Interstate 15 Express Lanes Project Southern Extension (I-15 ELPSE)

RIVERSIDE COUNTY, CALIFORNIA
DISTRICT 8 – RIV–15 PM 20.3 TO PM 40.1
EA: RIV 08-0J0820 / ID: 08-18000063

Combined Paleontological Identification Report / Paleontological Evaluation Report

Prepared for the
State of California Department of Transportation
in coordination with the Riverside County Transportation Commission

December 2021

15-RIV-08-PM 20.3 to PM 40.1
EA:RIV 08-0J0820

Traffic capacity and operational improvements would be constructed on Interstate 15 (I-15) between post miles (PM) 21.2 near Main Street in Lake Elsinore to PM 38.1 near El Cerrito Road in Corona. This area is referred to as the lane improvement limits. These lane improvements are located within Riverside County, California and run through the cities of Lake Elsinore, Corona and portions of unincorporated Riverside County including the Temescal Valley. Limits for the express lanes advance signage extend from PM 20.3 to PM 40.1 in Riverside County; these post miles constitute the overall project limits.

Combined Paleontological Identification Report / Paleontological Evaluation Report

1/21/2022
Date of Approval

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Acronyms and Abbreviations

amsl	above mean sea level
APS	Advance Planning Study
B.A.	Bachelor of Art
bgs	below ground surface
BMP	Best Management Practices
B.S.	Bachelor of Science
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
DVLLF	Diamond Valley Lake Local Fauna
ECR	Environmental Commitment Record
EIR/EIS	Environmental Impact Report/Environmental Impact Statement
ELP	Express Lanes Project
ELPSE	Express Lanes Project – Southern Extension
FR	Federal Register
GIS	Geographic Information System
GPS	Global Positioning System
HOV	high-occupancy vehicle
I-10	Interstate 10
I-15	Interstate 15
Kcg	Cretaceous-age monzogranite
Kgd	Cretaceous-age granodiorite, undifferentiated
Kgh	Cretaceous-age Gavilan Ring Complex, hypabyssal tonalite
Khg	Cretaceous-age heterogeneous granitic rocks
Ksv	Cretaceous-age intermixed Estelle Mountain volcanics and sedimentary rocks
Kvem	Cretaceous-age Estelle Mountain volcanics of Herzig
Kvsp	Cretaceous-age Santiago Peak Volcanics
LACM	Natural History Museum of Los Angeles County
MMRP	Mitigation Monitoring and Reporting Program
M.S.	Master of Science
NEPA	National Environmental Policy Act
Paleo Solutions	Paleo Solutions, Inc.
PBDB	Paleobiology Database
PER	Paleontological Evaluation Report
Ph.D.	Doctor of Philosophy
PIR	Paleontological Identification Report
PM	Post Mile
PMP	Paleontological Mitigation Plan
PRIMP	Paleontological Resource Impact Mitigation Program
Project	Interstate 15 Express Lanes Project – Southern Extension
Pub. L.	Public Law
Qoa	late to middle Pleistocene-age old axial channel deposits
Qof	late to middle Pleistocene-age old alluvial fan deposits
Qop	late to middle Pleistocene-age old axial channel deposits old paralic deposits, undivided
Qvoa	middle to early Pleistocene-age very old axial channel deposits

Qvof	middle to early Pleistocene-age very old alluvial fan deposits
Qw	late Holocene-age very young wash deposits
Qya	Holocene- to late Pleistocene-age young axial-channel deposits
Qyf	Holocene- to late Pleistocene-age young alluvial fan deposits
Qyv	Holocene- to late Pleistocene-age young alluvial valley deposits
Qyw	Holocene- to late Pleistocene-age young wash deposits
RCTC	Riverside County Transportation Commission
RTA	Riverside Transit Agency
RTP	Regional Transportation Plan
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategy
SER	Standard Environmental Reference
SPGR	Structure Preliminary Geotechnical Report
SR-60	State Route 60
SR-74	State Route 74
SR-91	State Route 91
SR-91 CIP	SR-91 Corridor Improvement Project
SVP	Society of Vertebrate Paleontology
TRmp	Triassic-age phyllite
TRmq	Triassic-age quartz-rich rocks
TRmu	Triassic-age metamorphic rocks of Menifee Valley, undifferentiated
Ts	early Miocene- to late Eocene-age Sespe Formation
Tsi	Paleocene-age Silverado Formation
Tvs	early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided
UCMP	University of California Museum of Paleontology
USC	United States Code
WSC	Western Science Center

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1 Executive Summary

The Riverside County Transportation Commission (RCTC), in cooperation with the California Department of Transportation (Caltrans), is proposing to construct new lanes along Interstate 15 (I-15) between Post Mile (PM) 21.2 and PM 38.1 in Riverside County, California. The primary component of the I-15 Express Lanes Project Southern Extension (Project) would be the addition of two tolled express lanes[1] in both the northbound and southbound directions within the median of I-15 from State Route 74 (SR-74) (Central Avenue) (PM 22.3) in the City of Lake Elsinore, through the unincorporated Riverside County community of Temescal Valley, to El Cerrito Road (PM 38.1) in the City of Corona, for a distance of approximately 15.8 miles. The proposed Project would also add a southbound auxiliary lane between both the Main Street (PM 21.2) off-ramp and SR-74 (Central Avenue) on-ramp (approximately 0.75 mile), and the SR-74 (Central Avenue) off-ramp and Nichols Road on-ramp (PM 23.9) (approximately 1 mile). Along with the lane additions, which would extend from PM 21.2 to 38.1, the proposed Project would include widening of up to 14 bridges, potential construction of noise barriers, retaining walls, drainage systems, and implementation of electronic toll collection equipment and signs. Associated improvements for the toll lanes, including advance signage and transition striping, would extend approximately 2 miles from each end of the express lane limits to PM 20.3 in the south and PM 40.1 in the north. The proposed lane additions and supporting infrastructure are expected to be constructed primarily within the existing State right of way.

This combined Paleontological Identification Report/Paleontological Evaluation Report (PIR/PER) presents the results of the paleontological technical study and resource potential evaluation conducted in support of the Project, located in Riverside County, California (Figure 1, Project Location map). On behalf of RCTC, Paleo Solutions, Inc. (Paleo Solutions) conducted an analysis of existing data and provided paleontological recommendations based on the geological and paleontological data. This paleontological work was required by Caltrans District 8 to fulfill their responsibilities as the lead agency under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The Project sponsor is the RCTC. All work was conducted in compliance with applicable federal, state, and local regulations and conforms to Caltrans guidelines and standards contained in the Caltrans Standard Environmental Reference (SER), Volume 1, Chapter 8 (Paleontology). Copies of this report have been submitted to Caltrans District 8 and RCTC.

The Project area is located within a moderately developed area with residential, commercial, and open space land uses adjacent to the Project. The Project area is located within the Peninsular Ranges Geomorphic Province (Harden, 2004), a region characterized by northwest-southeast-trending, fault-bounded discrete blocks, with mountain ranges, broad intervening valleys, and low-lying coast plains (Yerkes et al., 1965; Norris and Webb, 1990).

Paleo Solutions conducted an analysis of existing paleontological data of the Paleontological Study Area, which includes the I-15 ELPSE Project area and a half-mile- to one-mile-wide surrounding buffer. The analysis of existing data included a geologic map review, a literature search, institutional records searches from the Natural History Museum of Los Angeles County (LACM) and the Western Science Center (WSC) located in Hemet, online records searches of paleontology databases, and a review of the geotechnical studies conducted for the Project (Leighton Consulting, 2020; 2021a-i). For the geologic map review, a half-mile buffer was used; and for the museum records search, a one-mile buffer was used.

[1] Express lanes are traffic lanes that are separated from general purpose lanes where users are charged a toll to use the lanes.

The analysis of existing data was supplemented with a pedestrian field survey, which was conducted on April 16, 2021.

Geologic mapping by Morton and Miller (2006) indicates that the Project area is underlain by Holocene- to late Pleistocene-age young axial channel deposits (Qya), young alluvial fan deposits (Qyf), young alluvial valley deposits (Qyv), and young wash deposits (Qyw); late to middle Pleistocene-age old axial channel deposits (Qoa), old alluvial fan deposits (Qof), and old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old axial channel deposits (Qvoa) and old alluvial fan deposits (Qvof); early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs); early Miocene- to late Eocene-age Sespe Formation (Ts); Paleocene-age Silverado Formation (Tsi); Cretaceous-age granodiorite, undifferentiated (Kgd); Cretaceous-age heterogeneous granitic rocks (Khg), intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv), and Santiago Peak volcanics (Kvsp); and Triassic-age phyllite (TRmp) (see Figure 3). Also mapped within the vicinity, within the half-mile buffer, are late Holocene-age very young wash deposits (Qw); Cretaceous-age monzogranite (Kcg), Estelle Mountain volcanics of Herzig (Kvem), and Gavilan Ring Complex, hypabyssal tonalite (Kgh); and Triassic-age quartz-rich rocks (TRmq) and metamorphic rocks of Menifee Valley, undifferentiated (TRmu) (Morton and Miller, 2006).

The results of this paleontological study indicate that the Project area is underlain, in part, by high paleontologically sensitive geologic units, which are known to contain scientifically significant paleontological resources. Due to the potential for Project construction to impact these units and any resources harbored within, a paleontological mitigation plan (PMP) will be required for this Project and should be prepared by a qualified paleontologist, a curation agreement should be obtained, and paleontological monitoring should be implemented during ground disturbing activities in order to mitigate impacts to paleontological resources, as identified in Measures PAL-1, PAL-2, and PAL-3, below.

PAL-1: **Paleontological Mitigation Plan.** During final design, RCTC will ensure that a Paleontological Mitigation Plan (PMP) is prepared. The PMP will provide the following elements:

- Recommended monitoring locations;
- A description of a worker training program; and
- Detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation and notification procedures in the event of a fossil discovery by a paleontological monitor, or other project personnel.

PAL-2: **Curation Agreement.** Prior to the start of construction, RCTC will ensure that a curation agreement with the Western Science Center (WSC) or another accredited repository will be obtained by the paleontological consultant.

PAL-3: **Paleontological Monitoring.** During construction, RCTC will ensure that excavations that disturb geologic units with high paleontological sensitivity, including late to middle Pleistocene-age old axial channel deposits (Qoa); old alluvial fan deposits (Qof); and old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old axial channel deposits (Qvoa) and very old alluvial fan deposits (Qvof); early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs); early Miocene- to late Eocene-age Sespe Formation (Ts); and Paleocene-age Silverado Formation (Tsi), will be monitored by a professional paleontologist in order to reduce potential adverse impacts on scientifically important paleontological resources to a less than significant level.

Excavations impacting geologic units with low sensitivity, including artificial fill or previously disturbed sediments; late Holocene-age very young wash deposits (Qw); and Holocene- to late Pleistocene-age young axial channel deposits (Qya), young alluvial fan deposits (Qyf), young alluvial valley deposits (Qyv), and young wash deposits (Qyw), will be spot-checked to inspect for the presence of older more paleontologically sensitive geologic units at depth. Spot-checking should be conducted when excavations impact depths at which paleontologically sensitive units are anticipated to be encountered, based on the geotechnical data. Therefore, all excavations in areas mapped as low and high sensitivity should be initially spot checked to inspect for the presence of native sensitive sedimentary deposits. The frequency and timing of subsequent spot checks should be determined by the qualified paleontologist based on the rate of excavation, excavation activity, and initial subsurface observations.

Areas mapped as geologic units with no sensitivity, including Cretaceous-age granodiorite, undifferentiated (Kgd); Cretaceous-age Gavilan Ring Complex, hypabyssal tonalite (Kgh); Cretaceous- age monzogranite (Kcg), heterogeneous granitic rocks (Khg), intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv), Estelle Mountain volcanics of Herzig (Kvem), and Santiago Peak volcanics (Kvsp); and Triassic-age phyllite (TRmp), quartz-rich rocks (TRmq), and metamorphic rocks of Menifee Valley, undifferentiated (TRmu), will not be monitored.

If it is determined, based on monitoring observations, that only geologic units with no or low sensitivity are impacted, or if sediments that are deemed non-conducive to fossil preservation, in a given area, the monitoring program should be immediately reduced or halted in that area. Any subsurface bones or potential fossils that are unearthed during construction will be evaluated by a professional paleontologist as described in the PMP (see Measure PAL-1).

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2 Introduction

RCTC, in cooperation with Caltrans, is proposing to construct new lanes along I-15 between PM 21.2 and PM 38.1 in Riverside County, California. The primary component of Project would be the addition of two tolled express lanes[2] in both the northbound and southbound directions within the median of I-15 from SR-74 (Central Avenue) (PM 22.3) in the City of Lake Elsinore, through the unincorporated Riverside County community of Temescal Valley, to El Cerrito Road (PM 38.1) in the City of Corona, for a distance of approximately 15.8 miles. The proposed Project would also add a southbound auxiliary lane between both the Main Street (PM 21.2) off-ramp and SR-74 (Central Avenue) on-ramp (approximately 0.75 mile), and the SR-74 (Central Avenue) off-ramp and Nichols Road on-ramp (PM 23.9) (approximately 1 mile). Along with the lane additions, which would extend from PM 21.2 to 38.1, the proposed Project would include widening of up to 14 bridges, potential construction of noise barriers, retaining walls, drainage systems, and implementation of electronic toll collection equipment and signs. Associated improvements for the toll lanes, including advance signage and transition striping, would extend approximately 2 miles from each end of the express lane limits to PM 20.3 in the south and PM 40.1 in the north. The proposed lane additions and supporting infrastructure are expected to be constructed primarily within the existing State right of way.

This combined PIR/PER presents the results of the paleontological technical study and resource potential evaluation conducted in support of the I-15 ELPSE, located in Riverside County, California (Figure 1, Project Location Map). On behalf of RCTC, Paleo Solutions conducted an analysis of existing data and provided paleontological recommendations based on the geological and paleontological data. This paleontological work was required by Caltrans District 8 to fulfill their responsibilities as the lead agency under NEPA and CEQA. The Project sponsor is the RCTC. All work was conducted in compliance with applicable federal, state, and local regulations and conforms to Caltrans guidelines and standards contained in the Caltrans SER, Volume 1, Chapter 8 (Paleontology). Copies of this report have been submitted to Caltrans District 8 and RCTC.

The purpose of the proposed Project is to:

- Improve and manage traffic operations, congestion, and travel times along the corridor;
- Expand travel mode choice along the corridor;
- Provide an option for travel time reliability;
- Provide a cost-effective mobility solution; and
- Expand and maintain compatibility with the express lane network in the region.

The need for the proposed Project is summarized below.

Existing traffic volumes often exceed current highway capacity along several segments of I-15 between SR-74 (Central Avenue) and El Cerrito Road. Due to forecasted population growth and the continued development to support the projected growth in the region, the I-15 corridor is expected to continue to experience increased congestion and longer commute times that are projected to negatively affect traffic operations along the freeway mainline.

The adopted SCAG 2016 RTP Growth Forecast estimates a 36.7-percent increase in population in Riverside County between 2015 and 2040. SCAG's recently adopted Connect SoCal (2020–2045 RTP/SCS) Growth Forecast estimates a 38.3-percent increase in population in Riverside County between

[2] Express lanes are traffic lanes that are separated from general purpose lanes where users are charged a toll to use the lanes.

2020 and 2045, with the number of households and employment increasing by approximately 30.5 percent and 34.02 percent, respectively. In the City of Corona, the 2020–2045 RTP/SCS Growth Forecast estimates an 11.6-percent increase in population from 2016 to 2045 and an 11.7-percent increase in households. The 2020–2045 RTP/SCS also found of the top three counties where Los Angeles residents migrate, Riverside County places third. In 2017, the number of Los Angeles migrants to Riverside County was approximately 11,000. Additionally, based on the 2016–2040 RTP/SCS Final Growth Forecast by Jurisdiction, the City of Corona is estimated to experience a 3.7-percent increase in population between 2020 and 2045. According to the same source, the City of Lake Elsinore is projected to see a 76.8-percent increase in population. This projected growth is expected to place a high demand on existing transportation facilities and services.

Existing regional transit in Riverside County includes the Riverside Transit Agency (RTA) and Metrolink, which connects to various local transit services offered by municipalities (i.e., Corona Cruisers). RTA operates a weekday commuter bus service (Route 205/206) along I-15 and State Route 91 (SR-91) for passengers traveling between the City of Temecula in Riverside County and the City of Orange in Orange County. Within the proposed Project limits, this route offers stops at Dos Lagos, Temescal Canyon Road (Tom's Farms), and Nichols Road. Metrolink and Amtrak also operate within the northwestern portion of Riverside County but do not currently offer rail transit options that would serve the populations traveling through Temescal Valley between Corona and Lake Elsinore. Overall, regional transit options are limited for travelers south of Corona's city limits.

The Express Lanes Network in both Riverside and San Bernardino Counties has been growing rapidly in response to the increased inter-county travel demand. Development of an extensive regional express lanes network is a key strategy in the 2020–2045 RTP/SCS that aims to improve travel time reliability, provide travel choices, and ensure existing freeway capacity is optimized within the SCAG region. In 2017, RCTC completed construction of the SR-91 Express Lanes in the City of Corona—the first Express Lanes constructed in Riverside County. RCTC's I-15 Express Lanes Project (ELP), which extends the SR-91 Express Lanes Network north and south of SR-91 along I-15 through the Cities of Jurupa Valley, Eastvale, Norco, and Corona, will be open to traffic in 2021. North of the I-15 ELP, in 2021 San Bernardino County Transportation Authority will break ground on the I-15 Corridor Project, which will construct Express Lanes in both directions along I-15 between Cantu-Galleano Ranch Road in the City of Jurupa Valley and Duncan Canyon Road in the City of Fontana. In addition to providing continuity of Express Lanes north of the I-15 ELP, the I-15 Corridor Project will connect to the Interstate 10 (I-10) Corridor Project (Phase 1), which is currently under construction and will add Express Lanes in each direction on I-10 between the Cities of Montclair and Upland. Once these projects are completed in 2021, the southern terminus of the Express Lanes Network in the Inland Empire will terminate at Cajalco Road on I-15.

As federal, state, and local funding becomes constrained and additional projects are developed to maintain the condition of existing roadways, it has become increasingly challenging for transportation agencies to develop, construct, operate, and maintain new projects that improve mobility in heavily congested corridors. Based on this situation, alternative funding streams like federal loans and revenue bonds can be utilized to fill the funding gaps. In some cases, if financial obligations are met on Express Lane projects, excess toll revenue can provide additional funding to invest in other improvements within the corridor.

Currently, north-south mobility options for motorists are limited through this portion of Riverside County. Besides local streets, the only parallel route for motorists is I-215, which is over ten miles east of I-15 and generally serves a different region within Riverside County. Under Existing Conditions (2019)[3] during

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[3] Existing Conditions (2019) do not include the I-15 Express Lanes Project from SR-60 to Cajalco Road, since that project was not operational in 2019.

the AM peak hour, northbound I-15 experiences heavy congestion at the Cajalco Road interchange due to commuter traffic along the corridor. This heavy congestion during the AM peak hour results in a bottleneck at the Cajalco Road on-ramp that extends to the Indian Truck Trail off-ramp. Through the Project limits, during the PM peak hour, the southbound direction experiences heavy congestion due to commuter traffic. The southbound I-15 bottleneck at the Cajalco Road on-ramp extends to the Magnolia Avenue on-ramp during the PM peak hour.

2.1 Project Alternatives

The lane improvements within Riverside County would run through the cities of Lake Elsinore and Corona, as well as the unincorporated Riverside County community of Temescal Valley (Figure 1, Project Location Map, and Figure 2, Project Overview Map). All proposed improvements would be constructed within the existing Caltrans right of way, with the majority of the improvements occurring within the existing I-15 median.

The existing I-15 corridor within the project limits is a six-lane highway with three mixed flow lanes in each direction and paved shoulders. Recent improvements along SR-91 constructed as part of the SR-91 Corridor Improvement Project (SR-91 CIP) within the City of Corona includes the easterly extension of the 91 Express Lanes from the Orange County Line to just east of I-15 and a direct connector between the eastbound 91 Express Lanes and southbound I-15, as well as a direct connector between northbound I-15 and the westbound 91 Express Lanes. RCTC is also currently constructing tolled express lanes along I-15 between State Route 60 (SR-60) and Cajalco Road, which will provide two tolled express lanes in each direction as part of the I-15 ELP. Construction of that project began in 2018 and is expected to be completed in the first half of 2021. This proposed I-15 ELPSE would construct tolled express lanes from Corona to Lake Elsinore, which would extend the existing tolled express lane system from Corona south to Lake Elsinore. The proposed Project consists of one Build Alternative and a No-Build Alternative.

2.1.1 Build Alternative

The proposed Project includes construction of two tolled express lanes in each direction on I-15 in Riverside County between PM 22.3 and PM 36.8. The proposed Project would be constructed within the existing right of way. The tolled express lanes would be used by vehicles for a toll and would also serve as high-occupancy vehicle (HOV) lanes for HOV 3+ users for a reduced toll. The toll rate would be adjusted based on congestion. These improvements would enhance regional mobility and offer greater user flexibility of the regional transportation system. Sign modifications and the installation of new signs would also be included to support the new tolled express lanes. Advanced signage is required to be posted a minimum of two miles prior to the start of the tolled express lanes. Signage will be located within the project limits between PM 20.3 and PM 38.8. The Build Alternative would not add any new connections and will not improve any existing ramps.

2.1.2 No-Build Alternative

Under the No-Build Alternative, the I-15 ELPSE would not be constructed. This alternative does not meet the Project purpose and need; however, it would not preclude the construction of future improvements or general maintenance activities. Even without construction of the proposed I-15 ELPSE, limited improvements on I-15 associated with the approved I-15 ELP are being constructed for opening in 2020. Describing and analyzing a No-Build Alternative helps both decision-makers and the public to compare the impacts of approving the proposed Project with the consequences of not approving the proposed Project.

2.2 Project Description and Location

RCTC, in cooperation with Caltrans, is proposing to construct new lanes along I-15 between PM 21.2 and PM 38.1 in Riverside County, California. The primary component of the Project would be the addition of two tolled express lanes in both the northbound and southbound directions within the median of I-15 from SR-74 (Central Avenue) (PM 22.3) in the City of Lake Elsinore, through the unincorporated Riverside County community of Temescal Valley, to El Cerrito Road (PM 38.1) in the City of Corona, for a distance of approximately 15.8 miles.

The proposed Project would also add a southbound auxiliary lane between both the Main Street (PM 21.2) off-ramp and SR-74 (Central Avenue) on-ramp (approximately 0.75 mile), and the SR-74 (Central Avenue) off-ramp and Nichols Road on-ramp (PM 23.9) (approximately 1 mile).

Along with the lane additions, which would extend from PM 21.2 to 38.1, the proposed Project would include widening of up to 14 bridges, potential construction of noise barriers, retaining walls, drainage systems, and implementation of electronic toll collection equipment and signs. In addition, due to the southbound express lanes access between the Cajalco Road and Weirick Road Interchanges, the southbound I-15 Weirick off-ramp would be configured as a dual lane exit. Associated improvements for the toll lanes, including advance signage and transition striping, would extend approximately 2 miles from each end of the express lane limits to PM 20.3 in the south and PM 40.1 in the north. The proposed lane additions and supporting infrastructure are expected to be constructed primarily within the existing State right of way.

Anticipated Project excavations and their corresponding depths are summarized below:

- Median paving to accommodate the Express Lanes on I-15 from just north of Cajalco Road to SR-74 (Central Ave) interchange will include excavations with a maximum depth of 8 feet.
- Outside widening to accommodate the southbound auxiliary lane on I-15 between Cajalco Road and Weirick Road; the southbound trap lane (minor widening) on I-15 approaching Nichols Road; the southbound auxiliary lane on I-15 between Nichols Road and SR-74; and the southbound auxiliary lane on I-15 between SR-74 and Main Street, will include excavations with a maximum depth of 8 feet.
- Median barrier construction to separate the northbound and southbound I-15 roadbeds will include excavations with a maximum depth of 8 to 12 feet.
- Pile foundation drilling to erect sign structures in the median on I-15 to accommodate Express Lane signage will include excavations with a maximum depth of 32 feet.
- Structure widening will involve excavation to install cast-in-place/prestressed concrete box girder bridges and steel piles at the following locations:
    - Advance Planning Study (APS) and Structure Preliminary Geotechnical Report (SPGR) Package 1
        - Gavilan Wash – Widening right and left bridges inside to median will include excavations with a maximum depth of 3.5 feet for cast-in-place/prestressed concrete box girder and a maximum depth of approximately 60 feet for steel piles.
        - Lake Street – Widening right and left bridges inside to median will include excavations with a maximum depth of 5.5 feet for a cast-in-place/prestressed concrete box girder.
        - Temescal Canyon – Widening right and left bridges inside to median will include excavations with a maximum depth of 6 feet for a cast-in-place/prestressed concrete box girder and a maximum of approximately 55 feet for steel piles.

