, playgrounds, long-term health care facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to noise impacts.
TWA	A constant sound level lasting 8 hours that would result in the equivalent sound energy as the noise that was sampled for a given threshold.

Noise Attenuation. Noise is attenuated as it propagates from the source to the receiver. Attenuation is logarithmic, rather than linear, which means:

- For line sources, such as streets, noise levels decrease by 3 to 5 dBA for every doubling of distance from the source.
- For point sources, noise levels decrease quicker, about 6 dBA, for every doubling of distance from the source
- Topography and the type of surface (paved or vegetated) also play a role in noise attenuation characteristics.

One way of estimating a person's subjective reaction to a new noise is to compare the new noise with the existing noise environment to which the person has become adapted, that is, the increase over the so-called "ambient" noise level. Research in the area of perceived impacts of various degrees of increase in dBA indicates the following:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A change in noise level of at least 5 dBA is required before any noticeable change in community response would be expected. A 5-dBA increase is often considered a significant impact.
- A 10-dBA increase is subjectively heard as approximately a doubling in loudness and almost always causes an adverse community response.

In assessing the impact of noise upon the environment, the nature and level of activities that generate the noise, the pathway through which the noise travels, the sensitivity of the receptor, the period of exposure, and the increase over the ambient noise levels are all considered. For the purposes of this analysis, sensitive receptors are defined to include single-family residences, convalescent homes, schools, auditoriums, and other similar land uses that may be affected to a greater degree by increased noise levels than industrial, manufacturing, or commercial land uses.

The noise evaluation identified sensitive noise receptors located inside and in proximity of the SSMTMP-PII project study area and included residences, schools, short-term accommodations (hotels, motels, and camps), churches, hospitals and healthcare facilities, and day-care centers. Therefore, an evaluation was undertaken to determine if such development would likely result in significant impacts, necessitating the consideration of mitigation measures. The noise evaluation not only informs the proposed project planning process, it provides the County with the information that would serve as the basis for assessment of noise in the Initial Study, pursuant to CEQA. The evaluation of noise was undertaken in accordance with Appendix G of the State CEQA Guidelines. This assessment focuses on the potential for the proposed project to exceed the standards for noise established for the County or result in the exposure of sensitive receptors to excessive ground-borne vibration, a substantial permanent increase in noise levels, or exposure to excessive noise from public or private airports for people residing or working in new structures.

Ground-Borne Vibration. Vibration is an oscillatory motion, which can be described in terms of the displacement, velocity, or acceleration. Because motion is oscillatory, there is no net movement of the vibrating element and the average of any of the motion descriptors is zero. Displacement is the easiest descriptor to understand. For a vibrating floor, the displacement is simply the distance that a point on the floor moves away from its static position. The velocity represents the instantaneous speed of the movement and the acceleration the rate of change of speed.

Although displacement is easier to understand than velocity and acceleration, it is rarely used for describing ground-borne vibration. This is because most transducers used for ground-borne vibration use either velocity or acceleration, and even more important, the response of humans, buildings, and equipment to vibration is more accurately described using velocity or acceleration.

The effects of ground-borne vibration include fellable movements of the building floors, rattling of windows, shaking of items on shelves or hangings on walls. The rumble is the noise radiated from the motion of the room surfaces. In essence, the room surfaces act like a loudspeaker. This is called ground-borne noise. In extreme cases, vibrations can cause damage to buildings.

Ground-borne vibration is almost never annoying to people who are outdoors, although the motion of the ground may be perceived.

Propagation of vibration from source to the receiver is dependent on soil conditions and on the receiving building. Vibration propagation is more efficient in stiff clay soils and shallow rocks seem to concentrate the vibration energy close to the surface and can result in ground-borne vibration problem at large distances. Factors such as layering of the soil and depth to water table can have significant effects on the propagation of ground-borne vibration. The vibration levels inside a building depend on the energy that reaches the building foundation, the coupling of the building foundation to the soil, and the propagation of vibration through the building. The general guideline is that the heavier the building is the lower the response would be to the incident vibration.

2.1 PROJECT LOCATION

The Trails Master Plan (approximately 49 square miles) is located north and west of the San Fernando Valley in the Santa Susana Mountains, in the western portion of the unincorporated area of the County of Los Angeles (Figure 2.1-1, *Regional Vicinity Map*). The Santa Susana Mountains are centrally located in the Transverse Ranges, a group of east-west trending mountains paralleling the Pacific Ocean between Santa Barbara and San Diego Counties. The proposed designation and improvement of a portion of the Johnson Motorway Trail is an element of the first phase of the Trails Master Plan (SSMFTMP).

2.2 TRAILS MASTER PLAN STUDY AREA

Phase I Area. The northern boundary of the Trails Master Plan – Phase I is defined by the southern limits of the Newhall Ranch Specific Plan Area and the northern limits of the proposed Santa Susana Mountains / Simi Hills Significant Ecological Area (SEA). The southern boundary is defined by the northern limit of the City of Los Angeles. The eastern boundary is defined by U.S. Interstate 5 (I-5). The western boundary is defined by the corporate boundary between Los Angeles and Ventura Counties (Figure 2.2-1, *Trails Master Plan Location*). The SSMFTMP is divided into two subareas or phases (see Figure 2.2-1). Phase I is the Northwest San Fernando Valley Study Area, and Phase II is the Southwest Santa Clarita Valley Study Area. Phase I includes 16,038.1 acres (25.1 square miles); the northern boundary is defined by the northern limits of the Los Angeles County Oat Mountain Planning Area, the southern boundary is defined by the northern limit of the City of Los Angeles, the eastern boundary is defined by the I-5 freeway, and the western boundary is defined by the boundary between Los Angeles and Ventura Counties.

Phase II Area. Phase II includes 8,084.4 acres (12.6 square miles). The northern boundary is defined by the northern limits of the proposed Santa Susana Mountains / Simi Hills SEA. The southern boundary is defined by the southern limits of the proposed Santa Susana Mountains / Simi Hills SEA. The eastern boundary is defined by the I-5 freeway. The western boundary is defined by the southern and eastern boundaries of the Newhall Ranch Specific Plan area.

The Trails Master Plan – Phase II has been expanded beyond the spatial extents of Phase II in the SSMFTMP and also divided into two subareas. The Phase II.a area is an approximately 22-square-mile area located in the north-facing slopes of the Santa Susana Mountains and the Santa Clarita Valley that is bound by Henry Mayo Drive (State Route [SR] 126) to the north, the I-5 freeway to the east, Phase I of the adopted SSMFTMP Area to the south, and the Newhall Ranch Specific Plan Area to the west. The Phase II.b area is an approximately 2-square-mile area located in the foothills of the Santa Monica Mountains, including Bell Canyon, Dayton Canyon, and Woolsey Canyon, west of the San Fernando Valley, that is bound by Ventura County to the north and west and the city of Los Angeles to the east and south.

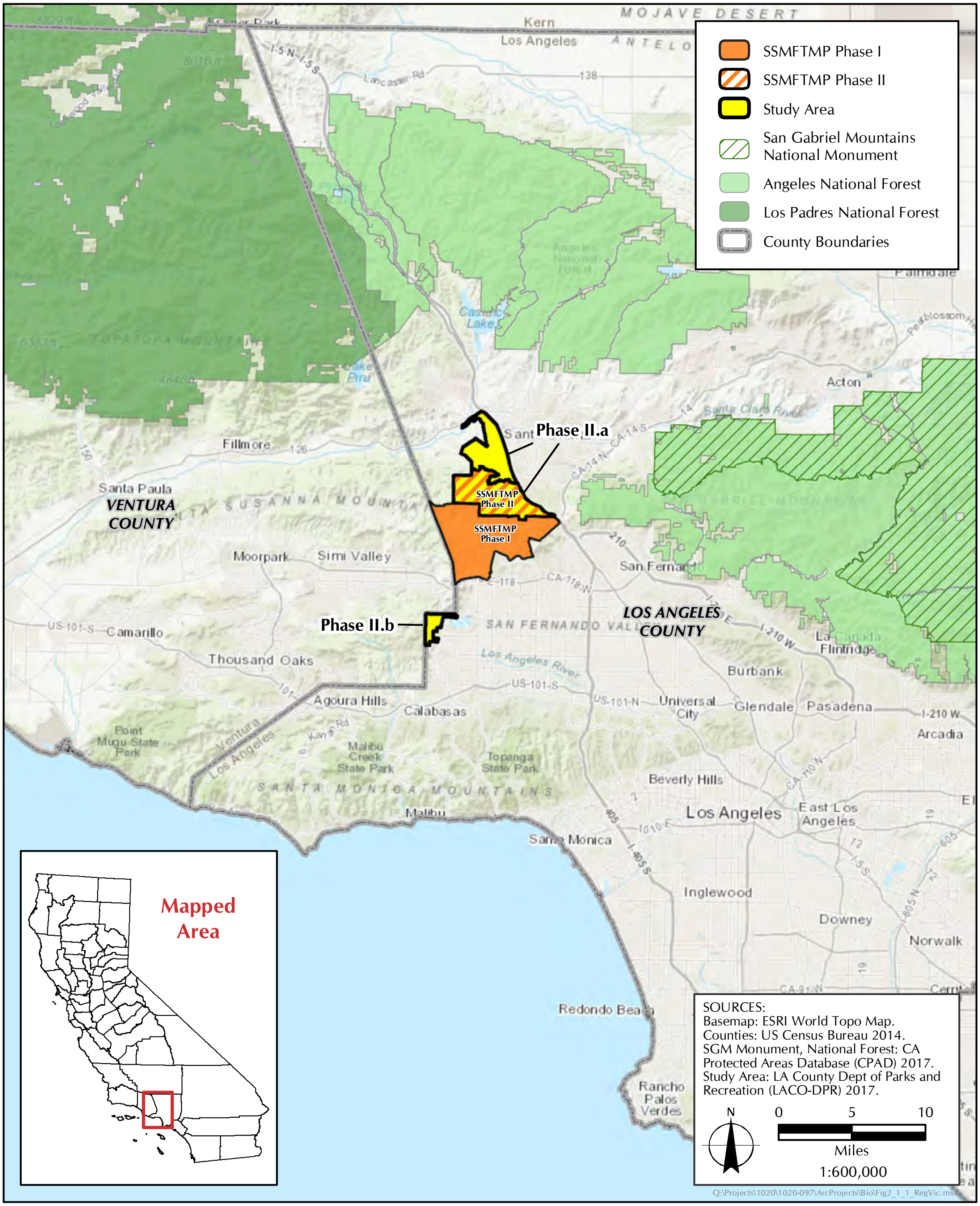


FIGURE 2.1-1

Regional Vicinity Map

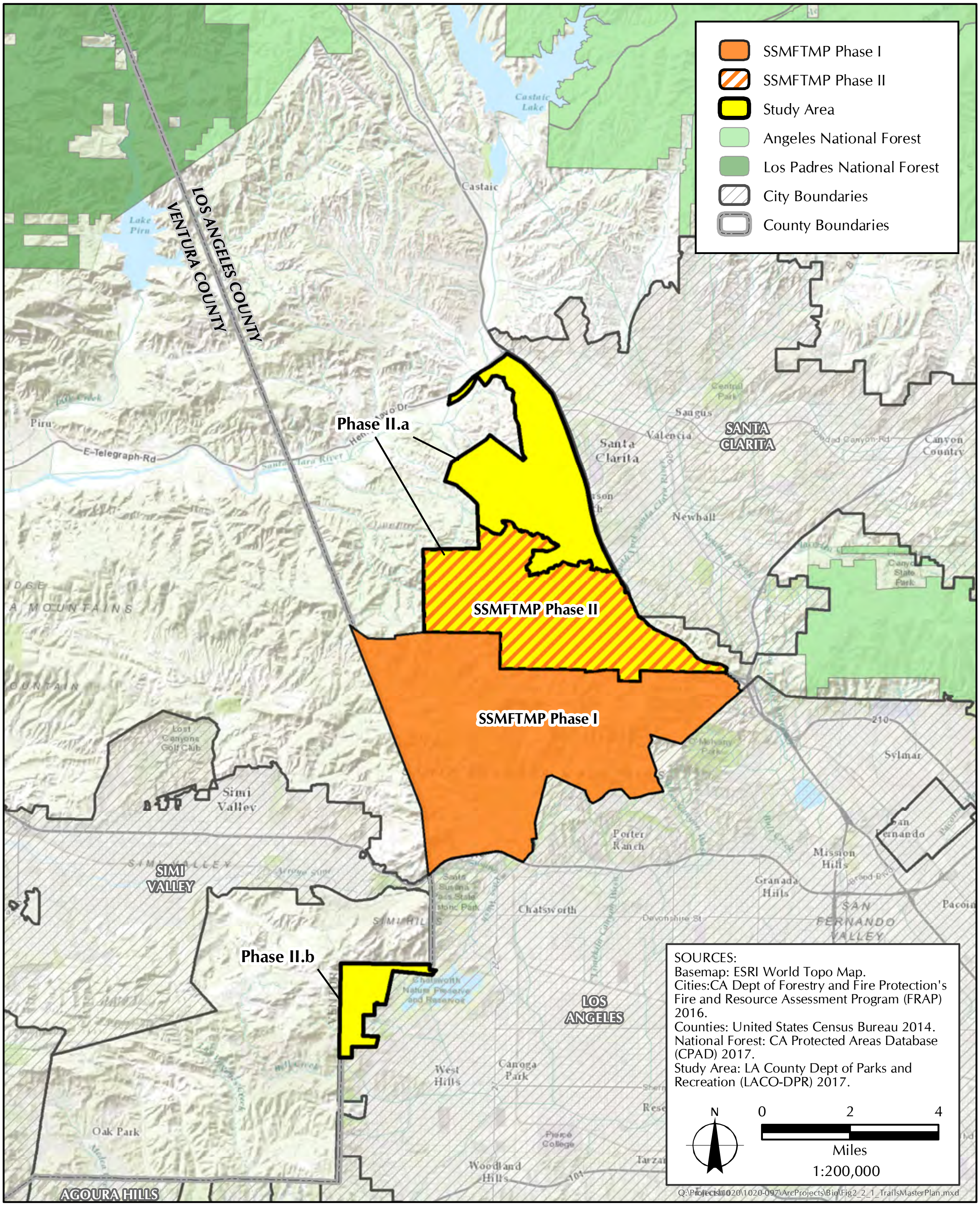


FIGURE 2.2-1

Trails Master Plan Location

Topography. The Trails Master Plan is located in the U.S. Geological Survey (USGS) 7.5-minute series, Newhall, Oat Mountain, Simi Valley East, and Val Verde, California, topographic quadrangles[1,2] and includes portions of Township 2 North, Range 16 West (San Bernardino Baseline and Meridian [SBB&M]); Sections 6 and 7, Township 2 North, Range 17 West (SBB&M), Sections 1, 2, 11, and 12; Township 3 North, Range 16 West (SBB&M), Sections 4–10, 13–24, and 26–34; and Township 3 North, Range 17 West (SBB&M), Sections 1, 2, 11–15, 22–27, and 34–36 (Figure 2.2-2, *Topographic Map with USGS 7.5-minute Quadrangle Index*). Phase I of the Trails Master Plan is located on the USGS 7.5-minute series Simi Valley East and Oat Mountain topographic quadrangles. Phase II of the Trails Master Plan is located on the Val Verde, Newhall, Simi Valley East (Santa Susana), Oat Mountain, and Calabasas topographic quadrangles. Situated along the southern flanks of the Santa Susana Mountains, the topography of the Trails Master Plan is characterized by a series of southwest draining canyons that are separated by steep-sloped and narrow ridge tops. The Trails Master Plan has elevations that range from 946 to 3,400 feet above mean sea level (msl). Vegetation in the area is characterized by a Sage and Chaparral plant communities with scattered yucca plants. Although small areas of exposed bedrock are seen along the trail corridor, much of the proposed project area is characterized by thick vegetative coverage, which is particularly dense in the canyon bottoms and at lower elevations.

2.3 PROJECT SUMMARY

The SSMTMP-PII will guide future trail development and recommend improvements to existing trails. The Trails Master Plan will provide trail users and local populations with seamless transitions throughout the proposed study area to trails of adjacent jurisdictions and prime destinations within and adjacent to the study area. The goals of the plan are to:

1. Develop a complete multi-use trail system connecting user groups and local populations to desired recreation destinations and experiences, with seamless transitions to the trails of adjacent jurisdictions, compatibility with adjacent land uses and environmental resources, and a safe and sustainable design that is consistent with the County of Los Angeles Trails Manual.

2. Develop a recreational trail system that supports low-intensity use, including mountain biking, equestrian use, and hiking, to accommodate the population increase anticipated in the Santa Clarita Valley Planning Area and San Fernando Valley Planning Area through the 2035 planning horizon consistent with the Parks and Recreation Element of the Los Angeles County General Plan 2035.

The overall work efforts will include a trails master plan and associated CEQA documentation. Individual trail alignments would be developed at a later phase of this project, which is intended to provide a trail planning framework for the study area.

[1] U.S. Geological Survey. 1969. 7.5-Minute Series, Oat Mountain, California, Topographic Quadrangle. Scale 1:24,000. Reston, VA.

[2] U.S. Geological Survey. 1969. 7.5-Minute Series, Willow Springs, California, Topographic Quadrangle. Reston, VA.

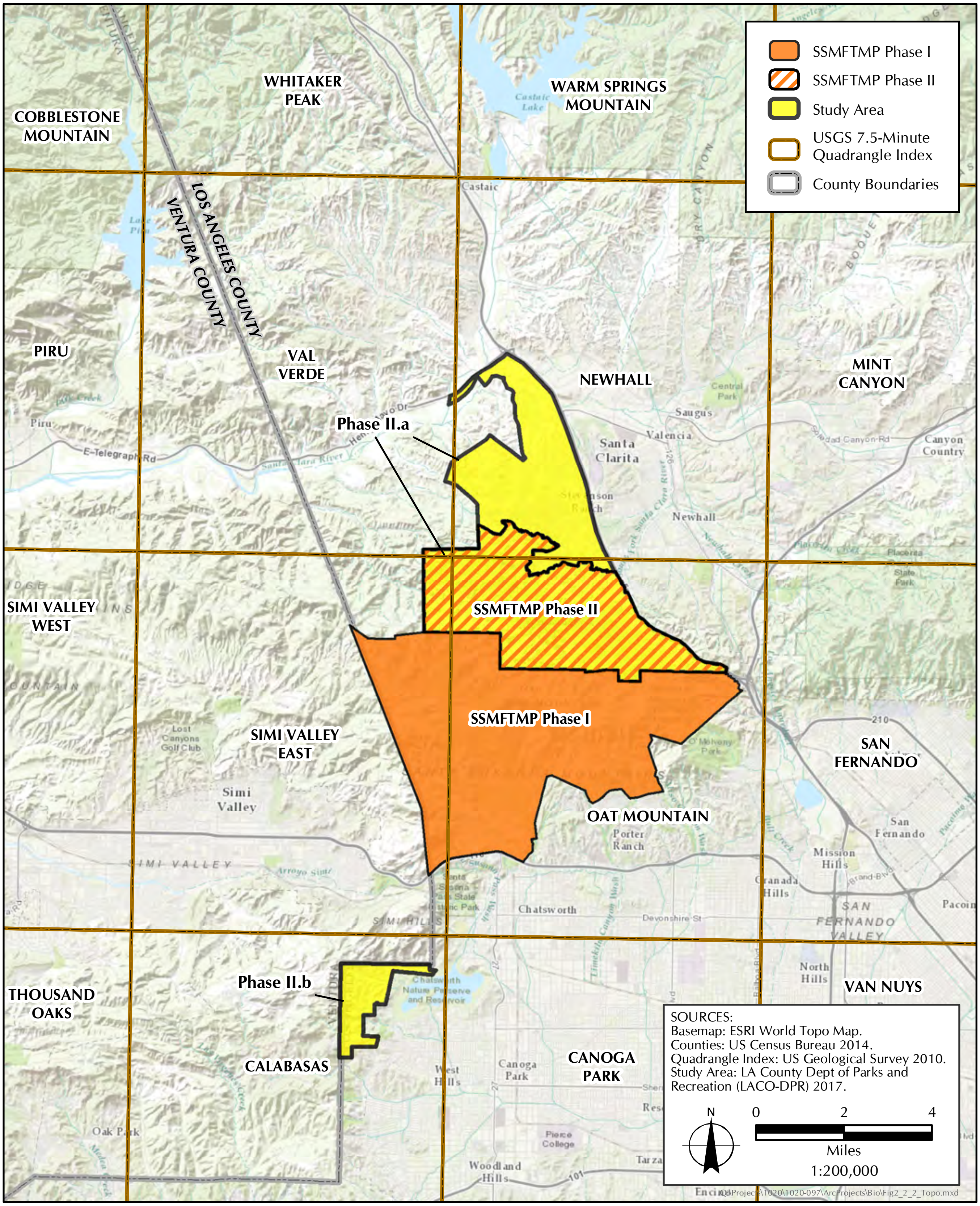


FIGURE 2.2-2

Topographic Map with USGS 7.5 Minute Quadrangle Index

The SSMTMP-PII involves approximately 70 miles of proposed new multi-use trails in the Santa Clarita Valley Planning Area and San Fernando Valley Planning Area (Figure 2.3-1, *Existing and Proposed Trails*). The trails would be multi-use and range from 3 to 12 feet wide based on site conditions, with adequate space for combined pedestrian, equestrian, and mountain biking use, in accordance with the County Trails Manual guidelines. The proposed trails would provide connections to the proposed Rim of the Valley Trail, trails in the City of Los Angeles, trails in the City of Santa Clarita, and trails in the Newhall Ranch Specific Plan, and trails within other jurisdictions as identified in the Trails Master Plan. The SSMTMP-PII identifies up to 20 potential locations for proposed facilities, including 4 trailheads, 2 bike skills areas, 2 equestrian parks, 8 trailhead and staging areas, and 4 trailheads outside the study area within the City of Los Angeles that would need to be developed by the City of Los Angeles (Figure 2.3-1). As the recommended City of Los Angeles trailheads would not be developed under jurisdiction of the County, this Report considers the 16 proposed facilities located within the SSMTMP-PII study area.

