State of California Business Transportation and Housing Agency

Memorandum

To : Yvonne Hoffmann
Environmental Planning

Date : July 2, 2014

File No. : SB-101- 2.0/12.3
South Coast HOV Lanes
E.A. 05-0N700
Project # 0500000225

From : Isaac Leyva
Central Coast Technical Studies Branch
Environmental Engineering Section

Subject : Addendum to Paleontological Evaluation Report - Sound Walls

Since preparation of the original Paleontological Evaluation Report (August 13, 2011) and the Addendum to the PER (March 27, 2012), additional revisions were made regarding recommended sound walls. These revisions were the result of further analysis after the public comment period on the draft environmental document. Mapping was updated, which required revisions to the Mapping depicting potential impacts to sensitive paleontological resources. The maps are now consistent with the sound wall mapping and the project mapping. In addition, a key was introduced that provides a description for each geologic formation shown on the mapping.

The following diagram is based on a comparison with the remaining sound walls and sound walls that have been dropped from the design. The sound walls will either have 'potential effects' or 'no potential effects'.

Sheet #	Sound Wall #	2011 PER	2014 Design Changes
14	S374 (Not recommended)	PE	NPE
15	S414 (Not recommended)	PE	NPE
15	S392 (Not recommended)	PE	NPE
16	S424	PE	PE
16	S414 (Not recommended)	PE	NPE
17	S464	PE	PE
17	S452 (Not recommended)	PE	NPE
21	S549	PE	NPE

PE= *Potential Effects*
NPE = *No Potential Effects*

As noted, all remaining sound walls have the potential to impact paleontological resources. The case also remains that other ground disturbances including excavations for retaining walls, storm water basins, bridges, and embankment cuts will continue to pose potential effects to paleontological resources.

Additionally, Proposed Paleontological mitigation for the project during construction was modified as follows:

- Prior to submittal of design plans for the Coastal Development Permit process, a qualified principal paleontologist (holds an M.S. or Ph.D. in paleontology or geology, and is familiar with paleontological procedures and techniques) must be retained to review the plans. The principal paleontologist or an assigned project paleontologist would review the construction plans with proposed excavation sites and the prepared Paleontological Evaluation Report to determine which, if any, project component would involve earth-moving activities at depths sufficient to warrant monitoring and the corresponding development of a Paleontological Monitoring Plan. If monitoring is deemed necessary, the principal paleontologist would review the construction schedule to develop a monitoring schedule and compile accompanying costs. This information would be used to prepare a site-specific Paleontological Monitoring Plan, if one is determined necessary for reducing adverse environmental impacts on paleontological resources to an insignificant level. Prior to Coastal Development Permit application
- A nonstandard special provision for paleontology mitigation must be included in the construction contract special provisions if monitoring has been determined to be necessary based upon the final project design. The provision would advise the construction contractor of the requirement to cooperate with the paleontological salvage.

If you have any questions or comments please contact Isaac Leyva at (805) 549-3487.

Attachments have been updated as of July 2014

Paleontological Sensitive Areas

Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.

Qmt — **Marine-terrace deposits (upper Pleistocene)**—Basal (~1 m) weakly to moderately consolidated, variably stratified, fossiliferous gravel, sand, and silt deposited as marine intertidal, beach, and estuarine deposits and overlying nonmarine eolian, alluvial, and colluvial deposits. Marine-terrace deposits rest on elevated marine wave-cut platforms and form single terraces or flights of terraces ranging in elevation from 10 to 90 m (30–300 ft) and in age from 45 ka (oxygen-isotope substage 3a) to 105 ka (substage 5c). Maximum exposed thickness about 20 m

Qca — **Casitas Formation (upper and middle Pleistocene)**—Nonmarine, moderately to well-consolidated siltstone and silt, sandstone and sand, and conglomerate and gravel deposited mainly as alluvium likely shed off of the Santa Ynez Mountains uplift. Conglomerate and gravel contain a greater percentage of Sespe Formation-derived clasts than the closely allied older alluvial deposits (Qoa). Maximum exposed thickness of 50 m in map area

South Coast HOV Project

USGS Geologic Mapping

Qa	Qia	Tmm
Qac	Qia?	Tmu
Qb	Qls	Tr
Qbx	Qmt	Tspl
Qca	Qoa	Tspm
Qca?	Qsb?	Tspu
Qdf	Tcw	Tv
Qe	Tml	af

Proposed Alternative 1

- pavement edges
- bridges
- retaining walls
- cut/fill
- soundwalls
- stormwater basins
- Potential limits of ground disturbance within Qmt and Qca

Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California. Scientific Investigations Map 3001. http://pubs.usgs.gov/sim/3001/

Tr

Qoa

Lambert Rd

Via Real

Qmt

R7.3

R7.2

af

R7.1

R7

af

Via Real

R6.9

Qsb?

Padaro Ln

af

Qmt

Qoa

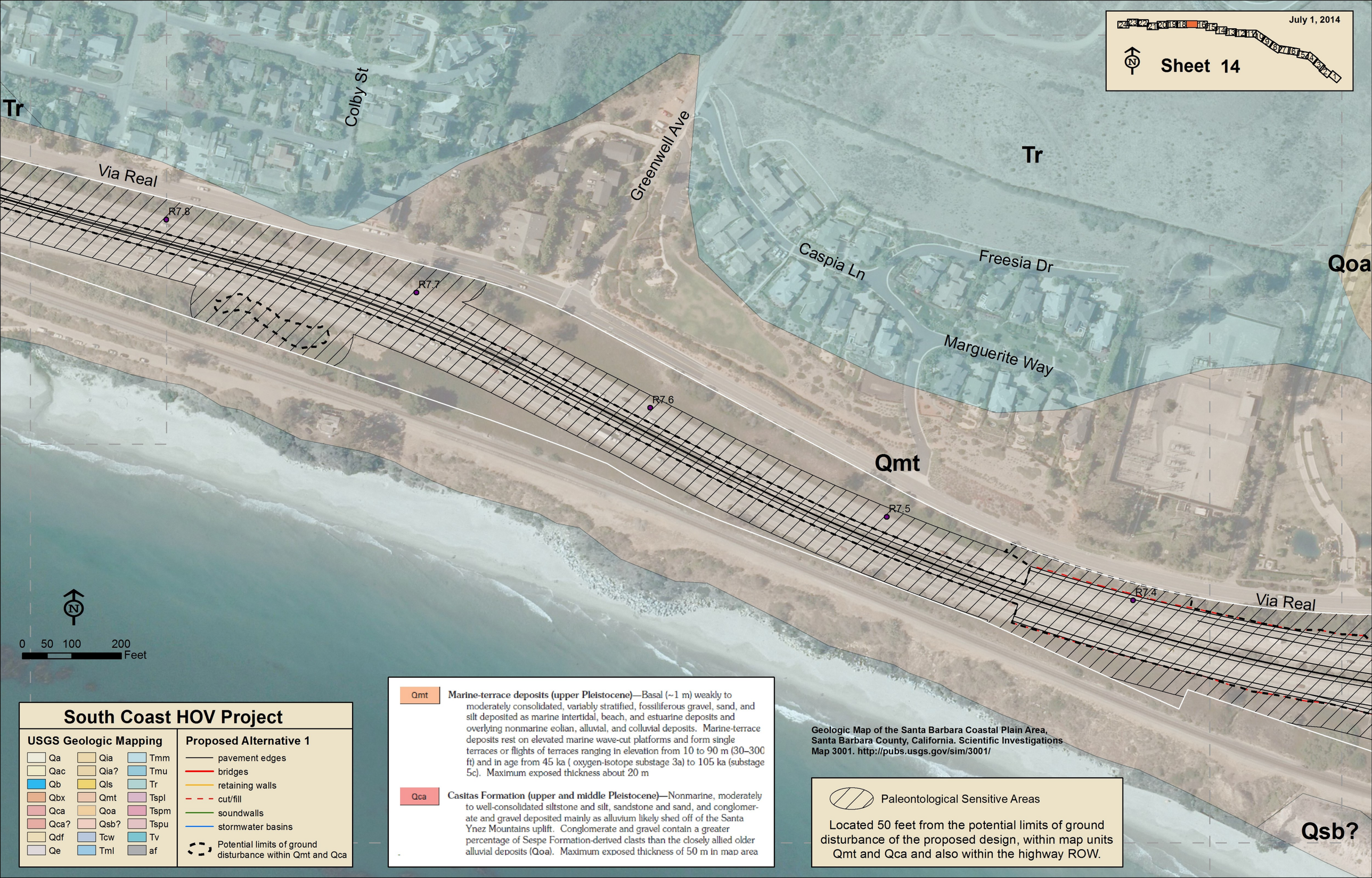
Qca

Qoa

July 1, 2014

Sheet 13

0 50 100 200 Feet



South Coast HOV Project

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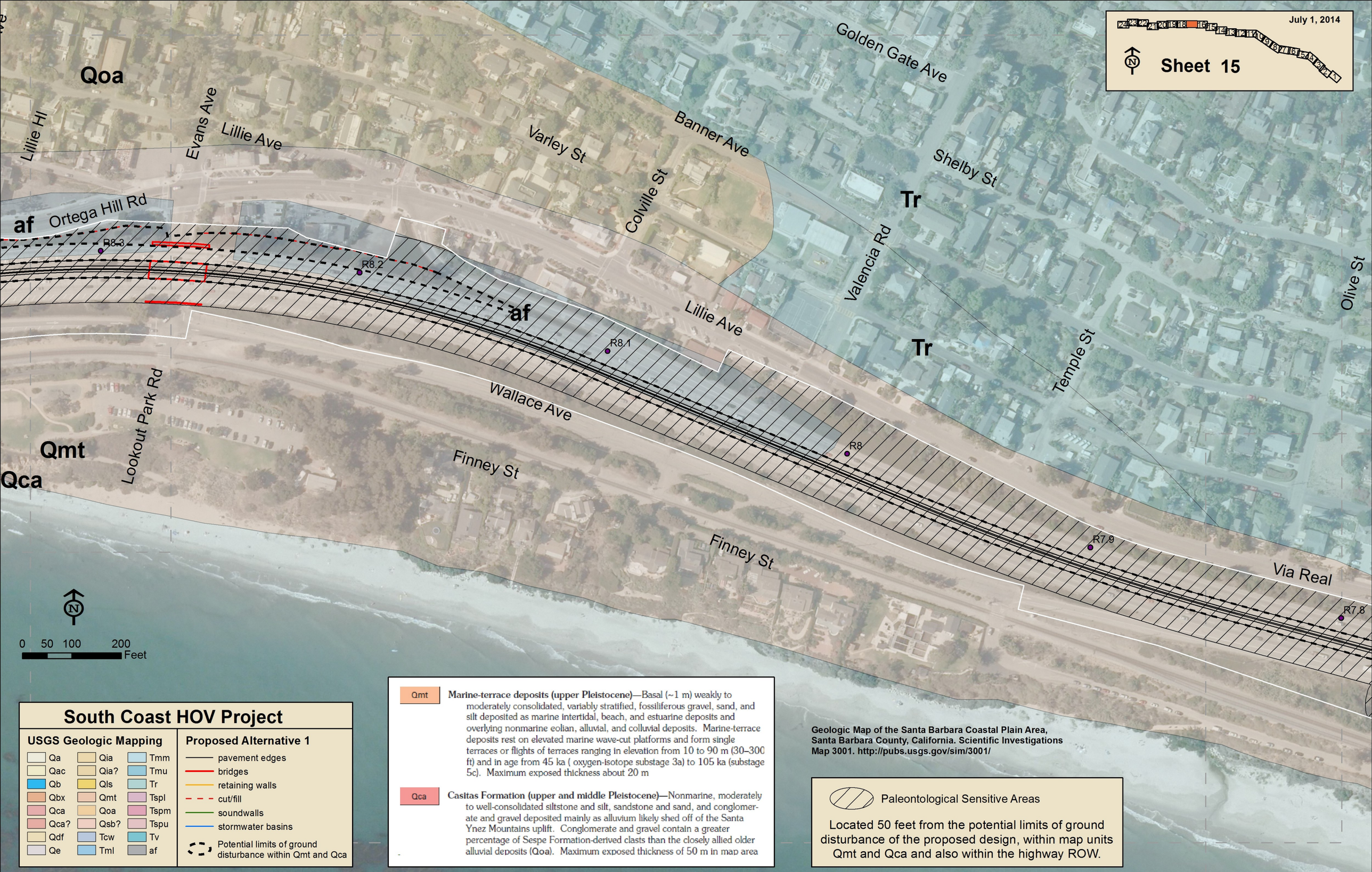

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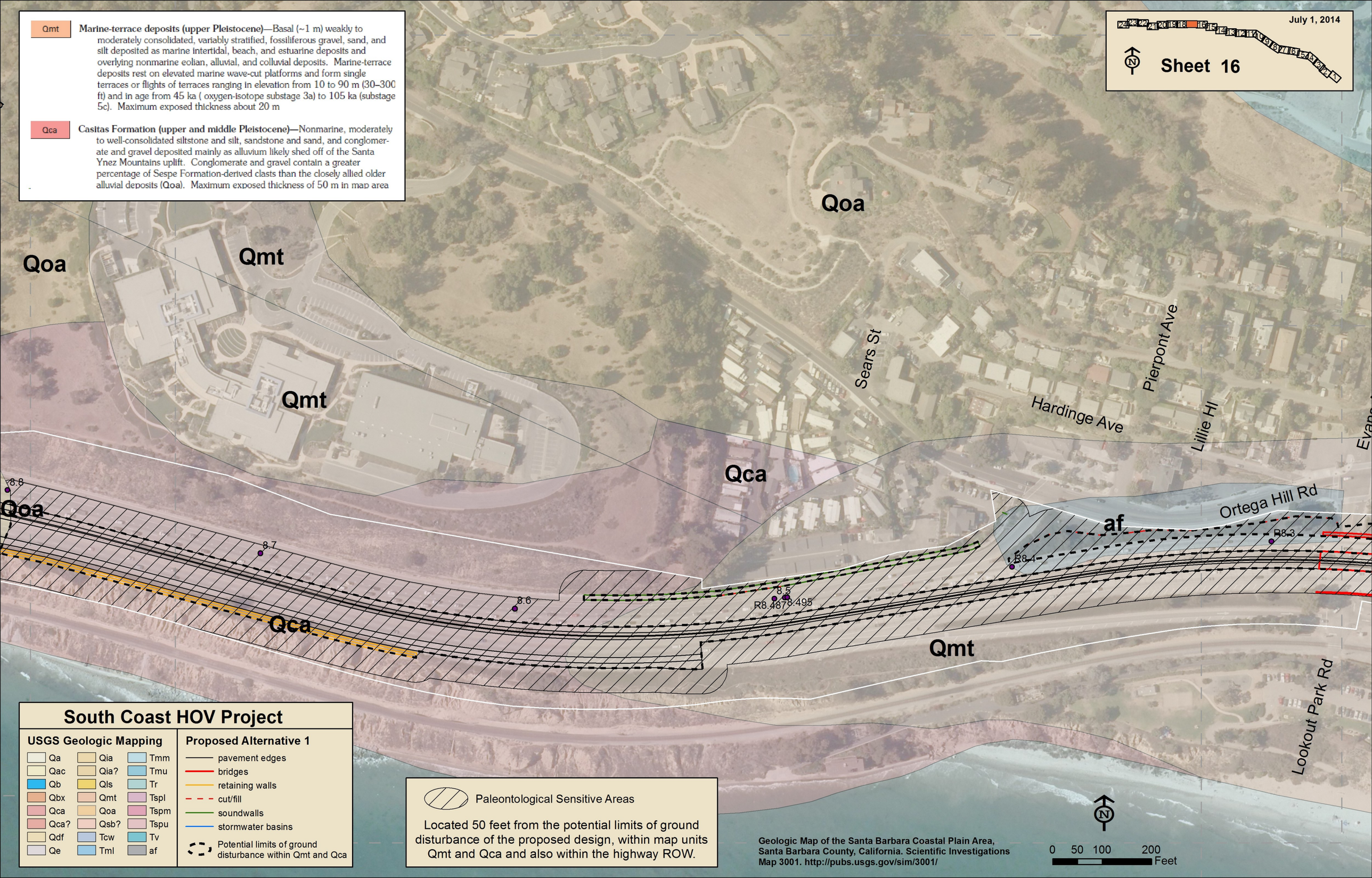
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July 1, 2014
Sheet 16
Qoa
Qmt
Qoa
Qmt
Qca
Qoa
Qca
Qca
Qmt
af
Sears St
Hardinge Ave
Pierpont Ave
Lillie Hl
Ortega Hill Rd
Lookout Park Rd
8.8
8.7
8.6
8.5
R8.487
8.495
R8.4
R8.3
South Coast HOV Project
USGS Geologic Mapping
Qa
Qac
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Proposed Alternative 1
pavement edges
bridges
retaining walls
cut/fill
soundwalls
stormwater basins
Potential limits of ground disturbance within Qmt and Qca
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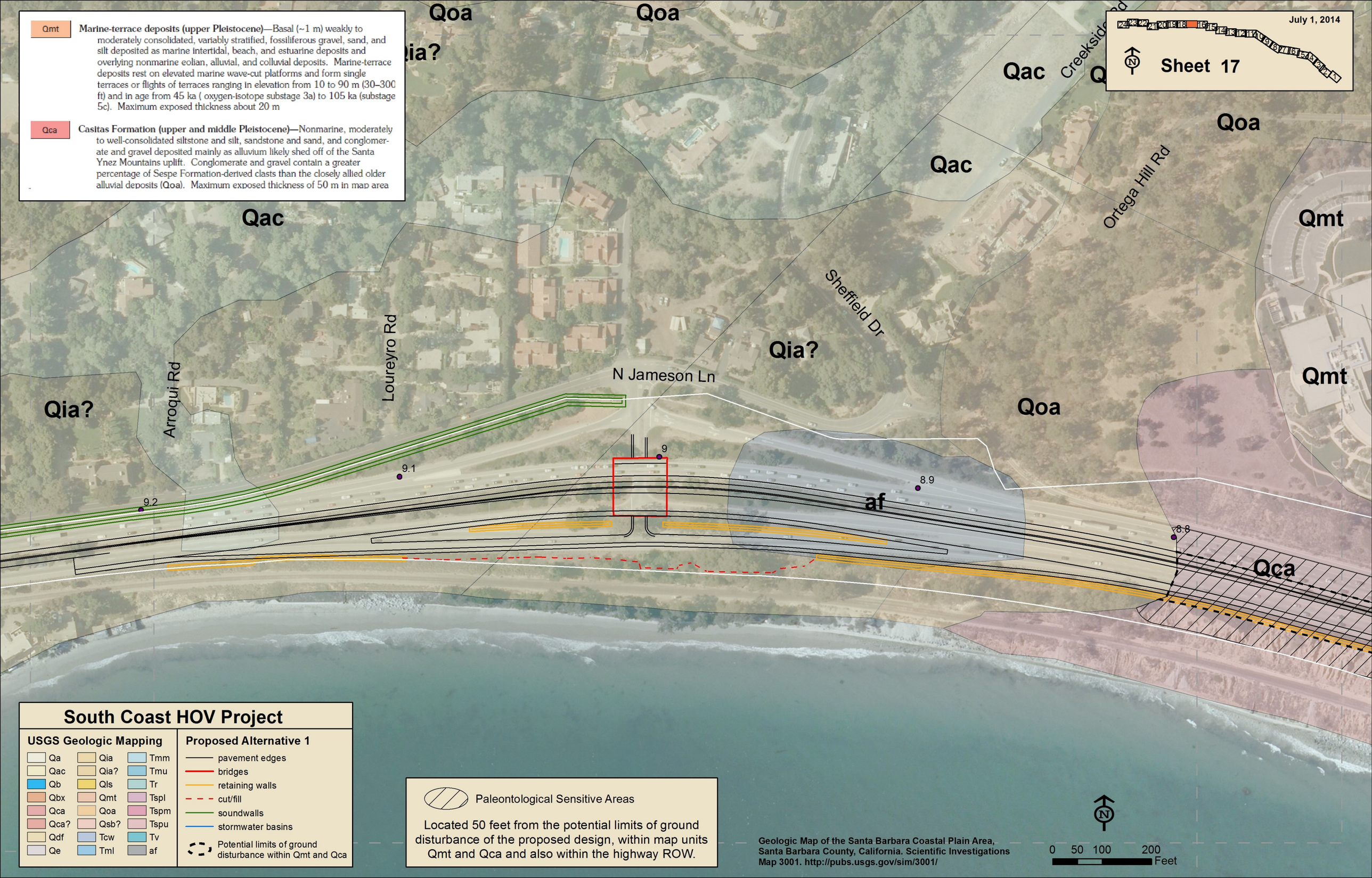
Feet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July 1, 2014
Sheet 17
Qoa
Qoa
Qia?
Qac
Creekside Rd
Qac
Qoa
Ortega Hill Rd
Qmt
Qac
Sheffield Dr
Qia?
Qmt
Qia?
Arroqui Rd
Loureyro Rd
N Jameson Ln
Qoa
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Qca
South Coast HOV Project
USGS Geologic Mapping
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0 50 100 200
Feet