    - Temescal Wash – Widening right and left bridges inside to median will include excavations with a maximum depth of 6 feet for a cast-in-place/prestressed concrete box girder and a maximum of approximately 68 feet for steel piles.
    - Horsethief Canyon – Widening right and left bridges inside to median will include excavations with a maximum depth of 5.5 feet for a cast-in-place/prestressed concrete box girder.
  - APS and SPGR Package 2
    - Horsethief Canyon Wash – Widening right and left bridges inside to median will include excavations with a maximum depth of 6 feet for a cast-in-place/prestressed concrete box girder and a maximum of approximately 60 feet for steel piles.
    - Indian Wash – Widening right and left bridges inside to median will include excavations with a maximum depth of 6.25 feet for a cast-in-place/prestressed concrete box girder and a maximum of approximately 57 feet for steel piles.
    - Indian Truck Trail – Widening right and left bridges inside to median will include excavations with a maximum depth of 6.25 feet for a cast-in-place/prestressed concrete box girder.
    - Temescal Canyon – Widening right and left bridges inside to median will include excavations with a maximum depth of 7.75 feet for a cast-in-place/prestressed concrete box girder and a maximum of approximately 75 feet for steel piles.
    - Mayhem Wash – Widening right and left bridges inside to median will include excavations with a maximum depth of 7 feet for a cast-in-place/prestressed concrete box girder and a maximum of approximately 72 feet for steel piles.
  - APS and SPGR Package 3 (in development and not currently available)
    - Coldwater Wash, Temescal Canyon, Brown Canyon Wash, and Weirick Road – excavation parameters associated with widening right and left bridges inside to median are currently unavailable.
    - Installing two retaining walls between Cajalco Road and Weirick Road along southbound roadbed will include excavations with a maximum depth of approximately 45 feet below ground surface (bgs) and 60 feet into the slope, based on early estimates.
- Miscellaneous excavation for drainage improvements and new system connections to existing drainage pipes throughout the I-15 corridor will include excavations with a maximum depth of 25 feet, with the deeper excavations anticipated in median areas.
- Implementing treatment best management practices (BMPs) is in the process of being identified and is anticipated to occur in existing interchange infield areas or in dirt areas along the I-15 mainline and will include excavations with a maximum depth of 15 feet.
- Excavation parameters for construction of sound walls, electrical/communication facilities and vaults, and utility relocations have yet to be identified.

The Project area is located within a moderately developed area with residential, commercial, and open space land uses adjacent to the Project. The Project area is located within the Peninsular Ranges Geomorphic Province (Harden, 2004), a region characterized by northwest-southeast-trending, fault-bounded discrete blocks, with mountain ranges, broad intervening valleys, and low-lying coast plains (Yerkes et al., 1965; Norris and Webb, 1990).

Table 1. I-15 Express Lanes Project – Southern Extension Summary

Project Name	I-15 Express Lanes Project – Southern Extension
Project Description	The RCTC and Caltrans District 8 propose to develop a tolled express lane network to meet existing and future travel demand, enhance mobility, and afford greater user

<table>
<tr><td></td><td colspan="4">flexibility on I-15 in Riverside County. The proposed Project would extend the I-15 Express Lanes, currently under construction, an additional 14.5 miles. The proposed new segment would extend from SR 74 (Central Avenue) (PM 22.3) in Lake Elsinore, through the unincorporated Riverside County community of Temescal Valley, to El Cerrito Road (PM 38.1) in the city of Corona. The Project proposes to increase capacity by adding two tolled express lanes in both directions within the I-15 median to accommodate increasing traffic volumes in southwestern Riverside County. Associated improvements, including advance signage and transition striping, would extend two miles from each end of the Project limits to PM 20.3 in the south and PM 40.1 in the north. All proposed improvements would be constructed within the existing Caltrans right of way, with the majority of the improvements occurring within the existing I-15 median.</td></tr>
<tr><td>Project Area</td><td colspan="4">The Project traverses the cities of Lake Elsinore and Corona and the unincorporated Riverside County community of Temescal Valley. The Project area is located within a moderately developed area with residential, commercial, and open space land uses adjacent to the Project. The Project area is located within the Peninsular Ranges Geomorphic Province (Harden, 2004), a region characterized by northwest-southeast-trending, fault-bounded discrete blocks, with mountain ranges, broad intervening valleys, and low-lying coast plains (Yerkes et al., 1965; Norris and Webb, 1990).</td></tr>
<tr><td>Acreage / Linear Mileage</td><td colspan="4">Approximately 15.8 linear miles (between PM 22.3 and PM 38.1) (two tolled lanes)</td></tr>
<tr><td rowspan="9">Location (PLSS)</td><td>Quarter-Quarter / Government Lot Number</td><td>Section</td><td>Township</td><td>Range</td></tr>
<tr><td>L37, L38</td><td>Sec.00</td><td rowspan="8">T4S</td><td rowspan="8">R6W</td></tr>
<tr><td>NWSE, NESW, NWSW, SWSW, SESW, SWSE, SESE, SENW, SWNE, SENE, NESE, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16</td><td>Sec.08</td></tr>
<tr><td>SESW, SWSW, NESW, NWSW, L1, L2, L3, L4</td><td>Sec.09</td></tr>
<tr><td>NENW, SESW, SWSE, SESE, NWNW, SWNW, SENW, NESE, NWSE, NESW, NWSW, SWSW, L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12</td><td>Sec.16</td></tr>
<tr><td>NENE, NWSE, NESW, NWSW, SWSW, SESW, SWSE, SESE, NWNE, NENW, NWNW, SWNW, SENW, SWNE, SENE, NESE, L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16</td><td>Sec.17</td></tr>
<tr><td>SESE, NESE, SENE, NENE, L1, L2, L3</td><td>Sec.18</td></tr>
<tr><td>SWSE, SESE, NWSE, NESE, SENE, SWNE, SENW, SWNW, NENE, NWNE, NENW, NWNW</td><td>Sec.20</td></tr>
<tr><td>SESW, SWSW, NESW, NWSW, NENE, NWSE, SWSE, SESE, NWNE, NENW, NWNW, SWNW, SENW, SWNE, SENE, NESE, L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12</td><td>Sec.21</td></tr>
</table>

	NENW, SESW, SWSE, NWNW, SWNW, SENW, NWSE, NESW, NWSW, SWSW, L1, L2, L3, L4, L6, L7, L8, L9, L10, L11	Sec.22		
	SWNW, SENW, NWNW, NENW, NWNE, L2, L3, L4, L5, L6	Sec.27		
	NESE, NWSE, NESW, SENE, SWNE, SENW, SWNW, NENE, NWNE, NENW, NWNW	Sec.28		
	SENE, NENE	Sec.29		

Land Owner/ Surface Management Agency	Undetermined
Topographic Map(s)	USGS Alberhill (2015), Lake Elsinore (2015), Lake Mathews (2018), Corona South (2018) 7.5’ Topographic Quadrangles
Geologic Map(s)	Geologic map of the San Bernardino and Santa Ana 30’ x 60’ quadrangles, California (Morton and Miller, 2006)

Mapped Geologic Units(s) and Age(s)	**Geologic Unit and Map Symbol**	**Age**	**Paleontological Sensitivity (Caltrans, 2014)**
	Artificial fill*	Recent	Low
	Very young wash deposits (Qw)	Late Holocene	Low
	Young axial-channel deposits (Qya)	Holocene to late Pleistocene	Low
	Young alluvial fan deposits (Qyf)	Holocene to late Pleistocene	Low
	Young alluvial valley deposits (Qyv)	Holocene to late Pleistocene	Low
	Young wash deposits (Qyw)	Holocene to late Pleistocene	Low
	Old axial channel deposits (Qoa)	Late to middle Pleistocene	High
	Old alluvial fan deposits (Qof)	Late to middle Pleistocene	High
	Old paralic deposits, undivided (Qop)	Late to middle Pleistocene	High
	Very old axial channel deposits (Qvoa)	Middle to early Pleistocene	High
	Very old alluvial fan deposits (Qvof)	Middle to early Pleistocene	High
	Vaqueros and Sespe Formations, undivided (Tvs)	Early Miocene to Oligocene	High
	Sespe Formation (Ts)	Early Miocene to late Eocene	High
	Silverado Formation (Tsi)	Paleocene	High
	Monzogranite (Kcg)	Cretaceous	None
	Granodiorite, undifferentiated (Kgd)	Cretaceous	None
	Gavilan Ring Complex, hypabyssal tonalite (Kgh)	Cretaceous	None
	Heterogeneous granitic rocks (Khg)	Cretaceous	None

	Intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv)	Cretaceous	None
	Estelle Mountain volcanics of Herzig (Kvem)	Cretaceous	None
	Santiago Peak volcanics (Kvsp)	Cretaceous	None
	Phyllite (TRmp)	Triassic	None
	Quartz-rich rocks (TRmq)	Triassic	None
	Metamorphic rocks of Menifee Valley, undifferentiated (TRmu)	Triassic	None
Surveyor(s)	Daniel Nolan, B.S. (Associate Paleontologist), Joseph Kobler, B.A. (Field Technician)		
Survey Date(s)	Surveying took place on April 16, 2021 (see Section 7.0)		
Geologic Units Surveyed	Holocene to late Pleistocene-age young alluvial fan deposits (Qyf); Holocene to late Pleistocene-age young axial channel deposits (Qya); late to middle Pleistocene-age old alluvial fan deposits (Qof); late to middle Pleistocene-age old axial channel deposits (Qoa); late to middle Pleistocene-age old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old alluvial fan deposits (Qvof); middle to early Pleistocene-age very old axial channel deposits (Qvoa); and Paleocene-age Silverado Formation (Tsi).		
Permits	No paleontological permits were required for the work conducted.		
Previously Documented Fossil Localities within the Project area	Paleontological record searches were conducted by LACM and WSC. Both the LACM and WSC searches yielded no fossil localities recorded within the Project area, although several localities are recorded from within the Project vicinity from Pleistocene-age sediments (Bell, 2021; Radford, 2021; see Section 6.2).		
Paleontological Results	No paleontological resources were observed during the survey, nor were any sediments conducive to fossilization.		
Disposition of Fossils	Not applicable; no fossils were observed or collected during the survey.		
Recommendation(s)	The results of this paleontological study indicate that the Project area is underlain, in part, by high paleontologically sensitive geologic units, which are known to contain scientifically significant paleontological resources. Due to the potential for Project construction to impact these units and any resources harbored within, a PMP will be required for this Project and should be prepared by a qualified paleontologist, a curation agreement should be obtained, and paleontological monitoring should be implemented during ground disturbing activities in order to mitigate impacts to paleontological resources, as identified in Measures PAL-1, PAL-2, and PAL-3 (see Section 9).		

*This geologic unit, although not mapped at the Project area surface (Morton and Miller, 2006), is present in areas that have been previously disturbed by construction activities.

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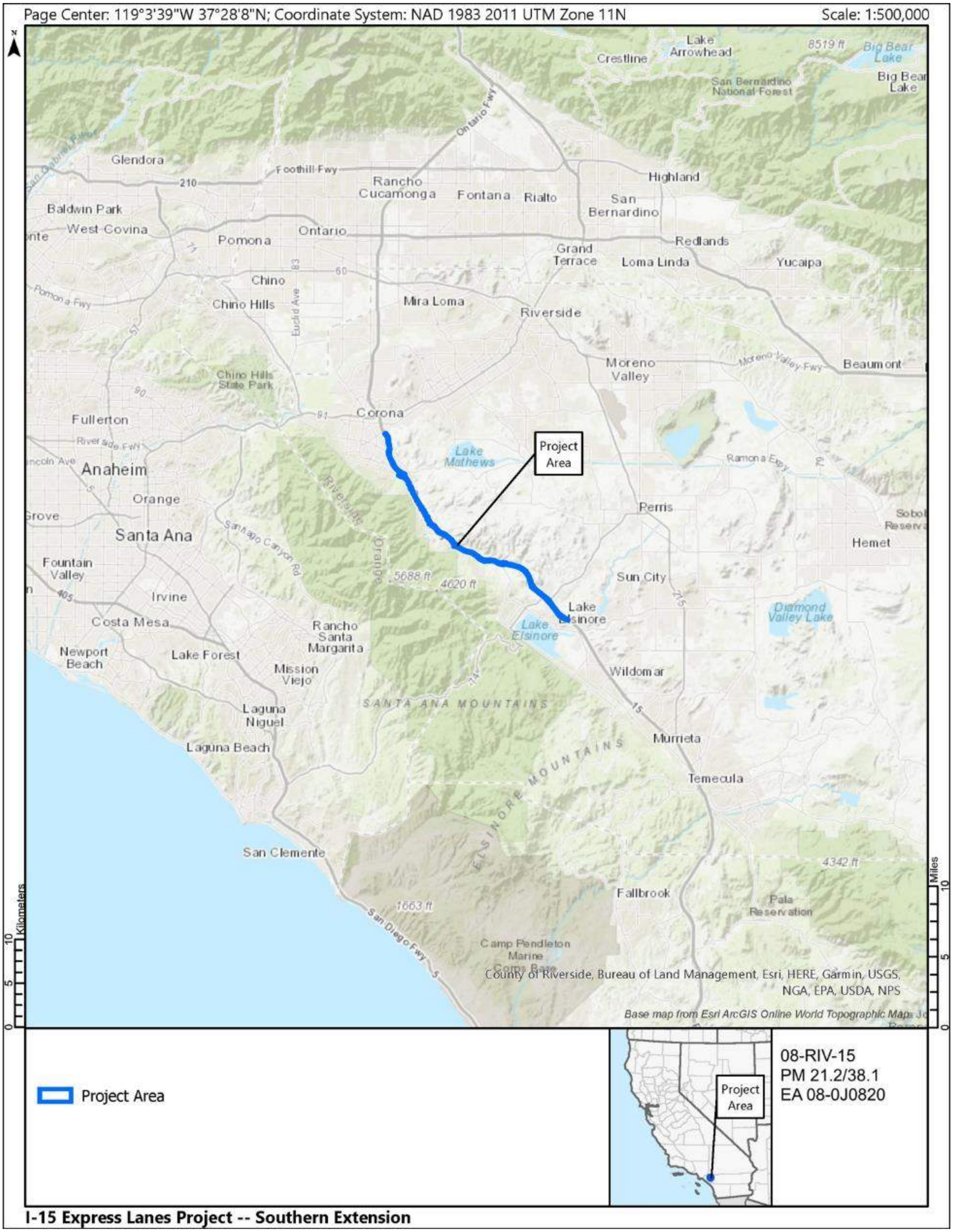

Figure 1. Project Location Map.

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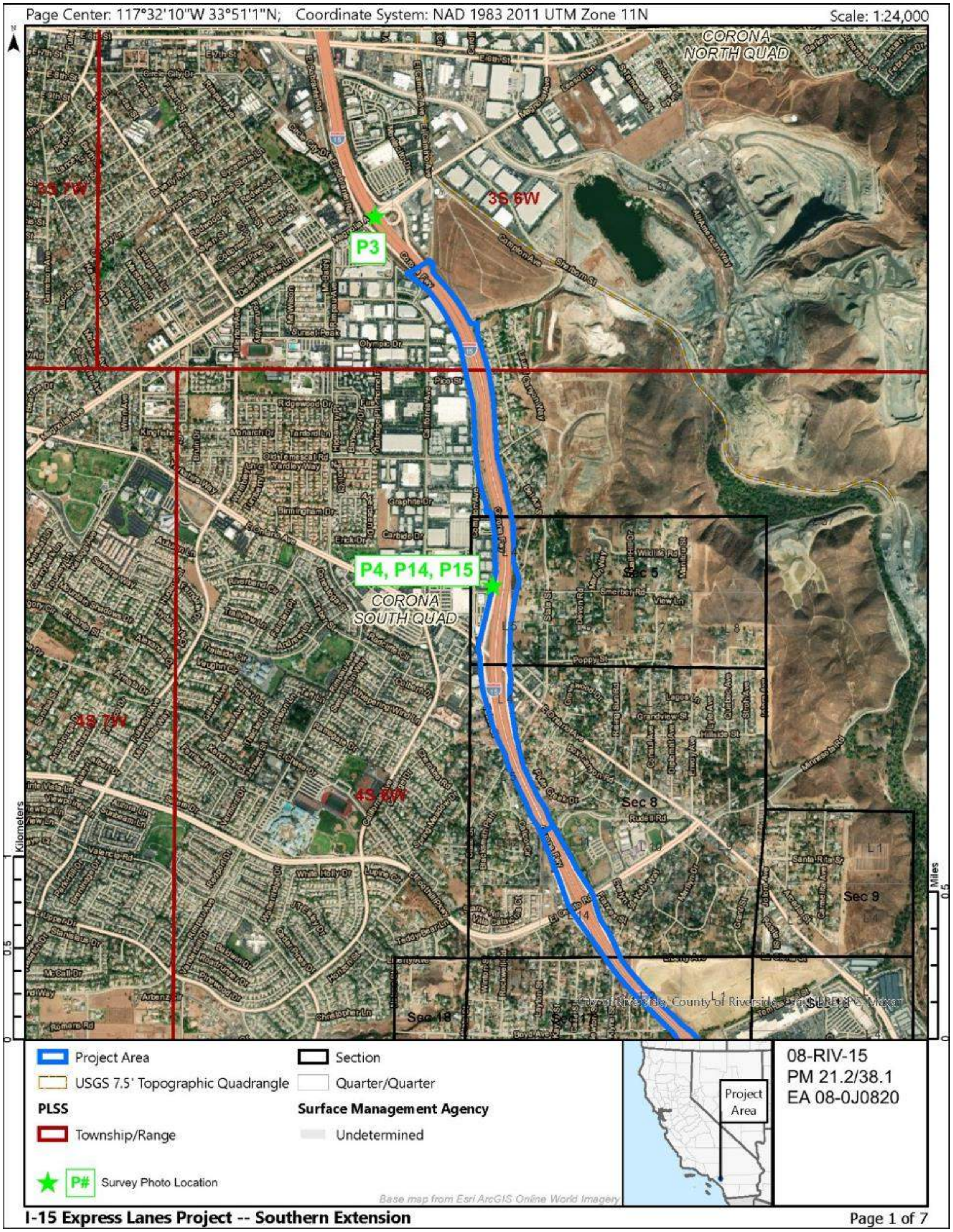

Figure 2a. Project Overview Map.

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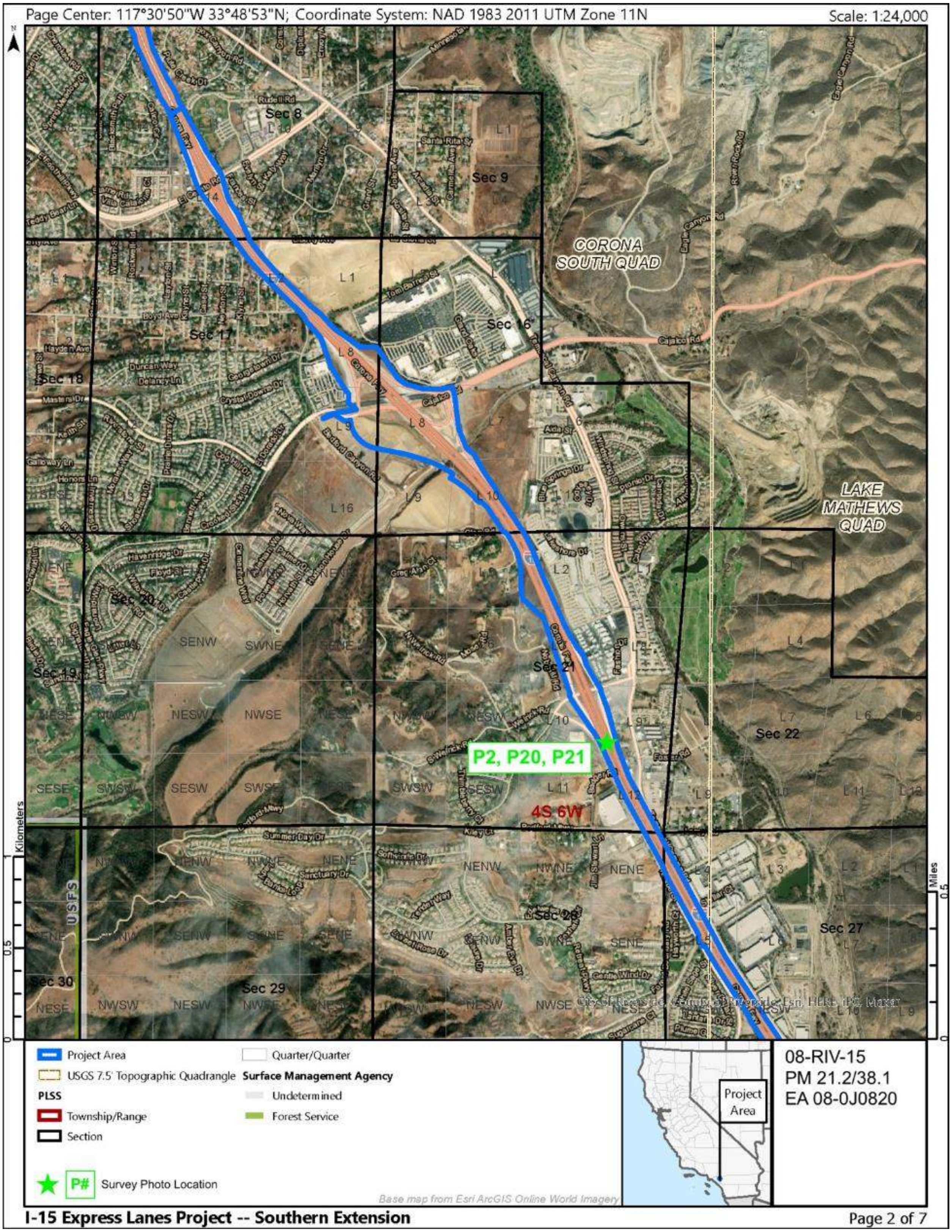

Figure 2b. Project Overview Map.

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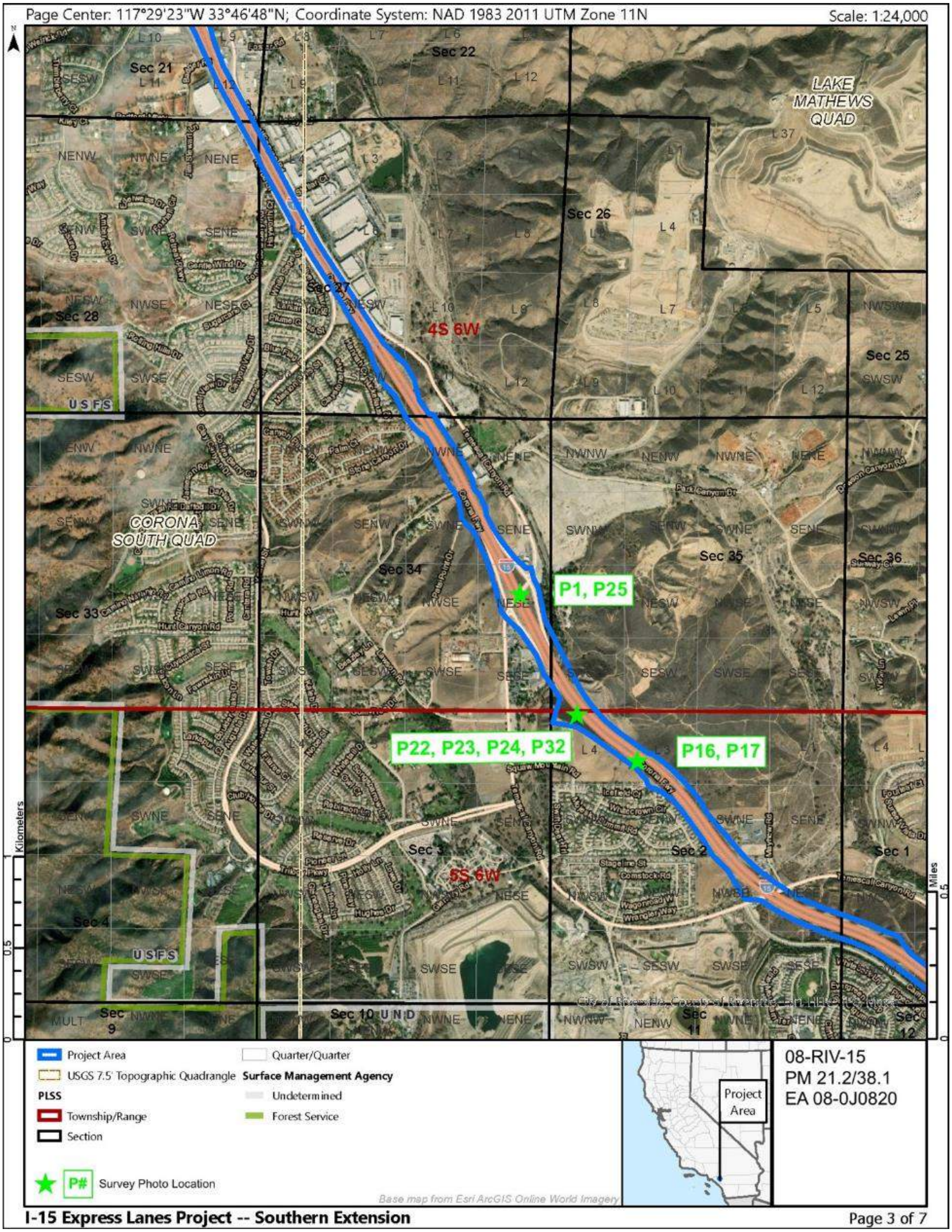

Figure 2c. Project Overview Map.