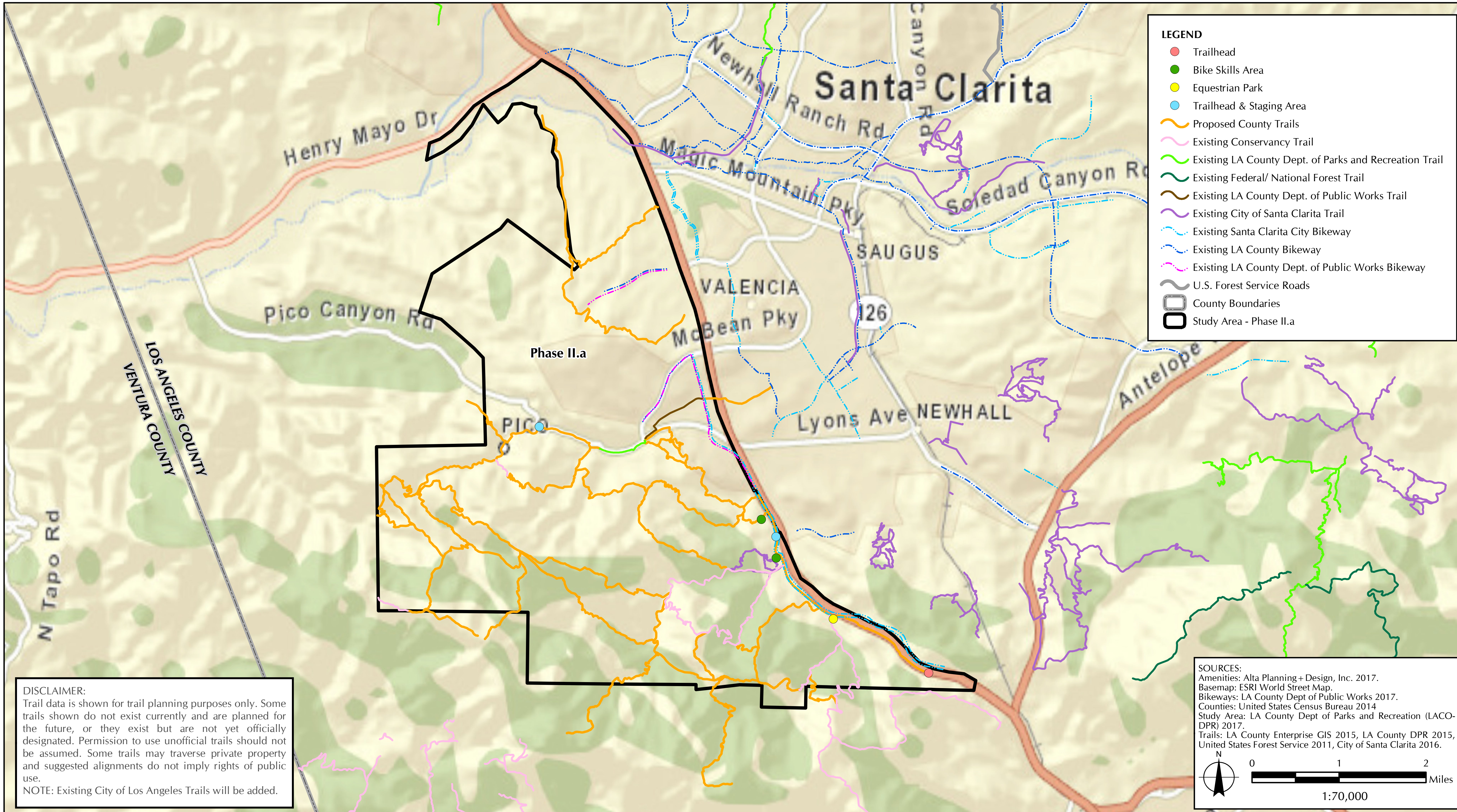
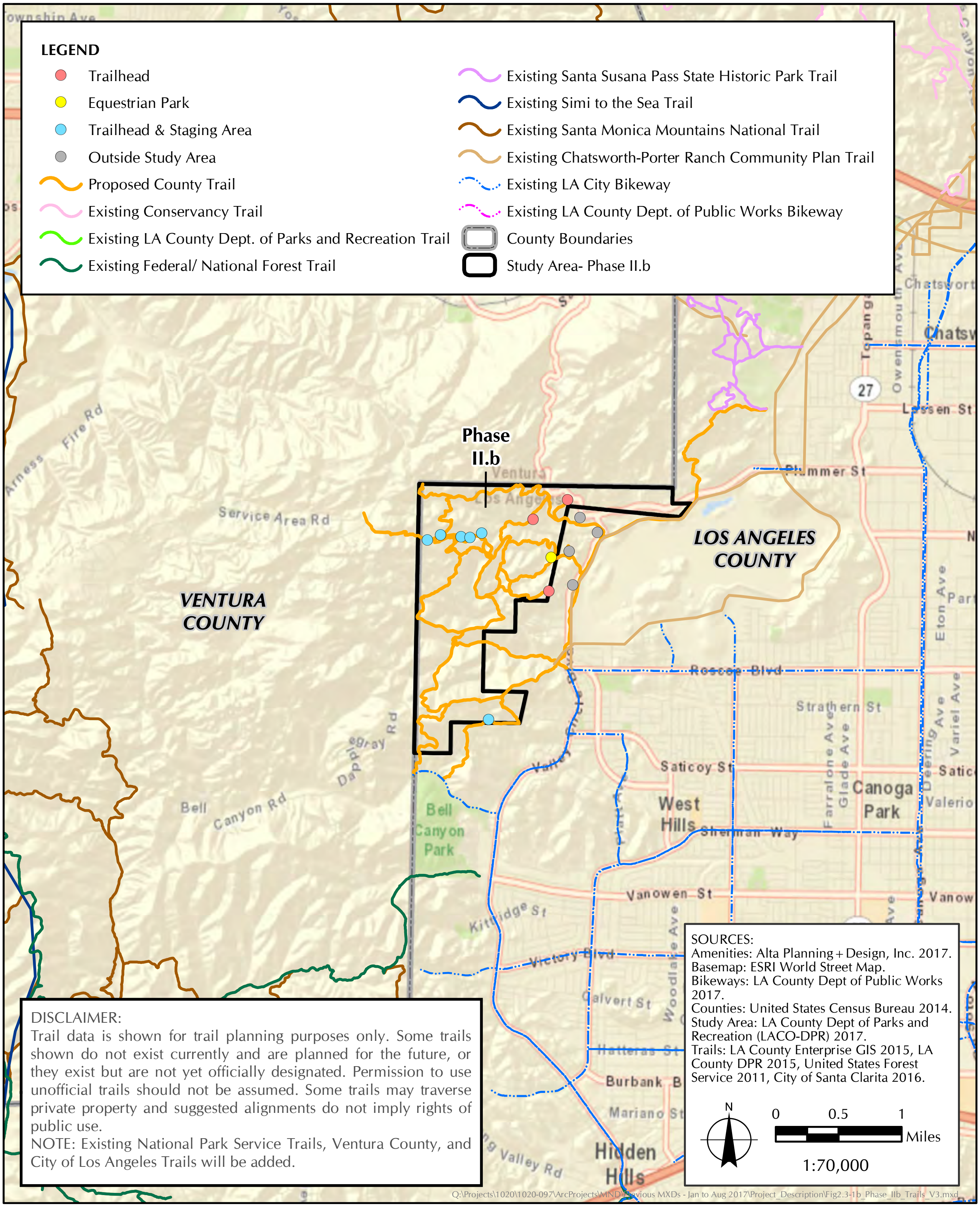


FIGURE 2.3-1a

Existing and Proposed Trails (Phase II.a)



DISCLAIMER:
Trail data is shown for trail planning purposes only. Some trails shown do not exist currently and are planned for the future, or they exist but are not yet officially designated. Permission to use unofficial trails should not be assumed. Some trails may traverse private property and suggested alignments do not imply rights of public use.
NOTE: Existing National Park Service Trails, Ventura County, and City of Los Angeles Trails will be added.

SOURCES:
Amenities: Alta Planning + Design, Inc. 2017.
Basemap: ESRI World Street Map.
Bikeways: LA County Dept of Public Works 2017.
Counties: United States Census Bureau 2014.
Study Area: LA County Dept of Parks and Recreation (LACO-DPR) 2017.
Trails: LA County Enterprise GIS 2015, LA County DPR 2015, United States Forest Service 2011, City of Santa Clarita 2016.

FIGURE 2.3-1b

Existing and Proposed Trails (Phase II.b)

SECTION 3.0
REGULATORY FRAMEWORK

3.1 FEDERAL

Noise Control Act of 1972

The adverse impacts of noise were officially recognized by the federal government in the Noise Control Act of 1972 (42 U.S. Code sections 4901–4918) which serves three purposes:

- Promulgating noise emission standards for interstate commerce;
- Assisting state and local abatement efforts; and,
- Promoting noise education and research.

The Office of Noise Abatement and Control (ONAC) was initially tasked with implementing the Noise Control Act. However, the ONAC has since been eliminated, leaving the development of federal noise policies and programs to other federal agencies and interagency committees. For example, the Occupational Safety and Health Administration (OSHA) prohibits exposure of workers to excessive sound levels. The U.S. Department of Transportation (DOT) assumed a significant role in noise control through its various operating agencies, such as the Federal Aviation Administration (FAA), which regulates noise generated by aircraft and airports. Surface transportation system noise is regulated by a host of agencies, including the Federal Transit Administration (FTA), which requires that all rail systems receiving federal funding be constructed and operated in accordance with its regulations and specifications. The Federal Railroad Administration (FRA) sets forth and enforces safety standards, including noise emissions within railroad locomotive cabs. Transit noise is regulated by the FTA, while freeways that are part of the interstate highway system are regulated by the Federal Highway Administration (FHWA). The FHWA has adopted and promulgated noise abatement criteria for highway construction projects. The federal government encourages local jurisdictions to use their land use regulatory authority to site new development to minimize potential noise impacts.

Title 14 Code of Federal Regulations, Part 150

Part 150 applies to airport noise compatibility planning and provides the procedures, standards, and methodology governing the development, submission, and review of airport noise exposure maps and airport noise compatibility programs, including the process for evaluating and approving or disapproving those programs. It provides guidance for measuring noise at airports and surrounding areas and for determining exposure of individuals to noise from the operations of an airport. Part 150 also identifies land uses that are normally compatible with various levels of exposure to noise by individuals. It provides guidance on the preparation and execution of noise compatibility planning and implementation programs.

Noise Abatement and Control, Title 24 Code of Federal Regulations, Part 51, Subpart B

The mission of Department of Housing and Urban Development (HUD) includes fostering "a decent, safe, and sanitary home and suitable living environment for every American." Accounting for acoustics is intrinsic to this mission, as an environment's safety and comfort can be compromised by excessive noise. In order to facilitate the creation of suitable living environments, HUD has developed a standard for noise criteria. The basic foundation of the HUD noise program is set out in the noise regulation 24 CFR Part 51 Subpart B, Noise Abatement and Control.

HUD's noise policy clearly requires noise attenuation measures be provided when proposed projects are to be located in high noise areas. Within the HUD Noise Assessment Guidelines, potential noise sources are examined for projects located within 15 miles of a military or civilian airport, 1,000 feet from a road, or 3,000 feet from a railroad.

HUD exterior noise regulations state that 65 dBA DNL noise levels or less are acceptable for residential land uses and noise levels exceeding 75 dBA DNL are unacceptable. HUD's regulations do not contain standards for interior noise levels. Rather, a goal of 45 dBA is set forth, and the attenuation requirements are geared toward achieving that goal. It is assumed that, with standard construction, any building will provide sufficient attenuation so that if the exterior level is 65 dBA DNL or less, the interior level will be 45 dBA DNL or less.

3.2 STATE

California Government Code Section 65302

Section 65302 of California Government Code provides a framework for general plans and their content. It requires that the noise element include implementation measures and possible solutions that address existing and foreseeable noise problems, if any. The adopted noise element shall serve as a guideline for compliance with the state's noise insulation standards. The noise element shall also identify and appraise noise problems in the community, analyze and quantify current and projected noise levels for (1) highways and freeways; (2) primary arterials and major local streets; (3) passenger and freight online railroad operations and ground rapid transit systems; (4) commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation; (5) local industrial plants, including, but not limited to, railroad classification yards; and (6) other ground stationary noise sources, including, but not limited to, military installations, identified by local agencies as contributing to the community noise environment.

Section 65302 also specifies that noise contours be shown for all of the above listed sources and be stated in terms of CNEL or day-night average level (L_{dn}). The noise contours shall be prepared on the basis of noise monitoring or following generally accepted noise modeling techniques for the various sources identified above. The noise contours shall be used as a guide for establishing a pattern of land uses in the land use element that minimizes the exposure of community residents to excessive noise.

California Noise Control Act of 1973

The California Noise Control Act (California Health and Safety Code, Division 28, section 46000 et seq), as found in the California Health and Safety Code, Division 28, § 46000 et seq., declares that excessive noise is a serious hazard to public health and welfare, and establishes the Office of Noise Control with responsibility to set standards for noise exposure in cooperation with local governments or the state legislature.

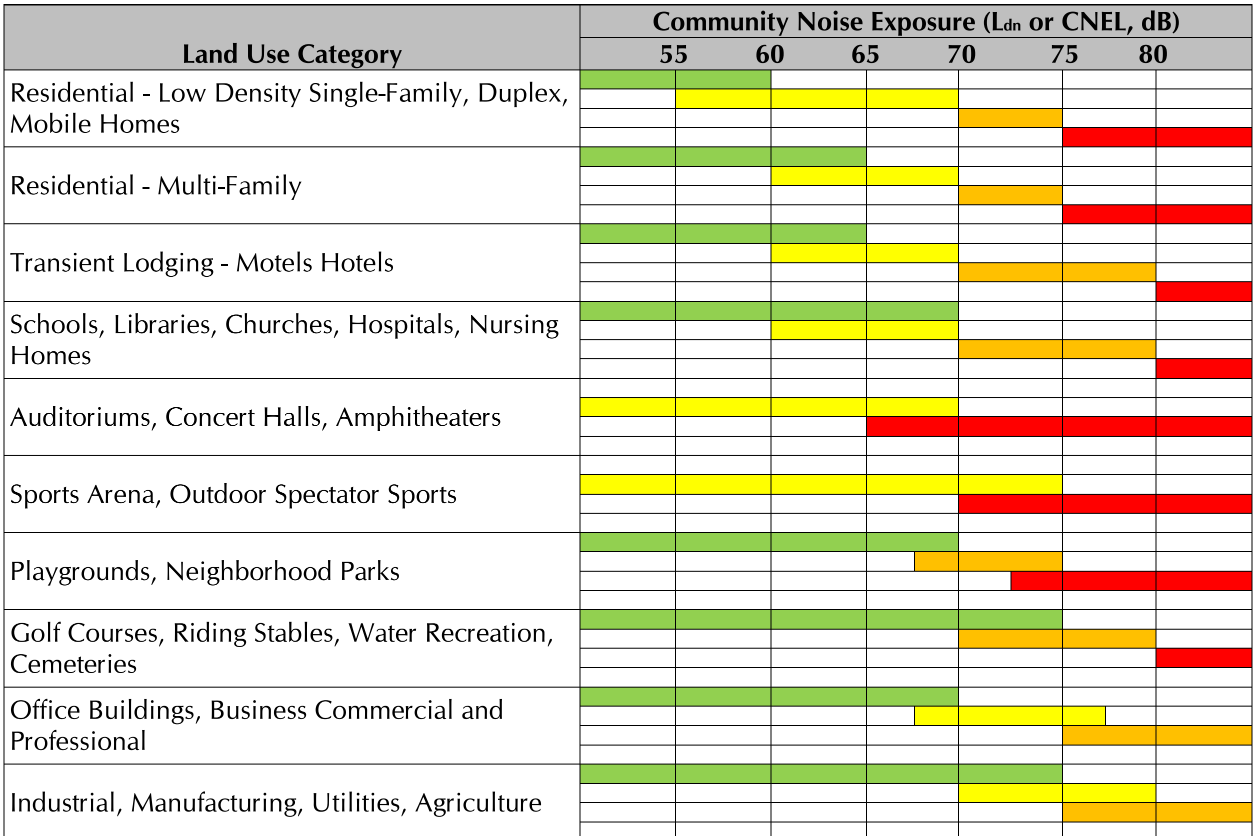
Title 24, California Code of Regulations, Part 2

The State of California has developed a Land Use Compatibility Matrix for community noise environments that further defines the four categories of acceptance and assigns CNEL values to them. In addition, the State Building Code (Title 24, California Code of Regulations [CCR], Part 2) establishes uniform minimum noise insulation performance standards to protect persons within new hotels, motels, dormitories, long-term care facilities, apartment houses, and residential units other than detached single-family residences from the effects of excessive noise, including, but not limited to, hearing loss or impairment and interference with speech and sleep. Residential structures to be located where the CNEL or L_{dn} is 60 dBA or greater are required to provide sound insulation to limit the interior CNEL to a maximum of 45 dBA. An acoustic, or noise, analysis report prepared by an experienced acoustic engineer is required for the issuance of a building permit for these structures. Conversely, land use changes that result in increased noise levels at residences of 60 dBA or greater must be considered in the evaluation of impacts to ambient noise levels. Table 3.2-1, *Normally Acceptable Noise Levels for Residential Land Use*, and Table 3.2-2, *Land Use Compatibility for Community Noise Environments*, depict noise levels for a variety of uses.

TABLE 3.2-1
NORMALLY ACCEPTABLE NOISE LEVELS FOR RESIDENTIAL LAND USE

Land Use	Acceptable Range (dBA)
Residential – low-density single-family, duplex, mobile homes	50–60
Residential – multiple family	50–65

TABLE 3.2-2
LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENTS



Normally Acceptable - Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable - New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply system or air conditioning will normally suffice.

Normally Unacceptable - New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable - New construction or development should generally not be undertaken.

SOURCE:
Adapted from: Governor's Office of Planning and Research. 2003. *State of California General Plan Guidelines. Appendix C, Noise Element Guidelines.* Figure 2. Sacramento, CA.

3.3 COUNTY

Los Angeles County Municipal Code

The County maintains the health and welfare of its residents with respect to noise through nuisance abatement ordinances and land use planning. The County Noise Control Ordinance, Title 12 of the County Code, was adopted by the Los Angeles County Board of Supervisors in 1977 "to control unnecessary, excessive, and annoying noise and vibration." It declares that the purpose of the County policy is to "maintain quiet in those areas which exhibit low noise levels and to implement programs aimed at reducing noise in those areas within the county where noise levels are above acceptable values."[3]

On August 14, 2001, the Los Angeles County Board of Supervisors approved an ordinance amending Title 12 of the County Code to prohibit loud, unnecessary, and unusual noise that disturbs the peace and/or quiet of any neighborhood or which causes discomfort or annoyance to any reasonable person of normal sensitivity residing in the area. Regulations can include requirements for sound barriers, mitigation measures to reduce excessive noise, or the placement and orientation of buildings, and can specify the compatibility of different uses with varying noise levels, as shown in Table 3.3-1, *Los Angeles County Community Noise Criteria*.

TABLE 3.3-1
LOS ANGELES COUNTY COMMUNITY NOISE CRITERIA

Noise Zone	Land Use of Receptor Property	Time	Noise Levels (dBA) Std 1 L50 30 min/hr	Std 2 L25 15 min/hr	Std 3 L8.3 5 min/hr	Std 4 L1.7 1 min/hr	Std 5 L0 At No Time
I	Noise Sensitive	Anytime	45	50	55	60	65
II	Residential	10 p.m. – 7 a.m.	45	50	55	60	65
		7 a.m. – 10 p.m.	50	55	60	65	70
III	Commercial	10 p.m. – 7 a.m.	55	60	65	70	75
		7 a.m. – 10 p.m.	60	65	70	75	80
IV	Industrial	Anytime	70	75	80	85	90

SOURCE: County of Los Angeles, *Municipal Codes*, Title 12, Chapter 8, *Noise Control*. Section 12.08.390.

In addition to the community noise criteria, the Los Angeles County Municipal Code establishes interior noise standards for multifamily residential dwellings. According to the Section 12.08.400 of the Los Angeles County Municipal Code, no person shall operate or cause to be operated within a dwelling unit, any source of sound, or allow the creation of any noise, which causes the noise level when measures inside a neighboring receiving dwelling to exceed the following standards:[4]

- Standard No. 1: The applicable interior noise level for cumulative period of more than five minutes in any hour; or

[3] County of Los Angeles. *Municipal Codes*, Title 12, Chapter 8, *Noise Control*.

[4] County of Los Angeles. *Municipal Codes*, Title 12, Chapter 8, *Noise Control*.

- Standard No. 2: The applicable interior noise level plus 5 dB for a cumulative period or more than one minute in any hour; or
- Standard No. 3: The applicable interior noise level plus 10 dB or the maximum measured ambient noise level for any period of time.

Furthermore, the following interior noise levels for multifamily residential dwellings shall apply, unless otherwise specifically indicated, within all such dwellings with windows in their noise seasonal configuration (Table 3.3-2, *Los Angeles County Interior Noise Standards*).

TABLE 3.3-2
LOS ANGELES COUNTY INTERIOR NOISE STANDARDS

Noise Zone	Designated Land Use	Time Interval	Allowable Interior Noise Level (dB)
All	Multifamily	10 p.m.–7 a.m.	40
	Residential	7 a.m.–10 p.m.	45

SOURCE: County of Los Angeles, *Municipal Codes*, Title 12, Chapter 8, *Noise Control*.

Section 12.08.440 of the Los Angeles County Municipal Code states that operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real property line, except for emergency work of public service utilities or by variance issued by the health office is prohibited. If noise disturbance crosses a residential or commercial property line, the County has established maximum noise levels for both mobile and stationary equipment (Table 3.3-3, *County of Los Angeles Construction Noise Restrictions*).

TABLE 3.3-3
COUNTY OF LOS ANGELES CONSTRUCTION NOISE RESTRICTIONS

Time Frame	Single-Family Residential	Multifamily Residential	Semiresidential/ Commercial
Mobile equipment*			
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m. (daytime)	75 dBA	80 dBA	85 dBA
Daily, 8:00 p.m. to 7:00 a.m. (nighttime) and all day Sunday and legal holidays	60 dBA	64 dBA	70 dBA
Stationary equipment**			
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m. (daytime)	60 dBA	65 dBA	70 dBA
Daily, 8:00 p.m. to 7:00 a.m. (nighttime) and all day Sunday and legal holidays	50 dBA	55 dBA	60 dBA

NOTE: * = Maximum noise levels for nonscheduled, intermittent, short-term operation (less than 10 days) of mobile equipment.
** = Maximum noise levels for repetitively scheduled and relatively long-term operation (periods of 10 days or more) of stationary equipment
SOURCE: County of Los Angeles, *Municipal Codes*, Title 12, Chapter 8, *Noise Control*.