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Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.

July 1, 2014

Sheet 21

Hermosillo Rd

Butterfly Ln

Qoa

Coast Village Hwy

Coast Village Cir

Qmt

Butterfly Ln

Qac

Depot Rd

Hill Rd

Qoa

11.7

11

10.9

10.8

10.7

10.6

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South Coast HOV Project

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Qb	Qls	Tr
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Qca	Qoa	Tspm
Qca?	Qsb?	Tspu
Qdf	Tcw	Tv
Qe	Tml	af

Proposed Alternative 1 and Cabrillo Interchange Configuration 'F Mod'

- pavement edges
- bridges
- retaining walls
- cut/fill
- soundwalls
- stormwater basins
- Potential limits of ground disturbance within Qmt and Qca

0 50 100 200 Feet

Qmt **Marine-terrace deposits (upper Pleistocene)**—Basal (~1 m) weakly to moderately consolidated, variably stratified, fossiliferous gravel, sand, and silt deposited as marine intertidal, beach, and estuarine deposits and overlying nonmarine eolian, alluvial, and colluvial deposits. Marine-terrace deposits rest on elevated marine wave-cut platforms and form single terraces or flights of terraces ranging in elevation from 10 to 90 m (30–300 ft) and in age from 45 ka (oxygen-isotope substage 3a) to 105 ka (substage 5c). Maximum exposed thickness about 20 m

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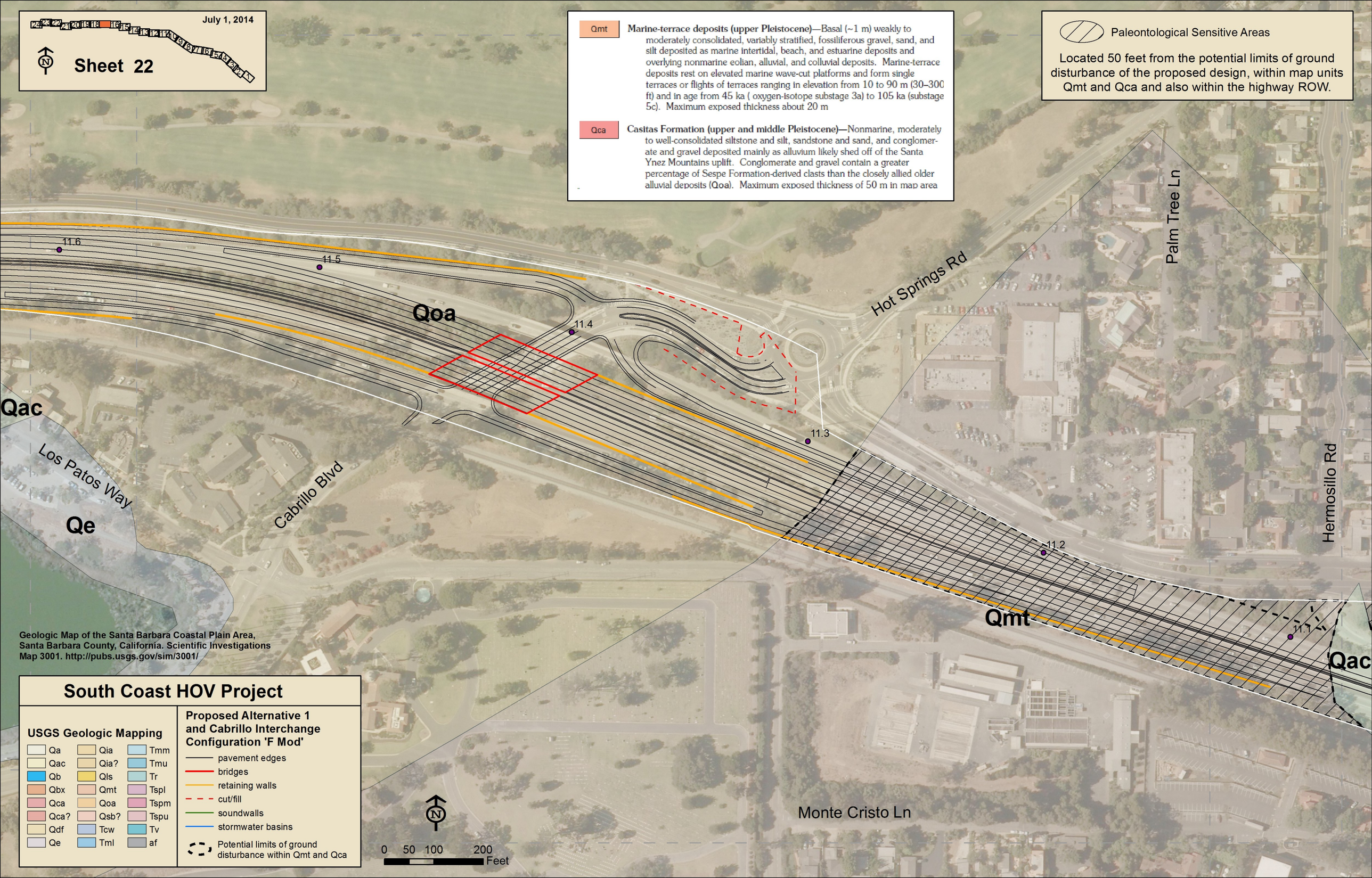
July 1, 2014
Sheet 22
Qmt
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Hot Springs Rd
Palm Tree Ln
Hermosillo Rd
Los Patos Way
Cabrillo Blvd
Monte Cristo Ln
Qoa
Qac
Qe
Qmt
11.6
11.5
11.4
11.3
11.2
11.1
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pavement edges
bridges
retaining walls
cut/fill
soundwalls
stormwater basins
Potential limits of ground disturbance within Qmt and Qca
0 50 100 200 Feet

State of California

Business, Transportation and Housing Agency

Memorandum

To: Marcia Vierra
District 5 Project Design

Date: March 27, 2012

File No.: 05–SB-101-PM 1.4-12.3
South Coast HOV Project
05-0N7000
Project# 05000000225

From: Isaac Leyva
DEPARTMENT OF TRANSPORTATION/District 5
Office of Environmental Management
Environmental Engineering

Subject: **SUPPLEMENTAL PALEONTOLOGY EVALUATION REPORT - Memo**

Environmental Engineering has reviewed the proposed changes to the project and included this memo as an addendum to cover the proposed changes. They include the following:

1.) The removal of the Salinas Ramp and related modifications from the HOV project.
2.) Incorporation of two modified configurations for the Hot Springs/Cabrillo interchange (F Modified and M Modified)
3.) Elimination of four additional sound wall segments.

Of the above proposed changes, only the elimination of the selected sound walls will result in changes to the original Paleontology Evaluation Report previously prepared for the project. In general, the elimination of walls will result in less ground disturbance, therefore reducing potential impacts to paleontological resources.

Based on the proposed changes, the following project sites where sensitive fossil resources may occur are now no longer at risk for impacts due to the elimination of the sound walls:

1.) Sound walls north bound between post miles 7.4- 7.8.

2.) Sound walls north bound between post miles 7.7- 7.05.

3.) Sound walls north bound between post miles 7.5- 8.40.

Additionally, the project description has been updated and these changes have been incorporated into the original final draft PER . The new updated project description is as follows:

Purpose
The purpose of the project is the following:

- Reduce congestion and delay
- Provide capacity for future travel demand
- Improve travel time on U.S. 101 within the project limits
- Provide for high-occupancy-vehicle-lane continuity on U.S. 101 in southern Santa Barbara County, as planned for in the 2008 Regional Transportation Plan
- Encourage a modal shift to transit and carpooling

To achieve the project goals in 2040, on typical weekdays1 this project should do the following:

- Reduce corridor delay by at least 7,000 person-hours daily2
- Reduce peak hour peak direction travel time on U.S. 101 in the project area for carpoolers and express bus riders by 25 percent or more on average

Need

U.S. 101 is the main highway through the South Coast region of Santa Barbara County and serves as the primary connection for vehicle travel between the communities of Goleta, Santa Barbara, Montecito, Summerland, and Carpinteria. The highway, as part of the national highway system, is a major interregional road connecting Northern and Southern California. U.S. 101 also plays a large role in the state economy by serving as a secondary route to Interstate 5. Local highway travelers rely on U.S. 101 for travel related to school, personal use, business, and leisure. Employment is concentrated at the northern end of the corridor in and near the cities of Santa Barbara and Goleta. The University of California Santa Barbara campus, near Goleta, also attracts a large number of vehicles during the peak commute periods.

While the majority of the U.S. 101 corridor through Santa Barbara and Ventura counties is a six-lane freeway, about 16 miles between Mussel Shoals and Milpas Street is a four-lane freeway. U.S. 101 is the main route for commuters, interregional traffic, and cargo throughout the South Coast area. The project limits consist of a high-demand stretch of U.S. 101 that is a four-lane section bounded by a six-lane highway to the north and the proposed Ventura/Santa Barbara 101 HOV project that would add an HOV lane in each direction from Ventura County to the southern boundary of the project limits. That project is expected to begin construction late 2012 or early 2013.

Motorists on U.S. 101 through the project limits experience traffic congestion during the morning and afternoon peak travel periods. Currently, peak travel periods occur for two to four hours daily in each direction. By 2040, peak travel periods are expected to increase to eleven

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[1] Performance measures were derived from 101 In Motion.

2 Delay is a measure of time "lost" per person due to travel in congested conditions. Delay occurs on U.S. 101 when vehicles travel at speeds below 55 miles per hour. Total person hours of delay are calculated by multiplying the amount of time lost per person per day during peak hours by the number of vehicles traveling during the congested peak periods.

hours each day. For through-travelers from Ventura to Northern Santa and beyond this area would become a bottleneck without the project.

Updated Project Description

Caltrans proposes to widen U.S. 101 to three lanes in each direction, from 0.22 mile south of the Bailard Avenue overcrossing (post mile 1.4) in the city of Carpinteria to the southern portion of the City of Santa Barbara (post mile 12.3) near Sycamore Creek.

Three build alternatives and the No-Build Alternative are being considered for this project.

Common Design Features of the Build Alternatives

Alternatives 1, 2, and 3 would include the following:

- Add a 12-foot lane in each direction on U.S. 101 to provide for a part- time, continuous access HOV lane within the project limits.
- Improve the southbound shoulder ditches near the Bailard Avenue interchange to provide a graded, flat-bottom swale to be used for storm water treatment.
- Replace bridge structures at Arroyo Paredon (Parida), Toro Canyon, Romero (Picay), Oak, and San Ysidro creeks.
- Widen bridge structures at Franklin and Santa Monica creeks.
- Widen traffic undercrossing structures at South Padaro Lane and Evans Avenue.
- Build a southbound auxiliary lane between the Sheffield Drive on-ramp and the Evans Avenue off-ramp.
- Replace the interchange at Sheffield Drive, which includes reconfiguring the southbound highway lanes and ramps. The reconstructed bridge would be 118 feet wide and would contain a single concrete barrier; the existing median planting would be removed. The one interchange configuration is being considered for all alternatives.
- Reconstruct the highway to remove a nonstandard-crest vertical curve north of Sheffield Drive near the Romero (Picay) Creek bridge. The freeway profile would be lowered a maximum of 2 feet to accomplish the reconstruction.
- Rebuild the interchange at Cabrillo Boulevard/Hot Springs. Five configurations, as described later in this section, are being considered for this interchange.
- Install traffic signals where warranted.
- Provide median landscaping from 0.4 mile south of Carpinteria Creek to 0.3 mile south of Carpinteria Creek.
- Install replacement planting where appropriate.
- Build soundwalls for noise abatement where appropriate.
- Build retaining walls where necessary. Each alternative and interchange configuration differs on the number of walls proposed. All build alternatives include a retaining wall on

the southbound ramp at Sheffield Drive and a retaining wall between Sheffield Drive and Evans Avenue on the southbound mainline.

- Provide noise attenuating pavement surface on all travel lanes.
- Relocate underground and aboveground utilities as needed.
- Lengthen cross-culverts to accommodate additional pavement width.
- Build maintenance vehicle pullout areas.
- Build storm water treatment facilities.

Unique Design Features

Alternative 1—Widen inside and outside (goal: balance competing resources)

- Selectively widen inside and outside within available right-of-way. This alternative was developed to maximize opportunities to retain and refine high value resources including scenic views, wetlands and median/outside landscaping.
- Add median landscaping, where appropriate: from Carpinteria Creek to Linden Avenue; near the South Padaro Lane interchange; Nidever Road to Garapato Creek; and near the North Padaro Lane interchange.
- Build one additional retaining wall to maximize median planting, on the southbound shoulder at the right-of-way line ending at the Santa Claus Lane southbound on-ramp (500 feet in length).

Alternative 2—Widen to the outside (goal: maximize median planting)

- Widen to the outside edge of pavement within the existing outside shoulder where feasible.
- Provide median landscaping, where appropriate: from Carpinteria Creek to Reynolds Avenue; and from Santa Monica Road to the Evans Avenue interchange.
- Build three additional retaining walls to maximize median planting: one on the southbound shoulder at the right-of-way line ending at the Santa Claus Lane southbound on-ramp (500 feet in length); one on the northbound shoulder near Greenwell Creek (700 feet in length); and one on the northbound shoulder near the northbound off-ramp to Summerland (300 feet in length.)

Alternative 3—Widen to the inside (goal: maximize the retention of outside planting)

- Widen to the inside edge of pavement within the existing median.
- Provide a single barrier in the median, separating the two inside paved shoulders, between Carpinteria Creek and Olive Mill Road. This largely retains the existing outside edge of pavement within these areas.
- No additional retaining walls are needed.

Cabrillo Boulevard Interchange

The Cabrillo Boulevard interchange would be rebuilt under all three build alternatives. There are five mutually exclusive interchange configurations—F, Modified F, J, M, and Modified M—

being considered under each of the three build alternatives. Two of the five configurations (F Modified and M Modified) would provide northbound access largely in the same way that it exists now with two northbound exits, one of the configurations would remove the off ramp at Hermosillo Road (configuration M), and two would consolidate the northbound off-ramp traffic at the Hermosillo Road off ramp (configurations F and J). Each configuration is described below and shown in more detail in Appendix G:

F—Existing Northbound Mainlines/Southbound Half Diamond

This configuration would do the following:

- Close both median off-ramps at Cabrillo Boulevard and the Los Patos Way off-ramp.
- Improve the northbound Hermosillo Drive off-ramp and the northbound Cabrillo Boulevard on-ramp.
- Acquire access control for 50' beyond the end of the southeast return of the reconstructed Hermosillo Road northbound off-ramp. Install access control fencing along the frontage of the existing gas station up to the first gas station driveway.
- Build new southbound on- and off- ramps to intersect at Cabrillo Boulevard immediately adjacent and to the right of the southbound freeway lanes.
- Install traffic signals at Hermosillo Road at Coast Village Road and at the Cabrillo Boulevard southbound ramps.