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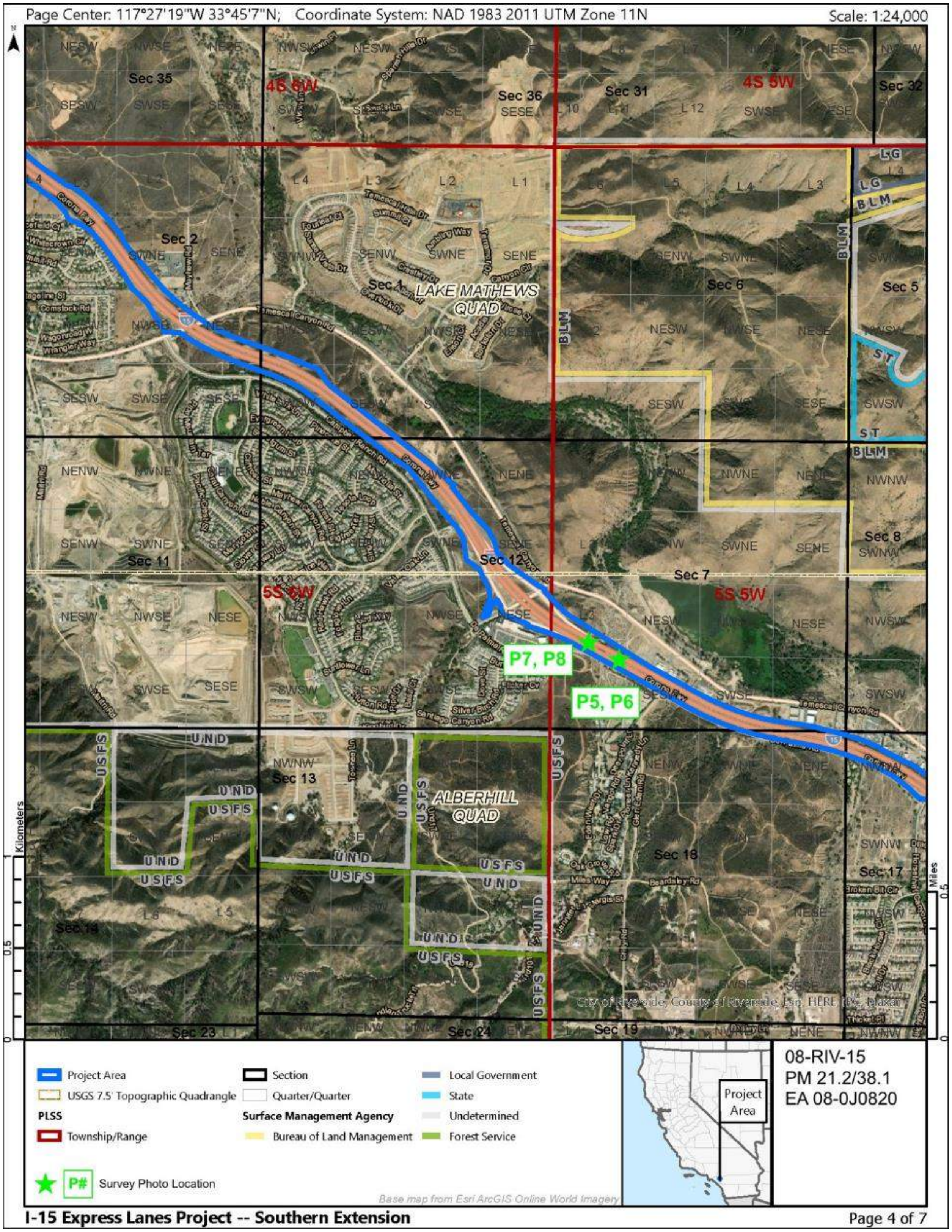

Figure 2d. Project Overview Map.

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Figure 2e. Project Overview Map.

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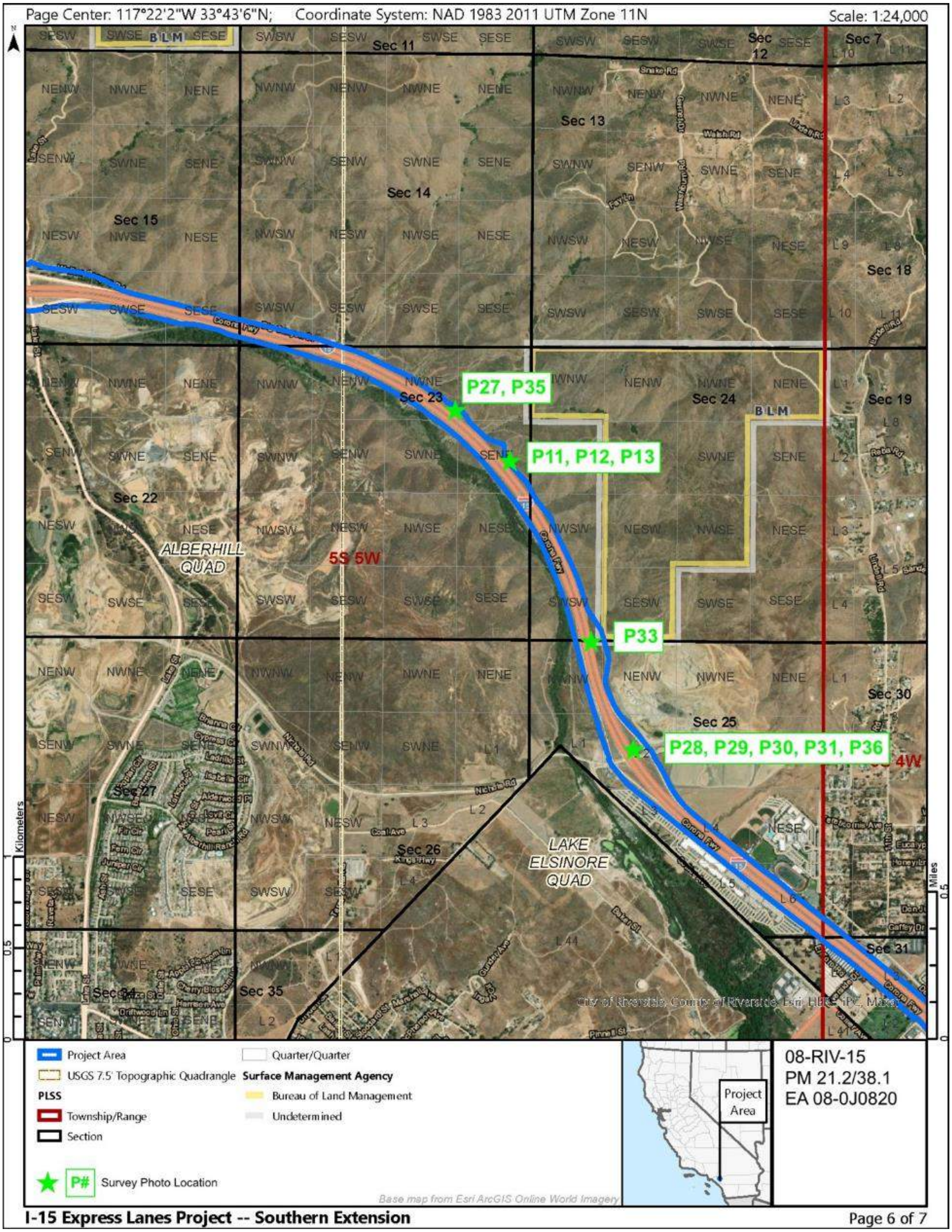

Figure 2f. Project Overview Map.

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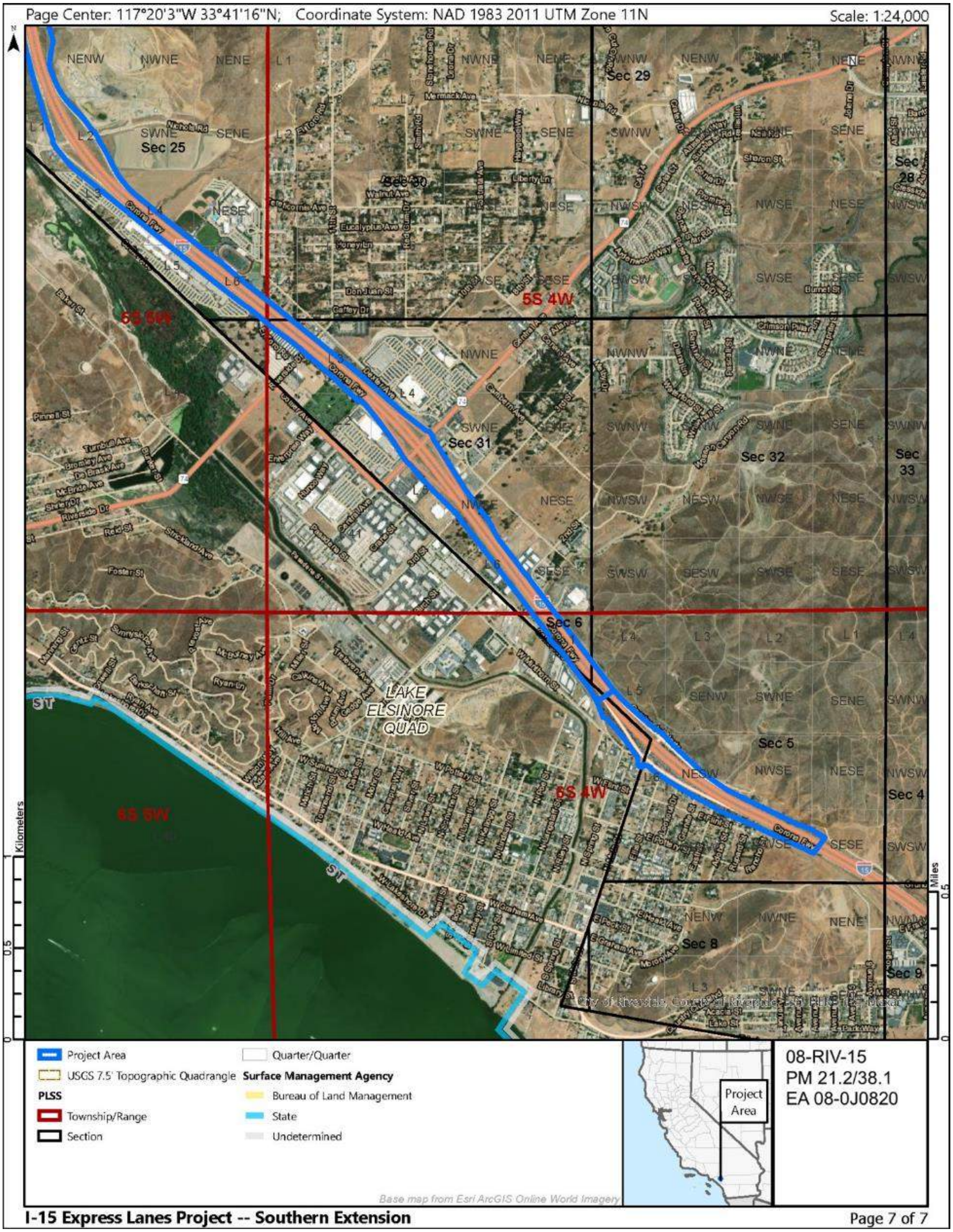

Figure 2g. Project Overview Map.

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3 Definitions and Significance of Paleontological Resources

As defined by Murphey and Daitch (2007): "Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only fossils themselves, but also the associated rocks or organic matter and the physical characteristics of the fossils' associated sedimentary matrix.

The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced. Fossils are important scientific and educational resources because they are used to:

- Study the phylogenetic relationships amongst extinct organisms, as well as their relationships to modern groups;
- Elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- Reconstruct ancient environments, climate change, and paleoecological relationships;
- Provide a measure of relative geologic dating that forms the basis for biochronology and biostratigraphy, and which is an independent and corroborating line of evidence for isotopic dating;
- Study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- Study patterns and processes of evolution, extinction, and speciation; and
- Identify past and potential future human-caused effects to global environments and climates."

Fossils vary widely in their relative abundance and distribution and not all are regarded as significant. According to Caltrans SER, Volume 1, Chapter 8 (Paleontology), scientifically significant paleontological resources are:

> "Sites or geologic deposits containing individual fossils or assemblages of fossils that are unique or unusual, diagnostically or stratigraphically important, and add to the existing body of knowledge in specific areas, stratigraphically, taxonomically, or regionally… Particularly important are fossils found in situ (undisturbed) in primary context (e.g., fossils that have not been subjected to disturbance subsequent to their burial and fossilization). As such, they aid in stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphological evolution, paleoclimatology, the relationships between aquatic and terrestrial species, and evolution in general. Discovery of in situ fossil bearing deposits is rare for many species, especially vertebrates. Terrestrial vertebrate fossils are often assigned greater significance than other fossils because they are rarer than other types of fossils. This is primarily due to the fact that the best conditions for fossil preservation include little or no disturbance after death and quick burial in oxygen depleted, fine-grained, sediments. While these conditions often exist in marine settings, they are relatively rare in terrestrial settings (e.g., as a result of pyroclastic flows and flashflood events). This has ramifications on the amount of scientific study needed to adequately characterize an individual species and therefore affects how relative sensitivities are assigned to formations and rock units" (Caltrans, 2014).

Vertebrate fossils, whether preserved remains or track ways, are classified as significant by most state and federal agencies and professional groups (and are specifically protected under the California Public Resources Code). In some cases, fossils of plants or invertebrate animals are also considered significant and can provide important information about ancient local environments.

The full significance of fossil specimens or fossil assemblages cannot be accurately predicted before they are collected, and in many cases, before they are prepared in the laboratory and compared with previously collected fossils. Pre-construction assessment of significance associated with an area or formation must be made based on previous finds, characteristics of the sediments, and other methods that can be used to determine paleoenvironmental and taphonomic conditions.

4 Laws, Ordinances, Regulations, and Standards

This section of the report presents the federal, state, and local regulatory requirements pertaining to paleontological resources that will apply to this project.

4.1 Federal Regulatory Setting

If any federal funding is used to wholly or partially finance a project, it is sited on federal lands, involves a federal permit, and/or includes a perceived federal impact, federal laws and standards apply, and an evaluation of potential impacts on paleontological resources may be appropriate and/or required. The management and preservation of paleontological resources on public and federal lands are prescribed under various laws, regulations, and guidelines.

4.1.1 National Environmental Policy Act (16 USC Section 431 et seq.)

NEPA, as amended, requires analysis of potential environmental impacts to important historic, cultural, and natural aspects of our national heritage (United States Code [USC], Section 431 et seq.; 40 Code of Federal Regulations [CFR], Section 1502.25). NEPA directs federal agencies to use all practicable means to "Preserve important historic, cultural, and natural aspects of our national heritage..." (Section 101(b)(4)). Regulations for implementing the procedural provisions of NEPA are found in 40 CFR 1500 1508.

4.1.2 Antiquities Act of 1906

The Antiquities Act of 1906 (16 USC 431-433) states, in part:

> That any person who shall appropriate, excavate, injure or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

Although there is no specific mention of natural or paleontological resources in the Act itself, or in the Act's uniform rules and regulations (Title 43 Part 3, Code of Federal Regulations [43 CFR 3]), the term "objects of antiquity" has been interpreted to include fossils by the National Park Service, the Bureau of Land Management, the Forest Service, and other federal agencies. Permits to collect fossils on lands administered by federal agencies are authorized under this Act. However, due to the large gray areas left open to interpretation due to the imprecision of the wording, agencies are hesitant to interpret this act as governing paleontological resources.

4.1.3 Archaeological and Paleontological Salvage

Archaeological and Paleontological Salvage Statute 23 USC 305 amends the Antiquities Act of 1906. Specifically, it states:

> Funds authorized to be appropriated to carry out this title to the extent approved as necessary, by the highway department of any State, may be used for archaeological and paleontological salvage in that state in compliance with the Act entitled "An Act for the preservation of American Antiquities," approved June 8, 1906 (Public Law [Pub. L.] 59-209; 16 USC 431-433), and State laws where applicable.

This statute allows funding for mitigation of paleontological resources recovered pursuant to federal aid highway projects, provided that "excavated objects and information are to be used for public purposes without private gain to any individual or organization" (Federal Register [FR] 46(19): 9570).

4.2 State Regulations

4.2.1 California Environmental Quality Act (CEQA)

The procedures, types of activities, persons, and public agencies required to comply with CEQA are defined in the Guidelines for Implementation of CEQA (State CEQA Guidelines), as amended on March 18, 2010 (Title 14, Section 15000 et seq. of the California Code of Regulations) and further amended January 4, 2013 and December 28, 2018. One of the questions listed in the CEQA Environmental Checklist is: "Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?" (State CEQA Guidelines Appendix G, Section VII, Part F).

4.2.2 State of California Public Resources Code

The State of California Public Resources Code (Chapter 1.7), Sections 5097 and 30244, includes additional state level requirements for the assessment and management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, and define the excavation, destruction, or removal of paleontological "sites" or "features" from public lands without the express permission of the jurisdictional agency as a misdemeanor. As used in Section 5097, "state lands" refers to lands owned by, or under the jurisdiction of, the state or any state agency. "Public lands" is defined as lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

4.3 Local Regulations

4.3.1 Riverside County

The Riverside County General Plan requires consideration of paleontological resources under the Multipurpose Open Space Element of the general plan (County of Riverside, 2015). The Riverside County General Plan recommendations are based on the Society of Vertebrate Paleontology (SVP) guidelines (SVP, 2010) for the mitigation of paleontological resources. The Multipurpose Open Space Element of the general plan (County of Riverside, 2015) provides the following requirements for paleontological sensitive areas within the county:

- OS 19.6: Whenever existing information indicates that a site proposed for development has high paleontological sensitivity as shown on Figure OS-8, a paleontological resource impact mitigation program (PRIMP) shall be filed with the County Geologist prior to site grading. The PRIMP shall specify the steps to be taken to mitigate impacts to paleontological resources.

- OS 19.7: Whenever existing information indicates that a site proposed for development has low paleontological sensitivity as shown on Figure OS-8, no direct mitigation is required unless a fossil is encountered during site development. Should a fossil be encountered, the County Geologist shall be notified and a paleontologist shall be retained by the project proponent. The paleontologist shall document the extent and potential significance of the paleontological resources on the site and establish appropriate mitigation measures for further site development.

- OS 19.8: Whenever existing information indicates that a site proposed for development has undetermined paleontological sensitivity as shown on Figure OS-8, a report shall be filed with the County Geologist documenting the extent and potential significance of the paleontological resources on site and identifying mitigation measures for the fossil and for impacts to significant paleontological resources prior to approval of that department.

- OS 19.9: Whenever paleontological resources are found, the County Geologist shall direct them to a facility within Riverside County for their curation, including the Western Science Center in the City of Hemet.

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5 Methods

The paleontological scope of work included an analysis of existing data consisting of a geologic map review, a review of literature and online databases, and a review of paleontological record searches from the LACM and the WSC. The analysis of existing data was supplemented with a paleontological field survey. The goal of this report is to identify the paleontological potential of the Project area and make recommendations for the avoidance of adverse impacts on paleontological resources that may occur as a result of the proposed construction. Paleontological sensitivity assignments were determined using the Caltrans' tripartite scale (Caltrans, 2014). Daniel Nolan, B.S. (Associate Paleontologist), and Joseph Kobler, B.A. (Field Technician) conducted the paleontological field survey. Joey Raum, B.S., completed the background research and authored this report. Courtney Richards, M.S., performed the technical review of this report. GIS maps were prepared by Robert Fritz, B.S. Courtney Richards, M.S., oversaw all aspects of the Project as the Paleontological Principal Investigator. Principal Investigator Geraldine Aron, M.S., oversaw all aspects of Project completion. Qualifications of key personnel are provided in Appendix B.

Copies of this report will be submitted to Caltrans District 8 and RCTC. Paleo Solutions will retain an archival copy of all project information including field notes, maps, and other data.

5.1 Analysis of Existing Data

Paleo Solutions conducted an analysis of existing paleontological data of the Paleontological Study Area, which is defined as the I-15 ELPSE Project area and a half-mile- (geologic map review) to one-mile-wide (museum records search) surrounding buffer. Paleo Solutions reviewed one geologic map that includes the Paleontological Study Area: The Geologic map of the San Bernardino and Santa Ana 30' x 60' quadrangles, California by D.M. Morton and F.K. Miller (2006). The literature reviewed included published and unpublished scientific papers. Paleontological museum record searches were conducted at the LACM and WSC. Alyssa Bell, Ph.D., conducted the LACM search (February 18, 2021), and Darla Radford, M.A., conducted the WSC search (February 22, 2021), both of which are included as Appendix A. Additional record searches of online databases, including the University of California Museum of Paleontology (UCMP) and the Paleobiology Database (PBDB), were completed by Paleo Solutions staff. Paleo Solutions also reviewed geotechnical studies for the Project (Leighton Consulting, 2020; 2021a-i) that include Caltrans as-built boring data from 1972, 1973, 1974, 1977, and 2005 during construction of the Gavilan Wash (PM 25.55), Horsethief Canyon Wash (PM 29.13), Indian Wash (PM 30.09), Mayhew Wash (PM 31.97), and Temescal Canyon Road (31.9) bridges; Horsethief Canyon (PM 28.87) and Temescal Canyon (PM 27.78) roads; Lake Street (PM 26.69); and Indian Truck Trail (PM 30.4), as well as geology and engineering design memos from 1972, 1974, 1975, 1976, 1978.

5.2 Field Survey

The field survey was conducted by Paleo Solutions staff members Daniel Nolan, B.S. (Associate Paleontologist), and Joseph Kobler, B.A. (Field Technician), on April 16, 2021. The paleontological survey was performed in order to determine the paleontological potential of the geologic deposits underlying the study area. The field survey included inspection of the Project area with the majority of the focus occurring in areas where native sediment exposures may occur. Sediment exposures as well as the surrounding areas were photographed and documented. Reference points were acquired using a GPS unit. Sediment lithologies and existing conditions were recorded and analyzed and used to better interpret the Project's paleontological potential, and thus better understand the Project's potential impact.

5.3 Criteria for Evaluating Paleontological Sensitivity

Based on the results of the analysis of existing data and the results of the field survey, paleontological sensitivity of the geologic units within the Project alignment were ranked using Caltrans' tripartite scale (Caltrans, 2014). Caltrans' paleontological sensitivity scale comprises three rankings: High Potential, Low Potential, and No Potential. The criteria for each ranking, as stated in Caltrans SER Chapter 8 (Caltrans, 2014), are as follows:

High Potential

Rock units which, based on previous studies, contain or are likely to contain significant vertebrate, significant invertebrate, or significant plant fossils. These units include, but are not limited to, sedimentary formations that contain significant nonrenewable paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. These units may also include some volcanic and low-grade metamorphic rock units. Fossiliferous deposits with very limited geographic extent or an uncommon origin (e.g., tar pits and caves) are given special consideration and ranked as highly sensitive. High sensitivity includes the potential for containing: 1) abundant vertebrate fossils; 2) a few significant fossils (large or small vertebrate, invertebrate, or plant fossils) that may provide new and significant taxonomic, phylogenetic, ecologic, and/or stratigraphic data; 3) areas that may contain datable organic remains older than Recent, including *Neotoma* (sp.) middens; or 4) areas that may contain unique new vertebrate deposits, traces, and/or trackways. Areas with a high potential for containing significant paleontological resources require monitoring and mitigation.

Low Potential

This category includes sedimentary rock units that: 1) are potentially fossiliferous, but have not yielded significant fossils in the past; 2) have not yet yielded fossils, but possess a potential for containing fossil remains; or 3) contain common and/or widespread invertebrate fossils if the taxonomy, phylogeny, and ecology of the species contained in the rock are well understood. Sedimentary rocks expected to contain vertebrate fossils are not placed in this category because vertebrates are generally rare and found in more localized stratum. Rock units designated as low potential generally do not require monitoring and mitigation. However, as excavation for construction gets underway it is possible that new and unanticipated paleontological resources might be encountered. If this occurs, a Construction Change Order must be prepared in order to have a qualified Principal Paleontologist evaluate the resource. If the resource is determined to be significant, monitoring and mitigation is required.