Los Angeles County 2035 General Plan

The Noise Element of the Los Angeles County General Plan summarizes noise issues and outlines goals and policies that seek to reduce noise impacts when making land use planning decisions. Of the 11 policies outlined in the Noise Element of the Los Angeles County 2035 General Plan, the following are applicable to the proposed project:[5]

Goal N-1: The reduction of excessive noise impacts.

- Policy N 1.1: Utilize land uses to buffer noise-sensitive uses from adverse noise impacts.
- Policy N 1.2: Reduce exposure to noise impacts by promoting land use compatibility.
- Policy N 1.3: Minimize impacts to noise-sensitive land uses by ensuring adequate site design, acoustical construction, and use of barriers, berms, or additional engineering controls through Best Available Technologies (BAT).
- Policy N 1.4: Enhance and promote noise abatement programs in an effort to maintain acceptable levels of noise as defined by the Los Angeles County Exterior Noise Standards and other applicable noise standards.
- Policy N 1.6: Ensure cumulative impacts related to noise do not exceed health-based safety margins.
- Policy N 1.9: Require construction of noise attenuation barriers on noise sensitive uses that would be exposed to exterior noise levels of 65 dBA CNEL and above, when unavoidable impacts are identified.

3.4 LOCAL

Santa Clarita Valley Area Plan

Phase II.a is covered by Santa Clarita Valley Area Plan which is an element of the County General Plan.

The Santa Clarita Valley Area Plan, which comprises the entire Santa Clarita Valley including the proposed project area, provides goals, policies, and maps to establish zoning regulations and guide new development proposals. Section 11.40.040 of the Santa Clarita City Municipal Code states, "It shall be unlawful for any person within the City to produce or cause or allow to be produced noise which is received on property occupied by another person within the designated region, in excess of the following levels, except as expressly provided otherwise herein."

Noise Element City of Los Angeles General Plan

While the County is not subject to the City General Plan, this information has been included based on the Phase II.b recommended connections to the immediately adjacent City of Los Angeles trails.

[5] County of Los Angeles Department of Regional Planning. Adopted 6 October 2015. *Los Angeles County General Plan 2035*. Chapter 11, Noise Element. Available at: http://planning.lacounty.gov/assets/upl/project/gp_final-general-plan-ch11.pdf

The Noise Element of the City of Los Angeles General Plan outlines the goal, objectives, and policies regarding the management of noise within the City. The following policies listed in the Noise Element of the City's General Plan are applicable to the proposed project:[6]

- Policy 2.2: Enforce and/or implement applicable city, state, and federal regulations intended to mitigate proposed noise producing activities, reduce intrusive noise and alleviate noise that is deemed a public nuisance.
- Policy 3.1: Develop land use policies and programs that will reduce or eliminate potential and existing noise impacts.

[6] City of Los Angeles Department of City Planning. 1999. Los Angeles City General Plan. Noise Element.

The method commonly used to quantify environmental noise involves evaluation of all frequencies of sound with an adjustment to reflect the constraints of human hearing. Since the human ear is less sensitive to low and high frequencies than to midrange frequencies, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity in a process called "A-weighting," written as dBA. In practice, environmental noise is measured using a sound level meter that includes an electronic filter corresponding to the A-weighted (Table 4-1, *A-Weighted Noise Levels*).

TABLE 4-1
A-WEIGHTED NOISE LEVELS

Noise Source	A-Weighted Sound Level (in dBA)	Subjective Loudness	Effect of Noise
Near jet engine	130	Intolerable or deafening	Hearing loss
Loud auto horn	100	Very noisy	Hearing loss
Normal conversation at 5–10 feet	60	Loud	Speech interference
Bird calls	40	Moderate	Sleep disturbance
Whisper	30	Faint	No effect
Rustling leaves	10	Very faint	No effect

4.1 AMBIENT NOISE LEVELS

For the purpose of establishing the ambient noise levels over a given period of time, the equivalent-continuous sound (L_{eq}) is the preferred measurement to describe noise levels that vary over time. The L_{eq} is the level of a constant sound, expressed in dB, which in a given time period ($T = T_2 - T_1$) has the same energy as a time varying sound. This analysis considers dBA to reflect the relative loudness of sounds in air as perceived by the human ear since the human ear does not have a linear response to sounds at different frequencies. In the A-weighted system, the decibel values of sounds at low frequencies are reduced compared with unweighted decibels, in which no correction is made for audio frequency.

In order to establish existing conditions for ambient noise levels in the proposed project area, Sapphos Environmental, Inc. conducted noise monitoring at four locations near potential sensitive receptors within the proposed project area (Figure 4.1-1, *Noise Monitoring Locations*).

TABLE 4.1-1
NOISE MONITORING LOCATIONS

Monitoring Location	Approximate Location	Land Use Description	Within Project Boundary?
A	Towsley Canyon Trail	OS-PR-Parks and Recreation	Yes
B	Valencia Blvd between Oaks Hills Elementary School and West Ranch High School	P-Public and Semi-Public	Yes
C	Valley Circle Blvd and Plummer Street	Residential	At boundary
D	Stagg Street and Wiscasset Drive	Residential	At boundary

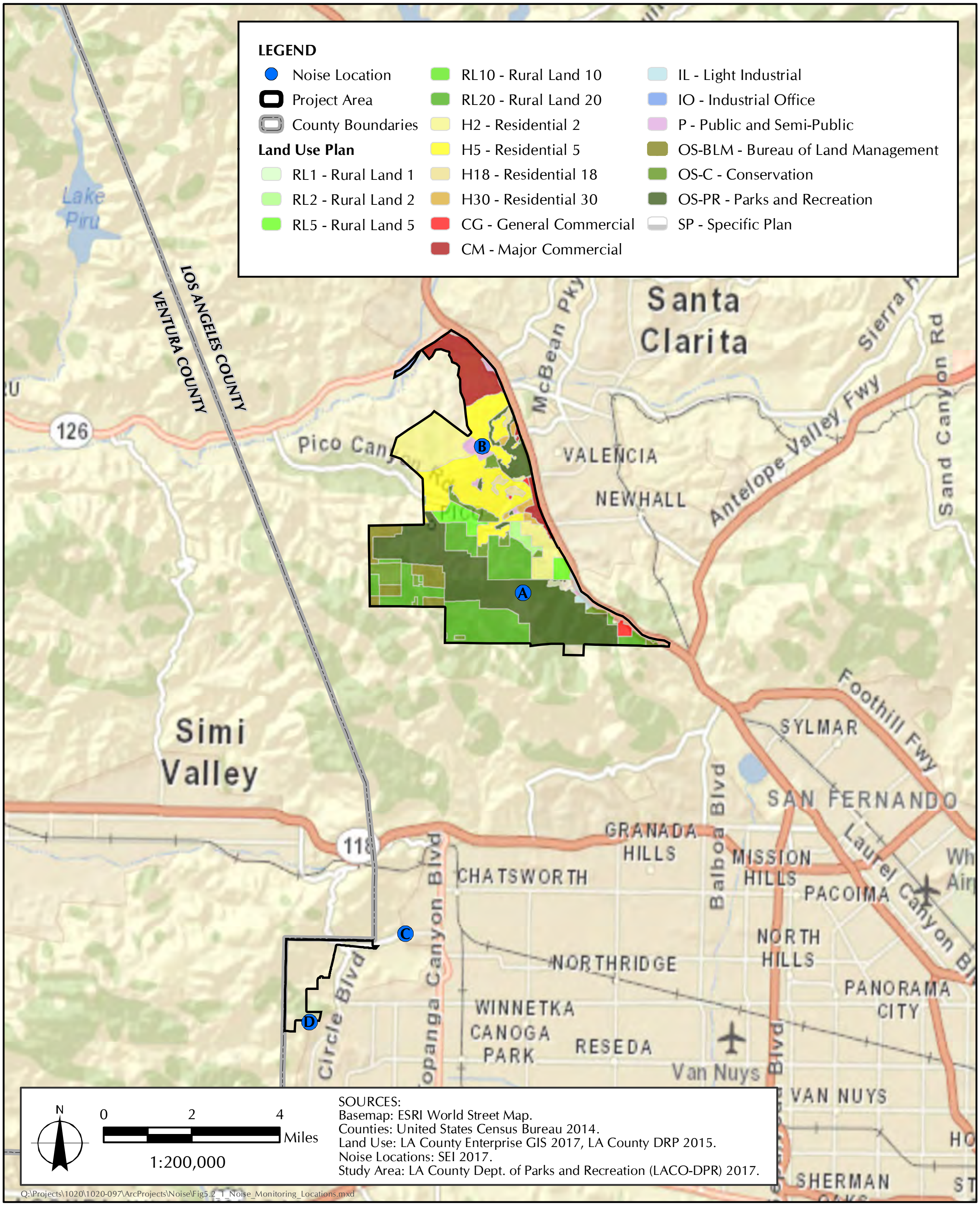


FIGURE 4.1-1

Noise Monitoring Sites

Baseline conditions were characterized by comparing the existing ambient noise levels to those levels that would be expected during construction, operation, and maintenance based on the type of equipment proposed for each phase of construction and for operation of the proposed project. The elevation of the Phase II.b area ranges from 946 feet above mean sea level (MSL) within the Santa Clara River near SR-126, to 2,889 feet above MSL in Santa Clarita Woodlands Park between Dewitt Canyon and Towsley Canyon. Sand Rock Peak (2,511 feet above MSL) is located within the northwestern portion of the Phase II.a area. The elevation of the Phase II.b area ranges from 895 feet above MSL at the northeastern corner of the Phase II.b area near Chatsworth Reservoir, to 1,867 feet above MSL near the northwestern corner of the Phase II.b area. Sound attenuation calculations would take into account the fluctuating elevation within the proposed project area. The process included ambient noise measurements taken within the proposed project area and the surrounding residential areas of both Phase II.a and II.b to characterize the ambient noise levels at the nearest sensitive receptors.

Ambient noise levels were established by continuously recording noise measurements in 15-minute intervals with a Larson Davis Spark 706RC Noise Dosimeters (serial number 18171) from 8:49 a.m. through 4:36 p.m. on June 28, 2017. The dosimeter was calibrated prior to recording measurements. Measurements were taken to establish ambient noise levels representative of the proposed project area. The average, maximum, and minimum L_{eq} for each monitoring site are the measurements used to describe ambient noise levels.

4.2 CONSTRUCTION NOISE

Construction noise impacts due to on-site construction activities were evaluated by calculating the construction-related noise levels at the selected points and comparing them to the existing ambient noise levels (i.e., noise levels without construction noise from the proposed project). Construction noise associated with the proposed project was analyzed using specified construction equipment inventory, construction durations, and construction phasing. The construction noise analysis for the proposed project is based on construction equipment noise levels as published in the *FHWA Roadway Construction Noise Model User's Guide*.[7]

The ambient noise levels were then calculated at adjacent property lines and were determined by field measurement data. The construction noise levels were then calculated based on the standard point source noise-distance attenuation factor of 6.0 dBA for each doubling of distance. Based on this attenuation factor, noise impacts at adjacent property lines were determined by Equation (1) for noise attenuation over distance:

(1) $$L_2 = L_1 - 20\ log_{10}\left(\frac{d_1}{d_2}\right)$$

Where

L_1 = known sound level at d_1
L_2 = desired sound level at d_2
d_1 = distance of known sound level from the noise source
d_2 = distance of the sensitive receptor from the noise source

[7] Federal Highway Administration. January 2006. *FHWA Roadway Construction Noise Model User's Guide*. Prepared by: U.S. Department of Transportation, Research and Innovative Technology Administration, John A. Volpe National Transportation Systems Center Acoustics Facility. Cambridge, MA.

4.2.1 Construction Scenario

This Noise Technical Report is based on an evaluation of the construction that would be required to build out the proposed trails in the general configurations of the conceptual plan. Proposed trail alignments are conceptual and will require additional survey, design, and engineering work to support dedication of easements and ultimately trail construction, operation, and maintenance. The final trail alignments are subject to refinement in relation to environmental, geologic, hydrologic, ownership, topology, and other factors, as specified in the County Trails Manual.

The environmental analysis for the proposed project is based on a potential worst-case scenario for construction activities, including improvements to existing trails, construction of new trails, site grading for facilities and access roads, and delivery and hauling of construction materials and equipment. Construction activities associated with the proposed project, as currently conceived, would entail construction of approximately 70 miles of trails. Construction equipment would be limited to mini-dozers; graders; small tractors; a water truck; and hand tools including picks, hoes, shovels, and wheelbarrows. Construction would be conducted in accordance with the guidelines specified in the County Trails Manual.[8] The County Trails Manual contains specific methods for building trails in areas with steep slopes and riparian crossings. The County Trails Manual should be referenced for further information to determine the constructability of trail segments.

Construction activities may include excavation, grading, and construction of trails and small structures at trailheads, rest areas, parking, equestrian parks, bicycle skills areas, and trailhead and staging areas. The County would require preparation of a trail site plan, site-specific geotechnical investigation, survey for biological and cultural resources, and a Categorical Exemption or Initial Study (the appropriate CEQA document) in support of each trail segment before project approval and construction can commence.

Site preparation and construction of the proposed project would be in accordance with all federal, state, and County building codes. Daily construction activities would be subject to County noise regulations, which state that construction equipment may not operate between the hours of 7:00 p.m. and 7:00 a.m., Monday through Saturday, or at any time on Sunday or holidays. Noise levels exceeding 75 dBA (A-weighted decibels) for single-family residences, 80 dBA for multi-family residences, and 85 dBA for semi-residential/commercial land uses are prohibited by the County Noise Control Ordinance, Title 12 of the County Code. The contractor shall conduct construction activities in such a manner that the maximum noise levels at the affected buildings would not exceed established noise levels.

Construction equipment would be turned off when not in use. The construction contractor would ensure that all construction and grading equipment is properly maintained. All vehicles and compressors would utilize exhaust mufflers and engine enclosure covers (as designed by the manufacturer) at all times.

[8] County of Los Angeles Department of Parks and Recreation. [Adopted 17 May 2011] Revised June 2013. County of Los Angeles Trails Manual. Available at:https://trails.lacounty.gov/Files/Documents/69/LA%20County%20Trails%20Manual%20%28Revised%2006-20-13%29.compressed.pdf

4.2.2 Temporary Noise Barrier, Baffles and Blankets

Temporary noise barriers, baffles, or blankets will be used in compliance with the requirements set forth in the complying with the County Noise Ordinance by limiting construction and maintenance activities to 7:00 a.m. to 7:00 p.m. on weekdays and Saturdays, and prohibiting work on federal holidays and Sundays, along with limiting noise levels to below 75 dBA for mobile equipment and 60 dBA for stationary equipment at sensitive receptor locations through the use of noise-attenuating barriers, baffles, or blankets. The proposed project would incorporate temporary noise barrier baffles, or blankets as project design features during outdoor construction activities. These project design features would be installed at construction staging areas and during construction activities on trial alignment, and at proposed facility locations to reduce the noise levels attributed to ground clearing, excavations, and erection of structures. The use of project design features and BMPs will ensure that impacts are less than significant.[9]

4.3 OPERATIONAL NOISE

Operational noise impacts associated with the proposed project were evaluated by identifying the noise levels generated by conversation noise from recreational uses such as hiking, bike riding, and horse riding, calculating the noise level from each noise source at surrounding sensitive receptor locations, and comparing such noise levels to ambient noise levels to determine significance. The operations of the trails built as a result of the proposed plans would typically result in conversation noise, bike riding, and horse riding and comparable to the existing baseline conditions.

4.4 SENSITIVE RECEPTORS

Sensitive receptors include, but are not limited to, hospitals, schools, daycare facilities, playgrounds, long-term health care facilities, elderly housing, and convalescent facilities. The proposed project area is located within multiple land use designations including RL-Rural Land, H-Residential, C-Commercial, I-Industrial, P-Public and Semi-Public, and OS-Open Space. GIS was used to search for sensitive receptors that are located within the SSMTMP-PII plan area or surrounding 0.25-mile buffer area. The 0.25-mile buffer was used based on sound levels of construction equipment anticipated to be used during construction of the proposed trails. Based on the noise attenuation calculation, noise levels due to construction activities outside of the 0.25-mile buffer were calculated below the ambient noise measurements in the vicinity of the proposed project and would not have effect on sensitive receptors within the 0.25-mile buffer.

[9] U.S. Environmental Protection Agency. 1971. *Noise from Construction Equipment and Operation, Building Equipment and Home Appliances*. PB 206717. Washington, DC.

5.1 EXISTING CONDITIONS

5.1.1 Ambient Noise Levels

The average of the A-weighted ambient noise level for all four monitoring sites at the proposed project area is 58.3 dBA (Table 5.1.1-1, *Ambient Noise Levels*). Ambient noise was characterized using ambient noise measurements recorded on June 28, 2017. The highest L_{eq} recorded was 76.8 dBA located within the Phase II.a plan area at Site B.

TABLE 5.1.1-1
AMBIENT NOISE LEVELS

Monitoring Site	Sensitive Receptor	Average L_{eq} (dBA)	Maximum L_{eq} (dBA)	Minimum L_{eq} (dBA)
A	Rural/Open Space	57.1	63.4	56.3
B	Schools/Residential	57.8	76.8	51.4
C	Residential	64.4	73.7	51.9
D	Residential	54	73.1	50.5

Phase II.a

Field observations at Site A (located in open space at Towsley Canyon) included conversational noise by trail hikers, walking, bike riding, birds chirping, and planes crossing overhead, along with environmental factors such as wind. The primary sources of noise at Site B (located adjacent to schools in a residential area of Stevenson Ranch) indicated the primary sources of noise can be attributed to sounds of birds chirping, and school bus and automobile traffic sounds heard from the adjacent.

Phase II.b

The primary sources of noise at Site C (located in a residential area) indicated the primary sources of noise can be attributed to sounds of birds chirping, and traffic sounds heard from the adjacent streets, along with environmental factors such as wind. Site D (located in a relatively quiet residential area) indicated the primary sources of noise can be attributed to sounds of birds chirping, planes flying overhead, and residents talking, as well as environmental factors such as wind. The freeways are a primary source of ambient noise in the Santa Clarita Valley and most noticeably measured within the Stevenson Ranch community location.

5.1.2 Sensitive Receptors

There are 5,467 known sensitive receptors within a 0.25-mile radius of the proposed project area including 5,456 residential areas, 3 hotels/motels, 2 churches, 2 schools (private), 1 college, 2 cemeteries, and 1 senior day care center (Figure 5.1.2-1a, *Sensitive Receptors [Phase II.a]*, and Figure 5.1.2-1b, *Sensitive Receptors [Phase II.b]*). The evaluation of the proposed project area (Phase II.a and II.b) identified 520 parcels with potentially sensitive receptors (>99 percent were residential land uses) within 251 feet mile of the proposed trail alignments.

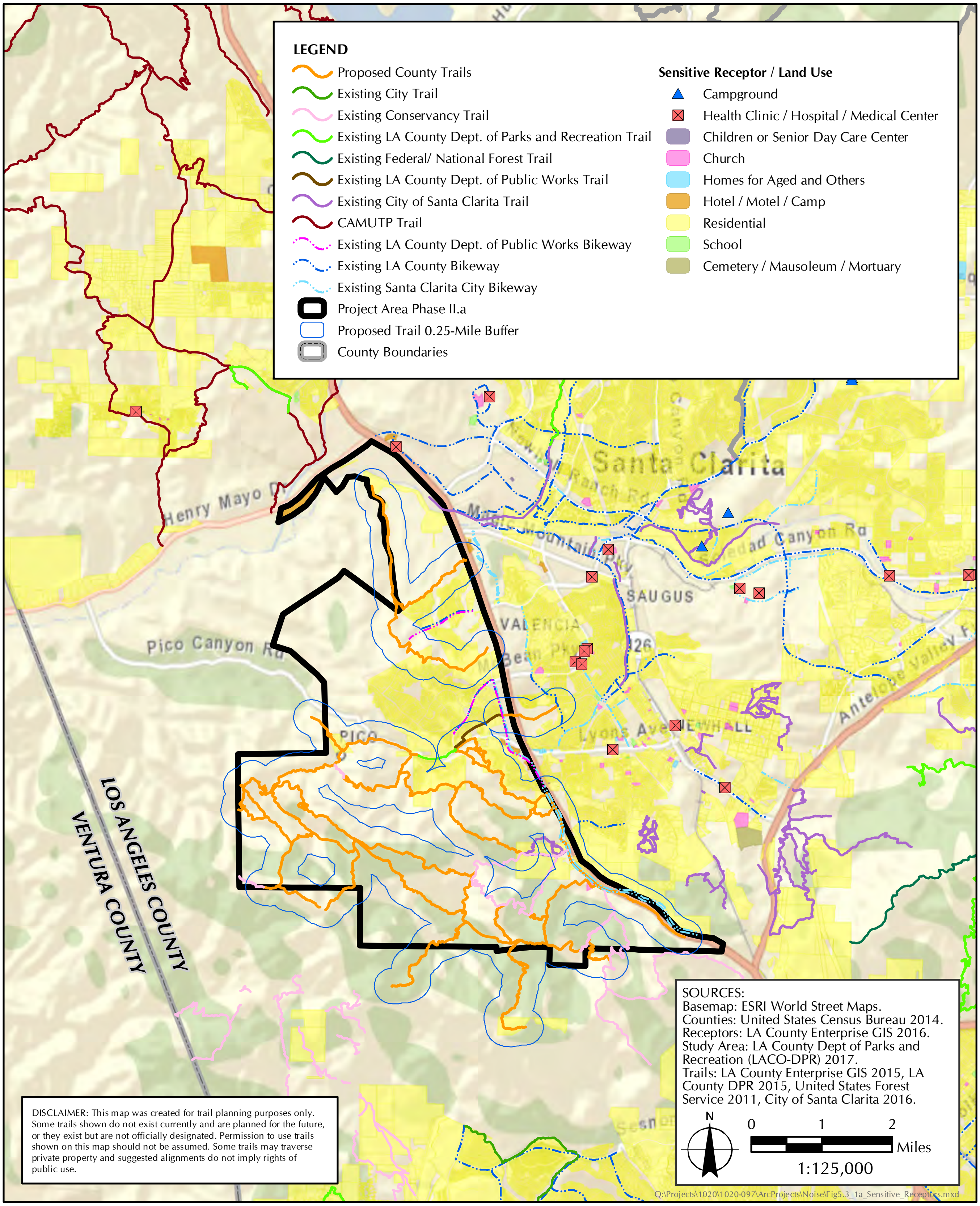


FIGURE 5.1.2-1a

Sensitive Receptors (Phase II.a)