Modified F—Northbound Half Diamond with Hermosillo Drive Off-Ramp and Southbound Half Diamond

This configuration would do the following:

- Add a northbound right side off-ramp at Cabrillo Boulevard.
- Improve the northbound Cabrillo Boulevard on-ramp.
- Retain the northbound Hermosillo Drive off-ramp.
- Construct new southbound on- and off-ramps to intersect at Cabrillo Boulevard immediately adjacent and to the right of the southbound freeway lanes.

J—Existing Northbound Mainlines and Improve Los Patos Way

This configuration would do the following:

- Close both median off-ramps at Cabrillo Boulevard.
- Improve the northbound Hermosillo Drive off-ramp and the northbound Cabrillo Boulevard on-ramp.
- Improve the southbound Los Patos Way off-ramp and add a new southbound Los Patos Way on-ramp.
- Install a traffic signal at the intersection of Hermosillo Road and Coast Village Road.

- Lower the existing railroad rail elevation by about 4 feet for 0.67 of a mile to allow southbound ramps at Los Patos Way to have standard vertical clearance.
- The Hermosillo Drive off-ramp would require the placement of access control fencing up to the first gas station driveway. The Los Patos Way ramp would also require the placement of access control fencing for a distance of 170 feet (just before the maintenance gate at the Andree Bird Refuge).

M—Northbound Half Diamond/Improve Los Patos Way

This configuration would do the following:

- Close both median off-ramps at Cabrillo Boulevard and the northbound Hermosillo Drive off-ramp.
- Add a northbound Cabrillo Boulevard off-ramp and improve the northbound Cabrillo Boulevard on-ramp.
- Improve the southbound Los Patos Way off-ramp and add a new southbound Los Patos Way on-ramp. The Los Patos Way ramp would require the placement of access control fencing for a distance of 170 feet (just before the maintenance gate at the Andree Bird Refuge).
- Lower the existing railroad rail elevation by about 4 feet for 0.67 of a mile to allow southbound ramps at Los Patos Way to have standard vertical clearance.
- Install a traffic signal at the Cabrillo Boulevard northbound ramps.

Modified M—Northbound Half Diamond with Hermosillo Drive Off-Ramp and Southbound Los Patos

This configuration would do the following:

- Close both median off-ramps at Cabrillo Boulevard.
- Add a northbound right side off-ramp at Cabrillo Boulevard and improve the northbound Cabrillo Boulevard on-ramp.
- Retain the northbound Hermosillo Drive off-ramp.
- Improve the southbound Los Patos Way off-ramp and add a new southbound Los Patos Way on-ramp.
- Lower the existing railroad rail elevation by about 4 feet for 0.67 of a mile to allow southbound ramps at Los Patos Way to have standard vertical clearance.

Other minor changes have been made to the original PER below:

1.) Page 14, Under - **Avoidance, Minimization or Mitigation**, Paragraph 2.

'Mitigation measures, specifically monitoring, salvage of fossil specimens, and data recovery during construction excavation for this project would result in the

reduction of any potential adverse impact.'

2.) A.) Page 15, Under – **Mitigation Measures**

'Paleontological mitigation for the project would require the following:

- A nonstandard special provision for paleontology mitigation must be included in the construction contract special provisions to advise the construction contractor of the requirement to cooperate with the paleontological salvage.

- Prior to construction, a qualified principal paleontologist (holds an M.S. or Ph.D. in paleontology or geology, and is familiar with paleontological procedures and techniques) must be retained. The principal paleontologist or an assigned project paleontologist would review the construction plans with proposed excavation sites and the prepared Paleontological Evaluation Report to determine which, if any, project component would involve earth-moving activities at depths sufficient to warrant monitoring and the corresponding development of a Paleontological Monitoring Plan. If monitoring is deemed necessary, the principal paleontologist would review the construction schedule to develop a monitoring schedule and compile accompanying costs. This information would be used to prepare a site-specific Paleontological Monitoring Plan, if one is determined necessary for reducing adverse environmental impacts on paleontological resources to an insignificant level.

- The Paleontological Mitigation Plan would include monitoring locations and procedures for data collection as indicated below.
    - Recording pertinent geographic and stratigraphic information
    - Recovery methods for both macrofossil and microfossil remains
    - Stabilization (preservation) methods for the specimens
    - Provisions for the remains to be accessioned into the collections of an appropriate repository such as the Los Angeles County Museum or University of California Museum of Paleontology and catalogued for future scientific study.
    - Preparation of a final report detailing the results of the mitigation program

- The qualified principal paleontologist would be present at pre-grading meetings to consult with grading and excavation contractors.
- Before the start of excavation, the principal paleontologist would conduct an employee environmental awareness training session for all persons involved in earth-moving for the project.
- A paleontological monitor, under the direction of the qualified principal paleontologist, would be on-site to inspect cuts for fossils at all times during original disturbance of sensitive geologic formations. Once excavation is underway, the intensity of monitoring may be reduced in areas that are not producing fossils.
- When fossils are discovered, the paleontologist (or paleontological monitor) would recover them. Construction work in these areas may be halted or diverted to allow recovery of fossil remains in a timely manner.

- Bulk sediment samples would be recovered from fossiliferous horizons and processed for micro vertebrate remains as determined necessary by the principal paleontologist.

- Fossil remains collected during the monitoring and salvage portion of the mitigation program would be cleaned and prepared to the point of identification (not exhibition), sorted and cataloged.

- Prepared fossils, along with copies of all pertinent field notes, photos, and maps, would then be deposited in an appropriate and Caltrans-approved scientific institution with paleontological collections.

- A final report would be completed that outlines the results of the mitigation program and would be signed by the Principal Paleontologist and Professional Geologist.'

2.) B). Page 16, Item 6

'6. If fossils are discovered, the paleontologist (or paleontological monitor) will recover them. Construction work in these areas may be halted or diverted to allow recovery of fossil remains in a timely manner.'

If you have any questions or comments regarding this Supplemental PER memorandum please contact the District Paleontology Coordinator, Isaac Leyva at (805) 549-3487

IVL/ivl
cc:file
Yvonne Hoffman-EP, SLO

PALEONTOLOGICAL EVALUATION REPORT

SOUTH COAST 101 HOV PROJECT BETWEEN THE CITIES OF SANTA BARBARA AND CARPINTERIA

05-SB-101-PM 1.4-12.3

Project Number 0500000225
(EA: 05-0N7000)

April 13, 2011

Prepared By:
Isaac Leyva
Engineering Geologist
Technical Studies Branch
Caltrans District 5
San Luis Obispo
(805) 549-3487

Approved By: for Kim Christmann
Kim Christmann
Senior Engineering Geologist
Caltrans- Division of Environmental Analysis
Environmental Engineering – Hazardous Waste and Paleontology
(916) 653-3265

SUMMARY

The California Department of Transportation (Caltrans) in cooperation with Santa Barbara County Association of Governments (SBCAG) proposes to widen U.S. 101 to three lanes in each direction between 0.22 miles south of the Bailard Avenue overcrossing (PM 1.4) in the City of Carpinteria to Sycamore Creek (PM 12.3) in the City of Santa Barbara, Figure 1, Appendix A. Three build alternatives and a no-build alternative are proposed for this project. Each build alternative would add a single High Occupancy Vehicle (HOV) lane in both the northbound and southbound directions and reconstruct interchanges at Sheffield Drive and Cabrillo Boulevard.

Regulatory Setting

Paleontology is the study of life in past geologic time based on fossil plants and animals. A number of federal statutes specifically address paleontological resources, their treatment, and funding for mitigation as a part of federally authorized or funded projects (such as the Antiquities Act of 1906 [16 U.S. Code 431-433], Federal-Aid Highway Act of 1935 [20 U.S. Code 78]). Under California law, paleontological resources are protected by the California Environmental Quality Act, the California Administrative Code, Title 14, Section 4306 et seq., and Public Resources Code Section 5097.5.

Affected Environment

The proposed project would construct High Occupancy Vehicle (HOV) lanes along SR 101 between the cities of Santa Barbara and Carpinteria. An initial paleontology survey in February 2009 determined that there is potential for high sensitivity paleontological resources in the area of the proposed project. The purpose of this report is to reveal if the project would impact these resources.

The results of the 2009 study are incorporated into this Paleontological Evaluation Report (PER) to reflect the current design alternatives.

The geologic strata that occur in the greater Santa Barbara region range from recent to Quaternary alluvial deposits located mostly along the lower coastal plains and valleys. These units typically overlie deeper upper and middle Tertiary rocks that form the Santa Ynez Mountains to the north.

State Route 101, through the project limits, bisects a number of these Quaternary units including artificial fill in the form of highways and roads (aft); recent active channel alluviums (Qa); Holocene estuarine deposits (Qe); Holocene and upper Pleistocene alluvium and colluviums (Qac); Pleistocene intermediate alluvial (Qia); upper Pleistocene Marine-terrace deposits (Qmt); Upper and middle Pleistocene Older deposits (Qoa) and the Casitas Formation (Qca)- a non-marine well consolidated siltstone, sandstone and conglomerate mainly deposited as alluvium shed off the Santa Ynez Mountains uplift. Additionally, State Route 101 is immediately adjacent to the Tertiary aged Rincon Formation (Tr) which is composed mostly of shale. Geologic time scale relationship of these units can be seen in Figure 9, Appendix C.

Scientifically significant paleontological resources are identified 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. Fossils found undisturbed are particularly important, as they aid in stratigraphic correlation, interpretation of tectonic events, paleoclimatology, and evolution in general. Terrestrial vertebrate fossils are often assigned greater significance than other fossils because they are rarer than other types of fossils and require a greater amount of scientific study. If a paleontological resource is determined to be significant, of high sensitivity, or of scientific importance, and the project impacts it, a mitigation program must be developed and implemented.

Two geologic units within the project limits are known to have sensitive paleontological significance. The upper Pleistocene Marine-terrace deposits (Qmt) in its basal sections (<=1m-thick) contains 102 species of mollusks and a rare species of fossil coral. Additionally, Dibblee (1966) reported the presence of a jaw bone of a late Pleistocene mammoth (*Archidiscodon imperator*) in alluvium within marine terrace deposits near the western edge of the City of Goleta. This location is outside the proposed project limits however, the probability of encountering sensitive fossil resources like those above within the project limits is high. The Casitas Formation (Qca) typically does not contain sensitive fossil resources but has been known to interfinger with the Santa Barbara Formation that has known sensitive fossil resources.

Environmental Consequences

Terrestrial vertebrate fossils are rarer than other types of fossils because the best conditions for fossil preservation are relatively rare in terrestrial settings. These conditions include little or no disturbance after death and quick burial in oxygen depleted, fine-grained sediments. Any invertebrate fossils found in association with the vertebrate fossils would aid in stratigraphic correlation and provide data for the interpretation of the ages of other specimens found. All of these fossils will provide important scientific information on tectonic events, paleoclimatology, the relationships between species, and evolution in general.

Three build alternatives -- Alternatives 1, 2, and 3 -- and a No-Build Alternative are proposed for this project. All build alternatives include construction of an additional lane in each direction to provide for a part time High Occupancy Vehicle (HOV) facility within the project limits. Alternative 1 proposes to balance competing resource interests such as scenic views, wetlands, and median/outside landscaping. Alternative 2 proposes to maximize landscaping in the median. Alternative 3 proposes to construct all new paved lanes within the existing available median and maximizes the retention of outside planting. All build alternative improvements would be constructed primarily within the existing public right of way.

Avoidance, Minimization, and/or Mitigation Measures

The proposed build alternatives could have the potential to adversely impact paleontological resources that cannot be avoided. Adverse impacts to paleontological resources could be avoided by selecting the No-build alternative. The build alternatives are all constrained by the current existing right of way. As a result minimization measures are unlikely to be effective. However, mitigation could actually result in beneficial effects on paleontological resources through the discovery of fossils that would not have been exposed without construction and, therefore, would not have been available for study. Mitigation for the proposed build alternatives would include proper paleontological monitoring, salvage and data recovery. The

implementation of the following mitigation measures will result in the project having a less than significant impact to paleontological resources. Paleontological mitigation for the project will include:

1. A nonstandard special provision for paleontology mitigation will be included in the construction contract special provisions to advise the construction contractor of the requirement to cooperate with the paleontological monitoring, salvage, and data recovery.

2. A qualified principal paleontologist will be retained to prepare a detailed Paleontological Mitigation Plan prior to the start of construction. The plan will include the following provisions:

- The qualified principal paleontologist will be present at pre-grading meetings to consult with grading and excavation contractors.

- Prior to the start of excavation, the principal paleontologist will conduct an employee environmental awareness training session for all persons involved in earth moving for the project.

- A paleontological monitor, under the direction of the qualified principal paleontologist, will be on site to inspect cuts for fossils at all times during original disturbance of sensitive geologic formations.

- When fossils are discovered, the paleontologist (or paleontological monitor) will recover them. Construction work in these areas may be halted or diverted to allow recovery of fossil remains in a timely manner.

- Bulk sediment samples will be recovered from fossiliferous horizons and processed for micro vertebrate remains as determined necessary by the principal paleontologist.

- Fossil remains collected during the monitoring and salvage portion of the mitigation program will be cleaned and prepared to the point of identification (not exhibition), sorted, and cataloged.

- Prepared fossils, along with copies of all pertinent field notes, photos, and maps, will then be deposited in an appropriate and Caltrans approved scientific institution with paleontological collections.

- A final report will be completed that outlines the results of the mitigation program and will be signed by the Principal Paleontologist and Professional Geologist.

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List of Abbreviated Terms

BLM U.S. Department of the Interior, Bureau of Land Management
Caltrans California Department of Transportation
CEQA California Environmental Quality Act
CGS California Geological Survey (California Division of Mines and Geology)
CSUF California State University, Fresno
DOD Department of Defense
FHWA Federal Highway Administration
ka Thousands of years
LACM Natural History Museum of Los Angeles County
Ma Million years

MRZ Mineral Resource Zone
PEAR Preliminary Environmental Analysis Report
PER Paleontological Evaluation Report
PIR Paleontological Identification Report
PL Public Law
PM Post Mile
PMP Paleontological Mitigation Plan
PMR Paleontological Mitigation Report
PSS Paleontological Stewardship Summary
SBFFP Santa Barbara Fold and Fault Belt
SB Santa Barbara
SMARA Surface Mining and Reclamation Act
UCMP University of California Museum of Paleontology
USDA United States Department of Agriculture
USDI United States Department of the Interior
WBS Work Breakdown Structure – Guide to Project Delivery Workplan Standards

Key Words

City of Carpinteria
City of Santa Barbara
City of Goleta
Carpinteria Quadrangle
Casitas Formation
Lagoon Fault
Holocene-Pliocene sedimentary rocks
Quaternary alluvium
Santa Barbara Coastal Plain
Santa Barbara Quadrangle
Santa Barbara Formation
Santa Ynez Mountains
Upper Pleistocene sedimentary rocks
Ventura County

INTRODUCTION

The California Department of Transportation (Caltrans) in cooperation with Santa Barbara County Association of Governments (SBCAG) proposes to widen U.S. 101 to three lanes in each direction between 0.22 miles south of the Bailard Avenue overcrossing (PM 1.4) in the City of Carpinteria to Sycamore Creek (PM 12.3) in the City of Santa Barbara, Figure 1, Appendix A. Three build alternatives and a no-build alternative are proposed for this project. Each build alternative would add a single High Occupancy Vehicle (HOV) lane in both the northbound and southbound directions and reconstruct interchanges at Sheffield Drive and Cabrillo Boulevard.

Purpose and Need

The purpose of this project is to reduce congestion and delay, provide capacity for future travel demand, encourage modal shift to transit and carpooling, and improve travel time on U.S. 101 within the project limits. This project is also anticipated to facilitate the flow of goods and services through the corridor and minimize diversion of freeway trips onto the local road system.

To achieve this stated purpose to an adequate degree, in the design year--on typical weekdays, this project should:

- Reduce corridor delay by at least 7,000 person-hours daily.
- Reduce peak-hour peak-direction travel time on Route 101 in the project area for carpoolers and express bus riders by 25% or more on average.

This project was initiated to implement one of the key elements from the *101 In Motion* consensus recommended package of projects; namely, an HOV lane on Route 101 from Milpas south to the county line. This proposed project is one of six elements that are being implemented through *101 In Motion*. Together this package will implement a multi-modal strategy to accommodate future travel demand while facilitating a modal shift to carpooling, transit, and passenger rail.

Disproportionate demand is overwhelming the existing capacity of the U.S. 101 during weekday and weekend peak periods. In 2007, Average Annual Daily Traffic (AADT) volumes within the project limits ranged from 70,000 to 94,000 vehicles.

Route 101 within the project limits typically operates with congested flow (Level of Service F) conditions during weekday and weekend peak periods. These conditions typically occur for one to four hours daily in each direction and result in significant travel delay (SBCAG *Congestion Management Program,* 2007).

Without capacity improvements, LOS F conditions on Route 101 within the project limits are forecast to exceed ten hours a day in each direction by 2030 (SBCAG's *101 in Motion* July 2006).

Without improvements, congested conditions would continue to cause delay for local traffic, transit, tourists, commuters, commercial trucks, and emergency vehicles.

The expected rise in traffic volumes, congestion, and delay is a result of several factors, including increased long distance commuting from Ventura County, internal population growth, which is forecast to expand ten percent by 2020 in Santa Barbara County (SBCAG *Regional Growth Forecast,* 2007), and interregional traffic growth, including goods movement (Caltrans, 2010).

Previous Studies

As part of the initial scoping, studies were conducted by District 5 Environmental Engineering for the proposed improvements to State Route U.S. 101 in Santa Barbara County with respect to potential paleontology resources. The preliminary evaluation included review of: The California State University, Fresno, Department of Geology Paleontological Sensitivity Mapping Project database (PSMP, 2000) and geologic and paleontologic literature. However, paleontological study maps were not available for the area.