No Potential

Rock units of intrusive igneous origin, most extrusive igneous rocks, and moderately to highly metamorphosed rocks are classified as having no potential for containing significant paleontological resources. For projects encountering only these types of rock units, paleontological resources can generally be eliminated as a concern when the Preliminary Environmental Analysis Report is prepared and no further action taken.

6 Analysis of Existing Data

Regional Background

The Project area is located within the Peninsular Ranges Geomorphic Province (Harden, 2004). A geomorphic province is a geographical area of distinct landscape character, with related geophysical features, including relief, landforms, orientations of valleys and mountains, type of vegetation, and other geomorphic attributes (Harden, 2004). Attributes of the Peninsular Ranges Geomorphic Province consist of northwest-southeast-trending, fault-bounded discrete blocks, with mountain ranges, broad intervening valleys, and low-lying coast plains (Yerkes et al., 1965; Norris and Webb, 1990). Within California, the province extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, extending southward approximately 775 miles toward to the tip of Baja California, and it is bound on the east by the right-slip San Andreas Fault Zone, the Eastern Transverse Ranges, and the Colorado Desert (Norris and Webb, 1990; Hall, 2007). Most of the geomorphic province is located offshore and includes the Santa Catalina and San Clemente islands (Hall, 2007). Topographically on the mainland, the Peninsular Ranges are steeper on the eastern slopes, where they are truncated by normal faults like the Elsinore or San Jacinto faults, and are more gradual on their western slopes toward the Pacific Ocean, similar to the topography of the Sierra Nevada (Norris and Webb, 1990; Prothero, 2017). Within the province, the highest elevations are found in the eastern-most block, with San Jacinto Peak reaching approximately 10,805 feet in elevation and various summits of the Santa Rosa Mountains averaging 6,000 feet in elevation (Norris and Webb, 1990). Westward toward the coast, elevations are less dramatic.

The pre-Phanerozoic history of the Peninsular Ranges is not represented within the province, and few locations contain rocks older than the Mesozoic (Norris and Webb, 1990), and sparse Paleozoic strata within the Peninsular Ranges is in stark contrast to the Sierra Nevada, which contains thick sections of Paleozoic rocks. The oldest pre-batholithic rocks in the Peninsular Ranges are Paleozoic in age and consist of metamorphosed remnants of a stable carbonate platform (now marble and schist) on a passive continental margin that existed along western North America at that time (Harden, 2004). Moreover, late Paleozoic limestone is present near Riverside (Norris and Webb, 1990), further supporting the presence of a shallow marine environment prior to the Mesozoic. Most of the geologic history of the Peninsular Ranges is represented by Mesozoic-age plutonic rocks and Cenozoic-age uplift, erosion, and sedimentary deposition in basins (Sylvester and O'Black Gans, 2016).

During the Triassic and Jurassic, marine sedimentary rocks composed of sandstone and shale were deposited in turbidite sequences along a submarine fan (Harden, 2004). Throughout the Jurassic and Cretaceous, the continental margin became active as the Farallon Plate, which ferried old island arcs, subducted beneath the North American Plate, creating a large pluton complex (i.e., batholith) beneath the surface that rose into the upper crust and intruded into Paleozoic and Mesozoic sedimentary and volcanic rocks (Harden, 2004; Sylvester and O'Black Gans, 2016). The large complex of batholiths resulted in the formation of the San Marcos Gabbro, Bonsall Tonalite, and Woodson Mountain Granodiorite among others in the Peninsular Ranges (Norris and Webb, 1990). Contact metamorphism from the plutons metamorphosed older sedimentary and volcanic rocks into marble, slate, schist, quartzite, gneiss, and metavolcanic rocks (Sylvester and O'Black Gans, 2016). The timing of the Peninsular Ranges Batholith is similar to that of the Sierra Nevada, ranging in age from 70 to 120 million years ago (Norris and Webb, 1990). The batholith complex originally formed south of the Mexican border but has since moved along the right-slip San Andreas Fault over the past 40 million years (Prothero, 2017). During the Late Cretaceous through the Paleogene, the Peninsular Ranges Batholith was uplifted and eroded into a broad plain, where fluvial systems transported sediments westward across the plain and onto the seafloor (Sylvester and O'Black Gans, 2016). Sedimentary rocks were deposited in a forearc basin by turbidity currents representing both deep and shallow marine and nonmarine environments, including the marine

Williams, Ladd, and Rosario formations and the nonmarine Trabuco Formation, with extensive exposures in the western flank of the Santa Ana Mountains (Norris and Webb, 1990; Harden, 2004).

Throughout the Cenozoic, thick sections of sedimentary rocks were deposited in large basins, such as the Los Angeles, Imperial, and offshore basins, due to erosion (Norris and Webb, 1990). Most exposures of early Tertiary strata are restricted to the coastal margins, with a maximum thickness of approximately 4,500 feet in the Santa Ana Mountains (Norris and Webb, 1990). Most Cenozoic strata represent nonmarine depositional environments; however, approximately 600 feet of marine sediments are present near San Diego (Norris and Webb, 1990). Thick nonmarine deposits formed during the Oligocene, followed by a pause of sedimentation at the end of the Oligocene due to tectonic uplift (Norris and Webb, 1990). By the beginning of the Miocene, most of the Farallon Plate had been subducted beneath the North American Plate, and the Pacific Plate came into contact with the North American Plate (Sylvester and O'Black Gans, 2016). As the Pacific Plate slid northwest along the North American Plate, a section of forearc basin was rafted, rotated clockwise approximately 110 degrees, and carried north approximately 130 miles; while carried northward, the forearc basin was compressed and formed the Transverse Ranges located immediately north of the Peninsular Ranges (Sylvester and O'Black Gans, 2016). Additionally, movement along the San Jacinto Fault Zone, which bifurcates from the San Andreas Fault Zone in an area north of the Peninsular Ranges, occurred in the middle to late Tertiary through the Quaternary, with a right-slip and vertical motion resulting in approximately 18 miles of lateral displacement (Norris and Webb, 1990). During this time, thick accumulations of nonmarine sediments filled basins, as well as coastal and offshore areas, in the northern Peninsular Ranges during the Pliocene, with up to 7,000-foot thick sections of siltstone, sandstone, and conglomerate in the Mount Eden and San Timoteo canyons (Norris and Webb, 1990). Despite widespread volcanism elsewhere in southern California during the late Tertiary, little volcanism occurred within the Peninsular Ranges during this time (Norris and Webb, 1990). Throughout the Quaternary, fluvial and lacustrine sediments continued to fill basins within the province, with restricted volcanic and marine terrace deposits along the coast (Norris and Webb, 1990).

Local Background

The Project area is situated in the Perris Block, which is a fault-bounded block comprising part of the northern Peninsular Ranges. The block lies between the Los Angeles Basin, the Santa Ana Mountains, and the San Jacinto Mountains and is bounded by the San Jacinto and Elsinore-Chino Fault zones and the Cucamonga Fault (Woodford et al., 1971). During the Pliocene and Pleistocene, deep isostatic flow caused the Perris Block to oscillate vertically as the Los Angeles Basin sank and the San Jacinto Mountains rose (Woodford et al., 1971). The oscillations resulted in deposition of deep valley continental sediments as well as volcanic rocks, which were emplaced on top of the dominantly crystalline basement, and multiple erosional surfaces (Woodford et al., 1971).

The Project area is situated in the western margin of the Perris Block, in the Elsinore Trough. The Elsinore Trough is an extensional fault zone and irregular graben or rift valley that is approximately 1.5 to 3 miles in width and 20 miles in length, extending from Corona to Elsinore (Gray, 1961). The Elsinore Trough has relatively low elevations caused by erosion and drains to the Santa Ana River and then to the Pacific Ocean on the north end and drains into the internal basin of Lake Elsinore on the south end (Jahns, 1954b). The Project area is situated west of Lake Mathews and Corona Lake and east of Lake Elsinore. The Project area is located along the relatively narrow valley floor and is bordered on the east by the Temescal Mountains and on the west by the Santa Ana Mountains. The northern portion of the Project area is situated near the triple junction of the Chino, Elsinore, and Whittier fault zones.

6.1 Geology

6.1.1 Geologic Map Review

Geologic mapping by Morton and Miller (2006) indicates that the Project area is underlain by Holocene- to late Pleistocene-age young axial channel deposits (Qya), young alluvial fan deposits (Qyf), young alluvial valley deposits (Qyv), and young wash deposits (Qyw); late to middle Pleistocene-age old axial channel deposits (Qoa), old alluvial fan deposits (Qof), and old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old axial channel deposits (Qvoa) and old alluvial fan deposits (Qvof); early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs); early Miocene- to late Eocene-age Sespe Formation (Ts); Paleocene-age Silverado Formation (Tsi); Cretaceous-age granodiorite, undifferentiated (Kgd); Cretaceous-age heterogeneous granitic rocks (Khg), intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv), and Santiago Peak volcanics (Kvsp); and Triassic-age phyllite (TRmp) (Figure 3). Also mapped within the vicinity, within the half-mile buffer, are late Holocene-age very young wash deposits (Qw); Cretaceous-age monzogranite (Kcg), Estelle Mountain volcanics of Herzig (Kvem), and Gavilan Ring Complex, hypabyssal tonalite (Kgh); and Triassic-age quartz-rich rocks (TRmq) and metamorphic rocks of Menifee Valley, undifferentiated (TRmu) (Morton and Miller, 2006; Figure 3).

6.1.1.1 Artificial Fill (Not Mapped) (Recent)

Artificial fill comprises recent deposits of previously disturbed sediments emplaced by construction operations and are found in areas where recent construction has taken place. Color is highly variable, and sediments are mottled in appearance. These sediments are not mapped at the surface of the Project area; however, they are likely to be encountered within previously disturbed portions of the Project (Morton and Miller, 2006; Figure 3).

6.1.1.2 Young Sedimentary Deposits (Qw, Qya, Qyf, Qyv, Qyw) (Holocene to Late Pleistocene)

Younger sedimentary deposits are Holocene to late Pleistocene in age (approximately 126,000 years to less than 11,700 years old) and include young axial-channel deposits (Qya), young alluvial fan deposits (Qyf), young alluvial valley deposits (Qyv), and young wash deposits (Qyw) (Morton and Miller, 2006). These younger sediments were deposited in fluvial systems in ancient and modern environments, and sediments generally consist of gray and slightly consolidated sand, gravel, and cobbles derived mostly from older sedimentary units in the Temescal Valley (Gray et al., 2002; Morton and Miller, 2006). Holocene- to late Pleistocene-age young sedimentary deposits are slightly to moderately dissected, are less topographically developed compared to older sedimentary deposits, and have upper surfaces that are capped by slightly to moderately developed pedogenic soil profiles (Gray et al., 2002; Morton and Miller, 2006).

Holocene- to late Pleistocene-age young alluvial fan deposits (Qyf) are mapped at the surface of portions of the northern, central, and southern Project area (Morton and Miller, 2006; Figure 3). Holocene- to late Pleistocene-age young axial-channel deposits (Qya) are mapped at the surface of portions of the southern and central Project area (Morton and Miller, 2006; Figure 3). Both Holocene- to late Pleistocene-age young alluvial valley deposits (Qyv) and young wash deposits (Qyw) are mapped at the surface of portions of the central Project area (Morton and Miller, 2006; Figure 3). Additionally, late Holocene-age very young wash deposits (Qw) are mapped to the southwest of the Project area, within the half-mile buffer (Morton and Miller, 2006; Figure 3).

6.1.1.3 Old and Very Old Sedimentary Deposits (Qoa, Qof, Qop, Qvoa, Qvof) (Pleistocene)

Old and very old sedimentary deposits are Pleistocene in age (approximately 2.58 million years to 11,700 years old) and include late to middle Pleistocene-age old axial channel deposits (Qoa); old alluvial fan deposits (Qof); and old paralic deposits, undivided (Qop); and middle to early Pleistocene-age very old axial channel deposits (Qvoa) and very old alluvial fan deposits (Qvof) (Morton and Miller, 2006). These older units were deposited by fluvial systems and as terrace deposits in ancient terrestrial and marine environments, and sediments generally consist of reddish-brown and moderately consolidated sand and gravel deposits with upper surfaces that are capped by moderately to well-developed pedogenic soils (Gray et al., 2002; Morton and Miller, 2006). Compared with younger deposits, Pleistocene-age old and very old sedimentary units typically have moderately- to well-developed soil horizons, are more topographically developed, and have moderately to well dissected surfaces, except where obscured by erosion.

Both Late to middle Pleistocene-age old axial channel deposits (Qoa) and old alluvial fan deposits (Qof) are mapped at the surface of the northern and central portions of the Project area as well as to the east and west of the Project area, within the half-mile buffer (Morton and Miller, 2006; Figure 3). Late to middle Pleistocene-age old paralic deposits (Qop) are mapped at the surface of the northern portion of the Project area as well as to the west of the Project area, within the half-mile buffer (Morton and Miller, 2006; Figure 3). Middle to early Pleistocene-age very old axial channel deposits (Qvoa) are mapped at the surface of the central portion of the Project area as well as to the southwest and northeast of the Project area, within the half-mile buffer (Morton and Miller, 2006; Figure 3). Middle to early Pleistocene-age very old alluvial fan deposits (Qvof) are mapped at the surface of the northern and central portions of the Project area as well as to the southwest, northeast, and east of the Project area, within the half-mile buffer (Morton and Miller, 2006; Figure 3).

6.1.1.4 Vaqueros and Sespe Formations, Undivided (Tvs) (Early Miocene to Oligocene)

The Vaqueros Formation is Oligocene in age (approximately 33.9 to 23 million years old) and was described by Hamlin (1904) based on exposures near King City, California. The formation consists primarily of shallow marine sandstones and shales, and it is exposed in the Coast Ranges, particularly in the Caliente Range-Carrizo Plain area, and as far north as the Salinas Valley and south to Orange County. The Vaqueros Formation conformably overlies the Simmler or Sespe formations and conformably underlies the Monterey Formation or Calabasa Formation; it interfingers with the laterally equivalent, non-marine Caliente Formation. The Vaqueros Formation may be up to 8,700 feet thick in the Caliente Range, whereas near the edges of its basin it is only about 200 feet thick (Bartow, 1974). Oligocene-age Vaqueros Formation represents deposition in a shallow marine to intertidal basin with nearshore sands and beach deposits and alluvial fans prograding into the shallow marine setting (Blundell, 1981).

The Sespe Formation was named by Watts (1897) for exposures along Sespe Creek near Fillmore in Ventura County, California. The formation is exposed from northern Santa Barbara County down to southern Orange County, as well as on Santa Rosa Island. The Sespe Formation is late Eocene to early Miocene in age (approximately 38 million to 17 million years old) and is composed of generally reddish to gray sandstone, conglomerate, and siltstone up to 4,000 feet thick in Los Angeles County (Kew, 1924; USGS, 2007; Calvano et al., 2008). Moderately well-bedded, the sandstone often contains crossbedding, and the siltstone and claystone are generally massive. This formation is generally poorly indurated, poorly sorted, and the sandstones are arkosic (Miller and Tan, 1976). The Sespe Formation overlies the Coldwater Sandstone and conformably underlies the gray marine sandstones and shales of the Vaqueros Formation, with which it interfingers (Belyea, 1984; Belyea and Minch, 1989; Minch et al., 1989; Prothero and Donohoo, 2001; Whistler and Lander, 2003; Calvano et al., 2008; USGS, 2007). The Sespe Formation is interpreted as river and floodplain deposition on a coastal braid-plain, and it reflects a major global drop in sea level (Howard, 1995).

Two major unconformities, or gaps in stratigraphic continuity, exist within the Sespe-Vaqueros sequence, such that the Sespe-Vaqueros represents three main episodes of deposition, one in the middle to late

Eocene, one in the Oligocene, and one in the early Miocene (Calvano et al., 2008). Within the Project region, the marine Vaqueros Formation and nonmarine Sespe Formations often cannot be mapped as separate units and are, thus, undifferentiated (Morton and Miller, 2006). Locally, this combined unit includes boulder conglomerate (Gray et al., 2002; Morton and Miller, 2006). Early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs) are mapped at the surface of the central-northern portion of the Project area as well as to the west of the Project area, within the half-mile buffer (Morton and Miller, 2006; Figure 3).

6.1.1.5 Sespe Formation (Ts) (Early Miocene to Late Eocene)

The Sespe Formation (Ts) is early Miocene to late Eocene in age (approximately 38 million to 17 million years old) and is mapped at the surface of the central-northern and central portions of the Project area as well as to the east of the Project area, within the half-mile buffer (Morton and Miller, 2006; Figure 3). This unit is described in further detail in Section 6.1.1.4.

6.1.1.6 Silverado Formation (Tsi) (Paleocene)

Paleocene-age Silverado Formation (Tsi) was first recognized by Dickerson (1914) for exposures in the Santa Ana Mountains and was later named and described in detail by Woodring and Popenoe (1945) (Morton and Weber, 2003). The unit is correlated with Paleocene-age Martinez Formation, which occurs in central California (Morton and Weber, 2003), and sediments consists of nonmarine and marine siltstone, sandstone, and conglomerate that was deposited on deeply weathered erosional surfaces (Morton and Weber, 2003). Paleocene-age Silverado Formation (Tsi) comprises a 2- to 25-meter-thick, massive, highly weathered, gray to red, pebble to boulder basal conglomerate overlain by weathered and relatively thin sequences of siltstone and sandstone, as well as two distinct 1- to 3-meter-thick, brown, green, gray, and white clay units, including the Claymont clay and the Serrano clay (Morton and Weber, 2003). Paleocene-age Silverado Formation (Tsi) is mapped at the surface of the central-northern and central portions of the Project area as well as in areas to the north, east, and west of the Project area, within the half-mile buffer (Morton and Miller, 2006; Figure 3).

6.1.1.7 Igneous and Metamorphic Rocks (Kcg, Kgd, Kgh, Khg, Ksv, Kvsp, Kvem, TRmu, TRmp, TRmq) (Cretaceous to Triassic)

Igneous rocks are crystalline or non-crystalline rocks that form through the cooling and subsequent solidification of lava or magma. Plutonic (intrusive) igneous rocks form below the earth's surface when magma, which is formed by the partial melting of pre-existing plutonic rocks in the earth's crust or mantle due to increases in temperature, changes in pressure, or changes in geochemical composition, slowly cools and solidifies. Similarly, volcanic (extrusive) igneous rocks form at the earth's surface when lava rapidly cools and solidifies. Metamorphic rocks are formed below the earth's surface through the heating and/or compressing of preexisting rocks at high temperatures and pressures, respectively.

Seven igneous geologic units are mapped within the Project area or within the vicinity, within the half-mile buffer, and include Cretaceous-age granodiorite, undifferentiated (Kgd), which is mapped at the surface of the southern portion of the Project area; heterogeneous granitic rocks (Khg), which are mapped at the surface of the southern portion of the Project area; intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv), which are mapped at the surface of the southern-central portion of the Project area; Santiago Peak volcanics (Kvsp), which are mapped at the surface of the central and northern portions of the Project area; Estelle Mountain volcanics of Herzig (Kvem), which are mapped at the surface of the central portion of the Project area; monzogranite (Kcg), which is mapped to the east of the northern portion of the Project area; and Gavilan Ring Complex, hypabyssal tonalite (Kgh), which is mapped to the east of the northern portion and to the west of the central portion of the Project area (Morton and Miller, 2006; Figure 3).

Three metamorphic geologic units are mapped within the Project area or within the vicinity, within the half-mile buffer, and include Triassic-age phyllite (TRmp), which is mapped at the surface of the southern portion of the Project area; quartz-rich rocks (TRmq), which are mapped to the southwest of the southern portion of the Project area; and metamorphic rocks of Menifee Valley, undifferentiated (TRmu), which are mapped to the northeast and southwest of the southern and central portions of the Project area (Morton and Miller, 2006; Figure 3).

6.1.2 Geotechnical Investigations

The geotechnical studies for the Project (Leighton Consulting, 2020; 2021a-i) indicate the presence of Holocene- to late Pleistocene-age young sedimentary deposits (Qya, Qyf), late to middle Pleistocene-age old axial channel deposits (Qoa), Paleocene-age Silverado Formation (Tsi), and Cretaceous-age igneous rocks (Kvem, Kvsp) beneath the Project area surface. Specifically, young sedimentary deposits (Qya, Qyf) were present starting at the ground surface (prior to initial construction of existing infrastructures) and extending down to elevations between 1,224 feet above mean sea level (amsl) and 989 feet amsl; late to middle Pleistocene-age old axial channel deposits (Qoa) (Temescal Canyon Road: PM 27.78) were present starting at the ground surface and extending down to an elevation of 1,130 feet amsl; either Cretaceous-age Estelle Mountain Volcanics of Herzig (Kvem) or Cretaceous-age Santiago Peak Volcanics (Kvsp) (Lake Street: PM 26.69) were present starting at an elevation of 1,172 feet amsl and extending to an indefinite depth; and Paleocene-age Silverado Formation (Tsi) (Horsethief Canyon Wash Bridge: PM 29.13; Indian Truck Trail: PM 30.4; Indian Wash Bridge: PM 30.09; Temescal Canyon Road: PM 27.78; and Temescal Wash Bridge: PM 28.04) was present starting at elevations between 1,130 to 1,175 feet amsl and extending down to elevations between 1,091 to 1,160 feet amsl (Leighton Consulting, 2020; 2021a-i).

Alluvial deposits, both young and old, were described as consisting of slightly compact to very dense, very poorly sorted, medium- to coarse-grained sand, gravel, cobbles, and boulders, with interbedded silt and clay (Leighton Consulting, 2020; 2021a-i). Additionally, late to middle Pleistocene-age old axial channel deposits (Qoa), late to middle Pleistocene-age old alluvial fan deposits (Qof), and middle to early Pleistocene-age very old axial channel deposits (Qvoa) are all mapped adjacent to the geotechnical study locations and may be encountered at depth beneath Holocene- to late Pleistocene-age young axial-channel deposits (Qya) and Holocene- to late Pleistocene-age young alluvial fan deposits (Qyf), although there is no apparent transition or distinction between the younger and older units based on the boring data. Paleocene-age Silverado Formation (Tsi) sediments consist of very hard fine- to coarse-grained sandstone and conglomerate with interbedded siltstone (Leighton Consulting, 2020; 2021a-i).

The subsurface geology documented by Leighton Consulting (2020; 2021a-i) at each of the study locations, including the Gavilan Wash (PM 25.55), Horsethief Canyon Wash (PM 29.13), Indian Wash (PM 30.09), Mayhew Wash (PM 31.97), and Temescal Canyon Road (31.9) bridges; Horsethief Canyon (PM 28.87) and Temescal Canyon (PM 27.78) roads; Lake Street (PM 26.69); and Indian Truck Trail (PM 30.4), is summarized below:

Gavilan Wash Bridge (PM 25.55): Holocene- to late Pleistocene-age young axial-channel deposits (Qya) were encountered starting at the ground surface and extending down to the maximum depth impacted, an elevation of 1,224 feet amsl (30 feet bgs).

Lake Street (PM 26.69): Holocene- to late Pleistocene-age young alluvial fan deposits (Qyf) were encountered starting at the ground surface and extending down to an elevation of 1,172 feet amsl (48 feet bgs) where they are underlain by either Cretaceous-age Estelle Mountain Volcanics of Herzig (Kvem) or Cretaceous-age Santiago Peak Volcanics (Kvsp).

Temescal Canyon Road (PM 27.78): Late to middle Pleistocene-age old axial channel deposits (Qoa) were encountered starting at the ground surface and extending down to an elevation of 1,130 feet amsl (60 feet bgs) where they are underlain by Paleocene-age Silverado Formation (Tsi), which extends down to the maximum depth impacted, an elevation of 1,114 feet amsl (76 feet bgs).

Horsethief Canyon Road (PM 28.87): Holocene- to late Pleistocene-age young alluvial fan deposits (Qyf) were encountered starting at the ground surface and extending down to the maximum depth impacted, an elevation of 1,131 feet amsl (102 feet bgs).

Horsethief Canyon Wash Bridge (PM 29.13): Holocene- to late Pleistocene-age young alluvial fan deposits (Qyf) were encountered starting at the ground surface and extending down to an elevation of 1,175 feet amsl (25 to 40 feet bgs) where they are underlain by Paleocene-age Silverado Formation (Tsi), which extends down to the maximum depth impacted, an elevation of 1,160 feet amsl (40 to 68 feet bgs).

Indian Wash Bridge (PM 30.09): Holocene- to late Pleistocene-age young axial-channel deposits (Qya) were encountered starting at the ground surface and extending down to the maximum depth impacted, an elevation of 1,106 feet amsl (30 to 60 feet bgs). Additionally, in several boring holes, Paleocene-age Silverado Formation (Tsi) was impacted starting at an elevation of 1,130 feet amsl (6 to 36 feet bgs) and extending down to the maximum depth impacted, an elevation of 1,116 feet amsl (20 to 40 feet bgs).