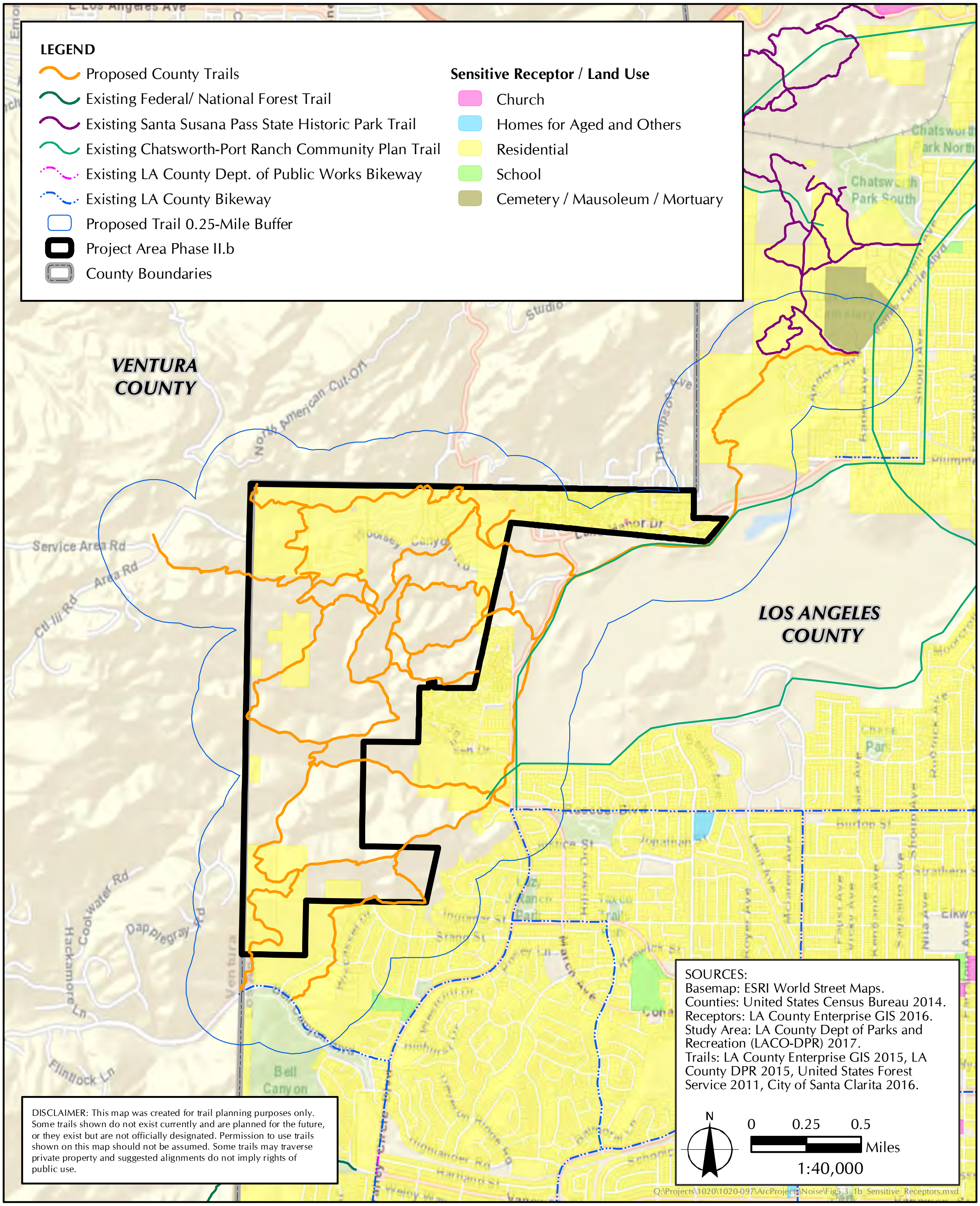


FIGURE 5.1.2-1b

Sensitive Receptors (Phase II.b)

The nearest sensitive receptors to the proposed project area, including any existing or proposed residences inside the proposed project area, are located within surrounding communities in the vicinity of the proposed project area. These sensitive land uses include residences, churches, short-term accommodations (hotels, motels and camps), schools, hospitals, cemeteries, and day care centers. Sensitive receptors located within residential communities of the proposed project area include the northeast portion of the Phase II.a project area of the Stevenson Ranch community within Santa Clarita Valley, California; and the northern and southern portions of the Phase 11.b project area, which include the Canoga Park, Chatsworth, and West Hills communities within the City of Los Angeles, California

5.1.3 Ground-Borne Vibration

Existing conditions for ground-borne vibration for Phase II.a and II.b of the proposed project area are comparable. Ground-borne vibration in the vicinity of the proposed project area is limited to recreational uses of current trails including, but not limited to, motorized dirt bikes and all-terrain vehicles (ATVs) as well as minor traffic-induced vibrations from nearby streets, highways, and freeway vehicular traffic. Furthermore, there are no current construction projects, oil fields, mining operations, blasting, or other activities resulting in ground-borne vibrations in the vicinity of the proposed project area.

5.1.4 Public and Private Airports

There are no public or private airports within 2 miles of the proposed project area. The nearest public airports to the proposed project area are the Van Nuys Airport, located approximately 9 miles southeast of Phase II.a and approximately 9 miles east from Phase II.b at 16461 Sherman Way, Van Nuys, California 91406; and the Whiteman Airport, located approximately 8 miles southeast of Phase II.a and 12.5 miles northeast of Phase II.b at 12653 Osborne Street, Los Angeles, California 91331 (Figure 5.1.4-1, Public *and Private Airports*).

5.2 IMPACT ANALYSIS

5.2.1 Construction Impacts

Noise impacts associated with the construction of the proposed project are expected to occur in three phases: ground clearing, excavations, and erections of poles and facilities. The average noise levels associated with these construction phases where all pertinent equipment is present and operating at a reference distance of 50 feet are presented in Table 5.2.1-1, *Construction Activity Noise Levels at 50 Feet*.

TABLE 5.2.1-1
CONSTRUCTION ACTIVITY NOISE LEVELS AT 50 FEET

Activity	Noise Level at 50 Feet (dBA)
Ground Clearing	84 ± 6 dBA
Excavations	89 ± 6 dBA
Erection of Structures	85 ± 5 dBA

SOURCE: VSA & Associates. 7 January 2008. *Altadena Crest Trail Improvement Noise Impact Analysis*. Whittier, CA.

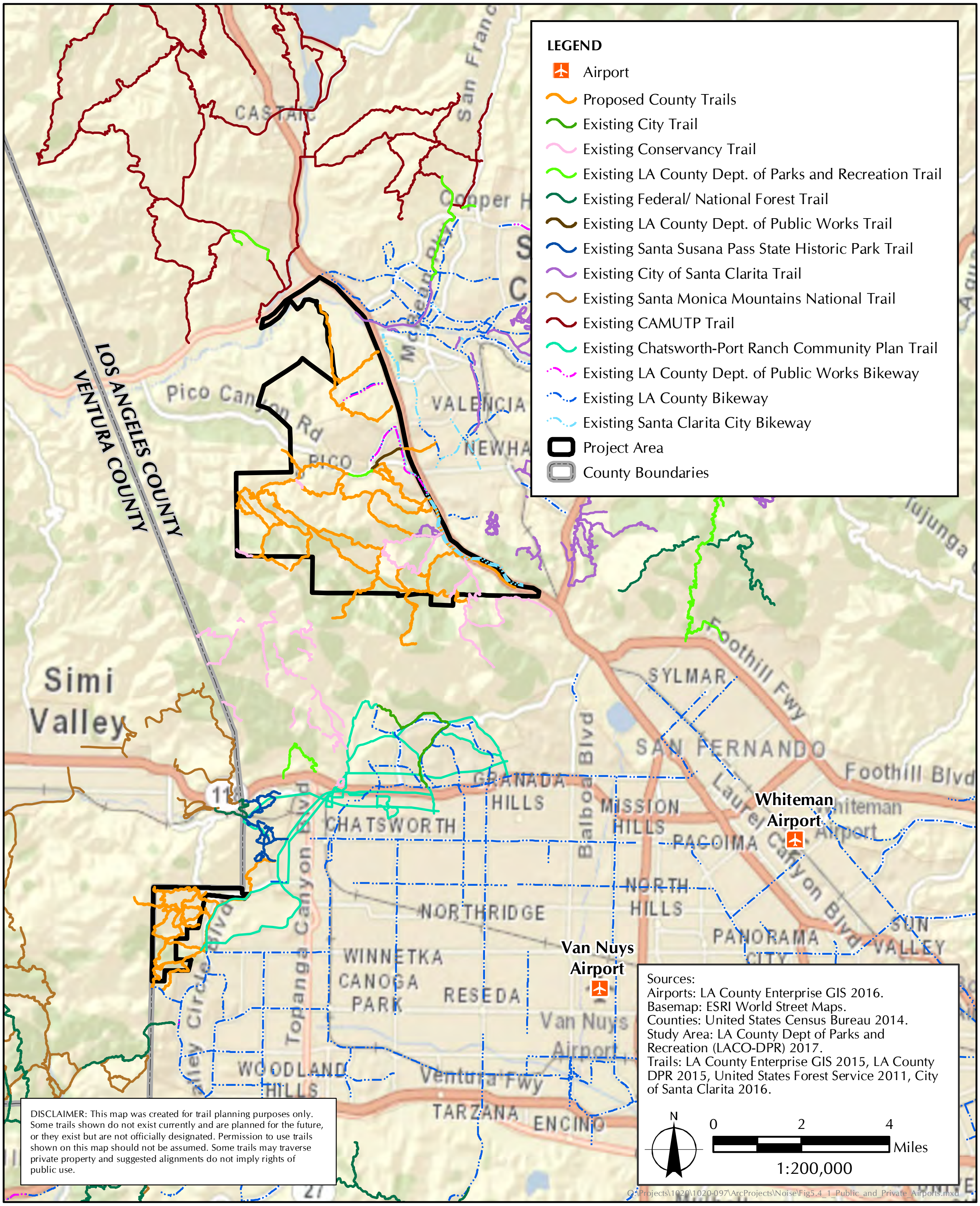


FIGURE 5.1.4-1

Public and Private Airports

Based on these noise levels, and the fact that noise attenuates at a rate of approximately 6.0 dBA per doubling of distance from a point source, the noise impacts on sensitive receptors can be determined by Equation 1 for noise attenuation over distance:

$$(1) \qquad L_2 = L_1 - 20\, log_{10}\left(\frac{d_1}{d_2}\right)$$

where

L_1 = known sound level at d_1
L_2 = desired sound level at d_2
d_1 = distance of known sound level from the noise source
d_2 = distance of the sensitive receptor from the noise source

By assigning the highest potential noise level during construction at 89 dBA during excavations (L_1) at a distance of 50 feet (d_1), the distance at which construction activities would reach a maximum of 75 dBA (L_2) and still be in compliance with Title 12, Chapter 8 of the Los Angeles County Municipal Codes for construction noise restrictions is approximately 251 feet (d_2). This distance, along with the other predicted distances at which the noise impacts would be below 75 dBA according to Equation 1 for each construction phase, are presented in Table 5.2.1-2, *Predicted Distance at which Noise Impact Would Be below Level of Significance*.

TABLE 5.2.1-2
PREDICTED DISTANCE AT WHICH NOISE IMPACT
WOULD BE BELOW LEVEL OF SIGNIFICANCE

Construction Phase	Distance at Which Noise Impact Will Be below 75 dBA	Number of Sensitive Receptors within This Distance
Ground Clearing	141 feet	291
Excavations	251 feet	510
Erection of Structures	158 feet	317

NOTE: According to Title 12, Chapter 8 of the Los Angeles County Municipal Codes, construction activities for mobile equipment may not exceed 75 dBA during weekly daytime hours from 7:00 a.m. to 8:00 p.m. for single-family residential. Construction activities are not expected to occur during nighttime hours from 8 p.m. to 7:00 a.m.

The distance at which noise impacts will be below the threshold of significance for a single-family residence for the different construction phases ranges from 141 to 251 feet. Up to 510 (507 residences, 2 cemeteries, and 1 church) sensitive receptors are expected to be within 251 feet (Table 5.2.1-2). However, construction activities associated with the proposed project are not expected to expose sensitive receptors to noise levels in excess of the standards established by the Los Angeles County Municipal Codes since impacts would be avoided by limiting construction and maintenance activities to 7:00 a.m. to 7:00 p.m. on weekdays and Saturdays, and prohibiting work on federal holidays and Sundays, along with limiting noise levels to below 75 dBA for mobile equipment and 60 dBA for stationary equipment at sensitive receptor locations through the use of project design features and BMPs including noise-attenuating barriers, baffles, or blankets.[10]

[10] U.S. Environmental Protection Agency. 1971. *Noise from Construction Equipment and Operation, Building Equipment and Home Appliances*. PB 206717. Washington, DC.

Furthermore, exposure to potential noise impacts would vary from day to day, depending on the amount of work being conducted, the weather conditions, the location of receptors, and the length of time that receptors would be exposed. Due to the short-term nature of project construction, sensitive receptors would not be significantly affected by the proposed project.

5.2.2 Ground-Borne Vibration

Construction activities for the proposed project are not expected to include blasting, drilling, or other activities that would result in excessive ground-borne vibrations at the proposed project area. Furthermore, there are no current construction projects, oil fields, mining operations, blasting, or other activities resulting in ground-borne vibrations in the vicinity of the proposed project area. Therefore, the proposed project would not result in exposure of sensitive receptors or generation of excessive ground-borne vibration or ground-borne noise levels.

5.2.3 Operational Impacts

The primary sources of noise can be attributed to conversational noise from recreational uses such as hiking, bike riding, and equestrian riding. Noise from typical conversations at the trail would be negligible at sensitive receptor locations, when compared with the average A-weighted ambient noise level (62.7 dBA) for all four monitoring sites. Therefore, operation of the proposed project would not result in substantial permanent or temporary increases in ambient noise levels in the vicinity above levels existing without the proposed project.

5.2.4 Public and Private Airports

The proposed project would not result in noise impacts in relation to exposure to persons residing or working near airports to excessive noise levels. There are no public or private airports within 2 miles of the proposed project area. The nearest public airports to the proposed project area at least 8 miles away. The proposed project area is sufficiently removed from public and private airports to protect workers engaged in construction or maintenance of the trails from exposure to excessive noise levels. Similarly, recreational users would not be exposed to excessive noise levels from an airport.

5.3 MITIGATION RECOMMENDATIONS

Impacts to noise as a result of the proposed project would be less than significant, and no mitigation is required.

SECTION 6.0
REFERENCES

City of Los Angeles Department of City Planning. 1999. Los Angeles City General Plan. Noise Element.

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U.S. Geological Survey. 1969. 7.5-Minute Series, Willow Springs, California, Topographic Quadrangle. Reston, VA.

VSA & Associates. 7 January 2008. *Altadena Crest Trail Improvement Noise Impact Analysis.* Whittier, CA.

APPENDIX A
AMBIENT NOISE DATA

The following tables summarize the ambient noise levels collected at the four monitoring locations on June 28, 2017. Ambient noise measurements were recorded with a Larson Davis Spark 706RC Noise Dosimeter (serial number 18171), which meets and exceeds the minimum industry standards performance requirements as defined by the American National Standard Institute (ANSI) S1.4.

The maximum existing daytime ambient noise levels at the four monitoring locations near potential sensitive receptors within the proposed project area ranged from 63.4 dBA (L_{eq}) at monitoring location A to 76.8 dBA (L_{eq}) at monitoring location B. The average L_{eq} for daytime ambient noise levels ranged from ranged from 54 dBA (L_{eq}) at monitoring location D to 64.4 dBA (L_{eq}) at monitoring location C. The maximum existing ambient noise levels at Location B located within a residentially zoned Public-Semi-Public land use designated area currently exceed the noise threshold under County of Los Angeles Community Noise Criteria of 70 dBA (L_{eq}) by 6.8 dBA (L_{eq}). Therefore, the measured existing ambient noise levels are appropriate for use as the baseline conditions for the purposes of determining the proposed project's noise impacts on the surrounding community.

Monitoring Location A								
Time	**L_{eq}**	**Max**	**Min**	**Peak**	**TWA1**	**TWA2**	**TWA3**	**TWA4**
8:49:15	58.3	58.7	57.8	—	—	—	—	—
8:50:15	57.2	57.3	57.1	—	—	—	—	—
8:51:15	56.8	56.8	56.8	—	—	—	—	—
8:52:15	56.8	56.8	56.7	—	—	—	—	—
8:53:15	56.7	56.7	56.7	—	—	—	—	—
8:54:15	56.9	56.9	56.8	—	—	—	—	—
8:55:15	56.7	56.8	56.7	—	—	—	—	—
8:56:15	56.9	56.9	56.9	—	—	—	—	—
8:57:15	56.9	57	56.9	—	—	—	—	—
8:58:15	56.6	56.7	56.6	—	—	—	—	—
8:59:15	56.8	56.8	56.8	—	—	—	—	—
9:00:15	56.8	56.8	56.8	—	—	—	—	—
9:01:15	56.6	56.7	56.4	—	—	—	—	—
9:02:15	57.2	57.2	57.2	—	—	—	—	—
9:03:15	57.3	57.3	57.3	—	—	—	—	—

NOTE: Time-weighted average (TWA) was calculated using the County's construction noise threshold (75 dBA).

Monitoring Location B								
Time	L_{eq}	Max	Min	Peak	TWA1	TWA2	TWA3	TWA4
13:20:47	76.5	76.8	75.9	—	76.5	—	—	—
13:21:47	61.8	62.2	61.2	—	—	—	—	—
13:22:47	52.5	53.1	52.1	—	—	—	—	—
13:23:47	52.6	52.7	52.5	—	—	—	—	—
13:24:47	52.8	53	52.7	—	—	—	—	—
13:25:47	54.7	55.2	54.2	—	—	—	—	—
13:26:47	52	52	52	—	—	—	—	—
13:27:47	53.3	53.8	52.8	—	—	—	—	—
13:28:47	53.4	53.9	53.1	—	—	—	—	—
13:29:47	53	53.2	52.7	—	—	—	—	—
13:30:47	52.5	52.6	52.4	—	—	—	—	—
13:31:47	53.9	54.1	53.8	—	—	—	—	—
13:32:47	56.1	56.2	56	—	—	—	—	—
13:33:47	52.7	52.8	52.7	—	—	—	—	—
13:34:47	53.6	53.9	53.3	—	—	—	—	—

NOTE: Time-weighted average (TWA) was calculated using the County's construction noise threshold (75 dBA).

Monitoring Location C								
Time	L_{eq}	Max	Min	Peak	TWA1	TWA2	TWA3	TWA4
15:29:37	57.3	57.6	57	—	—	—	—	—
15:30:37	64.2	64.6	63.8	—	—	—	—	—
15:31:37	71.1	71.7	70	—	—	—	—	—
15:32:37	62.9	63.1	62.8	—	—	—	—	—
15:33:37	65.3	66.5	64.1	—	—	—	—	—
15:34:37	63.4	64.8	62	—	—	—	—	—
15:35:37	54.2	54.3	54.2	—	—	—	—	—
15:36:37	66.1	66.2	65.9	—	—	—	—	—
15:37:37	68.7	69.7	67.4	—	—	—	—	—
15:38:37	59.1	60.2	58.1	—	—	—	—	—
15:39:37	69.4	69.9	68.9	—	—	—	—	—
15:40:37	56.5	56.9	55.8	—	—	—	—	—
15:41:37	52.3	52.5	52.2	—	—	—	—	—
15:42:37	55.5	56.1	55.1	—	—	—	—	—
15:43:37	63.7	64.5	63.3	—	—	—	—	—

NOTE: Time-weighted average (TWA) was calculated using the County's construction noise threshold (75 dBA).

Monitoring Location D								
Time	**L_{eq}**	**Max**	**Min**	**Peak**	**TWA1**	**TWA2**	**TWA3**	**TWA4**
16:21:20	55.7	55.9	55.4	—	—	—	—	—
16:22:20	53	53.1	52.9	—	—	—	—	—
16:23:20	53.9	54	53.7	—	—	—	—	—
16:24:20	51	51.1	51	—	—	—	—	—
16:25:20	51.6	51.7	51.5	—	—	—	—	—
16:26:20	51	51.3	50.8	—	—	—	—	—
16:27:20	51.7	51.7	51.6	—	—	—	—	—
16:28:20	51.6	51.7	51.5	—	—	—	—	—
16:29:20	51.5	51.6	51.5	—	—	—	—	—
16:30:20	51.7	51.8	51.6	—	—	—	—	—
16:31:20	51.9	52.4	51.5	—	—	—	—	—
16:32:20	51.2	51.3	51.1	—	—	—	—	—
16:33:20	67.7	68.6	65.9	—	—	—	—	—
16:34:20	51.5	51.6	51.5	—	—	—	—	—
16:35:20	51	51	51	—	—	—	—	—

NOTE: Time-weighted average (TWA) was calculated using the County's construction noise threshold (75 dBA).

Appendix H

Traffic and Parking Assessment

MEMORANDUM

To:	Ms. Laura Male Sapphos Environmental, Inc.	Date:	October 31, 2017
From:	Clare M. Look-Jaeger, P.E. CL-Jaeger Chin S. Taing, PTP CST Linscott, Law & Greenspan, Engineers	LLG Ref:	1-17-4210-1
Subject:	**Traffic and Parking Assessment for the Santa Susana Mountains Trails Master Plan – Phase II Project, County of Los Angeles, California**		

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This memorandum has been prepared by Linscott, Law & Greenspan, Engineers (LLG) to summarize the traffic and parking assessment prepared for the Santa Susana Mountains Trails Master Plan – Phase II (SSMTMP-PII or Trails Master Plan) located in the northwestern portion of the unincorporated area of the County of Los Angeles. In May 2015, the County adopted the first phase of the Santa Susana Mountains Final Trails Master Plan (SSMFTMP), which involved the extension of the 35.7 miles of existing County-, City-, and Conservancy-managed trails in the Phase I and Phase II study areas by approximately 35.9 miles with 22 proposed trail segments, for a total of approximately 71.6 miles of trails within the SSMFTMP Area. In 2017, the County initiated planning efforts for further development of the Phase II study area, which has been expanded to include Phases II.a and II.b.

Pursuant to coordination with the County and stakeholders, we understand that a traffic and parking assessment is needed to document the existing parking demand and forecast expected future parking demand associated with the Trails Master Plan – Phase II study area. The Trails Master Plan is being prepared for the County of Los Angeles Department of Parks and Recreation.