A Paleontological Identification Report (PIR) was prepared (Mills 2008) for the Linden Avenue and Casitas Pass Road Interchange project. The project area is approximately one mile in length and located within the City of Carpinteria in Santa Barbara County. The PIR was prepared for the proposed project that would make operational improvements to Route 101 within the City of Carpinteria reconstructing the Linden Avenue and Casitas Pass Road interchanges, reconfiguring on- and off-ramps, replacing Route 101 bridges over Carpinteria Creek, extending Via Real frontage road from Bailard Avenue through to Casitas Pass Road, adding a new bridge over Carpinteria Creek at Via Real, and reconstructing bike paths. This report is attached in Appendix B (Mills 2008).

The project was is in an area shown as having low potential for encountering sensitive paleontological resources in the PSMP. The PSMP in District 5 is based on the 1:250,000 scale Geologic Map of California—map sheets. According to the 1:24,000 scale Geologic Map of the Carpinteria Quadrangle, published by Thomas Dibblee in 1986, the entire project limits are underlain by a thick deposit of Quaternary alluvium (Qa). This formation is described in PSMP as having a low potential for containing sensitive fossils. Paleontology field surveys were conducted in the project vicinity in Fall 2006. No evidence of sensitive paleontological resources was found at that time.

Project Alternatives

Three build alternatives -- Alternatives 1, 2, and 3 -- and a No-Build Alternative are proposed for this project. All build alternatives include construction of an additional lane in each direction to provide for a part time High Occupancy Vehicle (HOV) facility within the project limits. Alternative 1 proposes to balance competing resource interests such as scenic views, wetlands, and median/outside landscaping. Alternative 2 proposes to maximize landscaping in the median. Alternative 3 proposes to construct all new paved lanes within the existing available median and maximizes the retention of outside planting.

All build alternative improvements would be constructed primarily within the existing public right of way.

Basic Common Design Features

Additional lanes will be added in each direction on Route 101 to provide for a part time, continuous access High Occupancy Vehicle (HOV) facility within the project limits. All build alternatives will include:

- Replacement of bridge structures at**:** Arroyo Paredon (Parida), Toro Canyon, Romero (Picay), Oak, and San Ysidro Creeks.
- Widening of bridge structures at Franklin and Santa Monica creeks.
- Widening of traffic undercrossing structures at South Padaro Lane and Evans Avenue.
- Reconstruction of the northbound off ramp and on ramp at Salinas Street.
- Conversion of the existing northbound auxiliary lane to a through lane between the northbound on ramp at Cabrillo Boulevard and Salinas Street off ramp.
- Construction of a southbound auxiliary lane between the Sheffield Drive on ramp and the Evans Avenue off ramp.
- Reconstruction of the interchanges at Sheffield Drive and Cabrillo Boulevard.
- Consideration, as design options, of three mutually exclusive Cabrillo Blvd. interchange configurations (F, J and M). Two other similar configurations that were considered but not selected were:

  (Configuration I) EXISTING MAINLINES / IMPROVE LOS PATOS - Close both median off ramps at Cabrillo Blvd.; improve the northbound Hermosillo Drive off ramp, the southbound Los Patos Way off ramp, and the northbound Cabrillo Blvd. on ramp.

  (Configuration L) NB 1/2 DIAMOND / IMPROVE LOS PATOS -Close northbound and southbound median off ramps at Cabrillo Blvd. and close the northbound Hermosillo Drive off ramp; add a southbound Cabrillo Blvd. off ramp; improve the southbound Los Patos Way off ramp and the northbound Cabrillo Blvd. on ramps.

Interchange configurations under consideration include:

Configuration F: SB 1/2 DIAMOND -Close both median off ramps at Cabrillo Blvd.; improve the northbound Hermosillo Drive off ramp and the northbound Cabrillo Blvd. on ramp. Construct new on and off ramps to intersect at Cabrillo Blvd., northbound and southbound, immediately adjacent and to the right of the freeway lane.

Configuration J: EXISTING MAINLINES / IMPROVE LOS PATOS - Identical to Configuration "I" with the addition of a southbound Los Patos Way on ramp.

Configuration M: NB 1/2 DIAMOND / IMPROVE LOS PATOS -Identical to Configuration "L" with the addition of a southbound Los Patos Way onramp.

Ancillary Common Design Features

All build alternatives will include the following ancillary design features:

- Construction of retaining walls at two locations: On the southbound outside shoulder at the right of way line along the southbound off ramp at Sheffield Drive (430 feet in length) and on the outside shoulder of the proposed southbound auxiliary lane from Sheffield Drive to Evans Avenue (1550 feet in length).

- Median landscaping in the first 0.2 mile at the southern limits of the project, and the last 0.5 mile of the project.
- Installation of replacement planting.
- Construction of sound walls for noise abatement where appropriate.
- Noise attenuating pavement surface on all travel lanes.
- Relocation of underground and aboveground utilities as needed.
- Lengthening of cross culverts to accommodate additional pavement width.
- Construction of maintenance vehicle pullout areas.

Regulatory Setting

Construction of this project will be funded in part by the United States Department of Transportation. The Federal Aid Highway Act of 1956 (PL 84-627) and 1958 (PL 85-767) specifically extends the Antiquities Act of 1906 (PL 59-209) to apply to paleontological resources on highway projects funded by the Highway Act and authorizes the use of Highway Act funds for paleontological salvage to the extent approved as necessary by the State Highway Department. (Pub. L. 85-767, Aug. 27, 1958, 72 Stat. 913; Pub. L. 86-657, Sec. 8(e), July 14, 1960, 74 Stat. 525. See also 23USC305.) The Antiquities Act requires that properly qualified institutions and experts carry out any investigations. Typical federal requirements for paleontological resource management for compliance with the Antiquities Act are outlined in Bureau of Land Management Manual Section 8270 (BLM, 1998). Additional federal requirements would apply if the project area included federal land; however no federal lands are involved.

The California Environmental Quality Act (CEQA), the California Administrative Code, Title 4, Section 4307 et seq., and Public Resources Code Section 5097.5 protect paleontological resources. CEQA requires that public agencies not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects (Chapter 1, Section 21002). California Public Resources Code 5097.5 protects vertebrate paleontological sites, including fossilized footprints or any other paleontological features situated on public lands.

Required Studies

The studies required for project-related paleontological resource efforts involve three steps that include identification, evaluations, and, as necessary, mitigation (SER, Chapter 8).

This report documents the results of the Paleontological Identification and Paleontological Evaluation Report in a combined report format.

This combined report determines the potential for a Caltrans project to impact paleontological resources. If the proposed project involves ground disturbance, there may be the potential to impact paleontological resources.

Also included is a description of the project setting, type of survey conducted, a summary of the literature search and findings, evaluation of potential paleontological resources/issues based on a review of databases and/or a background document review, discussion as to the effects that the project might have on resources within or adjacent to the project area, and description of contact with any necessary outside agencies or repositories.

This report also specifies: 1) Caltrans' legal responsibilities; 2) the necessity for involving other agencies and stakeholders; 3) whether the resource can be avoided (regardless of its potential significance); and 4) the significance of the resource.

Scope of Studies

This PER is being prepared because a preliminary survey of the project site (inclusive within this report) identified the presence of paleontological resources in the project area that may be affected by project excavation. The purpose of this investigation is to identify the paleontological resources at the project site and evaluate the project's potential to affect those resources. The study will identify the project area's geology and stratigraphy and extent of project excavation. Once it has been determined that a paleontological resource will be impacted by the project, it is necessary to determine Caltrans' legal responsibilities, and the necessity for involving other agencies and stakeholders. This study will then identify the recommended course of action: avoidance, minimization or mitigation as appropriate.

Study Methods

A record search for fossil sites by Caltrans Environmental staff as part of the PIR/PER within the Route 101 HOV project area was conducted at websites located at the University of California Museum of Paleontology at Berkeley (UCMP) and the Los Angeles County Museum of Natural History (LACM).

After reviewing the UCMP and LACM locality records and geologic maps and reports at the USGS web sites and conducting a field examination of the project area, high sensitivity zones were plotted around areas of exposed Pleistocene Marine-terrace deposits (Qmt), the Casitas Formation (Qca), and Rincon Formation (Tr).

The evaluation included review of: The California State University, Fresno, Department of Geology and Paleontological Sensitivity Mapping Project database (PSMP, 2000); geologic maps; and geologic and paleontologic literature (see attached references). Isaac Leyva, Caltrans District 5 Engineering Geologist conducted a field survey on February 28, 2009 and on November 9, 2010.

Limitations

This PER is based on previous studies and published geologic reports. The assessment of which geologic formations will be impacted is believed to be reasonable and accurate based on existing reports and mapping. The extent to which scientifically important fossils will be encountered during construction excavation cannot be determined until excavation begins and the sensitive strata are exposed.

Geologic hazards in the State Route 101 HOV project area include reconstruction of an interchange structure at State Route 101 and Cabrillo Boulevard and would be located ¼ mile south of the Lagoon Fault, an east-west trending reverse fault.

The studies required for seismic hazards are beyond the scope of this report.

AFFECTED ENVIRONMENT

Regional Geology

The western Transverse Ranges consist mainly of variably deformed marine and non-marine sedimentary rocks and deposits that range in age from Jurassic to the present. These strata record a long history of continental-margin sedimentation and deposits as young as middle Pleistocene record considerable protracted deformation that includes Neogene and Quaternary transpressional faulting, folding and clockwise vertical-axis rotations of crustal blocks. The local fault relationships can be seen in Figure 1, Appendix C (Gurrola and others, 2001). A dramatic result of this deformation is the prominent Santa Ynez Mountains directly north of the Santa Barbara coastal plain, which were uplifted along a large homoclinal to anticlinal structure beginning in the Pliocene. Figure 2, Appendix C, illustrates an aerial photo with superimposed USGS 7.5 Quadrangle maps to show geomorphic scale and spatial relation (Dibblee, 1982).

The oldest stratigraphic units consist of Eocene resistant, southward-dipping to overturned, mostly marine sedimentary rocks along the south flank of the Santa Ynez Mountains uplift, as seen in Figure 3, Appendix C, which form a backdrop of prominent hogbacks and cuestas adjacent to the Santa Barbara coastal plain. Figure 4, Appendix C is a view of the Santa Barbara Coastal Plain which was formed by deposition from the Santa Ynez Mountains beginning from the early Pliocene. The city of Santa Barbara lies in the center of the photo with the Santa Cruz Island in the background. Less resistant but similarly deformed, Miocene terrestrial and marine sedimentary rocks are exposed in the lower Santa Ynez foothills and in the coastal hills and sea cliffs farther south. Figure 5 Appendix C, shows the relationship between the younger Marine terrace deposits (Qmt) over the older folded and faulted Miocene rocks (Tml) near Santa Barbara Point. Moderately faulted and folded or warped Pleistocene marine and terrestrial sediments underlie many of the hills and mesas on the coastal plain and undisturbed uppermost Pleistocene and Holocene surficial deposits directly underlie much of the low-lying coastal plain area and are locally present along the lower flanks of the Santa Ynez Mountains. This relationship can be seen in Figure 6, Appendix C in the local sea cliffs off of Loon Pt. (Minor, USGS 2009).

Local Geology

The area including the cities of Santa Barbara, Montecito, Summerland and Carpinteria are within the coastal plain and are located in the Western Transverse Ranges physiographic province along an east-west-trending segment of the southern California coastline about 100 km northwest of Los Angeles (Figure 1, Appendix C). The coastal plain is defined here as the relatively low elevation (lower than 150 to 300 m, depending on location), low to moderate relief piedmont that generally slopes gently seaward from the steep Santa Ynez Mountain range front on the north to the Santa Barbara Channel on the south. The maximum width of the coastal plain is about 7 km near the cities of Santa Barbara and Goleta, and narrows to 3 km or less several kilometers west of Goleta and near Carpinteria. A localized geomorphic relief map is presented in Figure 7, Appendix C. The coastal plain surface includes several mesas and hills that are geomorphic expressions of potentially active folds and partly buried oblique and reverse faults of the Santa Barbara fold and fault belt that transects the coastal plain. These fault blocks are presented in Figure 8, Appendix C (Keller and Gurrola, 2000; Gurrola and others, 2001). Strong earthquakes have occurred offshore within 10 km of the Santa Barbara coastal plain in 1925 (6.3 magnitude), 1941 (5.5 magnitude), and 1978 (5.1 magnitude) (Minor, and others, USGS 2009).

Beginning at about 105 ka and possibly much earlier, terrace basal abrasion surfaces were cut by wave action along the coast during multiple interglacial sea-level high stands, with accumulation of overlying marine-terrace (Qmt) and alluvial (Qoa and Qia) sediments (Figure 10a & 10b, Appendix C). This resulted in deposition during subsequent marine regressions from eustatic drops in sea level and tectonic uplift (Rockwell and others, 1992; Muhs and others, 1992; Keller and Gurrola, 2000; Gurrola and others, 2001). Marine terrace surfaces, as shown on the relief map presented in Figure 7, Appendix C, show spanning segments of the coastline that were differentially uplifted into broad upwarps, some of which were coincident with pre-existing folds formed in underlying deposits. Late movement along some faults, including the central and western segments of the More Ranch and Arroyo Parida fault system as seen in Figure 8, Appendix C resulted in locally pronounced folding and reverse-oblique displacement of marine-terrace deposits. Alluvial and colluvial deposition continued into the Holocene on broad low-lying, possibly down warped (Keller and Gurrola, 2000; Gurrola and others, 2001) floodplains underlying Goleta Valley, downtown Santa Barbara, Montecito, the Carpinteria area, and elsewhere along major stream canyons. This sedimentation was locally accompanied by the deposition of estuarine deposits (Qe) in low-lying coastal areas owing to local subsidence and (or) possible sea-level rise. During times of heavy precipitation in the late Pleistocene and Holocene, relatively steeply sloping areas in the map area underlain by clay-rich sedimentary rocks were, and continue to be, prone to land sliding and (or) debris flows. Deposits resulting from such slope failures (units Qls and Qdf) include the large Mission debris flow, which was deposited on a now-urbanized part of the coastal plain (Selting and Urban, *in* Gurrola and others, 2001; Urban, 2004). State Route 101 within the proposed project limits meanders through the coastal plain exposing some of the Eocene-Pleistocene to recent strata through road cuts and roadway structures.

Quaternary Geology

The area of the proposed alternatives and existing alignment are shown on project base maps (sheets 13-16, 21-22, Appendix D) superimposed on mapped geologic units. Table 1, Appendix D summarizes locations of proposed excavation within potentially sensitive fossiliferous units. Each geologic unit identifier in Table 1 corresponds to a specific geologic project map sheet and includes post mile, proposed structure type, sensitivity and fossil type. The geologic unit symbols were adapted from the digital database of Minor, Kellogg, Brandt and others (2009).

Quaternary units that have potential of being disturbed from earth movement in the construction phase but that have not been identified in the literature and records search as having sensitive fossil resources include the following:

- (af) artificial fill in the form of highways, roads, buildings, airport runways, breakwaters, dams and harbor facilities.
- (Qa) recent active channel alluvium~~s~~.
- (Qe) Holocene estuarine deposits.
- (Qac) Holocene and upper Pleistocene alluvium and colluvium.
- (Qia) Pleistocene intermediate alluvium.
- (Qoa) Upper and middle Pleistocene Older deposits.

Please refer to Correlation of Map units Figure 9, Appendix C and the Geologic Maps in Figure 10a & 10b, Appendix C for depositional relationships.

Quaternary units with potential paleontological resources are described below:

Marine-terrace deposits - Qmt (upper Pleistocene) – These deposits (Figure 10a &10B, Appendix C) are mostly pale- to medium-tan, -brown, and -gray, weakly to moderately consolidated, crudely to moderately bedded, pebble-cobble gravel and conglomerate, pebbly to conglomeratic sand and sandstone, and silt and siltstone. These deposits unconformably overlie eroded bedrock or older sediments on elevated marine wave-cut abrasion platforms. Lower part, of marine-terrace sequences, typically consists of a thin ($\leq$1 m-thick) basal layer of fossiliferous cobble to pebble gravel or conglomerate that locally grades upward into laminated to massive beach(?) sand or sandstone and/or estuarine organic-rich clay and silt.

Basal gravel and conglomerate clasts commonly exhibit mollusk (pholad) borings that rarely contain pholad shells. An open-coast invertebrate fauna of at least 125 taxa, including 102 mollusks and 18 foraminifers, has been collected from the lowermost emergent terrace of this unit near Goleta (Wright, 1972; C.L. Powell II, USGS, unpublished data, 2001). The mollusks from this terrace inhabited an exposed rocky and sandy shore from intertidal to inner sublittoral depths (0-9 m) (Valentine, 1961; Wright, 1972). Among the fauna is the rare fossil solitary coral *Balanophyllia elegans* (Verrill, Gurrola and others, 2001). Upper two-thirds or more of terrace sequences typically includes nonmarine eolian sand or sandstone and silt or siltstone, stratified fluvial and alluvial pebble-cobble gravel or conglomerate, and minor colluvial deposits (Figure 9, Appendix C)

Casitas Formation - Qca (upper and middle Pleistocene) – This formation (Figure 10a &10b, Appendix C) is made up of non-marine siltstone and silt, sandstone and sand, and conglomerate and gravel forming narrow to wide and thin to thick lenticular interbeds; mostly moderately consolidated to well consolidated. Deposits in aggregate exhibit pale to medium shades of buff, tan, gray, brown, and, locally, red and orange, and they commonly form badlands topography where exposed in cliffs. Siltstone and silt are commonly pale gray and pale greenish-gray, sandy to clayey, and thinly bedded and laminated. Sandstone and sand are typically buff, pale tan, gray, and greenish-gray, fine to coarse grained, silty and clayey to pebbly, and well bedded and laminated. Sandstone locally contains conglomeratic lenses (Figure 9, Appendix C). In exposures at Ortega Hill, sandstone beds are locally impregnated with oil. (Minor, USGS 2009). The conglomerates and gravels contain sub-rounded to rounded pebbles, cobbles, and boulders, combined in various proportions, in a clayey, silty and/or sandy matrix; deposits are both clast-supported and matrix-supported. Conglomerate and gravel deposits are massive to moderately well stratified in places and appear to fill paleochannels forming beds that locally exceed 3 m in thickness. The Casitas Formation in the map area is bracketed by underlying and possibly interfingering middle Pleistocene upper Santa Barbara Formation (Qsb) that is known to be abundantly fossiliforous and by emergent upper Pleistocene marine terrace deposits (Qmt) that unconformably overlie it. (Minor, USGS 2009).