Indian Truck Trail (PM 30.4): Holocene- to late Pleistocene-age young axial-channel deposits (Qya) were encountered starting at the ground surface and extending down to the maximum depth impacted, an elevation of 1,093 feet amsl (80 feet bgs). Additionally, in one boring hole, Paleocene-age Silverado Formation (Tsi) was impacted starting at an elevation of 1,132 feet amsl (18 feet bgs) and extending down to the maximum depth impacted, an elevation of 1,091 feet amsl (41 feet bgs).

Temescal Canyon Road Bridge (PM 31.9): Holocene- to late Pleistocene-age young axial-channel deposits (Qya) were encountered starting at the ground surface and extending down to the maximum depth impacted, an elevation of 991 feet amsl (51 feet bgs).

Mayhew Wash Bridge (PM 31.97): Holocene- to late Pleistocene-age young axial-channel deposits (Qya) were encountered starting at the ground surface and extending down to the maximum depth impacted, an elevation of 989 feet amsl (56 feet bgs).

Further, although artificial fill is not documented in the boring logs, it is anticipated to be present within the Project area where previous construction has occurred. Artificial fill was emplaced during construction of the original I-15 alignment as well as at the abutment approaches for the existing bridges during the 1970s and 1980s during construction of the bridges. In general, artificial fill is expected to be deeper below the southbound bridges (Leighton Consulting, 2020; 2021a-i).

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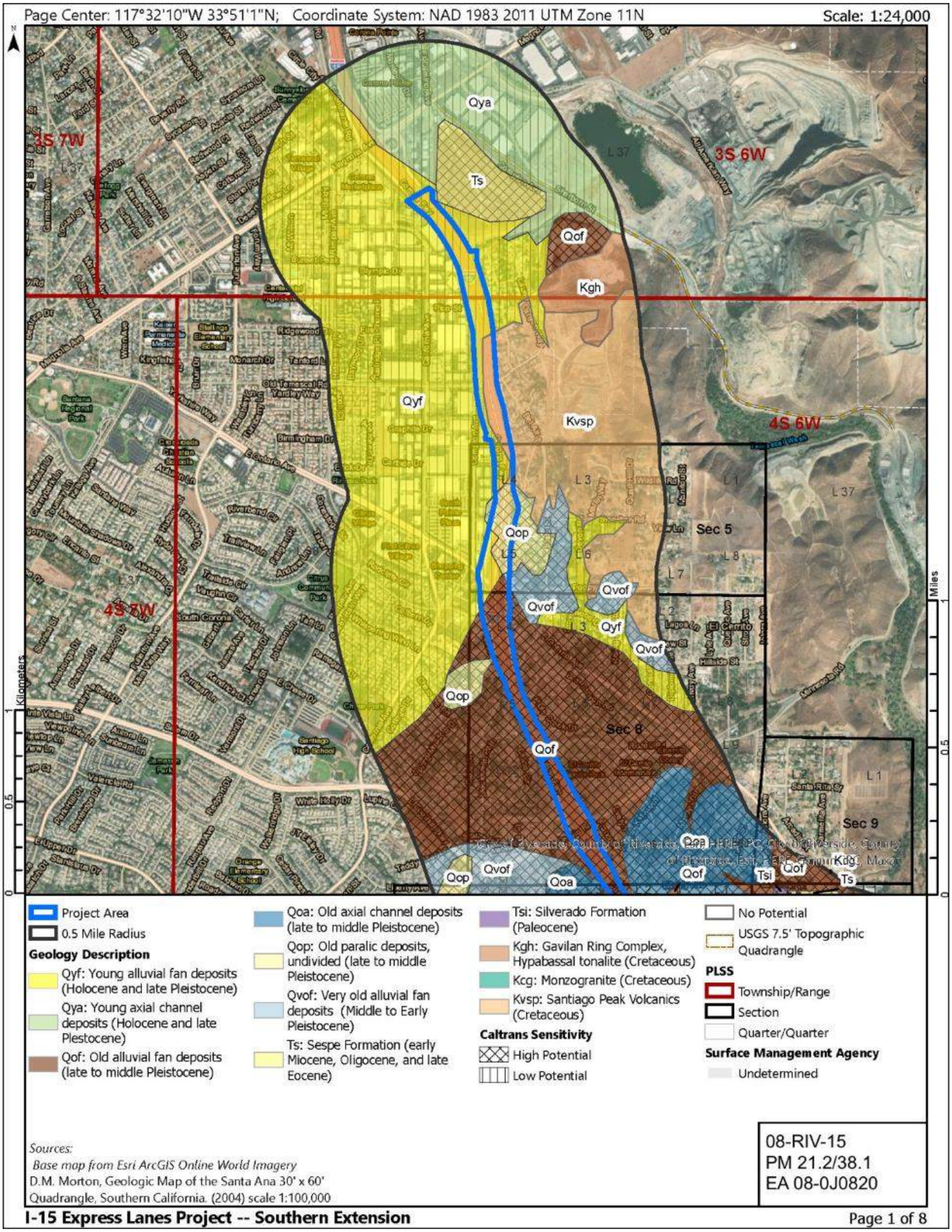

Figure 3a. Project Geology Map.

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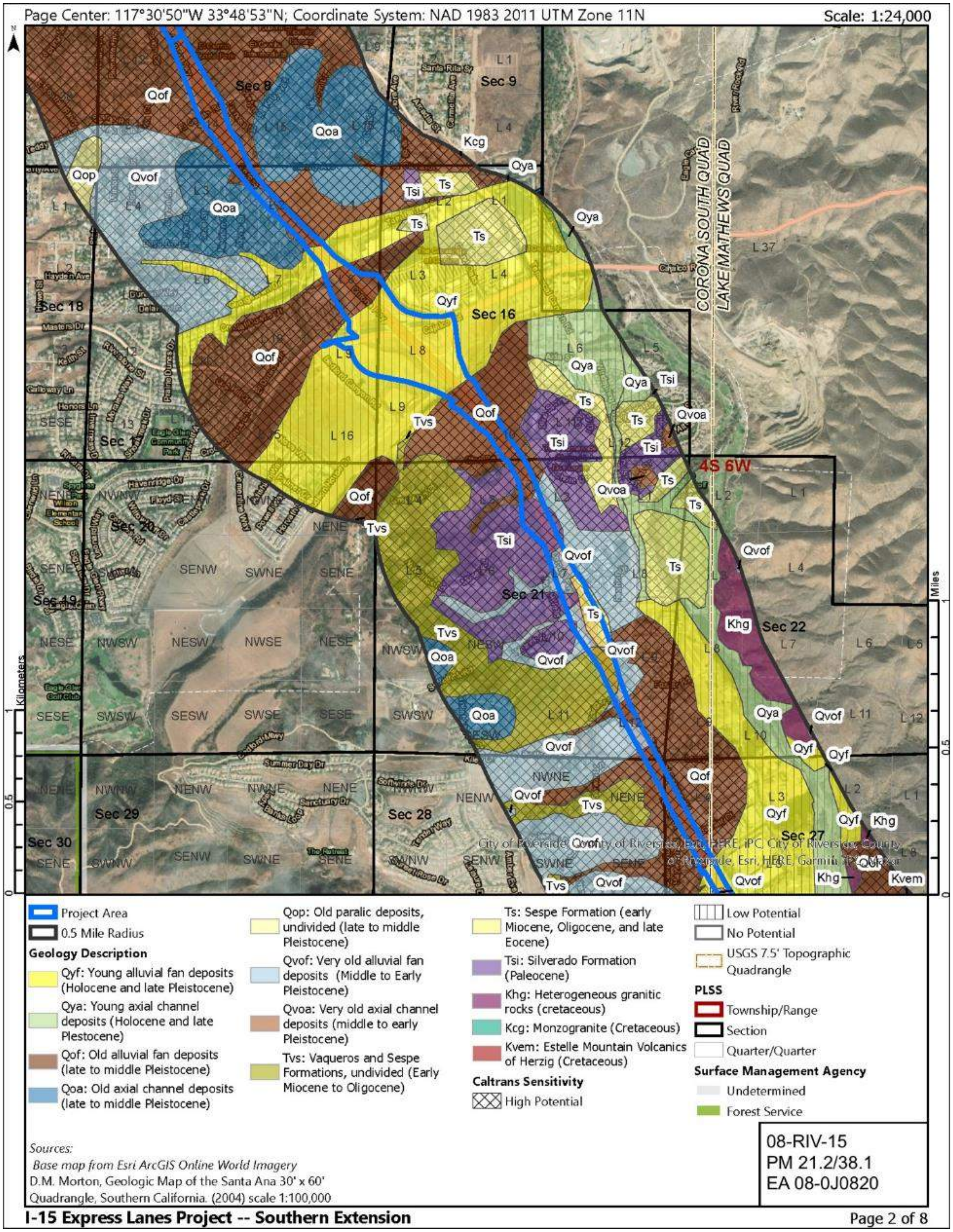

Figure 3b. Project Geology Map.

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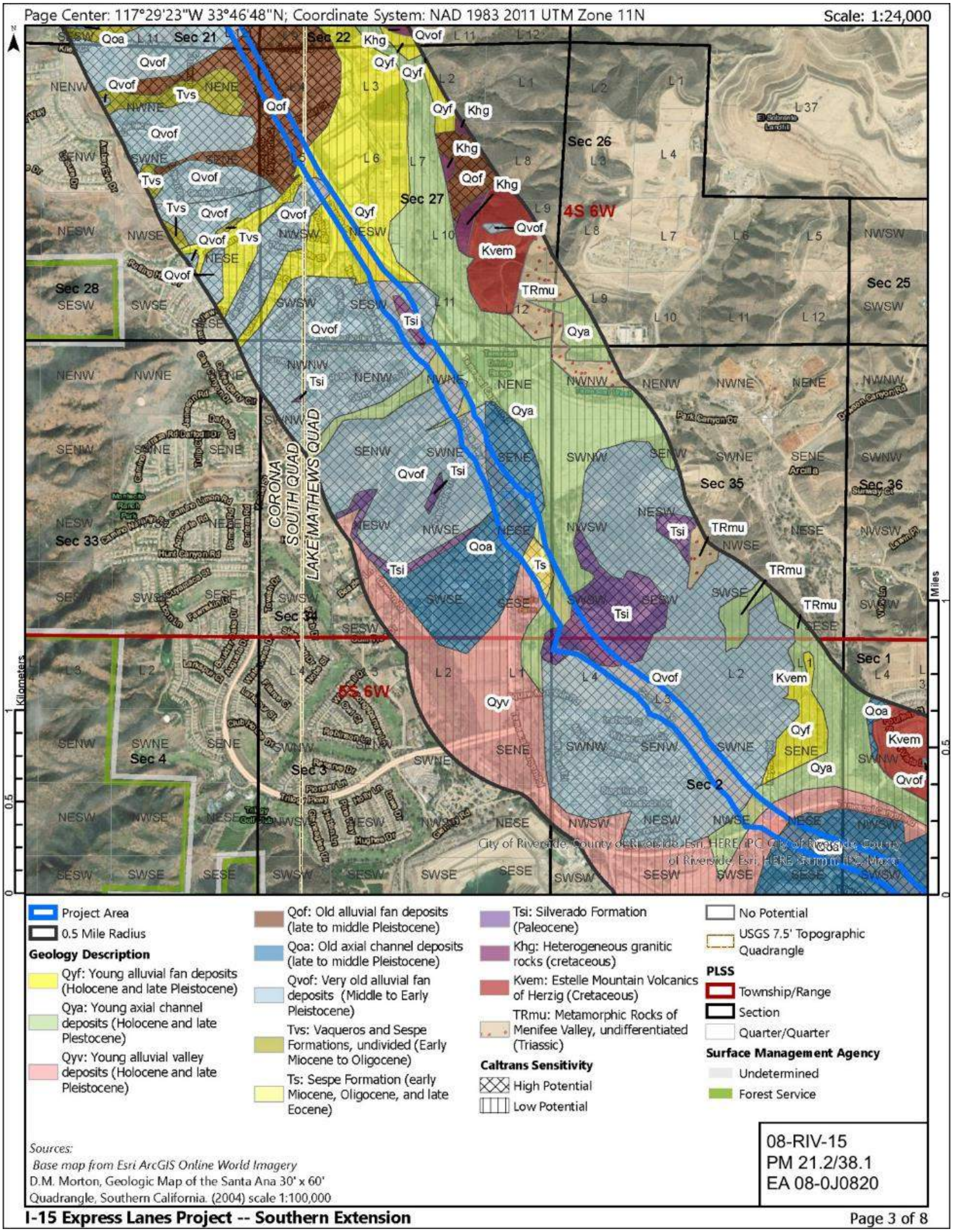

Figure 3c. Project Geology Map.

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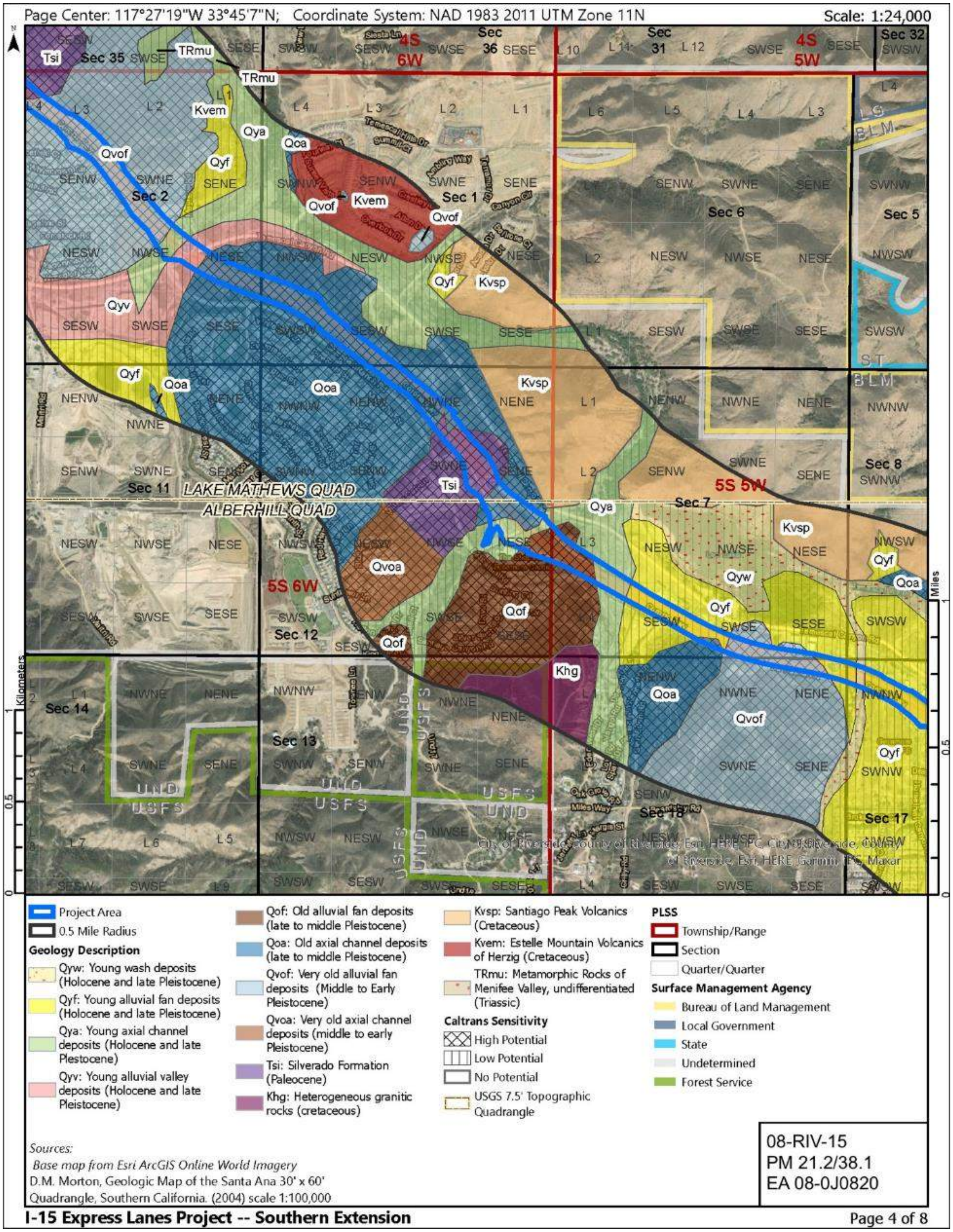

Figure 3d. Project Geology Map.

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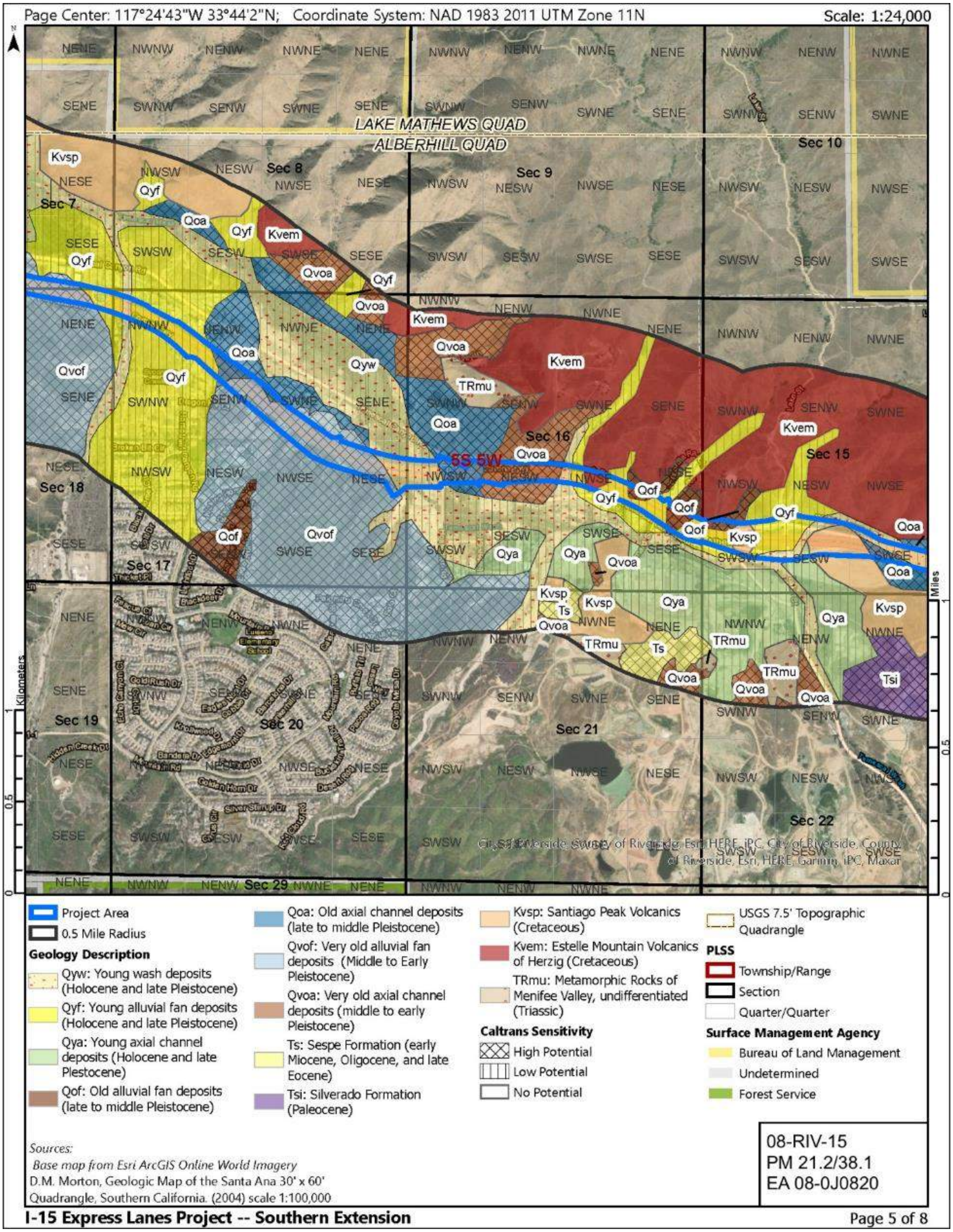

Figure 3e. Project Geology Map.

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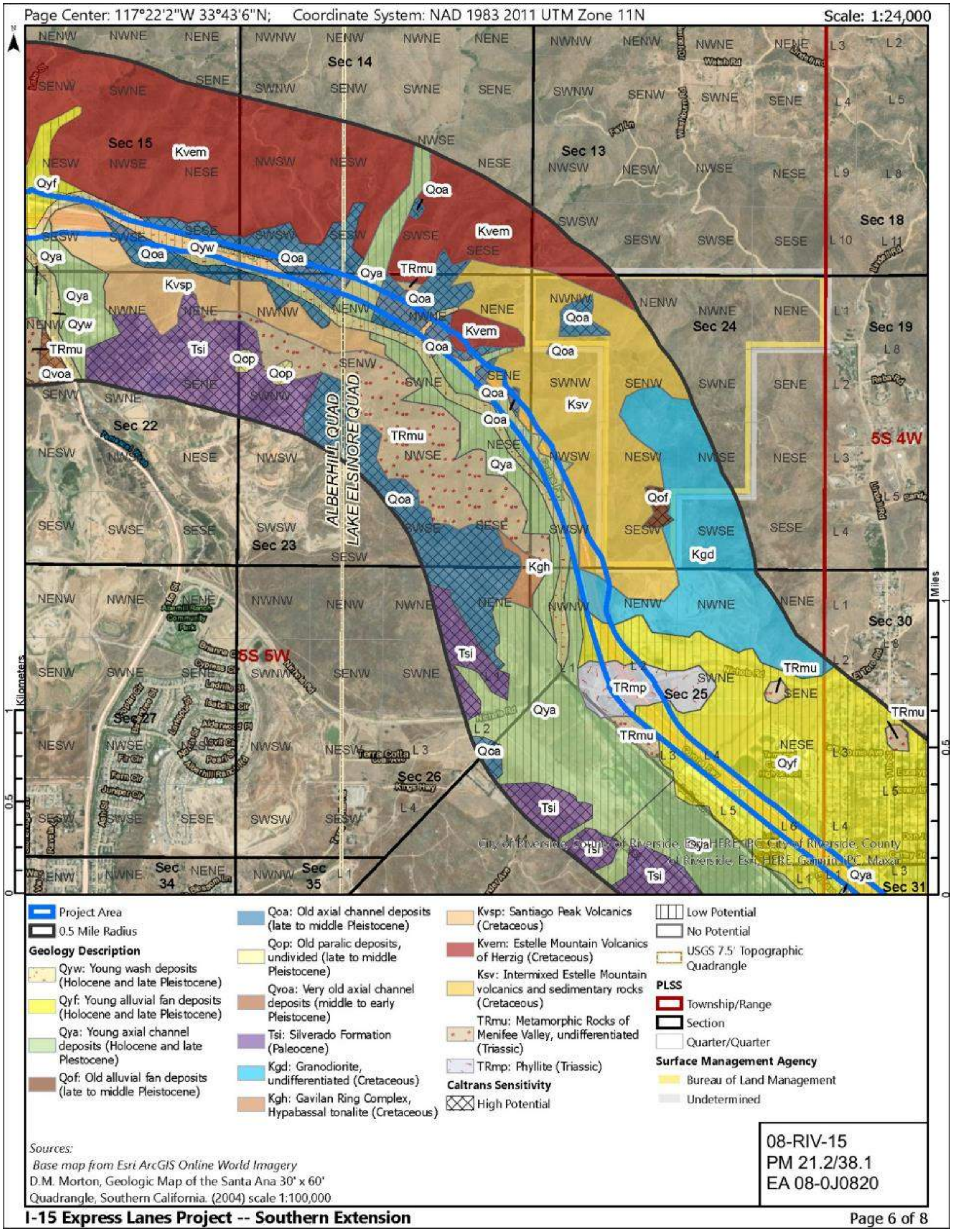

Figure 3f. Project Geology Map.