This traffic and parking assessment memorandum provides the following data:

- Description of the existing conditions
- Project description of general objectives for the Trails Master Plan
- Overview of the existing trailhead locations analyzed for the Phase II.a and II.b areas
- Summary of the vehicle inbound and outbound driveway/street parking counts conducted for the traffic assessment
- Derivation of the site specific trip generation rate associated with trail use
- Forecast of the trip generation for Phase II of the Trails Master Plan
- Summary of the existing and forecast future parking demand for the surveyed trailhead locations

- Conclusion regarding the future traffic and parking demand anticipated with future trail connections assumed to be completed as part of the Trails Master Plan

Existing Setting and Study Area

The proposed SSMTMP-PII study area is located in the northwestern unincorporated area of Los Angeles County, California. The study area for the trails master plan location is displayed in ***Figure 1***. The study area encompasses approximately 31,398.1 acres (49.1 square miles). The northern boundary of the study area is defined by the southern limits of the Newhall Ranch Specific Plan Area and the northern limits of the Santa Susana Mountains/Simi Hills Significant Ecological Area. The southern boundary is defined by the City of Los Angeles. The eastern boundary is defined by Interstate 5 (I-5) Freeway and the western boundary is defined by the jurisdictional boundary line dividing Los Angeles and Ventura Counties.

The study area for the SSMTMP-PII is divided into two sub-areas or phases. Phase I, referred to as the Northwest San Fernando Valley Study Area, contains approximately 16,038.1 acres (25.1 square miles). The Phase I study area is generally bounded by the Los Angeles County Oat Mountain Planning Area to the north, the northern City of Los Angeles limit to the south, I-5 Freeway to the east, and the Los Angeles/Ventura County boundary line to the west. Phase II, referred to as the Southwest Santa Clarita Valley Study Area in the 2015 SSMFTMP, has been expanded beyond the spatial extents of Phase II in the SSMFTMP and divided into two subareas. The proposed project, including Phase II.a and Phase II.b, represents approximately 15,360 acres (24 square miles).

Phase II.a. The Phase II.a area is an approximately 22-square-mile area located in the north-facing slopes of the Santa Susana Mountains and the Santa Clarita Valley. Phase II.a is composed of generally mountainous and valley terrain that abuts Henry Mayo Drive (State Route 126) to the north, the I-5 Freeway to the east, Phase I of the SSMFTMP Area to the south, and the Newhall Ranch Specific Plan Area to the west. The Phase II.a area, which is located in the County of Los Angeles Fifth Supervisorial District, includes a portion (Phase II) of the SSMFTMP Area. The community of Stevenson Ranch and Six Flags Magic Mountain are located within the Phase II.a area.

Phase II.b. The Phase II.b area is an approximately 2-square-mile area located in the foothills of the Santa Monica Mountains, including Bell Canyon, Dayton Canyon, and Woolsey Canyon, west of the San Fernando Valley. The Phase II.b area, which is also located in the County of Los Angeles Fifth Supervisorial District, is composed of generally mountainous and valley terrain that abuts Ventura County to the north and west and the City of Los Angeles to the east and south.

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Based on coordination with the project team, six trailhead locations were identified and analyzed herein for purposes of developing project trip generation forecasts for use in this traffic and parking assessment. These trailheads are all located within the Phase II.a and II.b study area of the SSMTMP-PII study area. The Sage Ranch Loop trailhead is located within the County of Ventura and is analyzed as part of the Phase II.b study area. The six analyzed trailhead locations are noted in ***Figures 2A*** and ***2B***.

- Survey Trailhead Location No. 1: Rice Canyon
- Survey Trailhead Location No. 2: Lower Towsley (Upper and Lower Lots)
- Survey Trailhead Location No. 3: Pico Canyon
- Survey Trailhead Location No. 4: Mentryville Overflow
- Survey Trailhead Location No. 5: Mentryville Main Lot
- Survey Trailhead Location No. 6: Sage Ranch Loop (Upper and Lower Lots)

Project Description

The purpose of the SSMTMP-PII project is to provide an analysis of existing and potential connectors between prime destination points and provide enhanced recreational opportunities for users. The trail systems are planned to be designed such that they provide an equal and safe experience for various trail users including pedestrians, bicyclists, and equestrians. The goals of the plan are to:

1. Develop a complete multi-use trail system connecting user groups and local populations to desired recreation destinations and experiences, with seamless transitions to the trails of adjacent jurisdictions, compatibility with adjacent land uses and environmental resources, and a safe and sustainable design that is consistent with the County of Los Angeles Trails Manual.

2. Develop a recreational trail system that supports low-intensity use, including mountain biking, equestrian use, and hiking, to accommodate the population increase anticipated in the Santa Clarita Valley Planning Area and San Fernando Valley Planning Area through the 2035 planning horizon consistent with the Parks and Recreation Element of the Los Angeles County General Plan 2035.

The SSMTMP-PII involves approximately 70 miles of proposed new multi-use trails in the Santa Clarita Valley Planning Area and San Fernando Valley Planning Area. The trails would be multi-use and range from 3 to 12 feet wide based on site conditions, with adequate space for combined pedestrian, equestrian, and mountain

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biking use, in accordance with the County Trails Manual guidelines. The proposed trails would provide connections to the proposed Rim of the Valley Trail, trails in the City of Los Angeles, trails in the City of Santa Clarita, trails in the Newhall Ranch Specific Plan, and trails within other jurisdictions as identified in the Trails Master Plan.

The SSMTMP-PII identifies up to twenty (20) potential locations for proposed facilities, including four (4) trailheads, two (2) bike skills areas, two (2) equestrian parks, eight (8) trailhead and staging areas, and four (4) trailheads within the City of Los Angeles which would need to be developed by the City of Los Angeles. The recommended City of Los Angeles trailheads would not be developed under jurisdiction of the County.

Existing Study Trailhead Locations

The six trailhead locations identified for developing project trip generation forecasts were surveyed to document existing conditions with respect to the existing trail/park development, trailhead access, parking areas and amenities. The surveyed trailhead locations, including site photographs of the surrounding trailhead areas, are shown in ***Figures 3A*** through ***3H***.

The on-site and adjacent on-street parking supply for each of the trailhead locations, as well as any amenities that are provided near the parking areas (i.e., based on field reviews conducted by LLG Engineers), is summarized in ***Table 1***. As outlined in the *County of Los Angeles Trails Manual*[1], the parking area designs must consider the nine elements listed below.

- Provide roadway signs that indicate turnouts for trailheads and parking
- Select a parking surface that is natural and permeable
- Install guardrails where needed to define parking edges for safety reasons
- Use natural logs or poles to define parking bumper stops and lot edges
- Install post bollards at trailheads to mark trailhead entrances and to discourage vehicular encroachment into the trail area
- Install and maintain a trailhead information kiosk
- Place picnic tables, trash receptacles, and toilets where possible

[1] *County of Los Angeles Trails Manual*, County of Los Angeles Department of Parks and Recreation – Planning and Development Agency, May 2011.

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- Allow adequate parking lot space (i.e., 300 square feet per car for 90-degree spaces) and also allow for ADA compliant parking

- Provide parking spaces for the anticipated occupancy load, with a minimum of five spaces, where site conditions permit

On-street parking in the vicinity of the trailhead locations was available at three of the six surveyed locations. On-site parking areas were provided for all six of the surveyed trailhead locations.

Traffic Assessment

Existing Trailhead Inbound/Outbound Traffic Counts

As part of the traffic assessment for the proposed project, vehicular traffic counts at the representative six trailhead locations were conducted during the Saturday morning peak period to document the number of vehicle trips entering and exiting the site driveways as well as the on-street parking associated with trail users. Specifically, these counts and observations were conducted in 15-minute time increments from 6:00 AM to 10:00 AM during a typical Saturday morning (i.e., Saturday, June 17, 2017). This time period is associated with the peak time period for use of multiple outdoor recreational opportunities by various trail user groups.

The inbound/outbound traffic counts for each of the representative trailhead locations are summarized and presented in ***Table 2***. Details of the inbound/outbound traffic count data are also attached. The traffic count data were reviewed and analyzed to determine the highest one-hour period of traffic generation associated with each site during the weekend (Saturday) morning count period. As indicated in *Table 2*, the weekend day morning peak hour of site generation for the six surveyed sites varied with peak hours beginning as early as 6:00 AM and as late as 8:45 AM. The Saturday morning peak hour vehicle trips observed at the six trailhead locations ranged between 7 total trips and 144 total trips. The Saturday morning peak hour combined traffic generation for all six surveyed trailhead locations (i.e., situated within the Phase II study area) totaled 226 vehicle trips (110 inbound trips and 116 outbound trips).

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Derivation of the Site-Specific Trail Trip Generation Rate

The Saturday morning peak hour trip generation associated with future trail connections, or newly proposed trails within the Santa Susana Mountains Trails Phase II study area, can be forecast through the derivation of a site-specific trail trip generation rate (i.e., based on the empirical trip rate derived from the traffic counts conducted at the existing trailhead locations). As summarized in *Table 2*, the Saturday morning peak hour inbound and outbound vehicle trips for the surveyed trailhead locations totaled 226 vehicle trips. By dividing this trip generation by the total length (in miles) of both the official and unofficial trails (i.e., by a total length of 56.2 miles, with the unofficial trail lengths determined based on community input and usage) the trip generation rate can be determined. The trip generation rate per mile of trail length is as follows:

- Derived Empirical Saturday AM Peak Hour Trip Rate for Trails
  226 AM peak hour vehicle trips/56.2 miles of total trail length = 4.0 vehicle trips per mile of trail (49% inbound trips, 51% outbound trips)

Proposed Project Trip Generation Forecast

As shown below, a total of 63.1 miles of adopted trails (53.4 miles of trail length in Phase II.a and 9.7 miles of trail length in Phase II.b) are included in the Trails Master Plan Phase II study area. These trails and associated trailheads are spatially distributed throughout the Trails Master Plan - Phase II.a and II.b study areas as illustrated in ***Figures 4A*** and ***4B***, respectively. In addition, some unadopted proposed trails are located outside of the study area. The trails are divided into the various categories:

- County of Los Angeles Adopted Proposed Trails within Phase II.a. area – 53.4 miles

- Unadopted Proposed Trails Outside of Phase II.a area – 5.3 miles

- County of Los Angeles Adopted Proposed Trails within Phase II.b area – 9.7 miles

- Unadopted Proposed Trails Outside of Phase II.b area – 1.5 miles

The proposed project analyzed herein consists of the future proposed trails which includes the County of Los Angeles adopted proposed trails within the Phase II.a and II.b subareas. As previously noted, these future proposed trails are spatially distributed throughout the Trails Master Plan study area. The unadopted proposed trails are recommended connections outside of the Phase II.a and II.b subarea boundaries. Since the County cannot formally adopt these proposed trail connections,

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these trails have been excluded in the forecast of the project trips for the Phase II study area. As stated above, the future proposed trails consist of 53.4 miles for Phase II.a and 9.7 miles for Phase II.b for a total of 63.1 miles within the Trails Master Plan – Phase II study area. The summary of the forecast Saturday AM peak hour project traffic generation for each of the Phase II subareas is shown below and has been determined based on the application of the derived empirical trip generation rate of 4.0 vehicle trips per mile of trail length:

- Phase II.a Project Saturday AM Peak Hour Trip Generation Forecast
  4.0 trips/mile of trail length x 53.4 miles of trail length = 214 Saturday AM Peak Hour Vehicle Trips (105 inbound trips, 109 outbound trips)

- Phase II.b Project Saturday AM Peak Hour Trip Generation Forecast
  4.0 trips/mile of trail length x 9.7 miles of trail length = 39 Saturday AM Peak Hour Vehicle Trips (19 inbound trips, 20 outbound trips)

The forecast project vehicle trips (i.e., 214 AM peak hour trips for Phase II.a and 39 AM peak hour trips for Phase II.b) are anticipated to be dispersed proportionately throughout all trailhead locations within the Trails Master Plan Phase II study area (i.e., throughout an over 15,000-acre recreational area). Any internal or pass-by vehicle trips, to the extent that any occur, are included in these volumes, as the peak hour counts conducted at each trailhead were of all vehicle trips. It is important to note that research regarding cumulative (related) development projects was not deemed necessary in the review of future volumes, since development projects typically impact the weekday commuter AM and PM peak hours to the greatest degree and therefore do not significantly contribute to the peak weekend (i.e., Saturday) early morning condition. Nonetheless, growth in the use of the trails is accounted for in the forecast trip generation.

Refer to *Figures 4A* and *4B* which show the existing and adopted proposed trails within the Santa Susana Mountains recreational area and trail system. It can be expected that future vehicle trips at any one trailhead location would be fairly nominal since many additional locations currently exist for access to the extensive trail system above and beyond those surveyed as part of this assessment. Potential trailheads and amenities are being reviewed within the Phase II.a and II.b study areas. It also should be noted that while all County of Los Angeles proposed trails and trails based on community input were included for purposes of forecasting future increases in vehicle trip generation and traffic patterns associated with the enhanced trail system, it is recognized that some of these trails are utilized today, while not formally designated. Furthermore, as the proposed trail length (in miles) cited above is comprised of new trails as well as extensions/connections to existing trails, the vehicle trip generation at these trailheads may not be solely new trips to the area since some recreational users may already frequent the existing trails. As such, the forecast

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trips associated with Phase II noted above can be considered conservative and actual vehicle trip generation may be lower. Lastly, while some new trailhead locations are planned, they are not expected to significantly alter existing traffic patterns as other existing trail access points are in the nearby vicinity and are expected to result in a small redistribution of localized trips.

Parking Assessment

Existing Parking Demand at Study Trailheads

Parking observations were conducted at each surveyed trailhead location in June 2017 in order to document the peak weekend (Saturday) morning parking demand. Specifically, the parking surveys were conducted in hourly time increments from 6:00 AM to 10:00 AM on Saturday, June 17, 2017. ***Figures 5A*** through ***5E*** illustrate the aerial view of the parking areas associated with each surveyed trailhead location. The parking accumulation surveys were conducted by a traffic data collection company (The Traffic Solution). The day and time periods were selected during the weekend (Saturday) morning peak time period based on the expected peak parking demand associated with recreational trail usage. It is noted that weekday morning and afternoon peak time periods associated with the commuter peak periods would not coincide with the peak traffic generation of the trail users, which typically coincide with the weekend (Saturday) morning time period.

A detailed summary of the hourly parking accumulation surveys conducted at the parking areas for each of the trailhead locations is presented in ***Table 3***. As shown in *Table 3*, the survey parking supply totals 481 spaces and the weekend peak parking demand occurred between 8:00 AM and 9:00 AM when a total of 178 spaces were occupied (i.e., a 37% occupancy). It should be noted that the Lower Towsley trailhead location, which had the highest parking demand of the surveyed locations, experienced its peak between 9:00 AM and 10:00 AM. Street parking was observed to be the most heavily utilized at the Rice Canyon and Lower Towsley trailhead locations.

Proposed Project Parking Demand Forecast

Similar to the project trip generation forecasts, parking is dispersed throughout all trailhead locations within the Trails Master Plan Phase II study area (i.e., throughout an over 15,000-acre recreational area). Any internal or pass-by trips and associated parking demand, to the extent that they occurred at the survey locations, are included in the parking demand survey data collected as part of this study. Based on information provided by the project team, three of the six surveyed trailhead locations are planned for some additional parking (i.e., Rice Canyon, Lower Towsley, and Mentryville Overflow locations). It can be expected that future parking demand

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increases at any one trailhead location would be fairly nominal since many additional locations currently exist for access to the extensive trail system above and beyond those surveyed as part of this assessment. As part of the Trails Master Plan, the parking areas for the prime trailhead locations should provide on-site parking areas which conform to the nine elements previously identified in the *County of Los Angeles Trails User Manual.*

Summary

Based on the traffic and parking assessment prepared for the proposed project, the following conclusions are made:

- Six trailhead locations were identified and analyzed herein for purposes of developing project trip generation forecasts for use in this traffic and parking assessment. Five of the six trailhead locations are situated generally within the Phase II.a subarea: 1) Rice Canyon Trailhead, 2) Lower Towsley Trailhead, 3) Pico Canyon Trailhead, 4) Mentryville Overflow Lot, and 5) Mentryville Main Lot. One of the six trailhead locations is situated within the Phase II.b subarea (i.e., Sage Ranch Loop Trailhead).

- Counts of existing Saturday AM peak period inbound/outbound vehicle trip generation associated with the six existing trailhead locations were conducted in June 2017. The Saturday morning peak hour trip generation for each trailhead ranged between 7 and 144 total vehicle trips. The Saturday morning peak hour trip generation for the six trailhead locations located within the Phase II (i.e., Phases II.a and II.b) study area totaled 226 vehicle trips (110 inbound trips and 116 outbound trips).

- The derived empirical trip generation rate per mile of trail length was determined to be 4.0 vehicle trips per mile of trail length (49% inbound trips, 51% outbound trips).

- With the exclusion of the existing trails, the future proposed trails comprise 53.4 miles for Phase II.a and 9.7 miles for Phase II.b, for a total of 63.1 miles within the Santa Susana Mountains Trails Master Plan - Phase II study area. The forecast Saturday AM peak hour project trip generation for Phases II.a and II.b of the Trails Master Plan (i.e., based on application of the derived empirical rate to the future proposed trail length) totals 214 vehicle trips and 39 vehicle trips, respectively.

- Research regarding cumulative (related) development projects was not deemed necessary in the review of future volumes since development projects typically impact the weekday commuter AM and PM peak hours to the greatest degree and

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therefore do not significantly contribute to the peak weekend (i.e., Saturday) early morning condition.

- As the Trails Master Plan Phase II study area is within an approximate 15,000-acre recreational area, this increased trip generation is not expected to result in significant congestion near trailhead locations.

- The forecast project trips are anticipated to be dispersed proportionately throughout all trailhead locations within the Trails Master Plan - Phase II study area. Thus, it can be expected that future vehicle trips at any one trailhead location would be fairly nominal since many additional locations currently exist for access to the extensive trail system above and beyond those surveyed as part of this assessment.

- Existing parking observations were conducted at each of the trailhead parking areas during the Saturday morning peak period in June 2017. As shown in *Table 3*, the majority of the trailhead locations were observed to experience a peak weekend morning parking demand between 8:00 AM and 9:00 AM, when a total of 178 spaces of the 481 spaces available were observed to be occupied (i.e., 37% occupancy).

- Similar to the project trip generation forecasts, parking is dispersed throughout all trailhead locations within the Trails Master Plan – Phase II study area. Thus, it can be expected that future parking demand increases at any one trailhead location would be fairly nominal since many additional locations currently exist for access to the extensive trail system above and beyond those surveyed as part of this assessment.

- As part of the Trails Master Plan, the parking areas for the prime trailhead locations should provide on-site parking areas which conform to the nine elements previously identified in the *County of Los Angeles Trails User Manual*.

- It is recommended that in the County's review of the designs for the enhanced and new trailhead locations, that adequate sight distance be provided at the planned access points and that parking areas be designed to minimize impacts to any surrounding off-site parking including residential streets. It is further recommended that County Staff consider traffic calming measures if warranted.

Please feel free to contact us should you have any questions regarding this traffic and parking assessment for the Trails Master Plan – Phase II.

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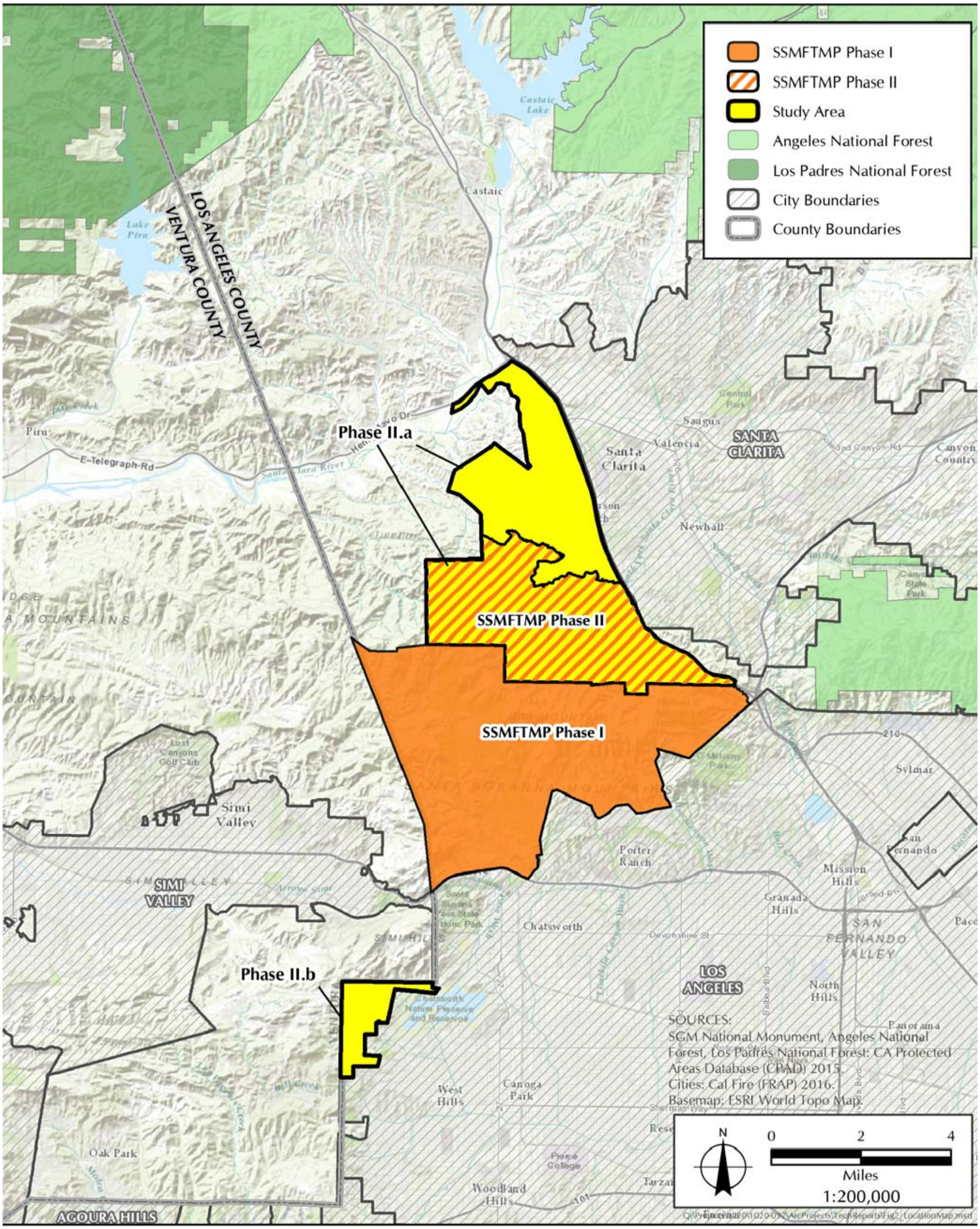

N
NOT TO SCALE

MAP SOURCE: SAPPHOS ENVIRONMENTAL INC.