Tertiary Geology

Rincon Formation- Tr (Lower Miocene) - The Rincon Formation (or Rincon Shale) is a sedimentary geologic unit of Lower Miocene age, abundant in the coastal portions of southern Santa Barbara County, California eastward into Ventura County. Consisting of massive to poorly-bedded shale, mudstone, and siltstone, it weathers readily to a rounded hilly topography with clayey, loamy soils in which landslides and slumps are frequent. The Rincon Formation is massive to poorly-bedded, and consists of predominantly argillaceous to silty shale and mudstone, with occasional dolomite. Two layers of siliceous shale are found in the middle of the unit, and they outcrop noticeably in the region west of Goleta. The base of the unit, which rests conformably on the shallower-water Vaqueros Formation (Tv), contains a glauconitic layer. Several thin layers of bentonite occur within the unit, and the unit is capped by one as well, which forms the base of the conformably overlying Monterey Formation. Microfossils are common in the Rincon. Within Santa Barbara County, two significant fossil finds (aside from microfossils) have been made in the Rincon Formation including a species of rodent related to modern voles, lemming and hamsters and a species of cartilaginous fishes or jawed fish with paired fins, paired nares, scales, two-chambered hearts, and skeletons made of cartilage.

Records Search

A record search was conducted for fossil sites within the project area at the University of California Museum of Paleontology at Berkeley (UCMP) and the Los Angeles County Museum of Natural History (LACM). The LACM has no fossil localities within the project area but does have documented fossil sites nearby from Holocene-Pleistocene marine and terrestrial deposits along the Santa Barbara coastal plains. The UCMP has no fossil sites within the project limits but has several invertebrate localities nearby from the Santa Barbara (Qsb) Formation.

The UCMP and LACM online collections database did not report fossil findings within the Marine-terrace deposits (Qmt) however, fossil finds are cited by Wright, 1972; C.L. Powell II, USGS (unpublished data 2001) and Dibblee,1966. These fossils included open-coast invertebrate fauna of at least 125 taxa, including 102 mollusks and 18 foraminifers from the lowermost emergent terrace of this unit and a rare fossil solitary coral *Balanophyllia elegans.* Dibblee (1966) reported the presence of a jaw bone of a late Pleistocene mammoth (*Archidiscodon imperator*) in alluvium within Marine-terrace deposits near the western edge of Goleta.

The geologic units that could potentially produce fossils within the project limits are the Marine-terrace deposits (Qmt) and the Casitas Formation (Qca). The Casitas Formation frequently contains inter-fingering facies of middle Pleistocene upper Santa Barbara Formation (Qsb), including the intermixing of clastic materials and to less extent, the Rincon Formation (Tr).

Because rare invertebrate fossils have been discovered in the Santa Barbara Formation which interfingers with the Casitas Formation, it has been determined the Casitas Formation may have potential for producing sensitive fossil resources. The Santa Barbara Formation is known to contain diverse marine invertebrate assemblages of mollusks, bryozoans, and foraminifers concentrated in multiple stratigraphic intervals, ranging in thickness from less than 1 m to several tens of meters, distributed throughout all but the uppermost, conglomeratic parts of unit.

Tables 1 and 2 below identify locations where fossils have been found in the Santa Barbara, and Rincon Formations, however, they are not within the project area.

The UCMP database reports 69 specimens in the Santa Barbara Formation in Santa Barbara County. The following UCMP invertebrate localities occur in the Santa Barbara Formation:

Table 1. Santa Barbara Formation Invertebrate Fossil Localities

Locality #	Locality Name	Specimen #	Taxa	Element
7076	----	31421	Mollusca	Shell
7091	----	15072	Mollusca	Shell
12675	Bathhouse Bch.	48813	Foraminifera	Test
A4476	Bathhouse Bch.	35743	Foraminifera	Test

The UCMP online collections database reports the following vertebrate fossil localities occur near the project area in the Rincon Formation:

Table 2. Rincon Vertebrate Fossil Localities

Locality #	Locality Name	Specimen	Taxa/Class	Element
V71204	Los Sauces Creek	96289	Rodentia	Mandible Fragment
V71204	Los Sauces Creek	96290	Chondrichthyes	Teeth or Dermal Denticals

ENVIRONMENTAL CONSEQUENCES

Definitions of Significance and Sensitivity

If a paleontological resource cannot be avoided, then it is necessary to determine its significance or scientific importance before any mitigation measures are proposed. This may be stated for a particular fossil species, fossil assemblage, or for a rock unit as a whole. This discussion of significance and sensitivity is from the Caltrans Standard Environmental Reference (Caltrans, 2008).

Generally, scientifically significant paleontological resources are identified 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 (Reynolds, 1990). 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. Significance may also be stated for a particular rock unit, predicated on the research potential of fossils suspected to occur in that unit. Such significance is often stated as "sensitivity" or "potential." In most cases decisions about how to manage paleontological resources must be based on this potential because the actual situation cannot be known until construction excavation for the project is underway. Caltrans uses the following tripartite scale.

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.

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 and no further action taken. Significance assessments should necessarily be based on the recommendations of a professional Principal Paleontologist with expertise in the region under study and the resources found in that region. An evaluation of a particular rock unit's significance rests on the known importance of specific fossils. Often this significance is reflected as a sensitivity ranking relative to other rock units in the same region. Regardless of the format used by a paleontologist to rank formations, the importance of any rock unit must be explicitly stated in terms of specific fossils known or suspected to be present (and if the latter, why such fossils are suspected), and why these fossils are of paleontological importance.

The formations below are within or near the project limits and have produced vertebrate, invertebrate and microfossils in the region and are therefore designated as being a High sensitive resource. They include:

- Marine – terrace deposits (Qmt) specifically, middle to upper Pleistocene sedimentary rocks.
- Casitas Formation (Qca) where it interfingers with the Santa Barbara (Qsb) Formation.

- Rincon Formation (Tr).

Construction Related Impacts

The State Route 101 Santa Barbara HOV project will likely require excavation in several local Quaternary units including potentially sensitive Marine-terrace deposits and the Casitas Formation (Map Sheets in Appendix B) and possibly in the Tertiary Rincon Shale. These units range anywhere from consolidated marine shale and siltstone to non-marine unconsolidated sands and gravels. The northern limit of the project begins near Sycamore Creek within the city limits of Santa Barbara at Post Mile 12.3 to its southern extent at Post Mile 1.4, near Carpinteria Creek in the City of Carpinteria.

Current project Alternatives 2 and 3 include widening to the inside medians to facilitate the HOV lanes in both directions while Alternative 1 proposes to widen to the outside from the existing number 2 lanes in both directions. Since Alternative 1 proposes to widen to the outside of the existing traveled way, requiring new cut sections and footing excavations, it has the potential to have the greatest environmental impact.

The proposed soil disturbance/excavation locations within potentially sensitive units that may require monitoring are depicted in Appendix B, Map Sheets 13-16, 21-22 and Table 1. Table 1 identifies type structure, post mile, map sheet, geologic unit/formation, sensitivity and known fossil types found within the unit. Based on the scope of work, construction impacts may come in the form of excavation for sound wall footings, retaining wall footings, cuts for widening, piles and bridge widening.

Proposed retaining and sound walls will either have a combination of spread or trench footings or pile caps. The range in depth below grade will be anywhere between 2- 4 feet for pile caps and spread footings and 6-10 feet for trench footings, depending on soil conditions.

In addition to the proposals for each of the Alternatives, construction of two highway structures are planned, including a new interchange at Sheffield Drive and Cabrillo Boulevard. At Sheffield Drive, pile caps and Cast-In-Drilled-Holes (CIDH) piles will support the structure(s). Pile cap depths will be 6 feet below grade while CIDH piles will be drilled to 35 feet and 2 feet in diameter.

Pier footings for the interchange at Cabrillo Boulevard. will be excavated to a depth of 5 feet.

Cumulative Impacts

Although construction excavation for the State Route 101 HOV project could have an adverse cumulative impact on paleontological resources, implementation of appropriate mitigation measures to salvage those resources during construction could reduce that impact to a less than significant level.

Land Ownership/Permits Required

At the time of this written report no private land will be required for the construction of the State Route 101 Santa Barbara HOV project and the existing right of way is assumed to be State owned and therefore not subject to permits for paleontological studies or fossil collection.

At the time of this written report no federal, other state agency or local agency land other than Caltrans property will be involved in construction that would require permits for paleontological studies or fossil collection.

RECOMMENDATIONS

The middle to upper Pleistocene sedimentary rocks of the Marine – terrace deposits, Santa Barbara Formation within the Casitas Formation, have produced vertebrate, invertebrate and microfossils in the region and are therefore designated as a sensitive resource.

Though the Rincon Formation is known to contain sensitive vertebrate and invertebrate fossils it is not exposed within the project limits. However, it is within close proximity along Via Real Road, north of State Route 101, between Post Mile 7.7 and 8.1 (Sheets 14 & 15, Appendix D). Due to its location its potential to produce fossils is considered relevant. However, the possibility of exposing fossils through excavation is unknown since data was not available on the vertical extent of this unit at the above site.

Based on field reviews and the paleontological literature available it does not appear that full-time monitoring will be required at the proposed excavation sites within the project. It is anticipated that only minor monitoring and spot checks will be necessary where soil disturbance will occur. However, this may change when a more definitive project scope has been established including the chosen alternative and its associated design parameters. Upon re-evaluation of the final design a Paleontological Mitigation Report may be initiated.

Avoidance, Minimization or Mitigation

The adverse impact to paleontological resources by construction excavation on the State 101 Santa Barbara HOV Project cannot be avoided by selecting a different alternative. Alternatives 1, 2 and 3 would all have potential to adversely impact paleontological resources. Adverse impacts to paleontological resources could be avoided by selecting the No-build alternative. The build alternatives are all constrained by the current existing right of way and the geologic formations of concern are laterally extensive. As a result, minimization measures are unlikely to be effective. However, proper mitigation could actually result in beneficial effects through the discovery of fossils that would not have been exposed without construction and, therefore, would not have been available for study.

Mitigation measures, specifically monitoring, salvage of fossil specimens, and data recovery during construction excavation for this project, will result in the reduction of the adverse impact to a less than significant level.

Mitigation Measures

Because there is a possibility of encountering scientifically significant specimens during excavation into middle to upper Pleistocene sedimentary rocks of the Marine – terrace deposits (Qmt), and interfingerings of the Santa Barbara (Qsb) into the Casitas Formation (Qca), paleontological mitigation in the form of monitoring, salvage and data recovery is indicated where excavation will disturb *in situ* deposits of these strata (Sheet 13-16, 21-22; Excavation table, Appendix D). The uppermost few feet of sediment in the project area is mostly covered by younger alluvial and fluvial fan deposits and is less likely to yield significant fossil remains however, deeper excavation for the proposed walls and structures has a chance of encountering fossils. Since the Rincon Formation (Tr) is adjacent to proposed excavation sites, mitigation in the form of monitoring, salvage and data recovery may also be necessary.

To reduce this potentially significant impact to a less than significant level, monitoring, salvage, and data recovery is recommended where excavation will disturb *in situ* sedimentary strata as indicated by the hatched areas on the Map Sheets in Appendix D. The goal of mitigation is to reduce the adverse impact on paleontological resources within the project area by collecting and preserving scientific data.

Paleontological mitigation for the project will require the following actions:

1. A nonstandard special provision for paleontology mitigation must be included in the construction contract special provisions to advise the construction contractor of the requirement to cooperate with the paleontological salvage.

2. A qualified principal paleontologist (M.S. or PhD in paleontology or geology familiar with paleontological procedures and techniques) must be retained to prepare a detailed Paleontological Mitigation Plan once enough design information is available to precisely define monitoring areas and prior to the start of construction. All geologic work must be performed under the supervision of a California Professional Geologist. The Paleontological Mitigation Plan will address in detail the procedures for data collection including:

- Recording pertinent geographic and stratigraphic information.
- Recovery methods for both macrofossil and microfossil remains.
- Stabilization (preservation) methods for the specimens.
- Provisions for the remains to be accessioned into the collections of an appropriate repository (such as the LACM or UCMP) and catalogued for future scientific study.
- Preparation of a final report detailing the results of the mitigation program once work is completed

3. The qualified principal paleontologist will be present at pre-grading meetings to consult with grading and excavation contractors.

4. Prior to the start of excavation, the principal paleontologist will conduct an employee environmental awareness training session for all persons involved in earth moving for the project.

5. A paleontological monitor, under the direction of the qualified principal paleontologist, will be on site to inspect cuts for fossils at all times during original disturbance of sensitive geologic formations. Once excavation is underway, the intensity of monitoring may be reduced in areas that are not producing fossils.

6. When fossils are discovered, the paleontologist (or paleontological monitor) will recover them. Construction work in these areas may be halted or diverted to allow recovery of fossil remains in a timely manner.

7. Bulk sediment samples will be recovered from fossiliferous horizons and processed for micro vertebrate remains as determined necessary by the principal paleontologist.

8. Fossil remains collected during the monitoring and salvage portion of the mitigation program will be cleaned and prepared to the point of identification (not exhibition), sorted, and cataloged.

9. Prepared fossils, along with copies of all pertinent field notes, photos, and maps, will then be deposited in an appropriate and Caltrans approved scientific institution with paleontological collections.

10. A final report will be completed that outlines the results of the mitigation program and will be signed by the Principal Paleontologist and Professional Geologist

APPENDIX A- Project Maps

APPENDIX B - Previous Reports

- Linden Avenue and Casitas Pass Road Interchange Project, July 15, 2008 EA 05-4482U0

APPENDIX C- Study Maps and Illustrations

APPENDIX D - Map Sheets in Sensitive Paleontological Table with Proposed Excavation.

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Appendix A

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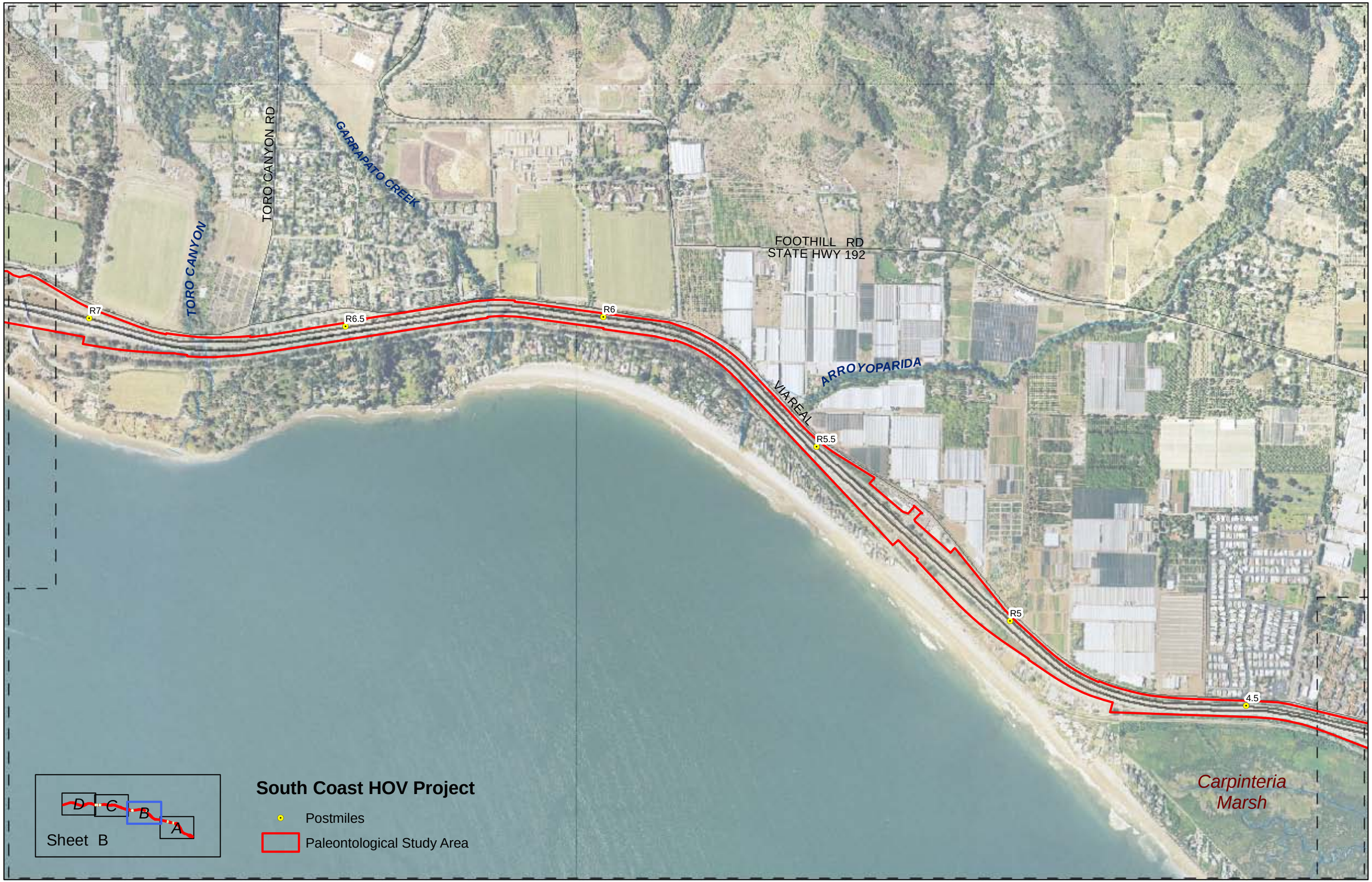
South Coast HOV Project
Postmiles
Paleontological Study Area
Sheet A
D
C
B
A
Carpinteria Marsh
VIA REAL
SANTA MONICA RD
SANTA YNEZ AVE
SANTA MONICA CREEK
FRANKLIN CREEK
7TH ST
LINDEN AVE
FOOTHILL RD
STATE HWY 192
CASITAS PASS RD
CARPINTERIA CREEK
CARPINTERIA AVE
BAILARD AVE
Begin Project
4
3.5
3
2.5
2
1.5