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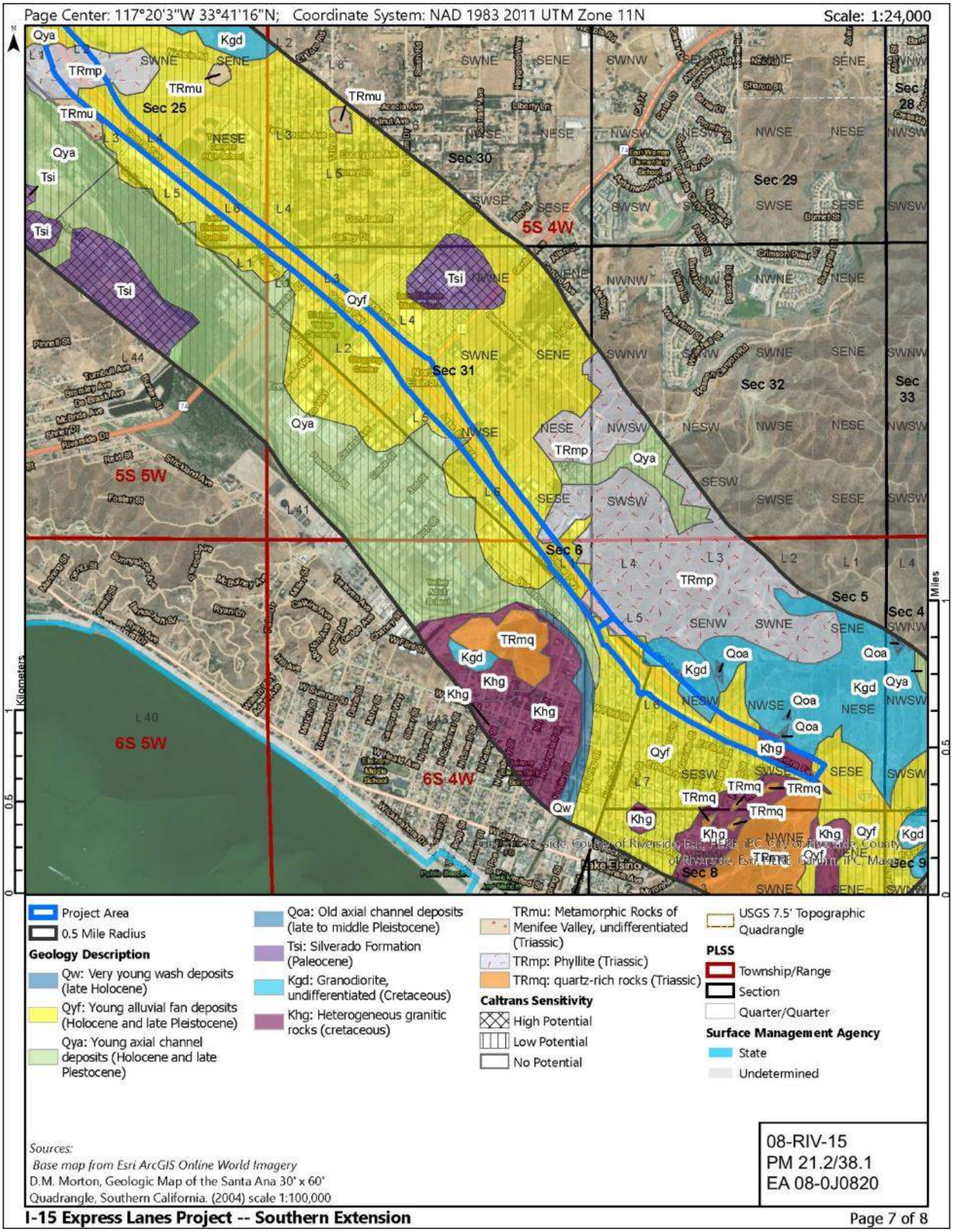

Figure 3g. Project Geology Map.

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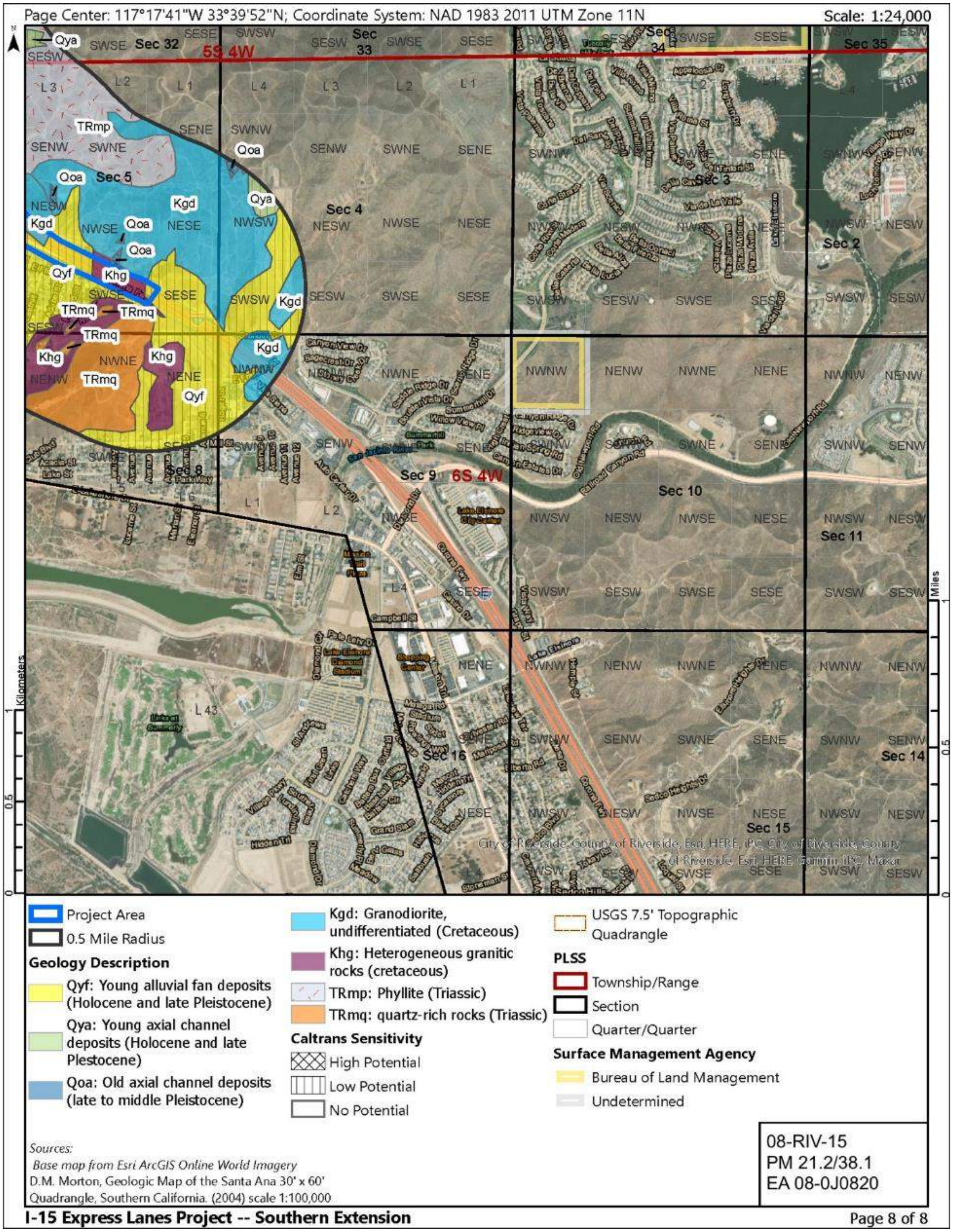

Figure 3h. Project Geology Map.

6.2 Paleontological Resources

6.2.1 Paleontological Record Search Results

Paleo Solutions requested a paleontological search of records maintained by the LACM and WSC. The museums responded on February 18 and 22, 2021, respectively, that no vertebrate fossil localities are recorded from within the Project area, although there are several localities recorded from the vicinity from sediments similar to those that underlie the Project area surface (Bell, 2021; Radford, 2021). The results of the records searches are provided as Appendix A and are summarized below as well as in Table 2.

Localities LACM VP 1207, 6059, 7261, 7811, and 1728 are recorded from unknown Pleistocene-age sediments, and locality LACM IP 17607 is recorded from Paleocene-age Silverado Formation. Locality LACM VP 1207, located north-northwest of Corona on a hill on the east site of the sewage disposal plant, produced fossil bovid (Bovidae) (Bell, 2021; Table 2). Locality 6059, located east-southeast of Lake Elsinore in an overflow area, produced fossil camel (Camelidae) (Bell, 2021; Table 2). Locality LACM VP 7261, located in Skinner Reservoir in Auld Valley, produced fossil elephant (Proboscidea) and ungulate (Ungulata) (Bell, 2021; Table 2). Locality LACM VP 7811, located west of Orchard Park in Chino Valley, produced fossil whip snake (*Masticophis*) (Bell, 2021; Table 2). Locality LACM VP 1728, located west of the intersection of English Road and Peyton Drive in Chino, produced fossil horse (*Equus*) and camel (*Camelops*) (Bell, 2021; Table 2). Locality LACM IP 17607, located along a northerly facing cut of the southern wall of Bedford Canyon, produced fossil invertebrates (Bell, 2021; Table 2).

The WSC records search did not yield any specific fossil localities within the Project vicinity. However, numerous fossils are documented from Pleistocene-age alluvial deposits in southern California, including Columbian mammoth (*Mammuthus columbi*), Pacific mastodon (*Mammut pacificus*), saber-toothed cat (*Smilodon fatalis*), and ancient horse (*Equus* sp.), among numerous other megafauna (Radford, 2021; Table 2).

6.2.2 Literature and Database Search Results

6.2.2.1 Artificial Fill (Not Mapped) (Recent)

Any fossil resources contained within these sediments will have been removed from their original deposition locations and, therefore, lack significant stratigraphic contextual data. Therefore, these deposits are considered to have a low potential for producing significant paleontological resources based on Caltrans (2014) guidelines.

6.2.2.2 Young Sedimentary Deposits (Qya, Qyf, Qyv, Qyw, Qw) (Holocene to Late Pleistocene)

Holocene-age deposits that are less than approximately 5,000 years old are typically too young to contain significant fossil resources (SVP, 2010). Although Holocene- to late Pleistocene-age young axial-channel deposits (Qya) and young alluvial fan deposits (Qyf) may comprise, in part, sediments greater than 5,000 years old, they are considered to have a low potential for producing significant paleontological resources based on Caltrans (2014) guidelines. However, these deposits may overlie sensitive, older (e.g., Pleistocene-, Miocene-, Oligocene-, and Eocene-age) deposits at variable depths.

6.2.2.3 Older Sedimentary Deposits (Qoa, Qof, Qop, Qvoa, Qvof) (Pleistocene)

Taxonomically diverse and locally abundant Pleistocene animals and plants have been collected from older alluvial deposits throughout southern California and include mammoth (*Mammuthus*), mastodon (*Mammut*), camel (Camelidae), horse (Equidae), bison (*Bison*), giant ground sloth (*Megatherium*), peccary (Tayassuidae), cheetah (*Acinonyx*), lion (*Panthera*), saber tooth cat (*Smilodon*), capybara

(*Hydrochoerus*), dire wolf (*Canis dirus*), and numerous taxa of smaller mammals (Rodentia) (Blake, 1991; Jahns, 1954a; Jefferson, 1991; Table 2). Numerous vertebrate fossil localities are recorded from Pleistocene-age deposits within the Project vicinity as well as elsewhere in Riverside County including desert tortoise (*Gopherus agassizil*), vole (*Microtus californicus, Mimomys*), pack rat (*Neotoma*), pocket mouse (*Perognathus*), deer mouse (*Peromyscus hagermanensis, Peromyscus complexus*), cotton rat (*Sigmodon minor*), long-tailed shrew (*Sorex leahy*), pocket gopher (*Thomomys gidleyi*), cottontail rabbit (*Sylvilagus hibbardi*), hare (*Lepus*), medium-sized deer (*Odocoileus*), tapir (*Tapirus merriami*), pronghorn (*Antilocapra*), dwarf pronghorn (*Capromeryx*), horse (*Equus bautistensis*), mammoth (*Mammuthus*), and ground sloth (*Megalonyx*) (UCMP, 2021; Table 2). Most notable is the massive fossil collection recovered during excavation for Diamond Valley Lake, which is located approximately 27 miles east-southeast of the Project area. These sediments have yielded tens of thousands of fossils corresponding to the late Irvingtonian and early Rancholabrean North American Land Mammal Ages (Reynolds and Reynolds, 1990a; 1990b). The Diamond Valley Lake Local Fauna (DVLLF) is the largest open, non-asphaltic late Pleistocene fossil assemblage known in the southwestern United States (Springer et al., 2009). The assemblage comprises 2,646 localities and includes nearly 100,000 identifiable fossils representing more than 105 vertebrate, invertebrate, and plant taxa (Springer et al., 2009). Vertebrate fossils are generally well-preserved and relatively complete and provide important data on the relative abundance and diversity of species through time at the given geographical location (Springer et al., 2009). A complete list of DVLLF taxa is provided in Table 2.

Late to middle Pleistocene-age old axial channel deposits (Qoa); old alluvial fan deposits (Qof), and old paralic deposits, undivided (Qop); and middle to early Pleistocene-age very old axial channel deposits (Qvoa) and very old alluvial fan deposits (Qvof) are considered to have a high potential for producing significant paleontological resources based on Caltrans (2014) guidelines.

6.2.2.4 Vaqueros and Sespe Formations, Undivided (Tvs) (Early Miocene to Oligocene)

Numerous vertebrate fossils are documented from both Oligocene-age Vaqueros Formation and middle Eocene- to early Miocene-age Sespe Formation. The Vaqueros Formation produces abundant marine molluscs, including at least 20 types of bivalves and the gastropods *Turritella* and *Rapana* (among several others), a fauna which has become the basis for the Vaquerosian molluscan stage in California (Calvano et al., 2008; Table 2). The formation also has yielded abundant foraminifera, barnacles, and echinoids (Rathbun, 1908; Bludell, 1981; Lagoe, 1988; Table 2). Rare fish, sharks, and scientifically significant marine mammals are well documented within the Vaqueros Formation, including extinct manatee-like sirenians, desmostylians, primitive whales, and a dolphin (Kearin and Barnes, 2001; Barnes, 2003a, 2003b, 2003c; Barnes et al., 2003; Deering et al., 2003, 2004; Dooley et al., 2004a, 2004b; Rivin, 2010; Table 2).

The land mammal assemblages of the Sespe Formation are representative of the Uintan (late middle Eocene) and Arikareean to Hemingfordian (late Oligocene to early Miocene) North American Land Mammal Ages (Prothero and Donohoo, 2001; Calvano et al., 2008). As a result of construction development projects to the south in Orange County, the Sespe Formation has produced relatively diverse assemblages of lizards and land mammals, the latter including hedgehog-like insectivores, marsupials, canids, miacid carnivores, rabbits, rodents, primates, tapir-like perissodactyls, horses, oreodonts, camels and oromerycids, and chevrotain-like dichobunid and hypertragulid artiodactyls (Raschke, 1984; Kelly et al., 1991; Cooper and Eisentraut, 2000; Fritsche and Behl, 2008; Calvano et al., 2008; Wang and Tedford, 2008; Uhen, 2014; Table 2). Additionally, numerous vertebrate fossils are recorded from middle Eocene- to early Miocene-age Sespe Formation in Ventura County, including specimens of crocodile (Crocodylidae), softshell turtle (Trionychidae), turtle (*Hadrianus*), rodent (*Simimys simplex*, *Metanoiamys fantasma*, *Pareumys milleri*, *Griphomys alecer*, *Leptotomus burkei*, *Rapamys fricki*, *Eohaplomys servus*, *Eohaplomys matutinus*, *Eohaplomys tradux*, *Ischyrotomus tapensis*), elephant shrew (*Sespedectes* *singularis*, *Proterixoides davisi*), rhinoceros (*Subhyracodon kewi*), oreodont (*Protoreodon tardus*, *Sespia californica*), odd-toed ungulate (*Amynodontopsis*, *Triplopus woodi*), brontothere (*Teleodus californicus*), protoceratid (*Leptoreodon edwardsi*), and primate (*Chumashius balchi, Yaquius travisi, Craseops sylvestris*, *Dyseolemur pacificus*) (UCMP, 2021; Table 2).

Further, undifferentiated Vaqueros-Sespe sediments have produced fossil mammals such as dogs, insectivores, artiodactyls, and many others in Orange County (Whistler and Lander, 2003; Wang and Tedford, 2008; Table 2).

Therefore, early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs) have a high paleontological sensitivity based on Caltrans (2014) guidelines.

6.2.2.5 Sespe Formation (Ts) (Early Miocene to Late Eocene)

The paleontological sensitivity of early Miocene- to late Eocene-age Sespe Formation (Ts) parallels that of early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs) (see Section 6.2.2.4). Therefore, early Miocene- to late Eocene-age Sespe Formation (Ts) has a high paleontological sensitivity based on Caltrans (2014) guidelines.

6.2.2.6 Silverado Formation (Tsi) (Paleocene)

Several vertebrate fossil localities as well as numerous invertebrate fossil localities are recorded from Paleocene-age Silverado Formation (Tsi) as well as the contemporaneous Martinez Formation. Vertebrate fossil specimens are documented from Contra Costa County and include shark (Chondrichthyes, *Striatolamia*), cartilaginous fish (*Ischyodus*), and bony fish (Osteichthyes) (UCMP, 2021; Table 2). Invertebrate fossils are represented by abundant marine mollusks including bivalve (*Mytilus* sp., *Polymesoda* sp., *Glycymerita major, Ostrea* sp., *Tellina* cf. *remondii, Pitar* cf. *stantoni*, *Pitar cf. uvasana*, *Claibornites* cf. *turneri*, *Axinaea veatchii*, *Cucullaea* cf. *mathewsoni, Crassatella unioides, Brachidontes* cf. *lawsoni, Corbula* cf. *tomulata*, *Meretrix uvasana*, *Cardiidae* indet., *Miltha* sp., *Nuculana* cf. *gabbi, Corbicula* sp.) and gastropod (*Brachysphingus* sp., *Turricula* sp., *Ficopsis* sp., *Cylichnina, Whitneyella* sp., Naticidae indet., *Turritella pachecoensis*, *Cylichnella tantilla*, *Scaphander costatus*, *Ancilla* sp., *Pseudoliva* sp., *Pseudoperissolax* sp., *Conus* sp., *Rimella, Polinices* cf. *horni*, *Amaurellina* sp., *Calyptraea diegoana*, *Homalopoma* cf. *wattsi*, *Streptolathyrus*, *Goniobasis* sp.) (PBDB, 2021; Table 2). Paleocene-age Silverado Formation (Tsi) is considered to have a high paleontological sensitivity based on Caltrans (2014) guidelines (Table 2).

6.2.2.7 Igneous and Metamorphic Rocks (Kcg, Kgd, Kgh, Khg, Ksv, Kvsp, Kvem, TRmu, TRmp, TRmq) (Cretaceous to Triassic)

Extreme temperatures in the environments in which igneous and metamorphic rocks form generally prevent the preservation of fossils. Therefore, Cretaceous-age monzogranite (Kcg); granodiorite, undifferentiated (Kgd); Gavilan Ring Complex, hypabyssal tonalite (Kgh); heterogeneous granitic rocks (Khg); intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv); Estelle Mountain volcanics of Herzig (Kvem); and Santiago Peak volcanics (Kvsp); and Triassic-age phyllite (TRmp); quartz-rich rocks (TRmq); and metamorphic rocks of Menifee Valley, undifferentiated (TRmu) are considered to have no paleontological sensitivity based on Caltrans (2014) guidelines.

Table 2. Paleontological Records Search and Literature Review Summary

Institutional Locality Number/Name	Geologic Unit and Age	Taxon	Common Name	Within Project Area (Yes or No)	Location	Source
LACM VP 1207	Unknown Pleistocene-age sedimentary deposits	Bovidae	bovid	No	North-northwest of Corona on a hill on the east site of the sewage disposal plant	Bell, 2021
LACM VP 6059	Unknown Pleistocene-age sedimentary deposits	Camelidae	camel	No	East-southeast of Lake Elsinore in an overflow area	Bell, 2021
LACM VP 7261	Unknown Pleistocene-age sedimentary deposits	Proboscidea	elephant	No	Skinner Reservoir in Auld Valley	Bell, 2021
LACM VP 7811	Unknown Pleistocene-age sedimentary deposits	*Masticophis*	whip snake	No	West of Orchard Park in Chino Valley	Bell, 2021
LACM VP 1728	Unknown Pleistocene-age sedimentary deposits	*Equus* *Camelops*	horse camel	No	West of Orchard Park in Chino Valley	Bell, 2021
Not reported	Pleistocene-age alluvial deposits	*Mammuthus columbi* *Mammut pacificus* *Smilodon fatalis* *Equus* sp.	Colombian mammoth Pacific mastodon saber-toothed cat horse	No	Southern California	Radford, 2021
UCMP 3247, 3245, 3244, 3243, 3242, 3241, 3240, RV8601, RV9612, V65248, V7006, V99828	Older sedimentary deposits (Pleistocene)	*Gopherus agassizil* *Microtus californicus* *Neotoma* *Mimomys* *Perognathus* *Peromyscus hagermanensis* *Peromyscus complexus* *Sigmodon minor* *Sorex leahyi* *Thomomys gidleyi* *Sylvilagus hibbardi* *Lepus* *Odocoileus* *Tapirus merriami* *Antilocapra* *Capromeryx* *Equus bautistensis* *Mammuthus* *Megalonyx*	desert tortoise California vole pack rat vole pocket mouse deer mouse deer mouse cotton rat long-tailed shrew pocket gopher cottontail rabbit hare medium-sized deer tapir pronghorn dwarf pronghorn horse mammoth ground sloth	No	Riverside County	UCMP, 2021

Institutional Locality Number/Name	Geologic Unit and Age	Taxon	Common Name	Within Project Area (Yes or No)	Location	Source
Not Reported	Older sedimentary deposits (Pleistocene)	*Mammuthus* *Mammut* Camelidae Equidae *Bison* *Megatherium* Tayassuidae *Acinonyx* *Panthera* *Smilodon* *Hydrochoerus* *Canis dirus* Rodentia	mammoth mastodon camel horse bison giant ground sloth peccary cheetah lion saber-toothed cat capybara dire wolf rodent	No	Southern California	Blake, 1991; Jahns, 1954a; Jefferson, 1991
Not Recorded	Vaqueros Formation (Oligocene)	- - - *Turritella* *Rapana* -	foraminifera bivalve barnacle gastropod gastropod echinoid	No	Orange County	Calvano et al., 2008; Rathbun, 1908; Bludell, 1981; Lagoe, 1988
Not Recorded	Vaqueros Formation (Oligocene)	- - - - - -	fish shark sirenian desmostylian primitive whale dolphin	No	Orange County	Kearin and Barnes, 2001; Barnes, 2003a, 2003b, 2003c; Barnes et al., 2003; Deering et al., 2003, 2004; Dooley et al., 2004a, 2004b; Rivin, 2010
Not Recorded	Sespe Formation (Middle Eocene to early Miocene)	- - - - - - - - - - - - - - - -	lizard hedgehog-like insectivore marsupial canid miacid carnivore rabbit rodent primate tapir-like perissodactyl horse oreodont camel oromerycid chevrotain-like dichobunid hypertragulid artiodactyl	No	Orange County	Raschke, 1984; Kelly et al., 1991; Cooper and Eisentraut, 2000; Fritsche and Behl, 2008; Calvano et al., 2008; Wang and Tedford, 2008; Uhen, 2014

Institutional Locality Number/Name	Geologic Unit and Age	Taxon	Common Name	Within Project Area (Yes or No)	Location	Source
UCMP RV200003, RV68173, V2601, V4215, V5235, V5236, V5242, V5368, V5814, V6101, V6012, V6013, V6625, V67114, V72064, V72065, V72066, V72087, V75003, V75233, V87155, V87156, V88030	Sespe Formation (Middle Eocene to early Miocene)	Crocodylidae Trionychidae *Hadrianus* *Simimys simplex* *Metanoiamys fantasma* *Pareumys milleri* *Griphomys alecer* *Leptotomus burkei* *Rapamys fricki* *Eohaplomys servus* *Eohaplomys matutinus* *Eohaplomys tradux* *Ischyrotomus tapensis* *Sespedectes singularis* *Proterixoides davisi* *Subhyracodon kewi* *Protoreodon tardus* *Sespia californica* *Amynodontopsis* *Triplopus woodi* *Teleodus californicus* *Leptoreodon edwardsi* *Chumashius balchi* *Yaquius travisi* *Craseops sylvestris* *Dyseolemur pacificus*	crocodile softshell turtle turtle rodent rodent rodent rodent rodent rodent rodent rodent rodent rodent elephant shrew elephant shrew rhinoceros oreodont oreodont odd-toed ungulate odd-toed ungulate brontothere protoceratid primate primate primate primate	No	Ventura County	UCMP, 2021
Not Recorded	Vaqueros and Sespe Formations, undivided (early Miocene to Eocene)	- - -	dog insectivore artiodactyl	No	Orange County	Whistler and Lander, 2003; Wang and Tedford, 2008
UCMP V70103, V70104, V71157, V71159	Martinez Formation (Paleocene) (contemporaneous with Silverado Formation)	Chondrichthyes *Striatolamia* *Ischyodus* Osteichthyes	shark shark cartilaginous fish bony fish	No	Contra Costa County	UCMP, 2021
LACM IP 17607	Silverado Formation (Paleocene)	Invertebrata undet.	invertebrate	No	Eagle Glen Project, along a north-facing cut of southern wall of Bedford Canyon	Bell, 2021
PBDB 52593 through 52609	Silverado Formation (Paleocene)	*Mytilus* sp. *Polymesoda* sp. *Glycymerita major* *Ostrea* sp. *Tellina* cf. *remondii* *Pitar* cf. *stantoni* *Pitar* cf. *uvasana* *Clabornites* cf. *turneri* *Axinaea veatchii*	bivalve bivalve bivalve bivalve bivalve bivalve bivalve bivalve bivalve	No	Santa Ana Mountains, Orange County	PBDB, 2021

Institutional Locality Number/Name	Geologic Unit and Age	Taxon	Common Name	Within Project Area (Yes or No)	Location	Source
		Cucullaea cf. *mathewsoni*	bivalve			
		Crassatella	bivalve			
		Brachidontes cf. *lawsone*	bivalve			
		Corbula cf. *tomulata*	bivalve			
		Meretrix uvasana	bivalve			
		Cardiidae indet.	bivalve			
		Miltha sp.	bivalve			
		Nuculana cf. *gabbi*	bivalve			
		Corbicula sp.	bivalve			
		Brachysphingus sp.	gastropod			
		Turricula sp.	gastropod			
		Ficopsis sp.	gastropod			
		Cylichnina	gastropod			
		Whitneyella sp.	gastropod			
		Naticidae indet.,	gastropod			
		Turritella pachecoensis	gastropod			
		Cylichnella tantilla	gastropod			
		Scaphander costatus	gastropod			
		Ancilla sp.	gastropod			
		Pseudoliva sp.	gastropod			
		Pseudoperissolax sp.	gastropod			
		Conus sp.	gastropod			
		Rimella	gastropod			
		Polinices cf. *horni*	gastropod			
		Amaurellina sp.	gastropod			
		Calyptraea diegoana	gastropod			
		Homalopoma cf. *wattsi*	gastropod			
		Streptolathyrus	gastropod			
		Goniobasis sp.	gastropod			

7 Field Survey

The survey area is located along I-15 between Magnolia Avenue in the north and Diamond Drive in the south. The site is located along the freeway proper and is bounded by the surrounding hills and drainages. The terrain is mostly flat along the freeway, with the shoulders of the freeway lined against occasional hills or slopes (Photos 1 and 4 [see Figure 2]). The majority of the hills and slopes along the survey area were covered by grass and other vegetation. An approximately one-mile-stretch along I-15 at Cajalco Road in Corona is excluded from the survey area.