FIGURE 1
TRAILS MASTER PLAN LOCATION

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SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

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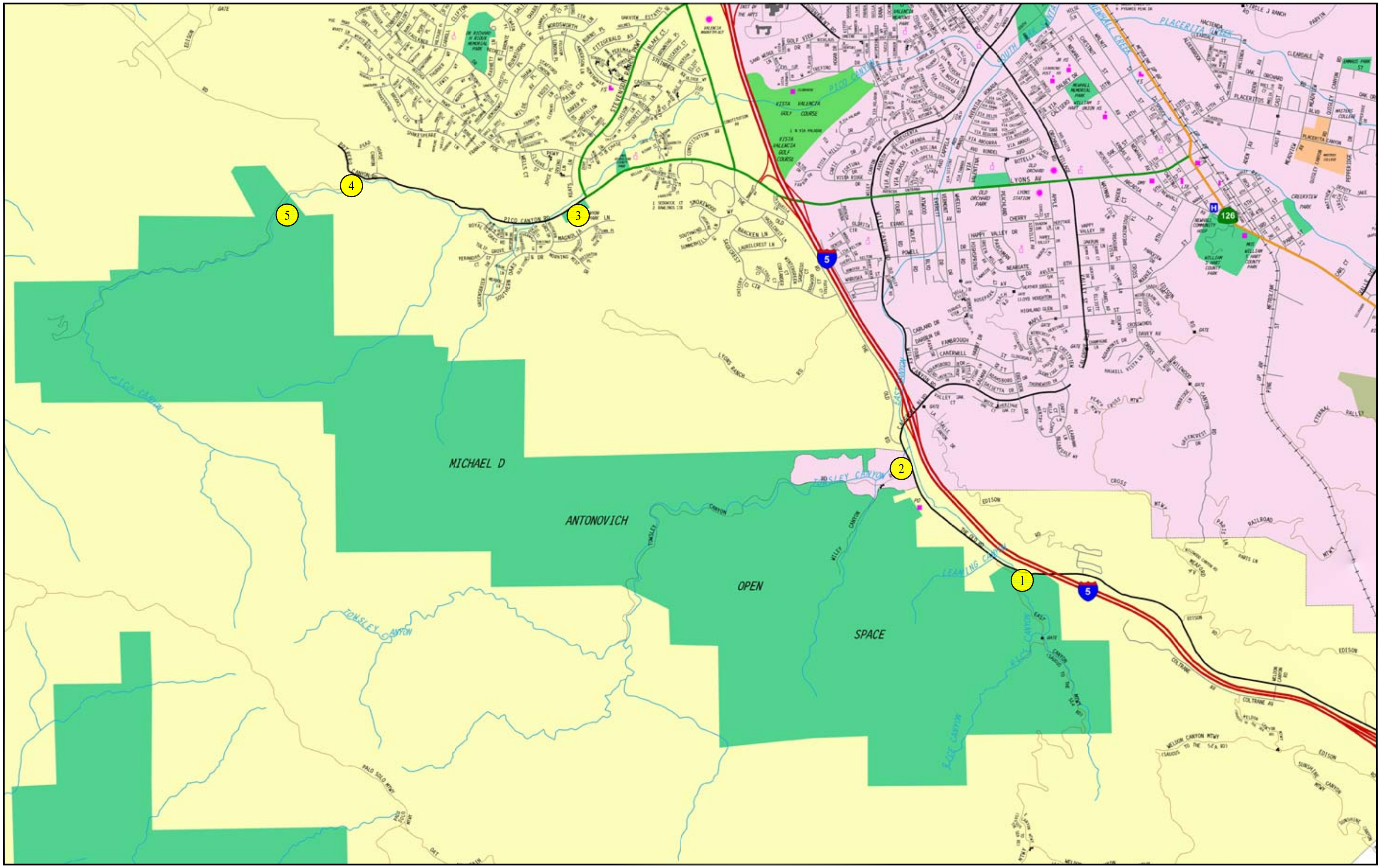

MAP SOURCE: RAND MCNALLY & COMPANY

N

NOT TO SCALE

1 RICE CANYON TRAILHEAD

2 LOWER TOWSLEY TRAILHEAD

3 PICO CANYON TRAILHEAD

4 MENTRYVILLE OVERFLOW

5 MENTRYVILLE MAIN LOT

FIGURE 2A
VICINITY MAP

PHASE II.a STUDY AREA

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

LINSCOTT, LAW & GREENSPAN, engineers

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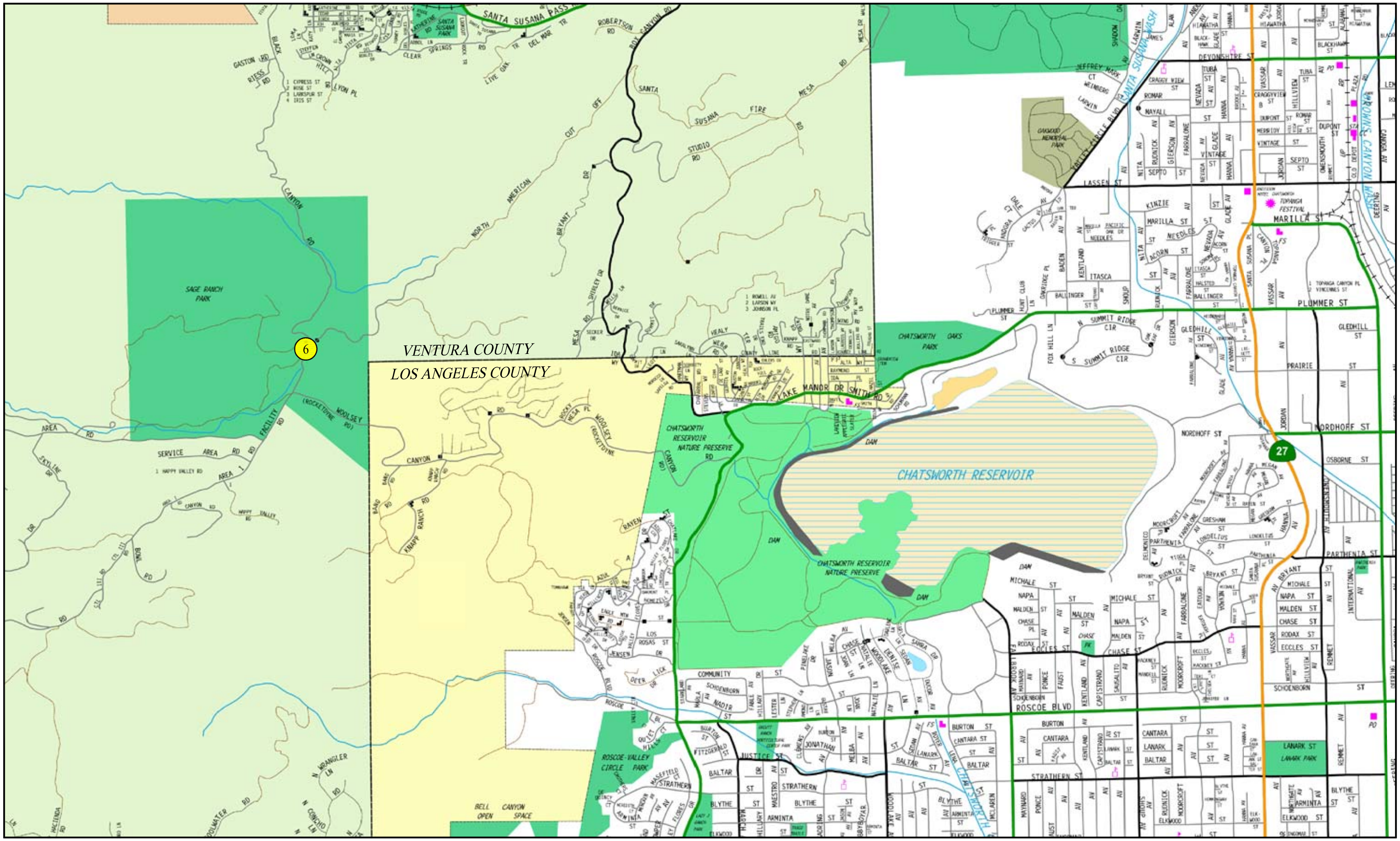

MAP SOURCE: RAND MCNALLY & COMPANY

6 SAGE RANCH LOOP TRAILHEAD

N

NOT TO SCALE

FIGURE 2B
VICINITY MAP

PHASE II.b STUDY AREA

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

LINSCOTT, LAW & GREENSPAN, engineers

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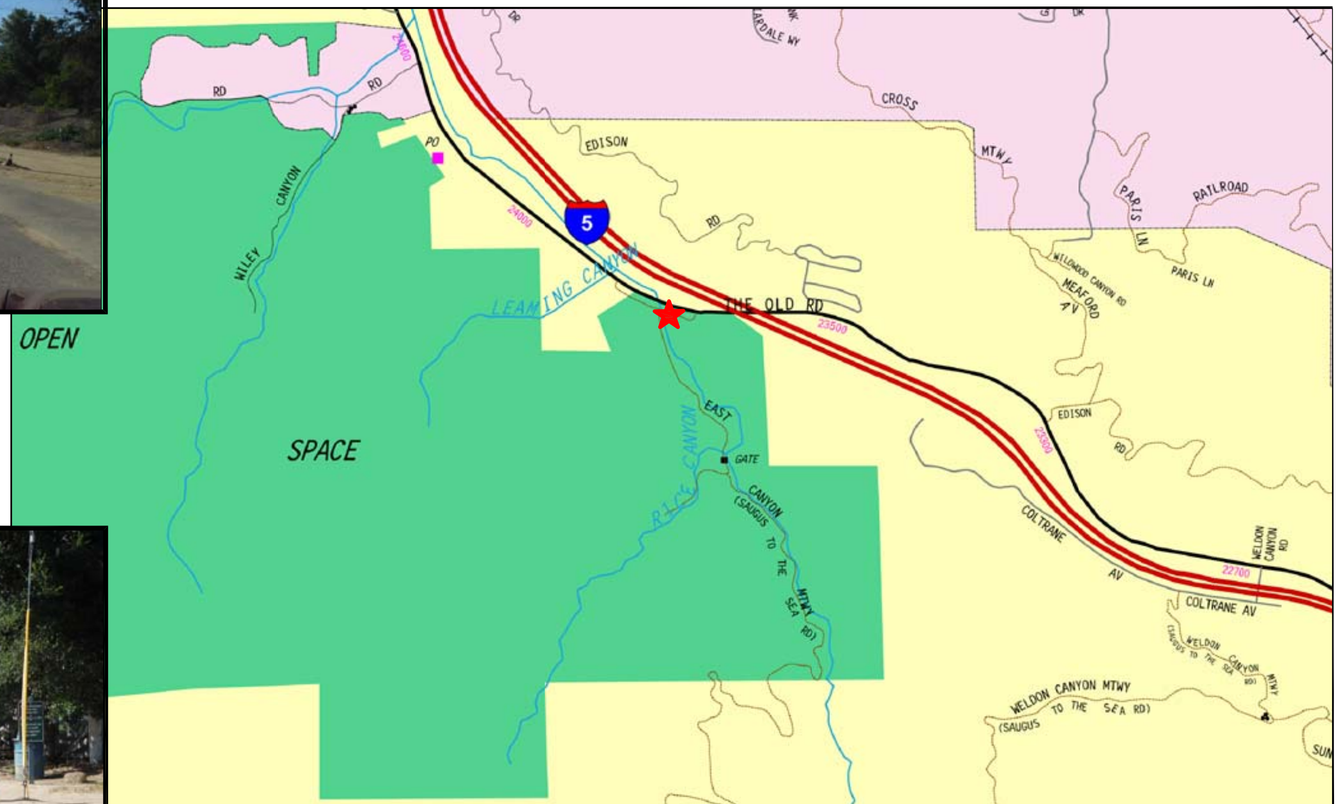


NOT TO SCALE

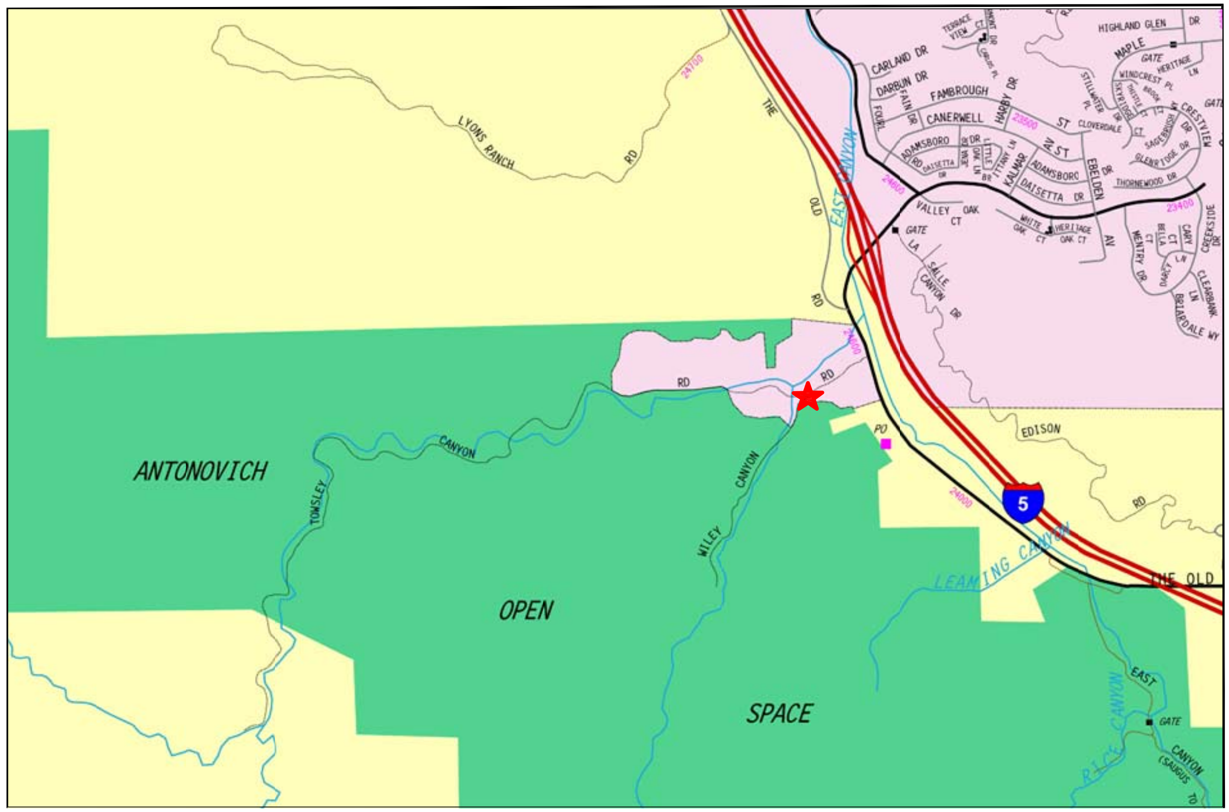
MAP SOURCE: RAND MCNALLY & COMPANY

SURVEY TRAILHEAD

FIGURE 3A
RICE CANYON TRAILHEAD

LINSCOTT, LAW & GREENSPAN, engineers

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT



NOT TO SCALE

MAP SOURCE: RAND MCNALLY & COMPANY

SURVEY TRAILHEAD

FIGURE 3B
LOWER TOWSLEY TRAILHEAD
UPPER LOT

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

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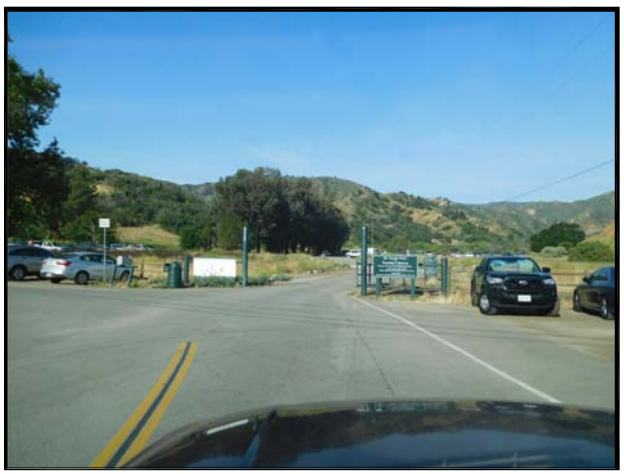

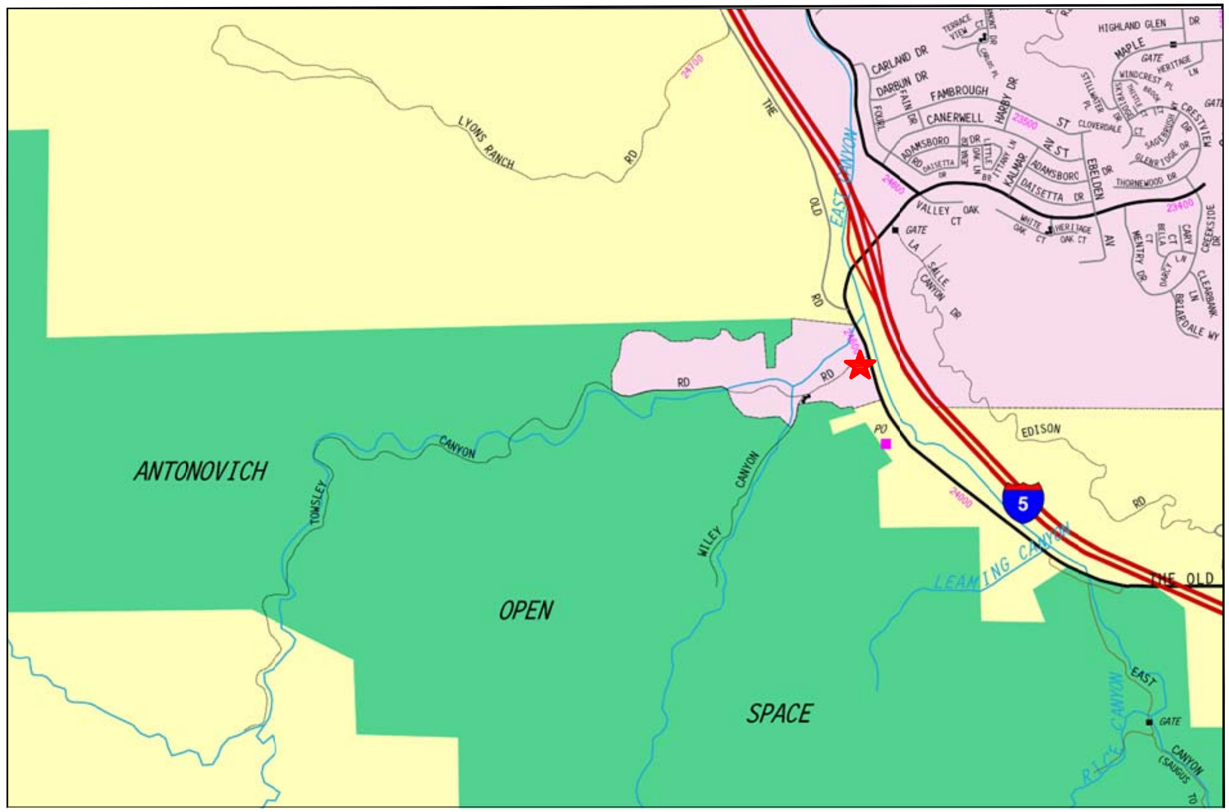

NOT TO SCALE

MAP SOURCE: RAND MCNALLY & COMPANY

SURVEY TRAILHEAD

FIGURE 3C
LOWER TOWSLEY TRAILHEAD

LOWER LOT

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

LINSCOTT, LAW & GREENSPAN, engineers

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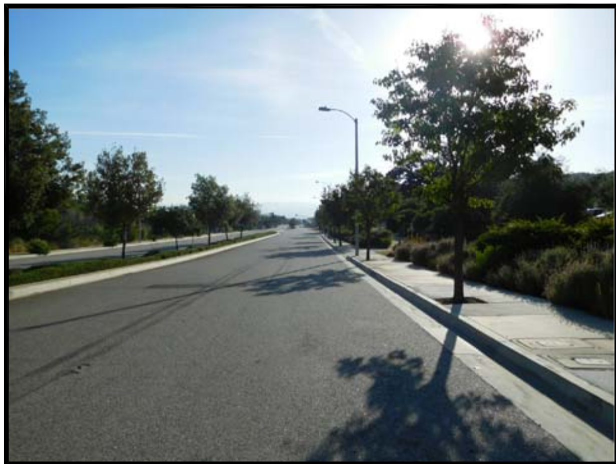
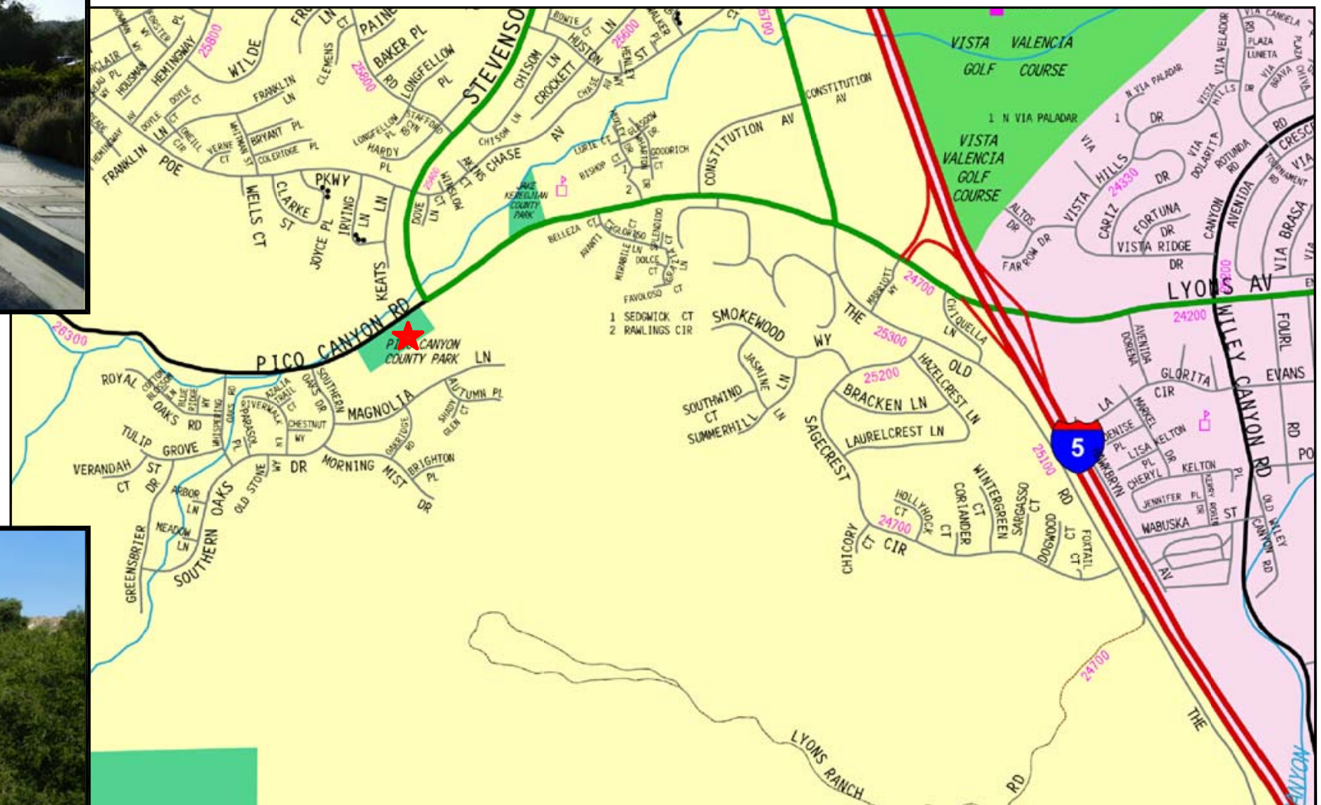