TORO CANYON RD
GARRAPATO CREEK
TORO CANYON
FOOTHILL RD
STATE HWY 192
R7
R6.5
R6
ARROYOPARIDA
VIA REAL
R5.5
R5
4.5
Carpinteria Marsh
D
C
B
A
Sheet B
South Coast HOV Project
Postmiles
Paleontological Study Area

SHEFFIELD DR
ORTEGA HILL RD
SAN YSIDRO CREEK
PICAY CREEK
JAMESON LN
9.5
9
8.5
R8
LILLIE AVE
R7.5
VIA REAL
D
C
B
A
Sheet C
South Coast HOV Project
Postmiles
Paleontological Study Area

CAMINO VIEJO
ALSTON RD
SYCAMORECANYON RD
HOT SPRINGS RD
HOT SPRINGS RD
SAN YSIDRO RD
MONTECITO CREEK
SALINAS ST
OLD COAST HWY
11.5
12
End Project
Andre Clark Bird Refuge
SYCAMORE CREEK
STATE HWY 225
CABRILLO BLVD
COAST VILLAGE HWY
COAST VILLAGE RD
11
OLIVE MILL RD
10.5
JAMESON LN
10
CHANNEL DR
D
C
B
A
Sheet D
South Coast HOV Project
Postmiles
Paleontological Study Area

Appendix B

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FINAL

PALEONTOLOGY IDENTIFICATION REPORT (PIR)

LINDEN AVENUE AND CASITAS PASS ROAD INTERCHANGES PROJECT

SB-101-PM 2.2/3.4

EA 05-4482U0

November 8, 2008

California Department of Transportation, Central Region, San Luis Obispo Office

Central Coast Technical Studies Branch

Environmental Engineering Section

Wayne W. Mills

For individuals with sensory disabilities this document is available in alternate formats. Please call or write to: Val Levulett, Environmental Planning, 50 Higuera Street, San Luis Obispo, CA 93401, Phone: 805-549-3669 and California Relay Service TTY number 1-800-735-2929.

Introduction

This paleontology identification report was prepared for the proposed project that would make operational improvements to Route 101 within the City of Carpinteria (see Figure 1) in Santa Barbara County. The purpose of this report is to determine the potential for the proposed project to impact sensitive paleontological resources within the project limits. The proposed action includes reconstructing the Linden Avenue and Casitas Pass Road interchanges, reconfiguring on- and off-ramps, replacing Route 101 bridges over Carpinteria Creek, extending Via Real frontage road from Bailard Avenue through to Casitas Pass Road, adding a new bridge over Carpinteria Creek at Via Real, and reconstructing bike paths. The proposed action will take place on Route 101 and adjacent streets from west of Franklin Creek to just east of Carpinteria Creek. The project area is approximately one mile in length and located within the City of Carpinteria in Santa Barbara County.

The southern half of the project south of the project from just south of Carpinteria Creek Bridge to Vallecito is the same in all four alternatives. The Casitas Pass Road over-crossing will be replaced by a 5-lane structure and the Via Real Frontage Road extension will be constructed. Route 101 will be repaved, and the profile of the highway will be raised from the southern end of the project to just north of the Casitas Pass Over-crossing.

Alternatives 1 and 4 would construct a 5-lane over-crossing at Linden Avenue with a direct connection to the northbound on-ramp. They are essentially the same, except for minor variations in the Via Real extension alignment in the area of the Verizon property northeast of the Linden Avenue Over-crossing. Alternatives 2 and 3 require a 4-lane over-crossing of Linden Avenue with the northbound on-ramp connection on Via Real. Alternative 2 would have a standard intersection on Via Real, and the on-ramp, whereas Alternative 3 would construct a roundabout. Approximately 20 other project alternatives were considered and rejected.

The project is required because this area (including local streets) is experiencing steadily increasing congestion. Another objective of the project is to reduce floodplain impacts from existing Route 101. Reduction of floodplain impacts would be accomplished by widening the existing bridges over Carpinteria Creek, and by planning an adequate structure for the proposed extension of Via Real. Application of the most current design standards will also improve traffic operations in this area. The improvements are funded through the HE-11 New Connections and Cross-Traffic Improvements Program.

Route 101 through Carpinteria currently has two lanes in each direction with a 40-foot median. The highway is bordered with a mix of commercial, residential, agricultural properties, and open space.

FIGURE 1—PROJECT VICINITY MAP

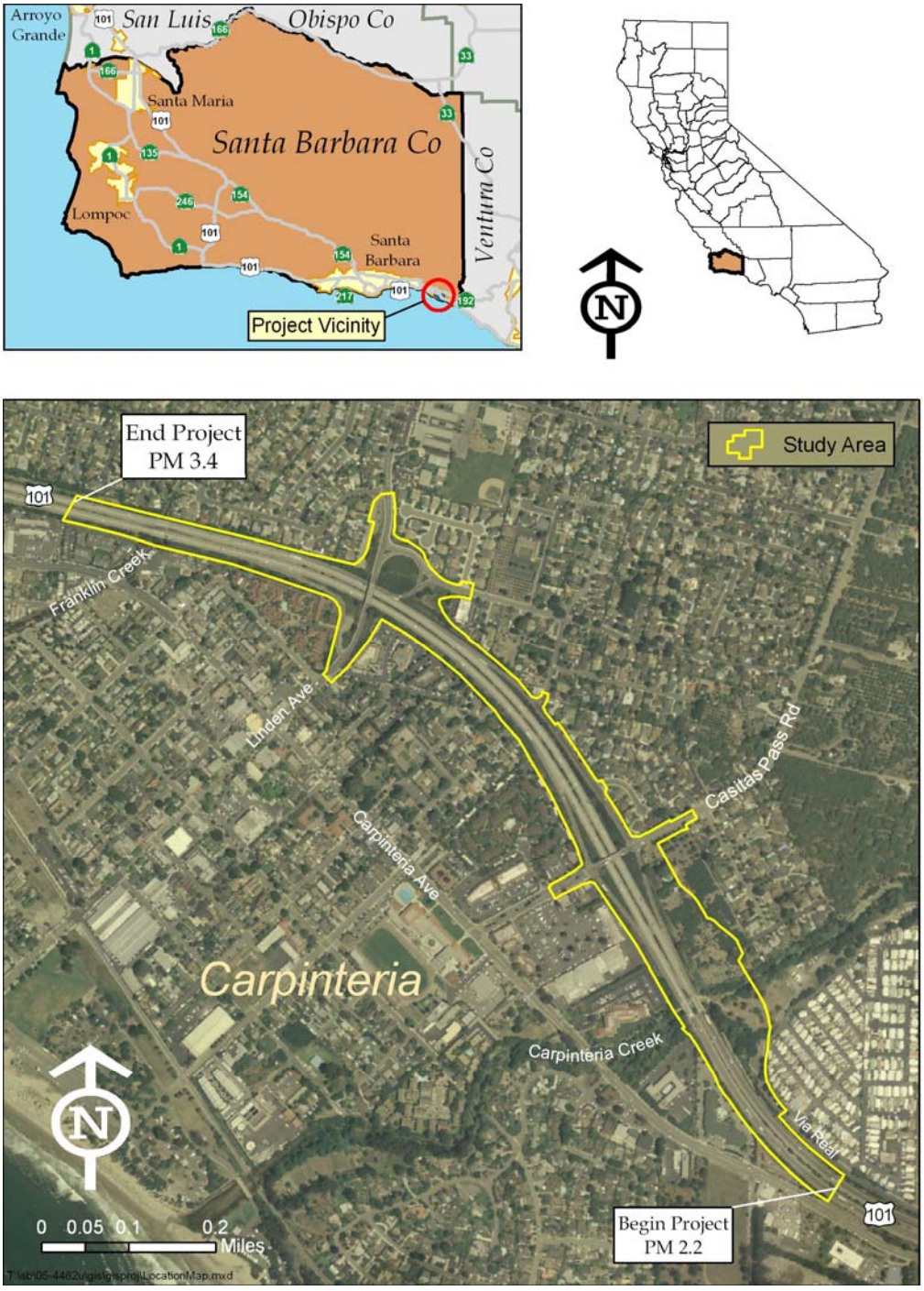
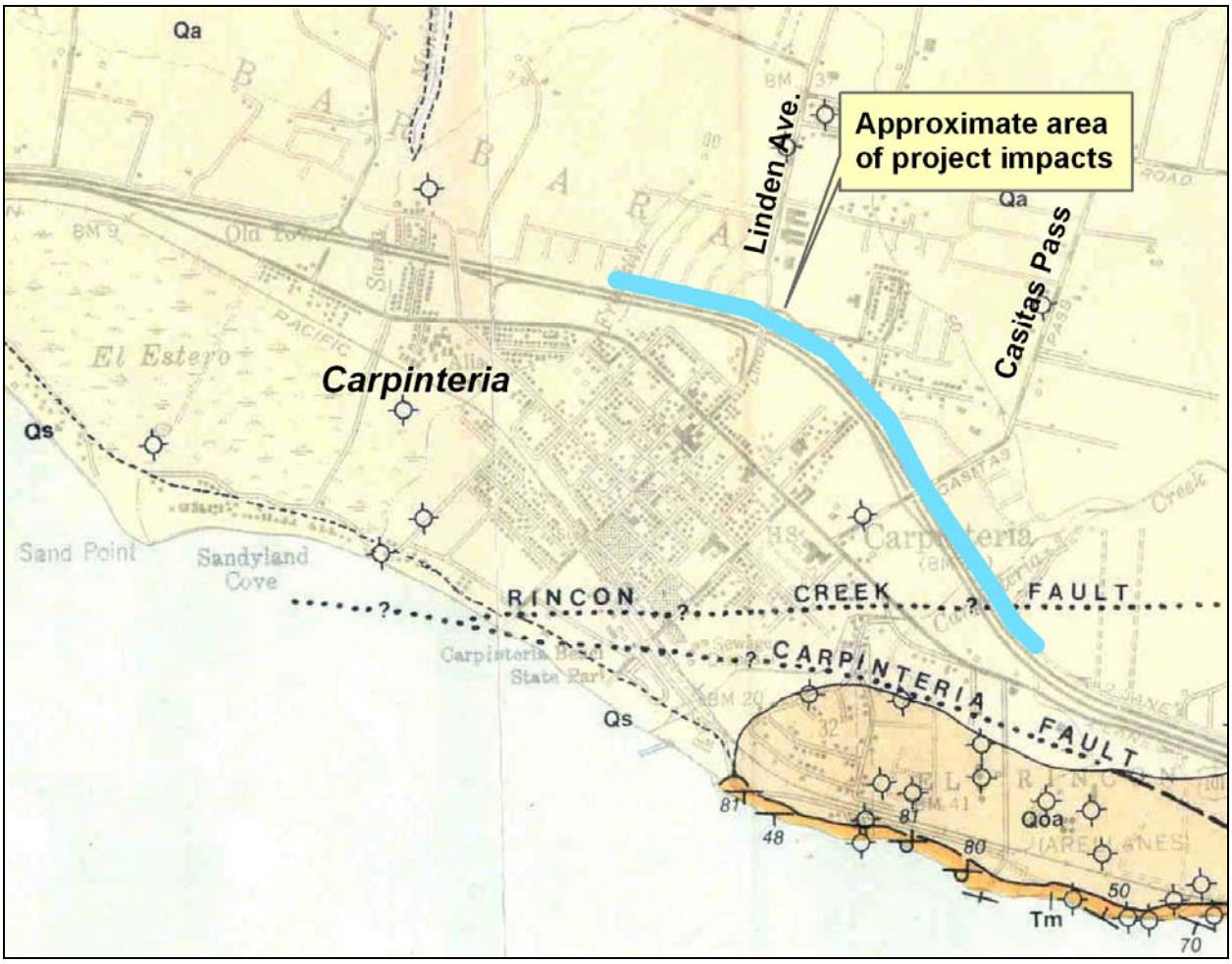


FIGURE 2—PROJECT GEOLOGY MAP



Regulatory Setting

Paleontology is the study of life from past geologic ages. The current geologic age is called the Holocene, and it began about 10,000 years ago. Several laws regulate impacts on paleontological resources. Some of these regulations are:

-The Antiquities Act of 1906 requires permission for collecting 'objects of antiquity" on public lands.

-The National Environmental Policy Act (NEPA) requires federal agencies to use "all practicable means to preserve important historic, cultural and natural aspects of our national heritage."

-The California Environmental Quality Act (CEQA) states that projects should not be approved if there are feasible alternatives that would avoid "significant effects" to the environment. This statement includes effects to sensitive paleontological resources.

-Public Resource Code 5097.5 requires permission from the regulating agency to `"excavate upon, remove, destroy, injure or deface…" paleontological or archaeological remains on public land.

For further information on these and other laws affecting paleontological resources, see Caltrans Standard Environmental Reference, Chapter 8 at:
www.dot.ca.gov/ser/vil11/sec3/physical/Ch08Paleo/ch08paleo

Long-term (Permanent) and Short Term (Construction) Impacts

Fossils (especially vertebrate fossils) recovered in situ by qualified paleontologists are our main source of important information about the history and changing environments of the land we now inhabit.

To assist with the identification of sensitive paleontological resources[1], Caltrans and California State University Fresno published Paleontology Sensitivity Mapping Project (PSMP) in June 2000. This work studied fossil occurrences throughout the Central Region, and assigned potentials for formations underlying highways in the Central Region to contain sensitive paleontological resources. PSMP is a good tool for initial studies, but often more detailed geologic maps need to be consulted to accurately determine if further work is required to preserve sensitive resources on individual projects.

[1] A sensitive paleontological resource is a vertebrate or rare or unusual plant fossil.

The proposed work is in an area that is shown as having low potential for encountering sensitive paleontological resources in PSMP. PSMP in District 5 is based on the 1:250,000 scale Geologic Map of California—map sheets. According to the 1:24,000 scale Geologic Map of the Carpinteria Quadrangle (Figure 1), published by Thomas Dibblee in 1986, the entire project limits are underlain a thick deposit of Quaternary alluvium (Qa). This formation is described in PSMP as having a low potential for containing sensitive fossils. Paleontology field surveys were conducted in the project vicinity in Fall 2006. No evidence of sensitive paleontological resources was found.

Minimization

Since there still exists the potential to find sensitive paleontological remains in low sensitivity formations, the following statement shall be included in the Resident Engineer's Instructions.

If any vertebrate or plant fossils are discovered during construction, it is required that construction be halted in the immediate vicinity (33-foot radius) of the discovery, until the District Paleontology Coordinator has the opportunity to review the find. Contact names and telephone numbers are:

District Paleontology Coordinator: Isaac Leyva (805) 549-3487

Remediation of any sensitive resources encountered before or during construction may include removal, preparation and curation of any significant remains.