7.1 Stratigraphy of Project Area

Sediments observed included artificial fill; Holocene to late Pleistocene-age young alluvial fan deposits (Qyf); Holocene to late Pleistocene-age young axial channel deposits (Qya); late to middle Pleistocene-age old alluvial fan deposits (Qof); late to middle Pleistocene-age old axial channel deposits (Qoa); late to middle Pleistocene-age old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old alluvial fan deposits (Qvof); middle to early Pleistocene-age very old axial channel deposits (Qvoa); and Paleocene-age Silverado Formation (Tsi). While early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs) were not observed directly along the survey corridor, these sediments were observed in nearby hill exposures immediately adjacent to the survey area (Photos 23 and 24 [see Figure 2]). Additionally, along the southern end of the survey area, numerous igneous and metamorphic rock formations were observed along shoulder slope exposures, including Cretaceous-age granodiorite, undifferentiated (Kgd); Cretaceous-age Santiago Peak volcanics (Kvsp); Cretaceous-age Estelle Mountain volcanics of Herzig (Kvem); Cretaceous-age intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv); and Triassic-age phyllite (TRmp) (Photos 33, 34, 35, and 36 [see Figure 2]). Due to dense vegetation coverage on the hills and slopes alluvial sediment exposures were limited to ground and hill surface areas devoid of vegetation.

Artificial fill was observed in areas where previous construction has occurred, including areas beneath and surrounded existing infrastructures. The depth of artificial fill in the Project area could not be determined based on field observations.

Holocene- to late Pleistocene-age young alluvial fan deposits (Qyf) were observed to range from less than 1 foot deep to greater than 1 foot deep (Photo 5 [see Figure 2]). Due to vegetation and low topographic relief, the exact thickness of the unit could not be determined. These sediments consist of yellow-brown colored, poorly to moderately sorted, poorly compacted, subrounded, fine- to coarse-grained sand (Photo 6 [see Figure 2]).

Holocene- to late Pleistocene-age young axial channel deposits (Qya) were observed to range from less than 1 foot deep to greater than 1 foot deep (Photo 7 [see Figure 2]). Due to vegetation and low topographic relief, the exact thickness of the unit could not be determined. These sediments consist of light brown to yellow-brown colored, poorly sorted, poorly compacted, subrounded to rounded, medium to coarse-grained sand and gravel (Photo 8 [see Figure 2]).

Late to middle Pleistocene-age old alluvial fan deposits (Qof) were observed to range from less than 1 foot deep to approximately 100 feet deep. These sediments consist of reddish-brown to gold-brown colored, moderately to poorly sorted, poorly to moderately compacted, subrounded, medium- to coarse-grained sand, with granules, pebbles, and cobbles composed of plutonic rocks and minerals (Photos 9 through 13 [see Figure 2]). Sediments also contain siliceous and ferrous mineralization and exhibit both graded bedding and crossbedding.

Late to middle Pleistocene-age old axial channel deposits (Qoa) were observed to range from less than 1 foot deep to greater than 4 feet deep (Photo 14 [see Figure 2]). These sediments consist of reddish-brown colored, moderately to poorly sorted, moderately to poorly compacted, subangular to subrounded, medium- to coarse-grained sand, with granules, pebbles, and cobbles composed of plutonic rocks and minerals (Photo 15 [see Figure 2]). The unit was observed to have a poorly defined erosional contact (unconformity) with underlying Cretaceous-age intermixed Estelle Mountain volcanics and sedimentary rocks (Kvs) (Photo 16 [see Figure 2]).

Late to middle Pleistocene-age old paralic deposits, undivided (Qop) were observed to range from 8 feet deep to approximately 30 feet deep (Photo 17 [see Figure 2]). These sediments consist of orange-gold colored, moderately sorted, poorly to moderately compacted, subangular to rounded, medium- to coarse-grained sand, and granules (Photo 18 [see Figure 2]).

Middle to early Pleistocene-age very old alluvial fan deposits (Qvof) were observed to be at least 4 feet deep (Photo 19 [see Figure 2]). These sediments consist of gray-brown colored, moderately sorted, poorly to moderately compacted, subangular to subrounded, medium- to coarse-grained sand (Photo 20 [see Figure 2]).

Middle to early Pleistocene-age very old axial channel deposits (Qvoa) were observed to be at least 4 feet deep (Photo 21 [see Figure 2]). These sediments consist of pale reddish-brown colored, moderately to well sorted, poorly compacted, subrounded, fine- to coarse-grained sand (Photo 22 [see Figure 2]).

Paleocene-age Silverado Formation (Tsi) was observed to be at least 25 feet deep. These sediments consist of light brown, beige, pale gray, pale gold, pink, to rusty-red colored; moderately lithified; poorly to moderately sorted; very fine- to very coarse-grained sandstone, with angular to subrounded granules composed of plutonic and metamorphic rocks (Photos 25 through 31 [see Figure 2]). Sediments also contain ferrous mineralization and exhibit graded bedding, crossbedding, and planar laminations. While vegetation covered much of the formation along the survey corridor, exposures were observed in gullies on the nearby hills immediately adjacent to the survey area (Photo 32 [see Figure 2]).

7.2 Paleontology

No paleontological resources were observed or collected during the survey. However, sediments potentially conducive to fossil preservation, particularly those of late to middle Pleistocene-age old alluvial fan deposits (Qof), late to middle Pleistocene-age old axial channel deposits (Qoa), late to middle Pleistocene-age old paralic deposits (Qop), middle to early Pleistocene-age very old alluvial fan deposits (Qvof), middle to early Pleistocene-age very old axial channel deposits (Qvoa), and Paleocene-age Silverado Formation (Tsi), were observed. Additionally, early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs) were observed in nearby exposures off the main survey corridor.

Photo 1. Overview of the survey area along the southbound side of I-15 at Temescal Canyon Road along the central section of the Project area, exposing the nearby hills and slopes. View to the north.

Photo 2. Overview of the survey area along the northbound side of I-15 at Weirick Road along the south-central section of the Project area, exposing the nearby hills and slopes. View to the south.

Photo 3. Overview of the survey area at the Magnolia overpass above I-15 along the northern end of the Project area, exposing the nearby hills and slopes. View to the south.

Photo 4. Overview of the survey area along the southbound side of I-15 along the northern end of the Project area, exposing the nearby hills and slopes. View to the south.

Photo 5. Outcrop exposure of Holocene to late Pleistocene-age young alluvial fan deposits (Qyf) on the shoulder along the south-central section of the survey area. Note the vegetation covering much of the exposure. View to the southeast.

Photo 6. Detailed outcrop exposure of uppermost Holocene to late Pleistocene-age young alluvial fan deposits (Qyf) within the south-central section of the survey area. View down.

Photo 7. Outcrop exposure of Holocene- to late Pleistocene-age young axial channel deposits (Qya) on the shoulder along the south-central section of the survey area. Note the vegetation covering much of the exposure. View to the west.

Photo 8. Detailed outcrop exposure of uppermost Holocene- to late Pleistocene-age young axial channel deposits (Qya) within the south-central section of the survey area. View down.

Photo 9. Outcrop exposure of late to middle Pleistocene-age old alluvial fan deposits (Qof) on the shoulder along the south-central section of the survey area. Note the vegetation covering much of the exposure. View to the east.

Photo 10. Detailed outcrop exposure of late to middle Pleistocene-age old alluvial fan deposits (Qof) within the south-central section of the survey area. View down.

Photo 11. Overview of sediment exposure above Bedford Wash containing late to middle Pleistocene-age old alluvial fan deposits (Qof). View to the south.

Photo 12. Late to middle Pleistocene-age old alluvial fan deposits (Qof) exposed west of I-15 and above Bedford Wash. Sediments shown are very poorly sorted and exhibit graded bedding. View to the south.

Photo 13. Late to middle Pleistocene-age old alluvial fan deposits (Qof) exposed west of I-15 and above Bedford Wash. Sediments shown are very poorly sorted and clasts-supported and exhibit graded bedding (upward coarsening). View to the south.

Photo 14. Outcrop exposure of late to middle Pleistocene-age old axial channel deposits (Qoa) on the shoulder along the southern section of the survey area. Note the vegetation covering much of the exposure. View to the east.

Photo 15. Detailed outcrop exposure of late to middle Pleistocene-age old axial channel deposits (Qoa) within the south-central section of the survey area. View down.

Photo 16. Outcrop exposure of late to middle Pleistocene-age old axial channel deposits (Qoa) (left) in contact (poorly observed) with Cretaceous-age intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv) on the shoulder along the southern section of the survey area. Note the vegetation covering much of the exposure. View to the southeast.

Photo 17. Outcrop exposure of late to middle Pleistocene-age old alluvial fan deposits (Qof) on the shoulder along the northern section of the survey area. View to the west.

Photo 18. Detailed outcrop exposure of late to middle Pleistocene-age old paralic deposits, undivided (Qop) within the northern section of the survey area. View down.

Photo 19. Outcrop exposure of middle to early Pleistocene-age very old alluvial fan deposits (Qvof) on the shoulder along the south-central section of the survey area. Note the high vegetation covering much of the exposure. View to the southwest.

Photo 20. Detailed outcrop exposure of middle to early Pleistocene-age very old alluvial fan deposits (Qvof) within the south-central section of the survey area. View down.

Photo 21. Outcrop exposure of middle to early Pleistocene-age old axial channel deposits (Qoa) on the shoulder along the south-central section of the survey area. Note the vegetation covering much of the exposure. View to the northeast.

Photo 22. Detailed outcrop exposure of middle to early Pleistocene-age very old alluvial fan deposits (Qvof) within the south-central section of the survey area. View down.

Photo 23. Mapped early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs) on the shoulder along the south-central section of the survey area. Note the vegetation covering much of the hill. View to the east.

Photo 24. Outcrop exposure of early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs) on nearby hill outside of the survey limits along the south-central section of the survey area. View to the west.

Photo 25. Outcrop exposure of Paleocene-age Silverado Formation (Tsi) on a hill on the shoulder along the south-central section of the survey area. Note the high vegetation covering much of the exposure. View to the northeast.

Photo 26. Detailed outcrop exposure of Paleocene-age Silverado Formation (Tsi) within the south-central section of the survey area. View down.

Photo 27. Overview of sediment exposure below I-15 freeway containing Paleocene-age Silverado Formation (Tsi). View to the west.

Photo 28. Paleocene-age Silverado Formation (Tsi) sandstone exposed east of I-15. Sediments shown exhibit ferrous mineralization or staining (rusty coloration) as well as graded bedding, crossbedding, and planar laminations. View to the west.

Photo 29. Paleocene-age Silverado Formation (Tsi) sandstone exposed east of I-15. Sediments shown exhibit ferrous mineralization or staining (rusty coloration) as well as graded bedding, crossbedding, and planar laminations. View to the west.

Photo 30. Paleocene-age Silverado Formation (Tsi) sandstone exposed east of I-15. Sediments shown exhibit ferrous mineralization or staining (rusty coloration) as well as graded bedding, crossbedding, and planar laminations. View to the west.

Photo 31. Paleocene-age Silverado Formation (Tsi) sandstone exposed east of I-15. Sediments shown exhibit ferrous mineralization or staining (rusty coloration) as well as graded bedding, crossbedding, and planar laminations. View to the west.

Photo 32. Outcrop exposure of Paleocene-age Silverado Formation (Tsi) within gullies on nearby hills along the south-central section of the survey area. View to the northeast.

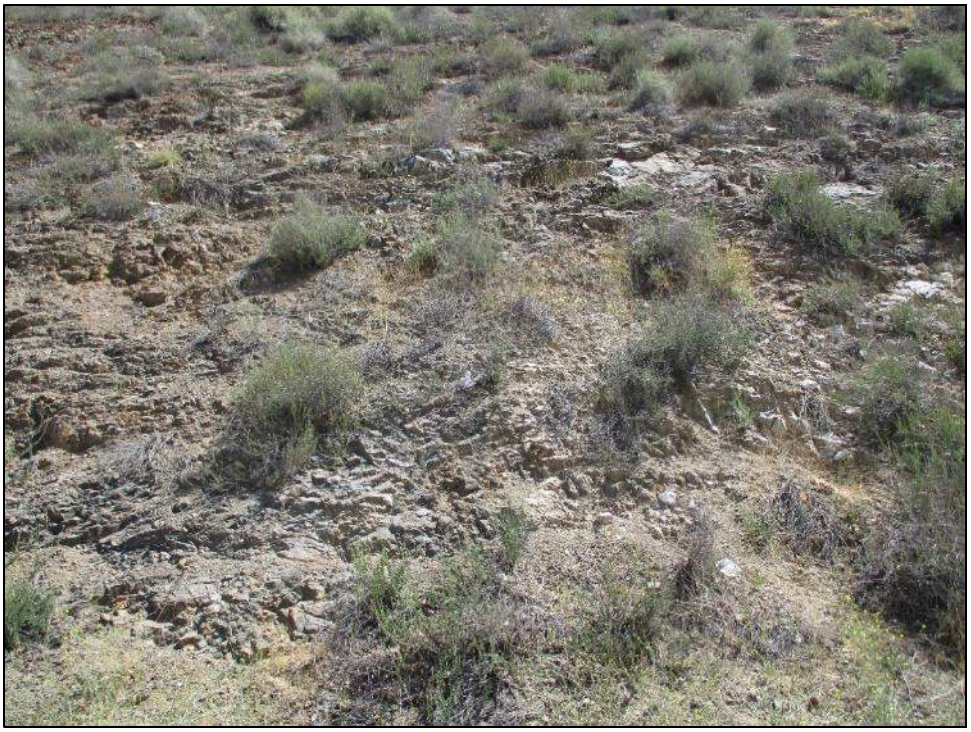

Photo 33. Outcrop exposure and contact between of Cretaceous-age granodiorite, undifferentiated (Kgd) (right) and Cretaceous-age intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv) along the southern section of the survey area. View to the east.

Photo 34. Outcrop exposure of Cretaceous-age Santiago Peak volcanics (Kvsp) along the southern section of the survey area. View to the north.

Photo 35. Detailed outcrop exposure of Cretaceous-age Estelle Mountain volcanics of Herzig (Kvem) within the southern section of the survey area. View down.

Photo 36. Detailed outcrop exposure of Triassic-age phyllite (TRmp) within the southern section of the survey area. View down.

8 Impacts to Paleontological Resources

Impacts on paleontological resources can generally be classified as either direct, indirect, or cumulative. Direct adverse impacts on surface or subsurface paleontological resources are the result of destruction by breakage and crushing as the result of surface disturbing actions including construction excavations such as trenching, grading, cutting, and drilling that is 36-inches in diameter or greater. In areas that contain paleontologically sensitive geologic units, ground disturbance has the potential to adversely impact surface and subsurface paleontological resources of scientific importance when native (i.e., not previously disturbed) sediments are impacted. Without mitigation, these fossils, and the paleontological data they could provide if properly recovered and documented, could be adversely impacted (damaged or destroyed), rendering them permanently unavailable to science and society.

Indirect impacts typically include those effects which result from the continuing implementation of management decisions and resulting activities, including normal ongoing operations of facilities constructed within a given project area. They also occur as the result of the construction of new roads and trails in areas that were previously less accessible. This increases public access and therefore increases the likelihood of the loss of paleontological resources through vandalism and unlawful collecting. Human activities that increase erosion also cause indirect impacts to surface and subsurface fossils as the result of exposure, transport, weathering, and reburial.

Cumulative impacts can result from incrementally minor but collectively significant actions taking place over a period of time. The incremental loss of paleontological resources over time as a result of construction-related surface disturbance or vandalism and unlawful collection would represent a significant cumulative adverse impact because it would result in the destruction of non-renewable paleontological resources and the associated irretrievable loss of scientific information.

Surface grading or shallow excavations entirely within geologic units with low paleontological sensitivity, including artificial fill, late Holocene-age very young wash deposits (Qw), and Holocene- to late Pleistocene-age young axial channel deposits (Qya), young alluvial fan deposits (Qyf), young alluvial valley deposits (Qyv), and young wash deposits (Qyw) are unlikely to uncover significant fossil remains due to their young age and/or lack of stratigraphic context. However, these deposits may shallowly overlie older *in situ* sedimentary deposits. Excavations within the Project area that impact geologic units with high paleontological sensitivity, including late to middle Pleistocene-age old axial channel deposits (Qoa); old alluvial fan deposits (Qof); and old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old axial channel deposits (Qvoa) and very old alluvial fan deposits (Qvof); early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs); early Miocene- to late Eocene-age Sespe Formation (Ts); and Paleocene-age Silverado Formation (Tsi), may well result in an adverse direct impact on scientifically important paleontological resources. Based on the results of the geotechnical studies (Leighton Consulting, 2020; 2021a-i), native sediments of high paleontological sensitivity geologic units are anticipated to be encountered starting at greater than 30 feet bgs at Gavilan Wash Bridge (PM 25.55); 0 feet bgs at Temescal Canyon Road (PM 27.78); greater than 102 feet bgs at Horsethief Canyon Road (PM 28.87); 25 to 40 feet bgs at Horsethief Canyon Wash Bridge (PM 29.13); 6 to 36 feet bgs at Indian Wash Bridge (PM 30.09); 18 feet bgs at Indian Truck Trail (PM 30.4); greater than 51 feet bgs at Temescal Canyon Road Bridge (PM 31.9); and greater than 56 feet bgs at Mayhew Wash Bridge (PM 31.97). Excavations into geologic units with no paleontological sensitivity, including Cretaceous-age granodiorite, undifferentiated (Kgd); Cretaceous-age Gavilan Ring Complex, hypabyssal tonalite (Kgh); Cretaceous-age monzogranite (Kcg), heterogeneous granitic rocks (Khg), intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv), Estelle Mountain volcanics of Herzig (Kvem), and Santiago Peak volcanics (Kvsp); and Triassic-age phyllite (TRmp), quartz-rich rocks (TRmq), and metamorphic rocks of Menifee Valley, undifferentiated (TRmu), will not impact scientifically important paleontological resources since these rocks are formed under conditions that are non-conducive to fossil preservation. A summary of the geologic units and their corresponding paleontological sensitivities is provided in Table 3.

No indirect or significant cumulative impacts are anticipated from any of the planned Project activities. No indirect impacts are anticipated since the Project will not increase public access to the Project area and ongoing operations of the Project will not involve ground-disturbance. Excavation activities associated with the Project in conjunction with other projects in the area could contribute to the progressive loss of fossil remains. However, the Project would have a less than significant impact to paleontological resources with incorporation of the paleontological mitigation recommendations provided in Section 9. Therefore, the Project's contribution to cumulative impacts to paleontological resources would be less than significant.

Table 3. Summary of Geologic Units and Corresponding Paleontological Sensitivities

Geologic Unit and Map Symbol	Age	Paleontological Sensitivity (Caltrans, 2014)
Artificial fill (not mapped)	Recent	Low
Very young wash deposits (Qw)	Late Holocene	Low
Young axial-channel deposits (Qya)	Holocene to late Pleistocene	Low
Young alluvial fan deposits (Qyf)	Holocene to late Pleistocene	Low
Young alluvial valley deposits (Qyv)	Holocene to late Pleistocene	Low
Young wash deposits (Qyw)	Holocene to late Pleistocene	Low
Old axial channel deposits (Qoa)	Late to middle Pleistocene	High
Old alluvial fan deposits (Qof)	Late to middle Pleistocene	High
Old paralic deposits, undivided (Qop)	Late to middle Pleistocene	High
Very old axial channel deposits (Qvoa)	Middle to early Pleistocene	High
Very old alluvial fan deposits (Qvof)	Middle to early Pleistocene	High
Vaqueros and Sespe Formations, undivided (Tvs)	Early Miocene to Oligocene	High
Sespe Formation (Ts)	Early Miocene to late Eocene	High
Silverado Formation (Tsi)	Paleocene	High
Monzogranite (Kcg)	Cretaceous	None
Granodiorite, undifferentiated (Kgd)	Cretaceous	None

Gavilan Ring Complex, hypabyssal tonalite (Kgh)	Cretaceous	None
Heterogeneous granitic rocks (Khg)	Cretaceous	None
Intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv)	Cretaceous	None
Estelle Mountain volcanics of Herzig (Kvem)	Cretaceous	None
Santiago Peak volcanics (Kvsp)	Cretaceous	None
Phyllite (TRmp)	Triassic	None
Quartz-rich rocks (TRmq)	Triassic	None
Metamorphic rocks of Menifee Valley, undifferentiated (TRmu)	Triassic	None

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9 Conclusions and Recommendations

The results of the analysis of existing data indicate that the Project area is underlain by low sensitivity Holocene- to late Pleistocene-age young axial channel deposits (Qya), young alluvial fan deposits (Qyf), young alluvial valley deposits (Qyv), and young wash deposits (Qyw); high sensitivity late to middle Pleistocene-age old axial channel deposits (Qoa), old alluvial fan deposits (Qof), and old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old axial channel deposits (Qvoa) and old alluvial fan deposits (Qvof); high sensitivity early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs); early Miocene- to late Eocene-age Sespe Formation (Ts); Paleocene-age Silverado Formation (Tsi); no sensitivity Cretaceous-age granodiorite, undifferentiated (Kgd); no sensitivity Cretaceous-age heterogeneous granitic rocks (Khg), intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv), and Santiago Peak volcanics (Kvsp); and no sensitivity Triassic-age phyllite (TRmp) (see Table 3).

No fossils were observed or collected during the field survey, although the results confirmed the presence of high sensitivity units, including late to middle Pleistocene-age old alluvial fan deposits (Qof); late to middle Pleistocene-age old axial channel deposits (Qoa); late to middle Pleistocene-age old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old alluvial fan deposits (Qvof); middle to early Pleistocene-age very old axial channel deposits (Qvoa); and Paleocene-age Silverado Formation (Tsi). Additionally, although high sensitivity early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs) were not observed directly along the survey corridor, these sediments were observed in nearby hill exposures immediately adjacent to the survey area.

The results of this paleontological study indicate that the Project area is underlain, in part, by high paleontologically sensitive geologic units, which are known to contain scientifically significant paleontological resources. Due to the potential for Project construction to impact these units and any resources harbored within, a PMP will be required for this Project and should be prepared by a qualified paleontologist, a curation agreement should be obtained, and paleontological monitoring should be implemented during ground disturbing activities in order to mitigate impacts to paleontological resources, as identified in Measures PAL-1, PAL-2, and PAL-3, below.

PAL-1: **Paleontological Mitigation Plan.** During final design, RCTC will ensure that a Paleontological Mitigation Plan (PMP) is prepared. The PMP will provide the following elements:

- Recommended monitoring locations;
- A description of a worker training program; and
- Detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation and notification procedures in the event of a fossil discovery by a paleontological monitor, or other project personnel.