NOT TO SCALE

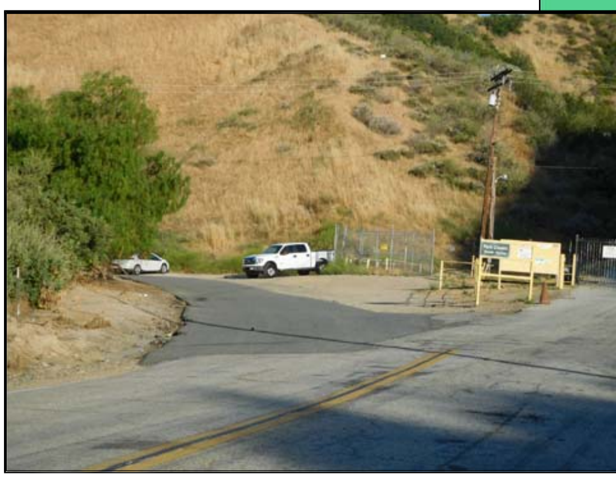
MAP SOURCE: RAND MCNALLY & COMPANY

★ SURVEY TRAILHEAD

FIGURE 3D
PICO CANYON TRAILHEAD

LINSCOTT, LAW & GREENSPAN, engineers

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT



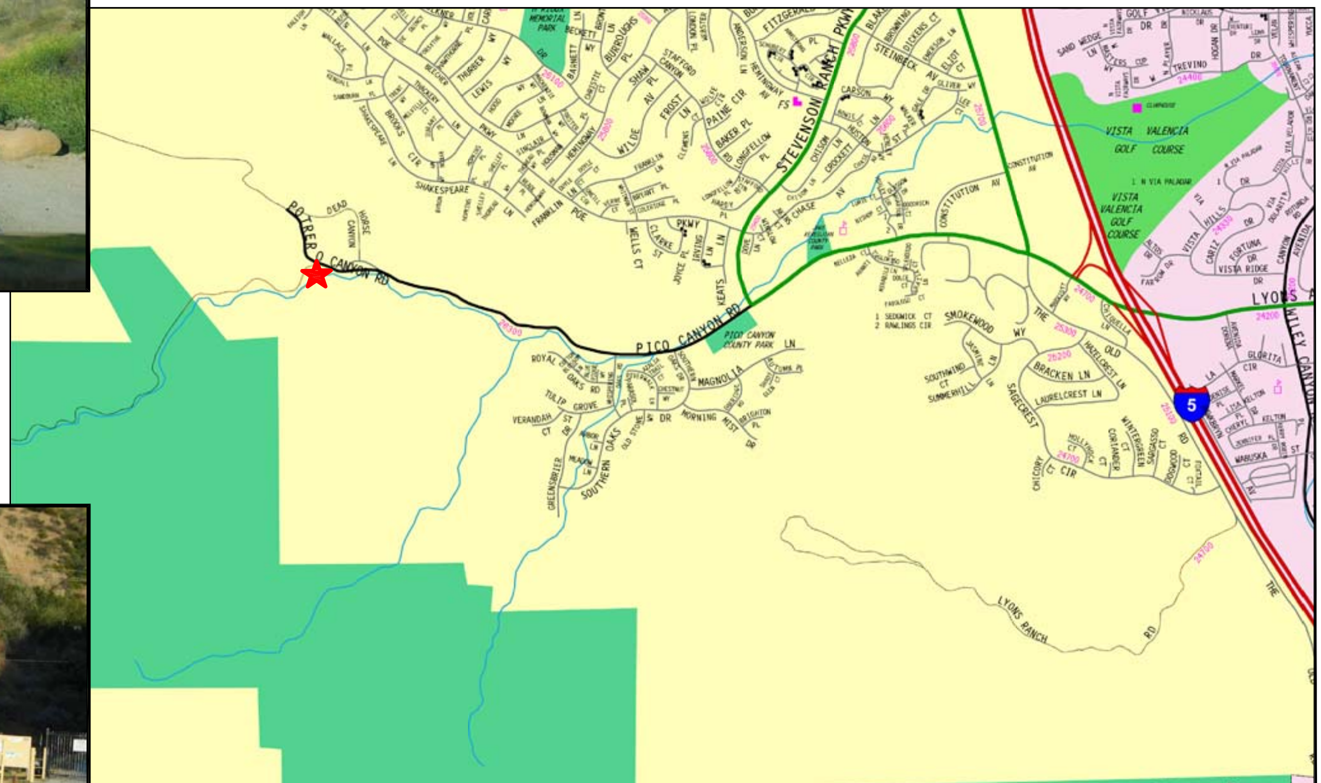


FIGURE 3E
MENTRYVILLE OVERFLOW LOT

NOT TO SCALE

MAP SOURCE: RAND MCNALLY & COMPANY

★ SURVEY TRAILHEAD

LINSCOTT, LAW & GREENSPAN, engineers

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

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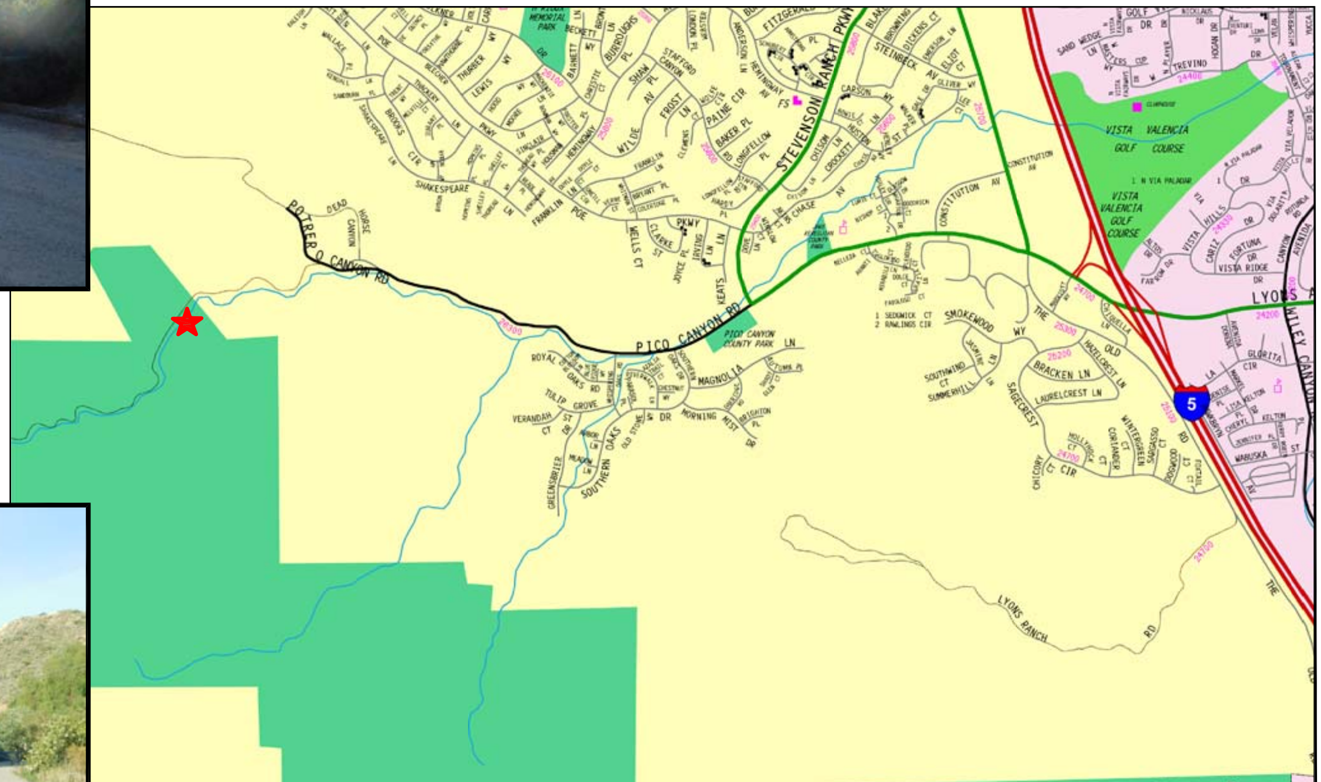


NOT TO SCALE

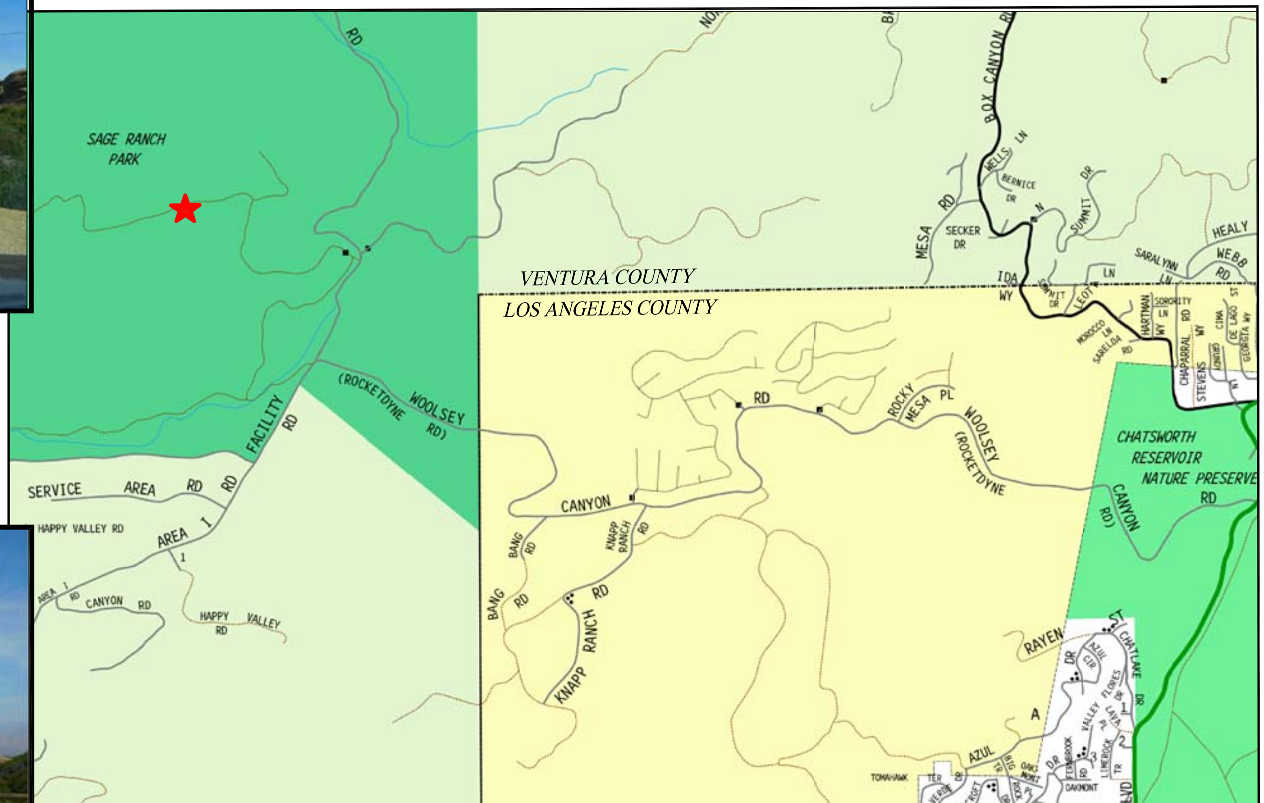
MAP SOURCE: RAND MCNALLY & COMPANY

SURVEY TRAILHEAD

FIGURE 3F
MENTRYVILLE MAIN LOT TRAILHEAD

LINSCOTT, LAW & GREENSPAN, engineers

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT



NOT TO SCALE

MAP SOURCE: RAND MCNALLY & COMPANY

★ SURVEY TRAILHEAD

LINSCOTT, LAW & GREENSPAN, engineers

FIGURE 3G
SAGE RANCH LOOP TRAILHEAD

UPPER LOT

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

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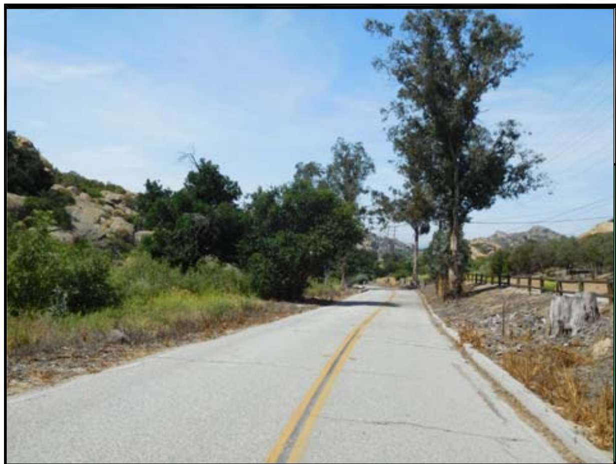

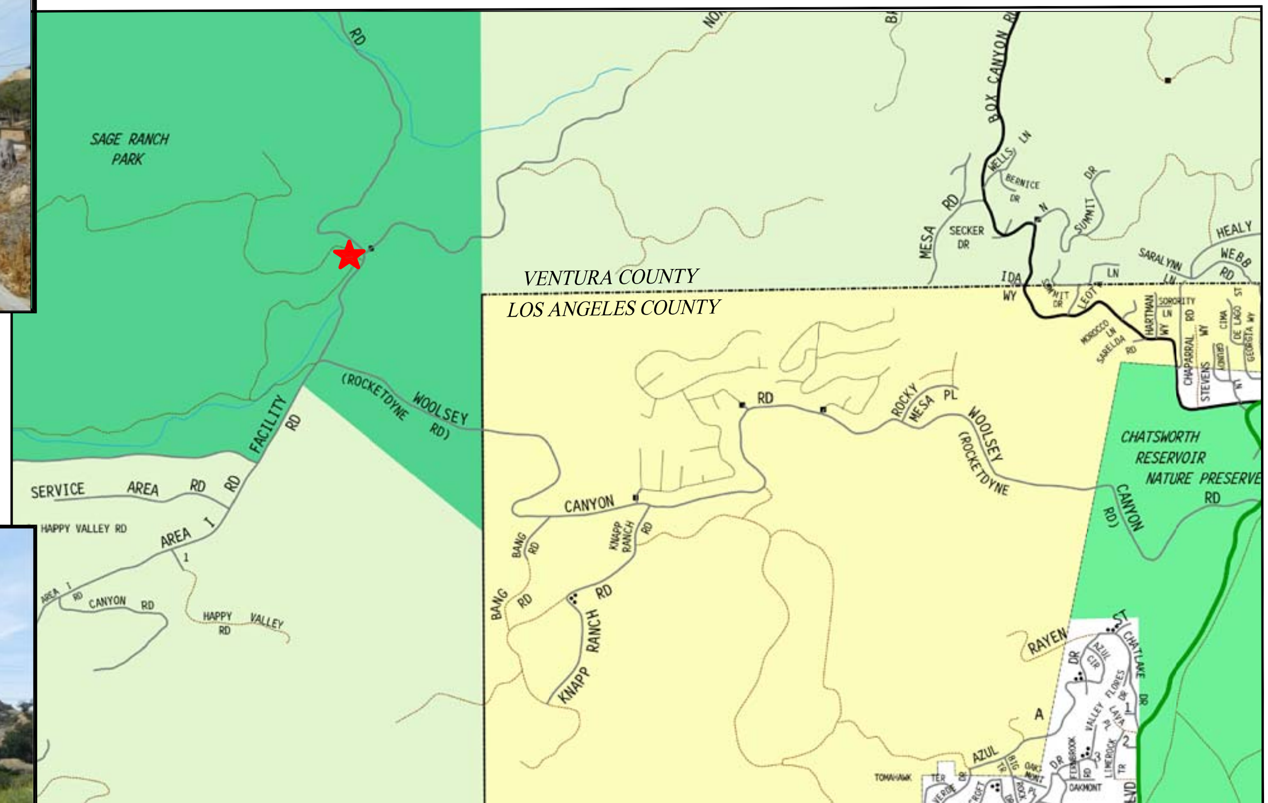

MAP SOURCE: RAND MCNALLY & COMPANY

★ SURVEY TRAILHEAD

N

NOT TO SCALE

LINSCOTT, LAW & GREENSPAN, engineers

FIGURE 3H
SAGE RANCH LOOP TRAILHEAD
LOWER LOT

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

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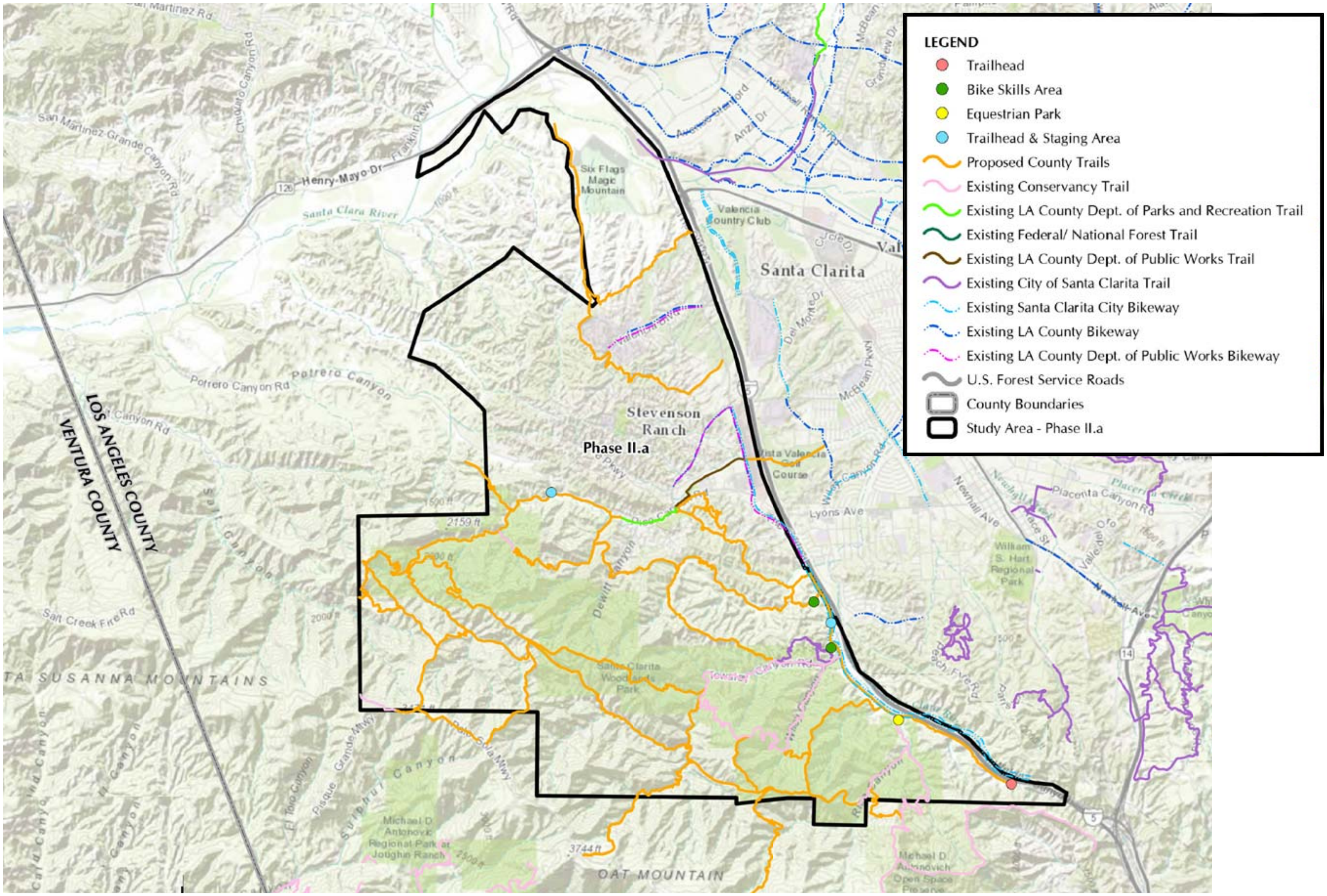

MAP SOURCE: SAPPHOS ENVIRONMENTAL, INC.