Report prepared by

Wayne W. Mills, District Paleontology Coordinator 1998 to present

BA Earth Science, Cal State Fullerton, 1974

WWM:wwm

cc:file

Lara Bertaina, Environmental Planning, SLO

Kari Bhana, Project Design, SLO

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Appendix C

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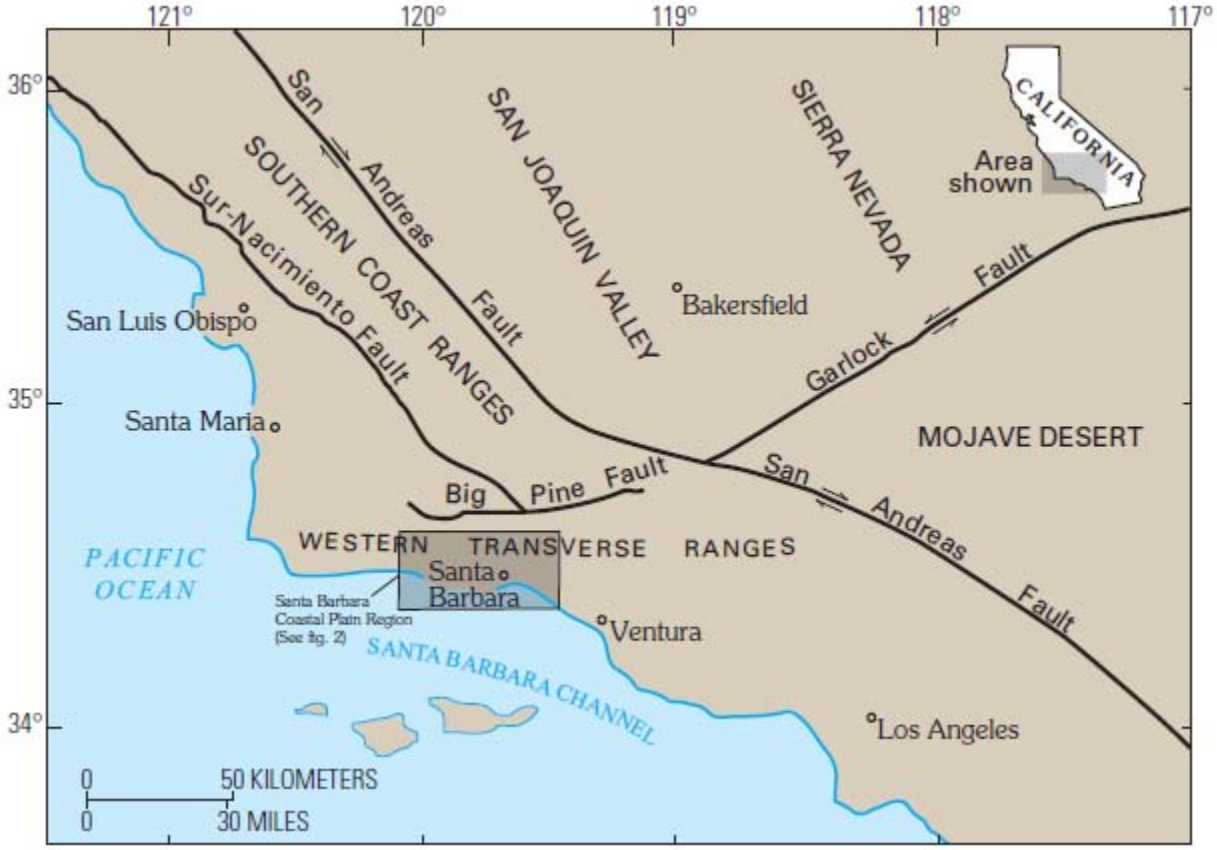

Figure 1, Appendix C. Regional map of southwestern California coast line with Santa Barbara Coastal Plain and major faults (Minor, USGS 2009)

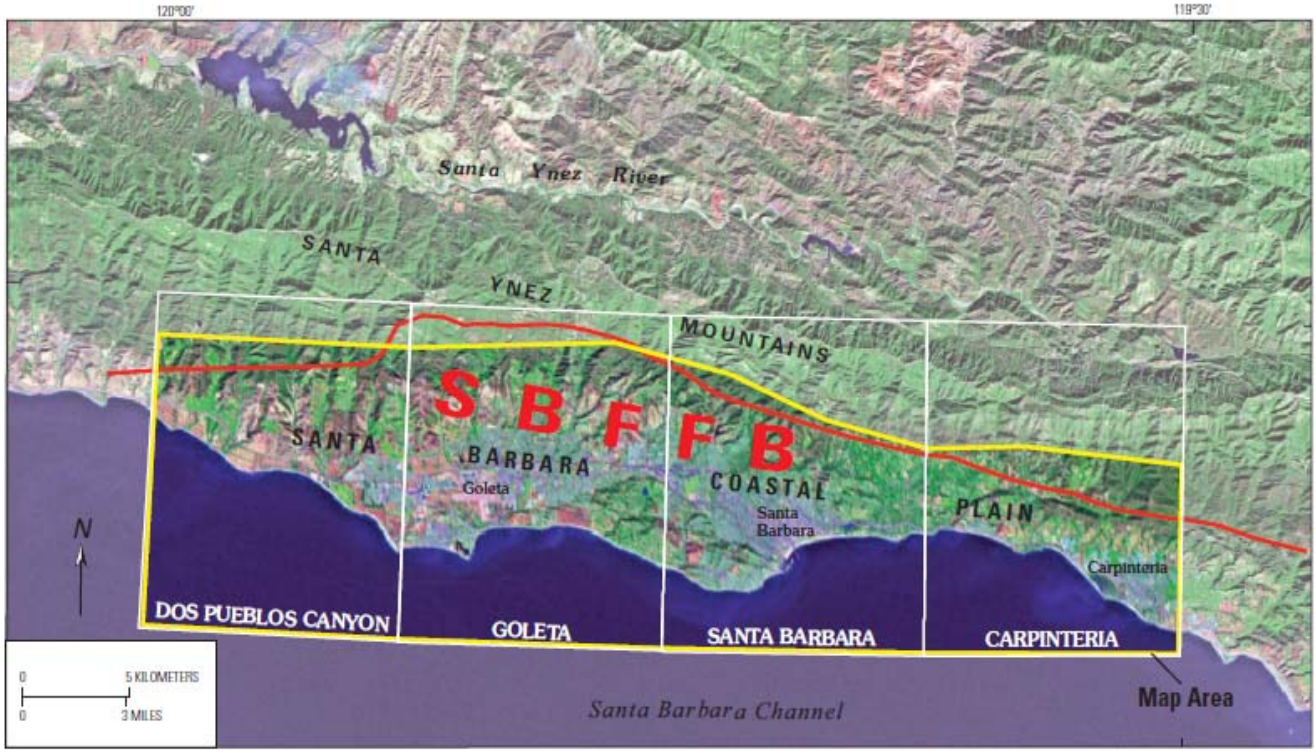

Figure 2, Appendix C. Landsat 7 image of Santa Barbara coastal plain region showing location of map area (yellow border) within the component 7.5' quadrangle (white rectangles). Approximate northern boundary of Santa Barbara fold and fault belt (SBFFB) is shown in red.

Figure 3, Appendix C. Photo of Santa Ynez Mountain range north of the City of Santa Barbara (Minor, 2009)

Figure 4, Appendix C. View from the northeast onto the Santa Barbara Coastal Plain. City of Santa Barbara in the central portion of the photo while Santa Cruz Island is in the background (Minor, 2009).

Figure 5, Appendix C. Exposure of Quanternary Marine-terrace unit (Qmt) near Santa Barbara Point. Qmt uncomformably sits over folded and faulted Monterey Formation (Minor, 2009)

Figure 6, Appendix C. View looking east off of Loon Pt. Shows oblique -reverse faulting exposed in the sea cliff with Pleistocene terrestrial deposits of the Casitas Fm. (Qca) overlying older Marine –terrace deposits. (Qmt) (Minor, 2009).

Figure 7, Appendix C. Santa Barbara coastal plain geomorphic relief map (Minor, 2009).

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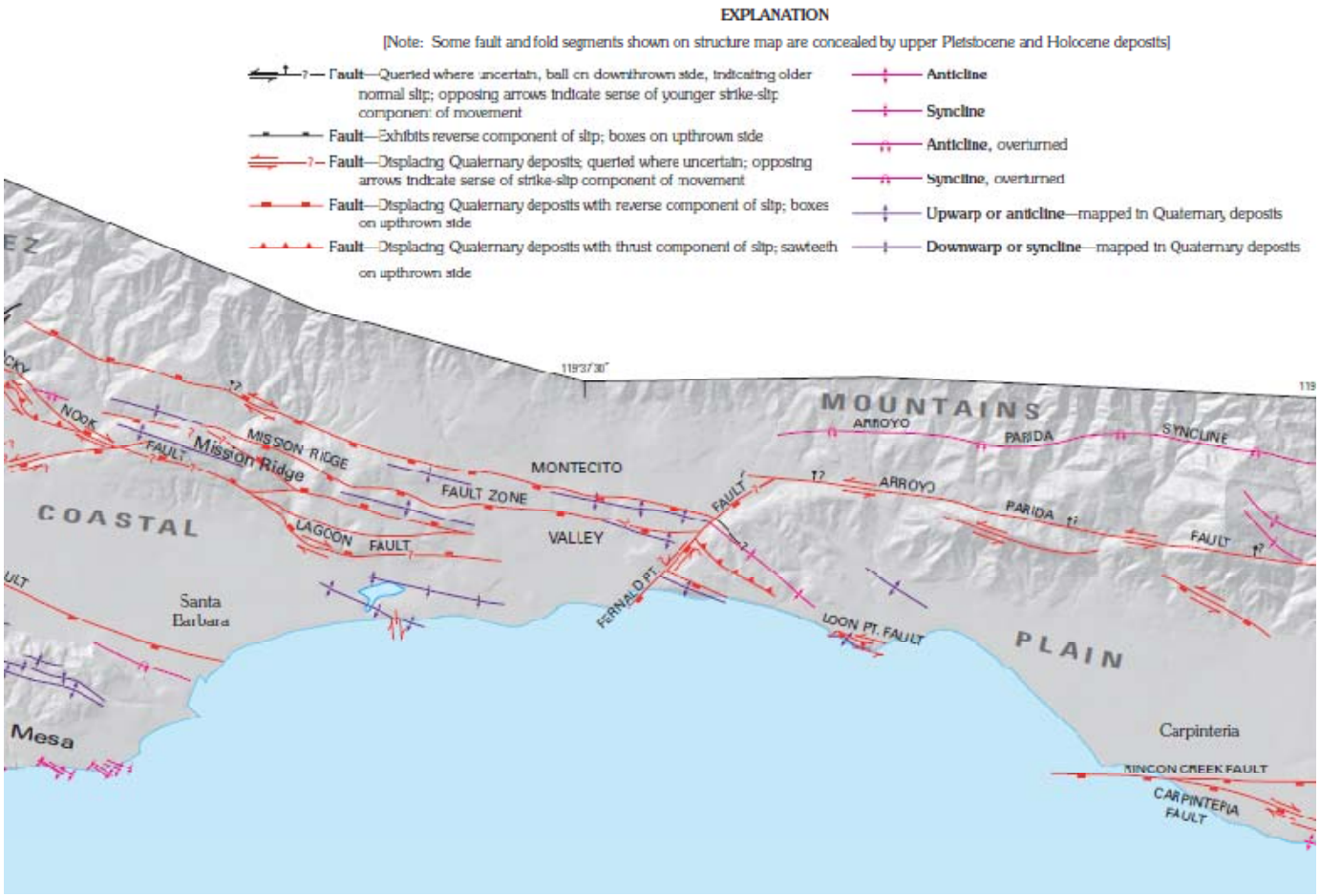

Figure 8, Appendix C. Map study area showing major structural blocks and faults. (Minor, USGS 2009)

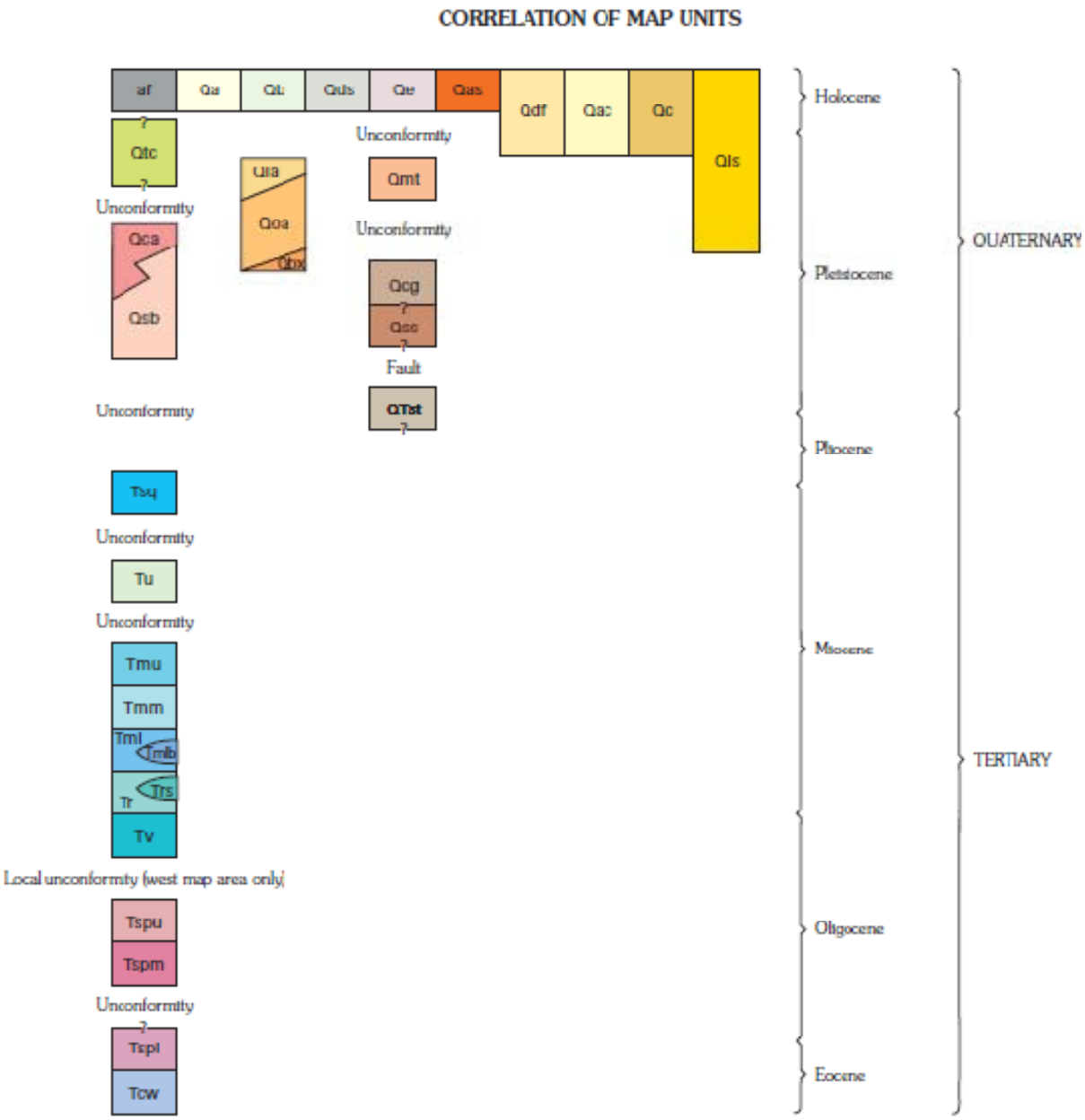

Figure 9, Appendix C. Geologic map unit and time scale correlation (Minor, USGS 2009).

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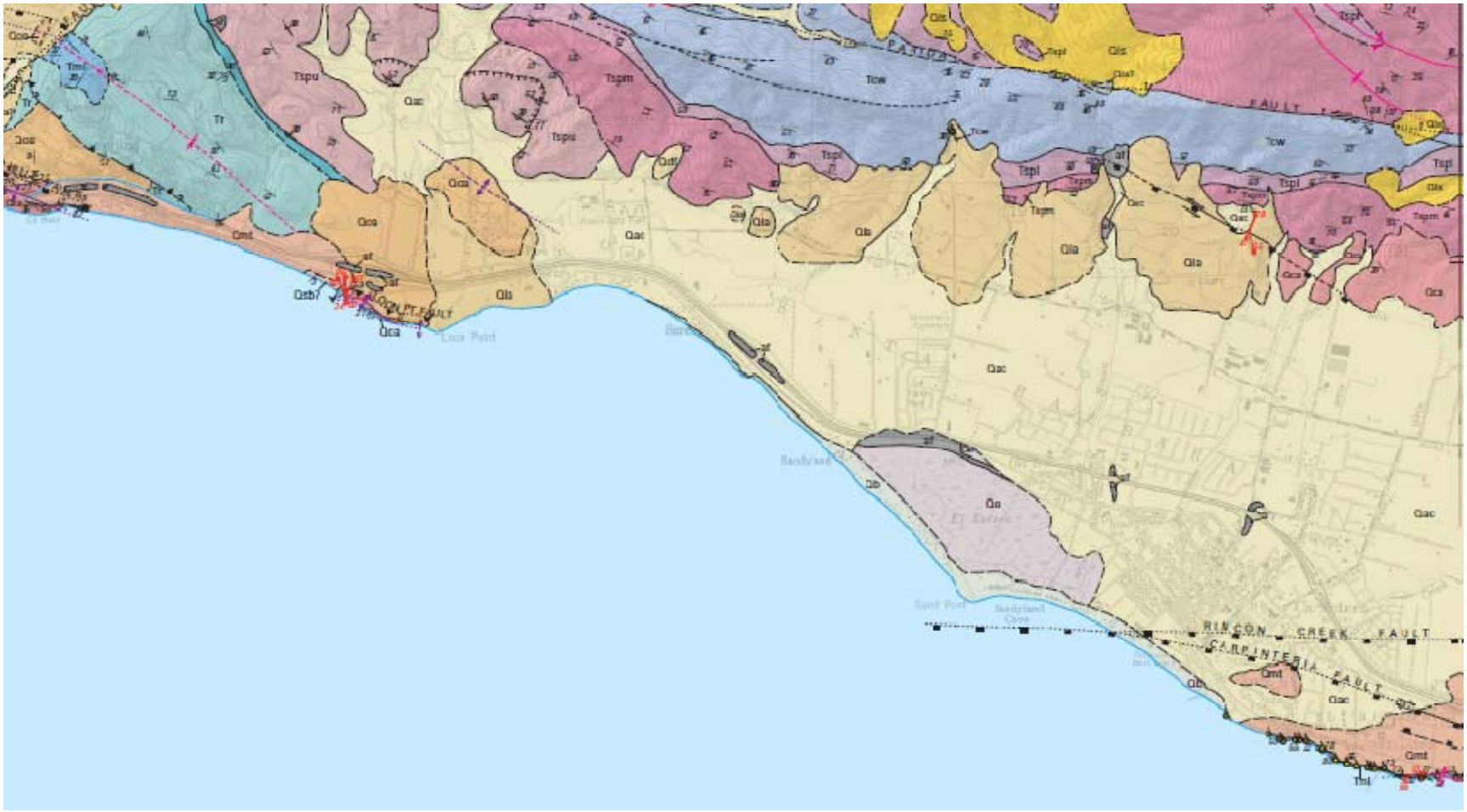

Figure 10a, Appendix C Geologic Map - Rincon Creek to Ortega Hill (Minor, USGS 2009).

Figure 10b, Appendix C. Geologic Map - Ortega Hill to Sycamore Creek (Minor, USGS 2009).