PAL-2: **Curation Agreement.** Prior to the start of construction, RCTC will ensure that a curation agreement with the Western Science Center (WSC) or another accredited repository will be obtained by the paleontological consultant

PAL-3: **Paleontological Monitoring.** During construction, RCTC will ensure that excavations that disturb geologic units with high paleontological sensitivity, including late to middle Pleistocene-age old axial channel deposits (Qoa); old alluvial fan deposits (Qof); and old paralic deposits, undivided (Qop); middle to early Pleistocene-age very old axial channel deposits (Qvoa) and very old alluvial fan deposits (Qvof); early Miocene- to Oligocene-age Vaqueros and Sespe Formations, undivided (Tvs); early Miocene- to late Eocene-age Sespe Formation (Ts); and Paleocene-age Silverado Formation (Tsi), will be monitored by a professional paleontologist in order to reduce potential adverse impacts on scientifically important paleontological resources to a less than significant level.

Excavations impacting geologic units with low sensitivity, including artificial fill or previously disturbed sediments; late Holocene-age very young wash deposits (Qw); and Holocene- to late Pleistocene-age young axial channel deposits (Qya), young alluvial fan deposits (Qyf), young alluvial valley deposits (Qyv), and young wash deposits (Qyw), will be spot-checked to inspect for the presence of older more paleontologically sensitive geologic units at depth. Spot-checking should be conducted when excavations impact depths at which paleontologically sensitive units are anticipated to be encountered, based on the geotechnical data. Therefore, all excavations in areas mapped as low and high sensitivity should be initially spot checked to inspect for the presence of native sensitive sedimentary deposits. The frequency and timing of subsequent spot checks should be determined by the qualified paleontologist based on the rate of excavation, excavation activity, and initial subsurface observations.

Areas mapped as geologic units with no sensitivity, including Cretaceous-age granodiorite, undifferentiated (Kgd); Cretaceous-age Gavilan Ring Complex, hypabyssal tonalite (Kgh); Cretaceous- age monzogranite (Kcg), heterogeneous granitic rocks (Khg), intermixed Estelle Mountain volcanics and sedimentary rocks (Ksv), Estelle Mountain volcanics of Herzig (Kvem), and Santiago Peak volcanics (Kvsp); and Triassic-age phyllite (TRmp), quartz-rich rocks (TRmq), and metamorphic rocks of Menifee Valley, undifferentiated (TRmu), will not be monitored.

If it is determined, based on monitoring observations, that only geologic units with no or low sensitivity are impacted, or if sediments that are deemed non-conducive to fossil preservation, in a given area, the monitoring program should be immediately reduced or halted in that area. Any subsurface bones or potential fossils that are unearthed during construction will be evaluated by a professional paleontologist as described in the PMP (see Measure PAL-1).

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10 References

Barnes, L.G. 2003a. Discovery of a new species of early Miocene platanistid toothed whale fossil from Irvine, Orange County, California: Report Prepared on Behalf of The Keith Companies, Inc., for Irvine Community Development Company. Irvine, California: The Keith Companies document JN 013767.03.006, 21 p.

Barnes, L.G. 2003b. Discovery of an early Miocene eurhinodelphinid toothed whale fossil from Irvine, Orange County, California: Report prepared on behalf of The Keith Companies, Inc., for Irvine Community Development Company, Irvine, California, Keith Companies Document JN 013767.03.005, 20 p.

Barnes, L.G. 2003c. Final report of Paleontological Mitigation Program, planning area 17, ‘‘Quail Hill,’’ Irvine Community Development Company, Irvine, California: Report prepared on behalf of The Keith Companies, Inc., for Irvine Community Development Company. Irvine, California: The Keith Companies document JN 013767.04.000, 118 p.

Barnes, L.G., S.A. McLeod, M.L. Kearin, and M.A. Deering. 2003. The most primitive known platanistid (Cetacea; Odontoceti), a new Early Miocene species from southern California. Journal of Vertebrate Paleontology, v. 23, Supplement to n. 3, p. 32A.

Bartow, J.A. 1974. Sedimentology of the Simmler and Vaqueros formations in the Caliente Range-Carrizo Plain area, California: U.G. Geological Survey Open-file Report 74-338, 163 p.

Bell, A. 2021. Paleontological resources for the I-15 Express Lanes Project, Ventura County, California project area. Search of paleontological records maintained by the Natural History Museum of Los Angeles County. Dated February 18, 2021.

Belyea, R.R. 1984. Stratigraphy and depositional environments of the Sespe Formation, northern Peninsular Ranges, California. Master’s Thesis, San Diego State University.

Belyea, R.R., and J.A. Minch. 1989. Stratigraphy and depositional environments of the Sespe Formation, northern Santa Ana Mountains, California: in, Colburn, I. P., P. L. Abbott, and J. A. Minch, eds., Conglomerates in basin analysis: a symposium dedicated to A. O. Woodford, Society of Economic Paleontologists and Mineralogists, Pacific Section, Book 62, p. 281–300.

Blake, G.H. 1991. Review of the Neogene Biostratigraphy and Stratigraphy of the Los Angeles Basin and Implications for Basin Evolution: in Biddle, K.T., ed., Active Margin Basins. American Association of Petroleum Geologists, Memoir 52, Chapter 4, p. 135-184.

Blundell, M.C. 1981. Depositional environments of the Vaqueros Formation in the Big Mountain area, Ventura County, California: Master’s Thesis, California State University – Northridge, 102 p.

California Department of Transportation (Caltrans). 2014. Caltrans Standard Environmental Reference, Chapter 8-Paleonotlogy. Available online at: https://dot.ca.gov/programs/environmental-analysis/standard-environmental-reference-ser/volume-1-guidance-for-compliance/ch-8-paleontology

Calvano, G., D.R. Prothero, J. Ludtke, and E.B. Lander. 2008. Magnetic stratigraphy of the Eocene to Miocene Sespe and Vaqueros formations, Los Angeles and Orange counties, California: in, Wang, X., and Barnes, L.G., eds., Geology and Vertebrate Paleontology of Western and Southern North America. Natural History Museum of Los Angeles County Science Series, Number 41, p. 43–61.

Cooper, J.D., and P.J. Eisentraut. 2002. Orange County Archaeo/Paleo Curation Draft Guidelines, Procedures and Policies -Draft Document. Prepared for County of Orange, Board of Supervisors.

County of Riverside. 2015. County of Riverside General Plan. Available online at: https://planning.rctlma.org/General-Plan-Zoning/General-Plan

Deering, M.A., M.L. Kearin, L.G. Barnes, E.M. Heathcoat, S.W. Orlando, C.E. Reeves, and G. Calvano. 2003. Discovery of a new species of rare early Miocene platanistid dolphin (Cetacea, Odontoceti) from the San Joaquin Hills, Orange County, southern California: Abstracts and Programs, The Western Association of Vertebrate Paleontologists Annual Meeting, Mojave River Valley Museum, Barstow, California, February 14–16, 2003, p. 8.

Deering, M.R., M.L. Kearin, S.A. Black, and L.G. Barnes. 2004. An archaic baleen-bearing mysticete whale resembling *Eomysticetus* from the Lower Miocene Vaqueros Formation in southern California: Abstracts and, Western Association of Vertebrate Paleontologists, Annual Meeting, Occidental College, February 14, 2004, p. 2.

Dickerson, R.E. 1914. The Martinez and Tejon Eocene and Associated Formations of the Santa Ana Mountains: University of California, Department of Geological Sciences, Bull., vol. 8, n. 11, pp. 257-274.

Dooley, A.C., Jr., L.G. Barnes, and M.L. Kearin. 2004a. A very primitive new taxon of squalodontid (''shark-toothed'') whale from the Lower Miocene Vaqueros Formation in Southern California: Abstracts, Western Association of Vertebrate Paleontologists, Annual Meeting, Occidental College, February 14, 2004, p. 3.

Dooley, A.C., Jr., L.G. Barnes, and M.L. Kearin. 2004b. A new taxon of squalodontid (Mammalia, Cetacea from the Lower Miocene Vaqueros Formation in Southern California. Journal of Vertebrate Paleontology, v. 24, Supplement to n. 3, p. 53A.

Fritsche, A.E., and R.J. Behl, eds. 2008. Geology of Orange County, California, and the Irvine Ranch National Landmark: Pacific Section SEPM, Book 106, 184 p.

Gray, C.H. 1961. Geology of the Corona South Quadrangle and the Santa Narrows Area, Riverside, Orange, and San Bernardino Counties, California and Mines and Mineral Deposits of the Corona South Quadrangle, Riverside and Orange Counties, California. California Division of Mines, San Francisco, Bull. 178, p. 52.

Gray, C.H., D.M. Morton, F.H. Weber, K.R. Bovard, and T. O'Brien. 2002. Geologic map of the Corona South 7.5-minute quadrangle, Riverside and Orange Counties, California. USGS Open-File Report OF-2002-21, Scale (1:24,000).

Hall, C.A. 2007. Introduction to the Geology of Southern California and its Native Plants. University of California Press. Berkeley. Pp. 101-149.

Hamlin, H. 1904. Water resources of the Salinas Valley, California: U.S. Geological Survey Water-Supply Paper 89, p. 1–91.

Harden, D.R. 2004. California Geology, 2nd Edition: Pearson Prentice Hall. Upper Saddle River. Pp. 464-479.

Howard, J.L. 1995. Conglomerates of the upper middle Eocene to lower Miocene Sespe Formation along the Santa Ynez fault – implications for the geologic history of the eastern Santa Maria basin area, California: U.S. Geological Survey Bulletin 1995-H, p. H1–H37.

Jahns, R.H., ed, 1954a, Geology of Southern California. State of California, Department of Natural Resources, Bulletin 170, Volume 1.

Jahns, R.H. 1954b. Geology of the Peninsular Range Province, southern California and Baja California, in Johns, R.H., (ed.), *Geology of southern California*: California Division of Mines Bulletin 170, Ch. 2, pp. 29-52.

Jefferson, G.T. 1991. A Catalogue of late Quaternary Vertebrates from California, Part two, Mammals: Natural History Museum of Los Angeles, Technical Report, v.7, 129 pp.

Kearin, M.L., and L.G. Barnes. 2001. The first known fossil squalodontid toothed whale (Mammalia; Odontoceti) from Irvine, Orange County, California: Report for Irvine Community Development Corporation, Irvine, California. Costa Mesa, California: The Keith Companies, Inc., 14 p.

Kelly, T.S., E.B. Lander, D.P. Whistler, M.A. Roeder, and R.E. Reynolds. 1991. Preliminary report on a paleontologic investigation of the lower and middle members, Sespe Formation, Simi Valley Landfill, Ventura County, California: PaleoBios, v. 13, p. 1–13.

Kew, W.S.W. 1924. Geology and oil resources of a part of Los Angeles and Ventura Counties, California: U.S. Geological Survey Bulletin 753, 202 p.

Lagoe, M.B. 1988. An outline of foraminiferal biofacies in the Soda Lake Shale Member, Vaqueros Formation, Cuyama Basin, California: in, Bazeley, W.J.M., ed., Tertiary Tectonics and Sedimentation in the Cuyama Basin, San Luis Obispo, Santa Barbara, and Ventura Counties, California, Pacific Section SEPM, v. 59, p. 21–27.

Leighton Consulting, Inc. (Leighton Consulting). 2020. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Gavilan Wash Bridge (Widen) Caltrans Bridge No. 56-0726 R/L (PM 25.55). Prepared for Caltrans in coordination with RCTC. Dated December 2020.

Leighton Consulting, Inc. (Leighton Consulting). 2021a. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Lake Street UC (Widen) Caltrans Bridge No. 56-0682 R/L (PM 26.69). Prepared for Caltrans in coordination with RCTC. Dated January 2021.

Leighton Consulting, Inc. (Leighton Consulting). 2021b. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Temescal Canyon Road OH (Widen) Caltrans Bridge No. 56-0681 R/L (PM 27.78). Prepared for Caltrans in coordination with RCTC. Dated January 2021.

Leighton Consulting, Inc. (Leighton Consulting). 2021c. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Temescal Wash Bridge (Widen)

Caltrans Bridge No. 56-0680 R/L (PM 28.04). Prepared for Caltrans in coordination with RCTC. Dated January 2021.

Leighton Consulting, Inc. (Leighton Consulting). 2021d. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Horsethief Canyon Road UC (Widen) Caltrans Bridge No. 56-0679 R/L (PM 28.87). Prepared for Caltrans in coordination with RCTC. Dated January 2021.

Leighton Consulting, Inc. (Leighton Consulting). 2021e. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Horsethief Canyon Wash Bridge (Widen) Caltrans Bridge No. 56-0678 R/L (PM 29.13). Prepared for Caltrans in coordination with RCTC. Dated March 2021.

Leighton Consulting, Inc. (Leighton Consulting). 2021f. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Indian Wash Bridge (Widen) Caltrans Bridge No. 56-0677 R/L (PM 30.09). Prepared for Caltrans in coordination with RCTC. Dated March 2021.

Leighton Consulting, Inc. (Leighton Consulting). 2021g. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Indian Wash Bridge (Widen) Caltrans Bridge No. 56-0677 R/L (PM 30.4). Prepared for Caltrans in coordination with RCTC. Dated April 2021.

Leighton Consulting, Inc. (Leighton Consulting). 2021h. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Mayhew Wash Bridge (Widen) Caltrans Bridge No. 56-0674 R/L (PM 31.97). Prepared for Caltrans in coordination with RCTC. Dated April 2021.

Leighton Consulting, Inc. (Leighton Consulting). 2021i. Interstate 15 Express Lanes Project Southern Extension (ELPSE): Structure Preliminary Geotechnical Report Temescal Canyon Road UC (Widen) Caltrans Bridge No. 56-0675 R/L (PM 31.9). Prepared for Caltrans in coordination with RCTC. Dated April 2021.

Miller., R.V., and S.S. Tan. 1976. Geology and engineering geologic aspects of the South Half Tustin Quadrangle, Orange County, California: California Division of Mines and Geology, Special Report 126, p. 13–28.

Minch, J. A., J.L. Howard, and R.R. Belyea. 1989, Sespe Formation conglomerates in the northern Santa Ana and Santa Monica Mountains, California: in, Colburn, I. P., Abbott, P.L., and Minch, J.A., eds., Conglomerates in basin analysis: a symposium dedicated to A. O. Woodford, Society of Economic Paleontologists and Mineralogists, Pacific Section, Book 62, p. 301–312.

Morton, D.M., and F.K. Miller. 2006. Geologic map of the San Bernardino and Santa Ana 30’ x 60’ quadrangles, California. USGS Open File Report OF-2006-1217, Scale (1:100,000).

Morton, D.M., F.H. Weber, V.M. Diep, and U. Edwards-Howells. 2002. Geologic map of the Lake Mathews 7.5-minute quadrangle, Riverside County, California. USGS Open-File Report OF-2001-479, Scale (1:24,000).

Morton, D.M. and F.H. Weber. 2003. Preliminary geologic map of the Elsinore 7.5-minute quadrangle, Riverside County, California. USGS Open-File Report 03-281, Scale (1:24,000).

Murphey, P.C. and D. Daitch. 2007. Paleontological overview of oil shale and tar sands areas in Colorado, Utah and Wyoming: U.S. Department of Energy, Argonne National Laboratory Report Prepared for the U.S. Department of Interior Bureau of Land Management, 468 p. and 6 maps (scale 1:500,000).

Norris, R.M. and R.W. Webb. 1990. Geology of California, 2nd ed. Xiii + 541 pp. + color map.

Paleo Biology Database (PBDB). 2021. Online records search of the PaleoBiology Database, performed February 2021.

Prothero, D.R. 2017. California's Amazing Geology: CRC Press. Boca Raton. Pp. 232-257.

Prothero, D.R., and L.L. Donohoo. 2001. Magnetic stratigraphy of the lower Miocene (early Hemingfordian) Sespe-Vaqueros formations, Orange County, California: in, Prothero, D.R., ed., Magnetic Stratigraphy of the Pacific Coast Cenozoic, Pacific Section SEPM, Book 91, p. 242–253.

Radford, D. 2021. Paleontological resources for the I-15 Express Lanes Project, Ventura County, California project area. Search of paleontological records maintained by the Western Science Center in Hemet, California. Dated February 22, 2021.

Raschke, R.E. 1984. Early and Middle Miocene vertebrates from the Santa Ana Mountains, California: in, Butler, B., Grant, J., and Stadum, C.J., eds., The Natural Sciences of Orange County, Memoirs of the Natural History Foundation of Orange County, Volume 1, Huntington Beach, California, p. 61–67.

Rathbun, M.J. 1908. Descriptions of fossil crabs from California: Proceedings of the U.S. National Museum, v. 35, p. 341–349.

Reynolds, R.E., and Reynolds, R.L. 1990a. A new late Blancan faunal assemblage from Murrieta, Riverside County, California: San Bernardino County Museum Association Quarterly, v. XXXVII, p. 34.

Reynolds, R.E., and Reynolds, R.L. 1990b. Irvingtonian? Faunas from the Pauba Formation, Temecula, Riverside County, California: San Bernardino County Museum Association Quarterly, v. XXXVII, p. 37.

Rivin, M.A. 2010. Early Miocene cetacean diversity in the Vaqueros Formation, Laguna Canyon, Orange County, California: Master's Thesis, California State University – Fullerton.

Society of Vertebrate Paleontologists (SVP). 2010. Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources. 11 p.

Springer, K., E. Scott, C. Sagebiel, and L.K. Murray. 2009. The Diamond Valley Lake local fauna: Late Pleistocene vertebrates from inland southern California. *in* Papers on geology, vertebrate paleontology, and biostratigraphy in honor of Michael O. Woodburne (L.G. Albright, III, ed.). Museum of Northern Arizona Bulletin 65, Flagstaff, Arizona. pp. 217-235.

Sylvester, A.G., and E. O'Black Gans. 2016. Roadside Geology of Southern California. Mountain Press Publishing Company. Missoula. Pp. 153-199.

Uhen, M.D. 2014. The Palebiology Database. Online database FAQs by John Alroy, after the original PMPD FAQ by John Alroy on 22 August 2000. Revised on an ongoing basis. Available at: http://paleobiodb.org/#/

U.S. Geological Survey (USGS) Geologic Names Committee. 2007. Divisions of geologic time—Major chronostratigraphic and geochronologic units: U.S. Geological Survey Fact Sheet 2007-3015, 2 p.

University of California Museum of Paleontology (UCMP). 2021. Online records search of the University of California Museum of Paleontology Database, performed February 2021.

Wang, X., and R.H. Tedford. 2008. Fossil dogs (Carnivora, Canidae) from the Sespe and Vaqueros formations in Southern California, with comments on relationships of *Phlaocyon taylori*: Natural History Museum of Los Angeles County, Science Series, n. 41, p. 255–272.

Watts, W.L. 1897. Oil and gas yielding formations of Los Angeles, Ventura, and Santa Barbara counties: California State Mining Bureau Bulletin, v. 11, p. 1–94.

Whistler, D.P., and E.B. Lander. 2003. New late Uintan to early Hemingfordian land mammal assemblages from the undifferentiated Sespe and Vaqueros formations, Orange County, and from the Sespe and equivalent marine formations in Los Angeles, Santa Barbara, and Ventura counties, southern California: Bulletin of the American Museum of Natural History, n. 279, p. 231–268.

Woodford, A.O., J.S. Shelton, D.O. Doehring, and R.K. Morton. 1971. Pliocene-Pleistocene History of the Perris Block, Southern California. GSA Bulletin, v. 82, pp. 3421-3448.

Woodring, W.P., and W.P. Popenoe. 1945. Paleocene and Eocene Stratigraphy of Northwestern Santa Ana Mountains, Orange County, California: USGS Oil and Gas Investigations Preliminary Chart OC 12.

Yerkes, R.F., T.H. McCulloh, J.E. Schoellhamer, and J.G. Vedder. 1965. Geology of the Los Angeles Basin, California: An Introduction: Professional Paper.

Appendix A

Museum Paleontological Records Search Results

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

Research & Collections

e-mail: paleorecords@nhm.org

February 18, 2021

Paleo Solutions, Inc.

Attn: Robert Fritz

re: Paleontological resources for the I-15 Express Lanes Project -- Southern Extension

Dear Robert:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for proposed development at the I-15 Express Lanes project area as outlined on the portion of the Corona South, Lake Matthews, Alberhill, and Lake Elsinore USGS topographic quadrangles map that you sent to me via e-mail on February 16, 2021. We do not have any fossil localities that lie directly within the proposed project area, but we do have fossil localities nearby from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

The following table shows the closest known localities in the collection of the Natural History Museum of Los Angeles County.

Locality Number	Location	Formation	Taxa	Depth
LACM VP 1207	Hill on east side of sewage disposal plant; 1 mile N-NW of Corona	Unknown formation (Pleistocene)	Bovidae	Unknown
LACM IP 17607	Eagle Glen Project, along northerly facing cut of southern wall of Bedford Canyon	Silverado Formation	Invertebrates	Unknown
LACM VP 6059	Overflow area just east-southeast of Lake Elsinore	Unknown formation (Pleistocene)	Camel (Camelidae)	Unknown
LACM VP 7261	Skinner Reservoir, Auld Valley	Unknown formation (Pleistocene, arenaceous silt)	Elephant family (Proboscidea); ungulate (Ungulata)	Unknown
LACM VP 7811	W of Orchard Park, Chino Valley	Unknown formation (eolian, tan silt; Pleistocene)	Whip snake (*Masticophis*)	9-11 feet bgs

LACM VP 1728	W of intersection of English Rd & Peyton Dr, Chino	Unknown (light brown shale with interbeds of very coarse brown sand; Pleistocene)	Horse (*Equus*), camel (*Camelops*)	15-20 ft bgs

VP, Vertebrate Paleontology; IP, Invertebrate Paleontology; bgs, below ground surface

This records search covers only the records of the Natural History Museum of Los Angeles County ("NHMLA"). It is not intended as a paleontological assessment of the project area for the purposes of CEQA or NEPA. Potentially fossil-bearing units are present in the project area, either at the surface or in the subsurface. As such, NHMLA recommends that a full paleontological assessment of the project area be conducted by a paleontologist meeting Bureau of Land Management or Society of Vertebrate Paleontology standards.

Sincerely,

Alyssa Bell

Alyssa Bell, Ph.D.
Natural History Museum of Los Angeles County

enclosure: invoice

WESTERN SCIENCE CENTER

Paleo Solutions, Inc.
Robert W.J. Fritz
911 S. Primrose Ave., Unit N
Monrovia, CA 91016

February 22, 2021

Dear Mr. Fritz,

This letter presents the results of a record search conducted for the I-15 Express Lanes Project – Southern Extension (I-15 ELPSE) in Riverside County, California. The project site is located along both sides of Interstate 15 between the Magnolia Avenue south to roughly 1.1 miles north of the Railroad Canyon Road exit in Lake Elsinore. The project area spans Sections 5 of Township 6 South and Range 4 West, Section 30 and 31 of Township 5 South and Range 4 West, Section 23-25 of Township 5 South and Range 5 West on the Lake Elsinore, CA USGS 7.5 minute topographic quadrangle, Section 7, 8, and 14-17 of Township 5 South and Range 5 West on the Alberhill, CA USGS 7.5 minute topographic quadrangle, Section 1, 2, and 12 of Township 5 South and Range 6 West, and Section 27, 34 and 35 of Township 4 South and Range 6 West on the Lake Mathews, CA USGS 7.5 minute topographic quadrangle, and Section 5, 8, 9, 16, 17, 21, 22, and 27 of Township 4 South and Range 6 West, and an un-sectioned portion of Township 3 South and Range 6 West on the Corona South, CA USGS 7.5 minute topographic map.

The geologic unit underlying the project area is mapped almost entirely as alluvial sand and gravel deposits dating to the Pleistocene epoch (Morton and Miller, 2006). Pleistocene alluvial units are considered to be of high paleontological sensitivity. The Western Science Center does not have localities within the project area, but does have numerous localities within similarly mapped alluvial sediments throughout the region. Pleistocene alluvial deposits in southern California are well documented and known to contain abundant fossil resources including those associated with Columbian mammoth (*Mammuthus columbi*), Pacific mastodon (*Mammut pacificus*), Sabertooth cat (*Smilodon fatalis*), Ancient horse (*Equus sp*.) and many other Pleistocene megafauna.

Any fossils recovered from the I-15 Express Lanes Project – Southern Extension (I-15 ELPSE) area would be scientifically significant. Excavation activity associated with development of the area has the potential to impact the paleontologically sensitive Pleistocene and Paleocene alluvial units and it is the recommendation of the Western Science Center that a paleontological resource mitigation plan be put in place to monitor, salvage, and curate any recovered fossils associated with the current study area. If you have any questions, or would like further information, please feel free to contact me at dradford@westerncentermuseum.org

Sincerely,

Darla Radford,
Collections Manager

2345 Searl Parkway ♦ Hemet, CA 92543 ♦ phone 951.791.0033 ♦ fax 951.791.0032 ♦ WesternScienceCenter.org

Appendix B

Qualifications