N

NOT TO SCALE

FIGURE 4A
EXISTING AND PROPOSED TRAILS
PHASE II.a SUBAREA

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

LINSCOTT, LAW & GREENSPAN, engineers

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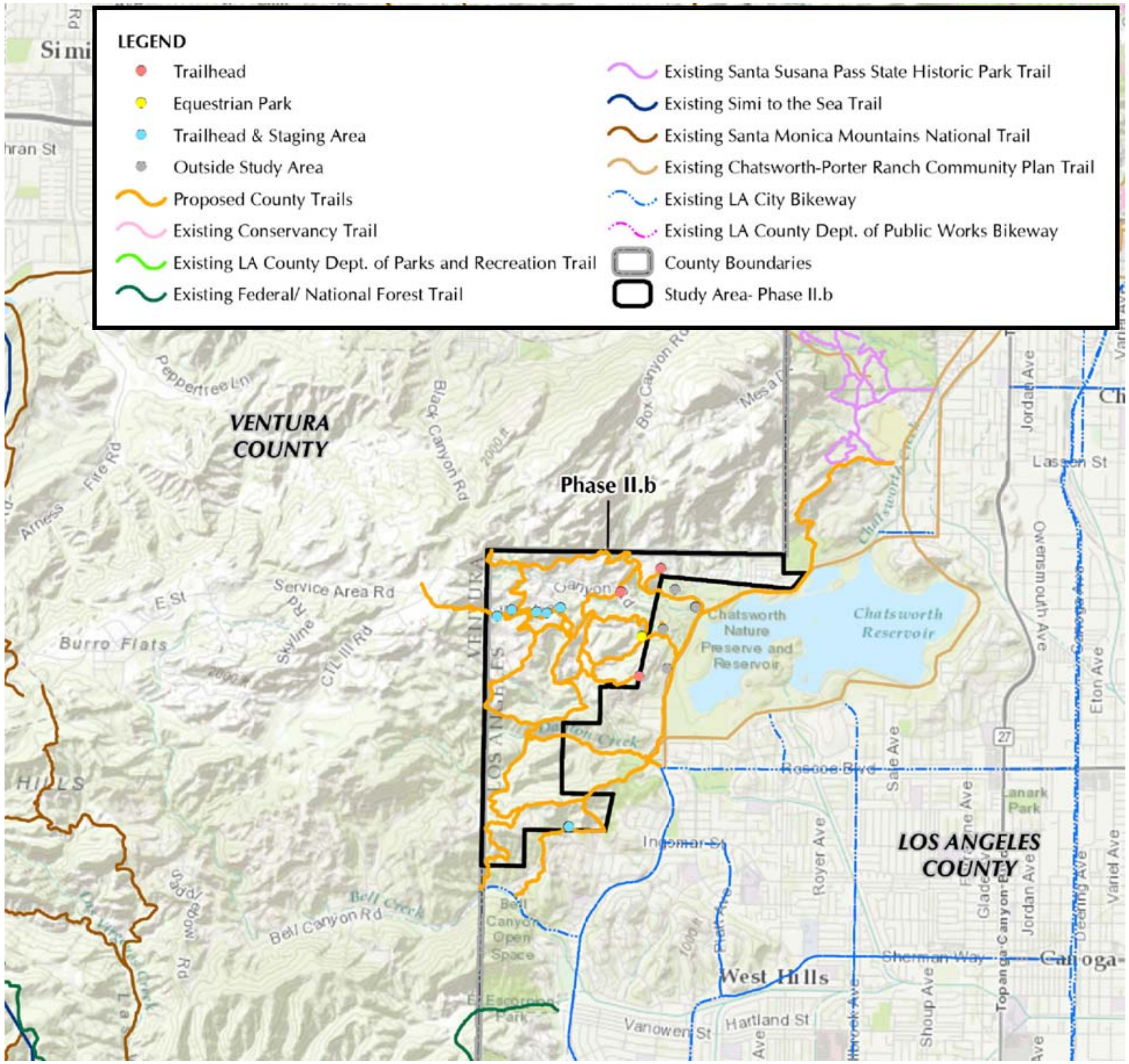

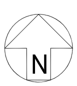

NOT TO SCALE

MAP SOURCE: SAPPHOS ENVIRONMENTAL, INC.

LINSCOTT, LAW & GREENSPAN, engineers

FIGURE 4B
EXISTING AND PROPOSED TRAILS

PHASE II.b SUBAREA

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

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NOT TO SCALE

MAP SOURCE: GOOGLE EARTH

FIGURE 5A
TRAILHEAD PARKING AREAS
RICE CANYON TRAILHEAD
SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

LINSCOTT, LAW & GREENSPAN, engineers

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NOT TO SCALE

MAP SOURCE: GOOGLE EARTH

FIGURE 5B
TRAILHEAD PARKING AREAS

LOWER TOWSLEY TRAILHEAD

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

LINSCOTT, LAW & GREENSPAN, engineers

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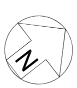

NOT TO SCALE

MAP SOURCE: GOOGLE EARTH

LINSCOTT, LAW & GREENSPAN, engineers

FIGURE 5C
TRAILHEAD PARKING AREAS

PICO CANYON TRAILHEAD

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

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NOT TO SCALE

MAP SOURCE: GOOGLE EARTH

FIGURE 5D
TRAILHEAD PARKING AREAS

MENTRYVILLE TRAILHEAD

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

LINSCOTT, LAW & GREENSPAN, engineers

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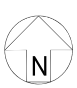

NOT TO SCALE

MAP SOURCE: GOOGLE EARTH

FIGURE 5E
TRAILHEAD PARKING AREAS

SAGE RANCH LOOP TRAILHEAD

SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II PROJECT

LINSCOTT, LAW & GREENSPAN, engineers

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Table 1
TRAILHEAD LOCATIONS
EXISTING PARKING AREA DESIGN AND AMENITIES [1]

TRAILHEAD LOCATIONS [2]	Parking Lot (No. of Spaces)	On-street (No. of Spaces)	Roadway Signage	Natural Parking Surface	Guardrails for Parking Edges	Natural Logs/Poles for Bumper Stops	Post Bollards at Trailheads	Trailhead Info Kiosk	Picnic Tables/ Trash Receptables	Parking Lot with ADA Spaces	5 Minimum Parking Spaces
Trailhead #1: Rice Canyon	18	22		X	X			X	X		X
Trailhead #2: Lower Towsley	175	80	X	X	X	X		X	X		X
Trailhead #3: Pico Canyon	25	46	X	X [3]				X	X	X	X
Trailhead #4: Mentryville Overflow	10	n/a		X					X		X
Trailhead #5: Mentryville Main Lot	60	n/a	X	X		X	X	X	X		X
Trailhead #6: Sage Ranch Loop	45	n/a	X	X	X			X	X		X

[1] Based on field reviews conducted by LLG Engineers in June 2017.
[2] Refer to Figures 3A to 3H for the identified trailhead survey areas.
[3] Paved surface parking is also provided

Table 2

INBOUND/OUTBOUND VEHICLE TRIP GENERATION [1]

SURVEY DATE: SATURDAY, JUNE 17, 2017

TOTAL VEHICLE GENERATION AT TRAILHEAD LOCATIONS

TRAILHEAD LOCATIONS [2]	[3] TIME PERIOD	SATURDAY AM PEAK HOUR TRAFFIC VOLUMES [4]			TRAIL LENGTH (IN MILES) [5]	SAT AM PEAK HOUR DERIVED TRIP RATE (TRIPS/TRAIL MILE)
		IN	OUT	TOTAL		
Trailhead #1: Rice Canyon	7:30 AM - 8:30 AM	7	10	17	23.7	0.7
Trailhead #2: Lower Towsley	8:00 AM - 9:00 AM	70	74	144	10.9	13.2
Trailhead #3: Pico Canyon	8:00 AM - 9:00 AM	21	25	46	2.0	22.5
Trailhead #4, #5: Mentryville Overflow & Main Lot	6:00 AM - 7:00 AM	12	0	12	17.0	0.7
Trailhead #6: Sage Ranch Loop	8:45 AM - 9:45 AM	0	7	7	2.6	2.7
Total of Trailhead Locations Nos. 1 through 6 [6]:		**110**	**116**	**226**	**56.2**	**4.0**

[1] The vehicle inbound/outbound traffic count data was conducted by The Traffic Solution.
[2] Refer to Figures 5A to 5E for the identified trailhead survey areas.
[3] The Saturday morning peak hour determined based on the inbound/outbound vehicle trips observed to enter and depart the on-site and/or on-street parking areas in 15-minute time increments between 6:00 AM and 10:00 AM. Refer to Appendix A for the traffic count data.
[4] Trips are one-way traffic movements, entering or leaving.
[5] Trail length in miles includes both official and unofficial trails as provided by Sapphos Environmental, Inc.
[6] Derived trip rate based on the total trail length in miles for trailhead locations #1 through #6 divided by the total Saturday morning peak hour inbound and outbound trips.

Table 3
WEEKEND PARKING ACCUMULATION SURVEYS [1]
SURVEY DATE: SATURDAY, JUNE 17, 2017
TOTAL OVERALL PARKING OCCUPANCY AT TRAILHEAD LOCATIONS

		Saturday, June 17, 2017														
	[3]	6:00 AM			7:00 AM			8:00 AM			9:00 AM			10:00 AM		
PARKING	NO. OF	OCC.		AVAIL.	OCC.		AVAIL.	OCC.		AVAIL.	OCC.		AVAIL.	OCC.		AVAIL.
LOCATION [2]	SPACES	SP.	%	SP.	SP.	%	SP.	SP.	%	SP.	SP.	%	SP.	SP.	%	SP.
Trailhead #1: Rice Canyon																
Parking Lot Spaces	18	0	0.0%	18	0	0.0%	18	0	0.0%	18	0	0.0%	18	0	0.0%	18
On-Street Parking Spaces [4]	22	4	18.2%	18	12	54.5%	10	9	40.9%	13	7	31.8%	15	6	27.3%	16
Total Trailhead #1 Parking	**40**	**4**	**10.0%**	**36**	**12**	**30.0%**	**28**	**9**	**22.5%**	**31**	**7**	**17.5%**	**33**	**6**	**15.0%**	**34**
Trailhead #2: Lower Towsley																
A. Upper Overflow Lot Spaces	65	0	0.0%	65	18	27.7%	47	54	83.1%	11	57	87.7%	8	39	60.0%	26
B. Lower Overflow Lot Spaces	60	0	0.0%	60	6	10.0%	54	24	40.0%	36	27	45.0%	33	16	26.7%	44
C. Upper Pay Lot Spaces	30	0	0.0%	30	0	0.0%	30	0	0.0%	30	0	0.0%	30	0	0.0%	30
D. Lower Pay Lot Spaces	20	0	0.0%	20	0	0.0%	20	0	0.0%	20	0	0.0%	20	0	0.0%	20
E. On-Street Parking Spaces [5]	80	23	28.8%	57	80	100.0%	0	53	66.3%	27	50	62.5%	30	21	26.3%	59
Total Trailhead #2 Parking	**255**	**23**	**9.0%**	**232**	**104**	**40.8%**	**151**	**131**	**51.4%**	**124**	**134**	**52.5%**	**121**	**76**	**29.8%**	**179**
Trailhead #3: Pico Canyon																
Parking Lot - Standard Spaces	15	4	26.7%	11	15	100.0%	0	14	93.3%	1	9	60.0%	6	11	73.3%	4
Parking Lot - Handicap Accessible Spaces	2	0	0.0%	2	0	0.0%	2	0	0.0%	2	0	0.0%	2	0	0.0%	2
Parking Lot - Dirt Spaces	8	0	0.0%	8	2	25.0%	6	5	62.5%	3	3	37.5%	5	2	25.0%	6
On-Street Parking Spaces [6]	46	0	0.0%	46	0	0.0%	46	0	0.0%	46	0	0.0%	46	0	0.0%	46
Total Trailhead #3 Parking	**71**	**4**	**5.6%**	**67**	**17**	**23.9%**	**54**	**19**	**26.8%**	**52**	**12**	**16.9%**	**59**	**13**	**18.3%**	**58**
Trailhead #4: Mentryville Overflow																
Parking Lot Spaces	10	1	10.0%	9	8	80.0%	2	9	90.0%	1	7	70.0%	3	7	70.0%	3
Total Trailhead #4 Parking	**10**	**1**	**10.0%**	**9**	**8**	**80.0%**	**2**	**9**	**90.0%**	**1**	**7**	**70.0%**	**3**	**7**	**70.0%**	**3**
Trailhead #5: Mentryville Main Lot																
Parking Lot Spaces	60	0	0.0%	60	4	6.7%	56	2	3.3%	0	1	1.7%	59	1	1.7%	59
Total Trailhead #5 Parking	**60**	**0**	**0.0%**	**60**	**4**	**6.7%**	**56**	**2**	**3.3%**	**58**	**1**	**1.7%**	**59**	**1**	**1.7%**	**59**
Trailhead #6: Sage Ranch Loop																
A. Overflow Lot Spaces	20	6	30.0%	14	8	40.0%	12	8	40.0%	12	5	25.0%	15	0	0.0%	20
B. Pay Lot Spaces	25	0	0.0%	25	0	0.0%	25	0	0.0%	25	0	0.0%	25	0	0.0%	25
Total Trailhead #6 Parking	**45**	**6**	**13.3%**	**39**	**8**	**17.8%**	**37**	**8**	**17.8%**	**37**	**5**	**11.1%**	**40**	**0**	**0.0%**	**45**
Totals for Trailheads #1 through #6	**481**	**38**	**7.9%**	**443**	**153**	**31.8%**	**328**	**178**	**37.0%**	**303**	**166**	**34.5%**	**315**	**103**	**21.4%**	**378**

[1] The parking survey was conducted by The Traffic Solution.
[2] Refer to Figures 5A to 5E for the identified parking areas.
[3] Parking inventory based on field review conducted by LLG Engineers in June 2017.
[4] On-street parking spaces provided along the south side of The Old Road.
[5] On-street parking spaces provided along the west side of The Old Road.
[6] On-street parking spaces provided along the south side of Pico Canyon Road.

OCC = occupied spaces
AVAIL = available spaces

APPENDIX A

TRAFFIC COUNT DATA -
SATURDAY AM PEAK PERIOD CONDITIONS

TRIP OBSERVATION STUDY - RESULTS

CLIENT: LLG - PASADENA

PROJECT: SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II

DATE: SATURDAY, JUNE 17, 2017

PERIOD: 06:00 AM TO 10:00 AM

LOCATION: RICE CANYON

FILE: 1-TRIP

BEGIN COUNT: THE OLD ROAD - 4 VEHICLES

RICE CANYON LOT - 0 VEHICLES

15-MIN	THE OLD ROAD		RICE CANYON LOT	
PERIOD	INBOUND	OUTBOUND	INBOUND	OUTBOUND
0600-0615	1	0	0	0
0615-0630	2	0	0	0
0630-0645	2	0	0	0
0645-0700	1	0	0	0
0700-0715	2	0	0	0
0715-0730	1	0	0	0
0730-0745	5	1	0	0
0745-0800	0	3	0	0
0800-0815	1	5	0	0
0815-0830	1	1	0	0
0830-0845	0	3	0	0
0845-0900	1	1	0	0
0900-0915	2	1	1	1
0915-0930	0	1	0	0
0930-0945	0	1	0	0
0945-1000	0	0	0	0

1-HOUR	THE OLD ROAD		RICE CANYON LOT	
PERIOD	INBOUND	OUTBOUND	INBOUND	OUTBOUND
0600-0700	6	0	0	0
0615-0715	7	0	0	0
0630-0730	6	0	0	0
0645-0745	9	1	0	0
0700-0800	8	4	0	0
0715-0815	7	9	0	0
0730-0830	7	10	0	0
0745-0845	2	12	0	0
0800-0900	3	10	0	0
0815-0915	4	6	1	1
0830-0930	3	6	1	1
0845-0945	3	4	1	1
0900-1000	2	3	1	1

THE TRAFFIC SOLUTION
329 DIAMOND STREET
ARCADIA, CALIFORNIA 91006
626.446.7978

TRIP OBSERVATION STUDY - RESULTS

CLIENT:	LLG - PASADENA
PROJECT:	SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II
DATE:	SATURDAY, JUNE 17, 2017
PERIOD:	06:00 AM TO 10:00 AM
LOCATION:	LOWER TOWSLEY
FILE:	2-TRIP

BEGIN COUNT: LOWER TOWSLEY (E) - 23 VEHICLES

15-MIN	LOWER TOWSLEY PARKING AREAS A-E	
PERIOD	INBOUND	OUTBOUND
0600-0615	9	0
0615-0630	29	0
0630-0645	17	0
0645-0700	22	0
0700-0715	21	6
0715-0730	18	8
0730-0745	26	16
0745-0800	15	14
0800-0815	21	17
0815-0830	18	14
0830-0845	19	20
0845-0900	12	23
0900-0915	7	18
0915-0930	10	17
0930-0945	5	26
0945-1000	7	21

1-HOUR	LOWER TOWSLEY PARKING AREAS A-E	
PERIOD	INBOUND	OUTBOUND
0600-0700	77	0
0615-0715	89	6
0630-0730	78	14
0645-0745	87	30
0700-0800	80	44
0715-0815	80	55
0730-0830	80	61
0745-0845	73	65
0800-0900	70	74
0815-0915	56	75
0830-0930	48	78
0845-0945	34	84
0900-1000	29	82

THE TRAFFIC SOLUTION
329 DIAMOND STREET
ARCADIA, CALIFORNIA 91006
626.446.7978

TRIP OBSERVATION STUDY - RESULTS

CLIENT: LLG - PASADENA
PROJECT: SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II
DATE: SATURDAY, JUNE 17, 2017
PERIOD: 06:00 AM TO 10:00 AM
LOCATION: PICO CANYON
FILE: 3-TRIP

BEGIN COUNT: PICO CANYON ROAD - 0 VEHICLES
PICO CANYON LOT - 4 VEHICLES

15-MIN	PICO CANYON ROAD		PICO CANYON LOT	
PERIOD	INBOUND	OUTBOUND	INBOUND	OUTBOUND
0600-0615	0	0	3	1
0615-0630	0	0	4	0
0630-0645	0	0	5	1
0645-0700	0	0	7	3
0700-0715	0	0	2	3
0715-0730	0	0	3	0
0730-0745	0	0	3	4
0745-0800	0	0	3	4
0800-0815	0	0	3	3
0815-0830	0	0	7	10
0830-0845	0	0	7	4
0845-0900	0	0	4	8
0900-0915	0	0	1	2
0915-0930	0	0	2	2
0930-0945	0	0	5	4
0945-1000	0	0	5	6

1-HOUR	PICO CANYON ROAD		PICO CANYON LOT	
PERIOD	INBOUND	OUTBOUND	INBOUND	OUTBOUND
0600-0700	0	0	19	5
0615-0715	0	0	18	7
0630-0730	0	0	17	7
0645-0745	0	0	15	10
0700-0800	0	0	11	11
0715-0815	0	0	12	11
0730-0830	0	0	16	21
0745-0845	0	0	20	21
0800-0900	0	0	21	25
0815-0915	0	0	19	24
0830-0930	0	0	14	16
0845-0945	0	0	12	16
0900-1000	0	0	13	14

THE TRAFFIC SOLUTION
329 DIAMOND STREET
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TRIP OBSERVATION STUDY - RESULTS

CLIENT: LLG - PASADENA
PROJECT: SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II
DATE: SATURDAY, JUNE 17, 2017
PERIOD: 06:00 AM TO 10:00 AM
LOCATION: MENTRYVILLE
FILE: 4,5 -TRIP

BEGIN COUNT: OVERFLOW LOT - 1 VEHICLE
MAIN LOT - 0 VEHICLES

15-MIN	OVERFLOW LOT / WALK-IN		MAIN LOT	
PERIOD	INBOUND	OUTBOUND	INBOUND	OUTBOUND
0600-0615	1	0	1	0
0615-0630	2	0	1	0
0630-0645	0	0	1	0
0645-0700	5	0	1	0
0700-0715	0	1	0	0
0715-0730	0	0	0	1
0730-0745	0	0	0	0
0745-0800	2	1	0	0
0800-0815	0	0	0	1
0815-0830	0	0	1	1
0830-0845	0	1	0	1
0845-0900	0	1	1	1
0900-0915	0	0	1	1
0915-0930	0	0	2	1
0930-0945	0	0	1	2
0945-1000	0	0	0	0

1-HOUR	OVERFLOW LOT / WALK-IN		MAIN LOT	
PERIOD	INBOUND	OUTBOUND	INBOUND	OUTBOUND
0600-0700	8	0	4	0
0615-0715	7	1	3	0
0630-0730	5	1	2	1
0645-0745	5	1	1	1
0700-0800	2	2	0	1
0715-0815	2	1	0	2
0730-0830	2	1	1	2
0745-0845	2	2	1	3
0800-0900	0	2	2	4
0815-0915	0	2	3	4
0830-0930	0	2	4	4
0845-0945	0	1	5	5
0900-1000	0	0	4	4

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TRIP OBSERVATION STUDY - RESULTS

CLIENT: LLG - PASADENA

PROJECT: SANTA SUSANA MOUNTAINS TRAILS MASTER PLAN - PHASE II

DATE: SATURDAY, JUNE 17, 2017

PERIOD: 06:00 AM TO 10:00 AM

LOCATION: SAGE RANCH

FILE: 6-TRIP

BEGIN COUNT: LOT A - 6 VEHICLES

LOT B - GATE CLOSED

15-MIN	PARKING LOT A		PARKING LOT B	
PERIOD	INBOUND	OUTBOUND	INBOUND	OUTBOUND
0600-0615	0	0	0	0
0615-0630	0	0	0	0
0630-0645	0	0	0	0
0645-0700	2	0	0	0
0700-0715	0	0	0	0
0715-0730	0	0	0	0
0730-0745	0	0	0	0
0745-0800	1	0	0	0
0800-0815	0	1	0	0
0815-0830	0	0	0	0
0830-0845	0	1	0	0
0845-0900	0	0	0	0
0900-0915	0	2	0	0
0915-0930	0	0	0	0
0930-0945	0	5	0	0
0945-1000	0	0	0	0

1-HOUR	PARKING LOT A		PARKING LOT B	
PERIOD	INBOUND	OUTBOUND	INBOUND	OUTBOUND
0600-0700	2	0	0	0
0615-0715	2	0	0	0
0630-0730	2	0	0	0
0645-0745	2	0	0	0
0700-0800	1	0	0	0
0715-0815	1	1	0	0
0730-0830	1	1	0	0
0745-0845	1	2	0	0
0800-0900	0	2	0	0
0815-0915	0	3	0	0
0830-0930	0	3	0	0
0845-0945	0	7	0	0
0900-1000	0	7	0	0

NOTE: PARKING LOT B CLOSED DURING OBSERVATION PERIOD

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