Appendix D

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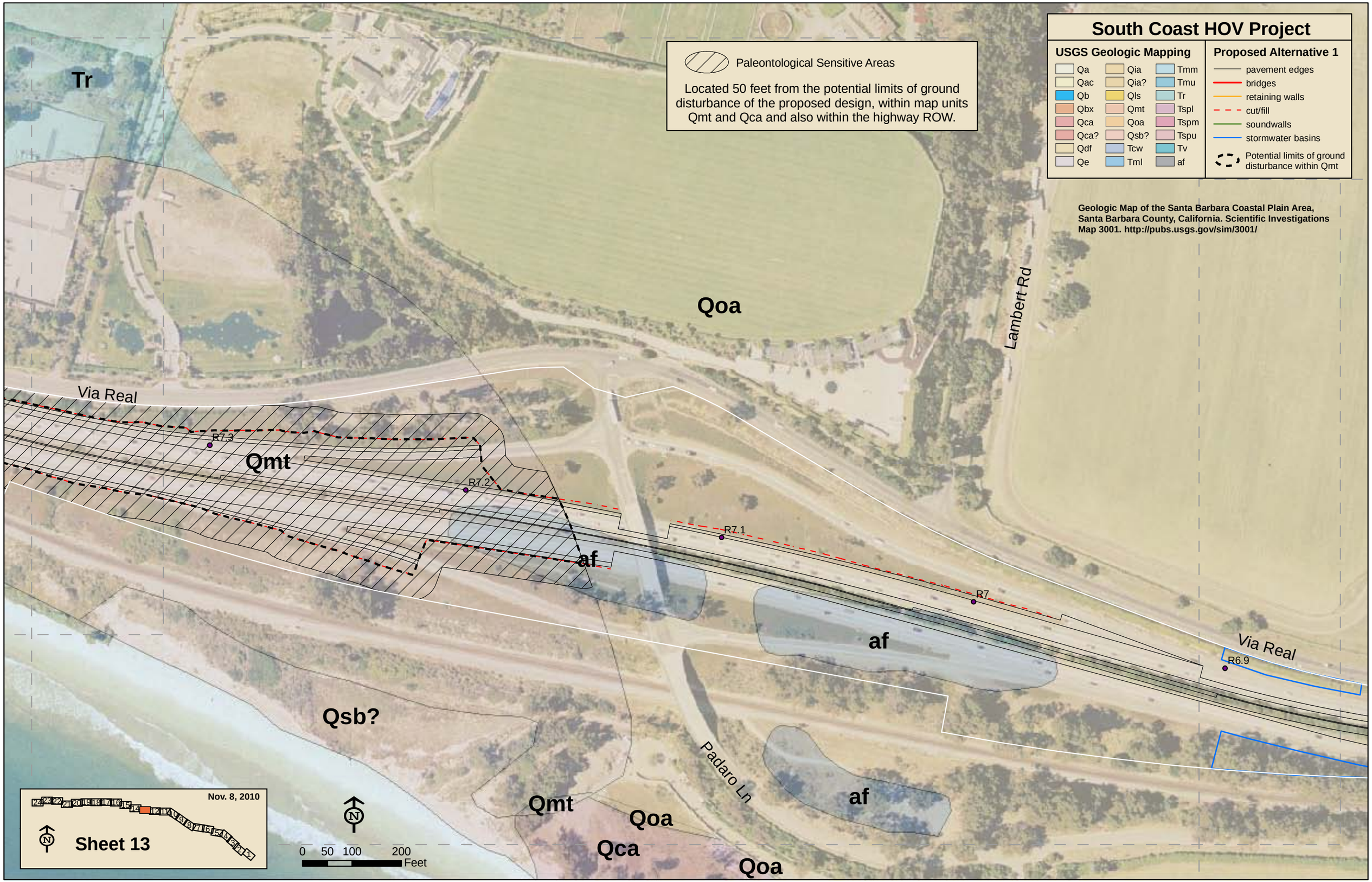
South Coast HOV Project
USGS Geologic Mapping
Qa
Qac
Qb
Qbx
Qca
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Qdf
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Qia
Qia?
Qls
Qmt
Qoa
Qsb?
Tcw
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Tmm
Tmu
Tr
Tspl
Tspm
Tspu
Tv
af
Proposed Alternative 1
pavement edges
bridges
retaining walls
cut/fill
soundwalls
stormwater basins
Potential limits of ground disturbance within Qmt
Paleontological Sensitive Areas
Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.
Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California. Scientific Investigations Map 3001. http://pubs.usgs.gov/sim/3001/
Tr
Qoa
Lambert Rd
Via Real
R7.3
Qmt
R7.2
R7.1
af
R7
af
Via Real
R6.9
Qsb?
Padaro Ln
af
Qmt
Qoa
Qca
Qoa
Nov. 8, 2010
Sheet 13
0 50 100 200
Feet

Nov. 8, 2010
Sheet 14
Tr
Colby St
Via Real
R7.8
R7.7
R7.6
R7.5
R7.4
Vista Oceano Ln
Caspia Ln
Freesia Dr
Marguerite Way
Tr
Qoa
Qmt
Via Real
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South Coast HOV Project
USGS Geologic Mapping
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Proposed Alternative 1
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retaining walls
cut/fill
soundwalls
stormwater basins
Potential limits of ground disturbance within Qmt
Paleontological Sensitive Areas
Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.
Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California. Scientific Investigations Map 3001. http://pubs.usgs.gov/sim/3001/

Nov. 8, 2010
Sheet 15
Qoa
Lillie Hl
Evans Ave
Lillie Ave
Varley St
Banner Ave
Golden Gate Ave
Shelby St
Colville St
Tr
Ortega Hill Rd
af
R8.3
R8.2
af
Valencia Rd
Olive St
Lillie Ave
R8.1
Tr
Temple St
Wallace Ave
Lookout Park Rd
Qmt
Qca
Finney St
R8
Finney St
R7.9
Via Real
R7.8
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Feet
South Coast HOV Project
USGS Geologic Mapping
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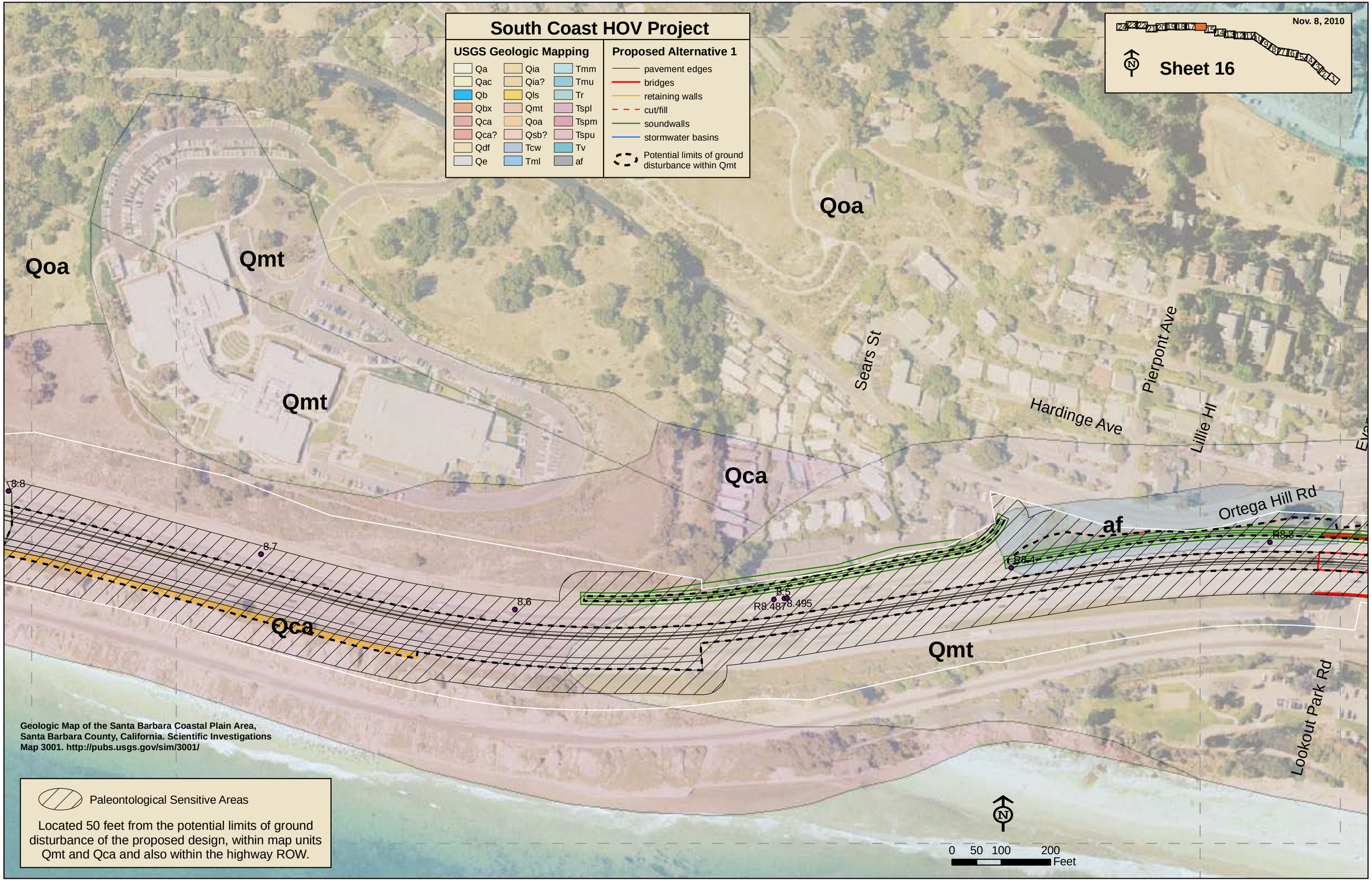
Proposed Alternative 1
pavement edges
bridges
retaining walls
cut/fill
soundwalls
stormwater basins
Potential limits of ground disturbance within Qmt
Paleontological Sensitive Areas
Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.
Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California. Scientific Investigations Map 3001. http://pubs.usgs.gov/sim/3001/


South Coast HOV Project
USGS Geologic Mapping
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Proposed Alternative 1
pavement edges
bridges
retaining walls
cut/fill
soundwalls
stormwater basins
Potential limits of ground disturbance within Qmt
Nov. 8, 2010
Sheet 16
Qoa
Qmt
Qmt
Qca
Qoa
Sears St
Hardinge Ave
Pierpont Ave
Lillie Hl
Ortega Hill Rd
af
Qca
Qmt
Lookout Park Rd
8.8
8.7
8.6
8.5
R8.487
8.495
R8.4
R8.3
Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California. Scientific Investigations Map 3001. http://pubs.usgs.gov/sim/3001/
Paleontological Sensitive Areas
Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.
0 50 100 200
Feet

Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California. Scientific Investigations Map 3001. http://pubs.usgs.gov/sim/3001/

Paleontological Sensitive Areas

Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.

N

0 50 100 200 Feet

South Coast HOV Project

USGS Geologic Mapping

Qa	Qia	Tmm
Qac	Qia?	Tmu
Qb	Qls	Tr
Qbx	Qmt	Tspl
Qca	Qoa	Tspm
Qca?	Qsb?	Tspu
Qdf	Tcw	Tv
Qe	Tml	af

Proposed Alternative 1

- pavement edges
- bridges
- retaining walls
- cut/fill
- soundwalls
- stormwater basins
- Potential limits of ground disturbance within Qmt

Nov. 8, 2010

N

Sheet 17

Paleontological Sensitive Areas
Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.
Hermosillo Rd
Butterfly Ln
Qoa
Coast Village Hwy
Coast Village Cir
11.1
11
10.9
10.8
10.7
10.6
Qmt
Butterfly Ln
Qac
Depot Rd
Hill Rd
Qoa
Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California. Scientific Investigations Map 3001. http://pubs.usgs.gov/sim/3001/
South Coast HOV Project
USGS Geologic Mapping
Qa
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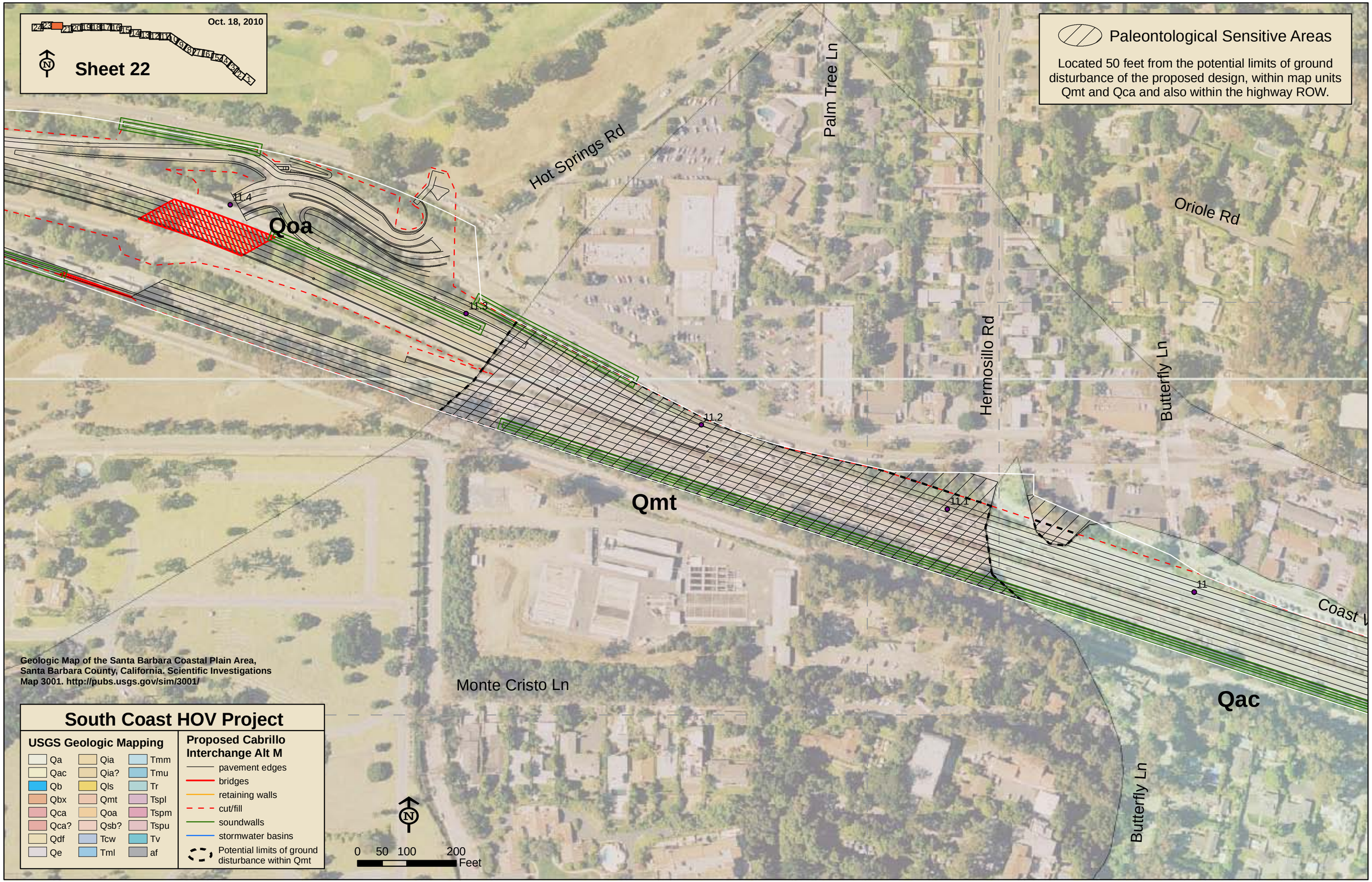
Proposed Cabrillo Interchange Alt M
pavement edges
bridges
retaining walls
cut/fill
soundwalls
stormwater basins
Potential limits of ground disturbance within Qmt
N
0 50 100 200
Feet
Oct. 18, 2010
Sheet 21


Oct. 18, 2010
Sheet 22
Paleontological Sensitive Areas
Located 50 feet from the potential limits of ground disturbance of the proposed design, within map units Qmt and Qca and also within the highway ROW.
Hot Springs Rd
Palm Tree Ln
Oriole Rd
Hermosillo Rd
Butterfly Ln
Monte Cristo Ln
Qoa
Qmt
Qac
11.4
11.3
11.2
11.1
11
Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California. Scientific Investigations Map 3001. http://pubs.usgs.gov/sim/3001/
South Coast HOV Project
USGS Geologic Mapping
Qa
Qac
Qb
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Qca
Qca?
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Proposed Cabrillo Interchange Alt M
pavement edges
bridges
retaining walls
cut/fill
soundwalls
stormwater basins
Potential limits of ground disturbance within Qmt
0 50 100 200 Feet

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Table 1. Proposed Soil Excavation within Sensitive Geologic Units

Structure/Feature Type	**Approx. Post Mile**	**Map Sheet**	**Geologic unit and Age**	**Sensitivity**	**Known fossil Type**
Sound Wall	R7.70-R7.8 R7.80-8.06	14,15,	Qmt – Marine Terrace Deposits. Middle to Upper Pleistocene	High	Coral- *Balanopha elegans* Mammoth – *Archidiscodon imperator*
Retaining Wall	8.63-8.80	16, 17	Qca – *Casitas Formation (Santa Barbara Fm. (Qsb) , Sespe Fm(Tv).)	High	Mammoth(Sespe Fm.- *Mammut americanum* Rihnocerose(Sespe Fm. – *Perissodactyca Brontotheriidae*
Cut	R7.1-7.3 R7.4-R7.8 R7.8-R8.06 11.05-11.08	13,14, 15,21	Qmt – Marine Terrace Deposits. Middle to Upper Pleistocene	High	Coral- *Balanopha elegans* Mammoth – *Archidison imperator*
Interchange at Cabrillo Blvd.	11.9	22	Qmt – Marine Terrace Deposits. Middle to Upper Pleistocene	High	Coral- *Balanopha elegans* Mammoth– *Archidiscodon imperator*
SoundWall	7.7-8.1	13,14	Tr- **Rincon Formation, Lower Miocene	High	Rodentia- *Cricetidea* *Chondrichthyes Elasmobranchii*

* The Casitas Formation typically does not contain sensitive fossil resources but has been known to have facies (inter-fingering) including clastic remnants of the Santa Barbara and Sespe Formation that have known sensitive fossil resources.

** The Rincon Formation is outside the limits of the project, yet is in close proximity to the above location.