Natural Environment Study

Santa Cruz Route 1 HOV

Tier I Corridor Analysis of
High Occupancy Vehicle (HOV) Lanes and Transportation System Management (TSM) Alternatives
(05 SCR-1-PM 7.24-16.13)
and

Tier II Build Project Analysis
41st Avenue to Soquel Avenue/Drive
Auxiliary Lanes and Chanticleer Avenue Pedestrian Overcrossing
(05 SCR-1-PM 13.5-14.9)
EA 0C7300

Prepared by the
State of California Department of Transportation

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U.S. Department of Transportation

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Natural Environment Study

TIER I - CORRIDOR ANALYSIS OF
HIGH OCCUPANCY VEHICLE (HOV) LANES
AND TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVES
AND
TIER II - BUILD PROJECT ANALYSIS OF
41ST AVENUE TO SOQUEL AVENUE/DRIVE AUXILIARY LANES AND
CHANTICLEER AVENUE PEDESTRIAN OVERCROSSING

San Andreas-Larkin Valley Road Interchange to Morrissey Boulevard Interchange in Santa Cruz County

05-SCR-1- PM R7.24/16.13 (KP R11.64/25.96)
EA 05-0C7300

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Prepared By: _____ Date: 01-13-15

Jon Claxton, Natural Resources Team Lead
(805) 543-7095
SWCA Environmental Consultants

Approved By: _____ Date: 1-29-15

Larry Bonner, Senior Environmental Planner
(805) 549-3337
District 5
California Department of Transportation

State Route 1 HOV Lane Widening Project (From Morrissey Boulevard to San Andreas Road) NATURAL ENVIRONMENT STUDY

Errata

June 10, 2015

This Errata sheet revises the Natural Environment Study as described below.

1. **Table 7: Special-status Animal Species Potentially Occurring in the BSA.** This Errata sheet revises the Natural Environment Study's discussion of the tricolored blackbird row in Table 7. The status of the tricolored blackbird is SE.

2. **Section 4.3.9**. This Errata sheet revises the Natural Environment Study's discussion of the tricolored blackbird. The tricolored blackbird is a state endangered (SE) species by CDFW.

3. **Species List**. This Errata sheet provides a new species list for the project, located at the end of this document.

4. **Project Description**. The project description text provided in Section 1.3 of the report is hereby changed to replace the existing text of Section 1.3 with the following text.

1.3 Project Description

Purpose

The purpose of the proposed Tier I project on Route 1 within the project limits is to achieve the following:

- Reduce congestion.
- Promote the use of alternative transportation modes as means to increase transportation system capacity.
- Encourage carpooling and ridesharing.

The purpose of the Tier II project is to:

- Reduce congestion.
- Improve safety.
- Promote the use of alternative transportation modes as means to increase transportation system capacity.

The main distinction between the Tier I and Tier II project purposes is the Tier II project also addresses a congestion-related safety need within its limits but will not promote carpooling in the Route 1 corridor.

The Tier I and Tier II projects are intended to address specific deficiencies and needs on Route 1, as described in the following subsection.

Need

The Tier I and Tier II projects address the following needs resulting from deficiencies on Route 1 within the project limits:

- Several bottlenecks along Route 1 in the southbound and northbound directions cause recurrent congestion during peak hours.
- Travel time delays due to congestion are experienced by commuters, commerce, and emergency vehicles.
- "Cut-through" traffic, or traffic on local streets, occurs and is increasing because drivers seek to avoid congestion on the highway.
- Limited opportunities exist for pedestrians and bicyclists to safely get across Route 1 within the project corridor.

Within the Tier I project limits, in addition to the common needs identified above there is a need to address the following corridor-wide deficiencies:

- Insufficient incentives to increase transit service in the Route 1 corridor because congestion threatens reliability and cost-effective transit service delivery.
- Inadequate facilities to support carpool and rideshare vehicles over single-occupant vehicles, reducing travel time savings and reliability.

The Tier II project, in addition to the common needs identified above, also addresses the following need:

- Improve operational safety to address accident rates in excess of the statewide average.

Project Alternatives

This section describes the proposed project improvements and the project alternatives developed to meet the purpose and need, while avoiding or minimizing environmental impacts. The alternatives are the Tier I Corridor HOV Lane Alternative, the Tier I Corridor TSM Alternative, and the Tier II Auxiliary Lane Alternative.

The proposed Tier I and Tier II project locations are in Santa Cruz County, California, on Route 1.The Tier I eastern project limit is just south of the village of Aptos, approximately 0.4 mile south of the San Andreas-Larkin Valley Road interchange; the Tier I project then traverses the villages of Soquel, Live Oak and unincorporated Santa Cruz County. The western Tier I project limit is in the City of Santa Cruz, approximately 0.4 mile north of the Morrissey Boulevard interchange, for a total length of 8.9 miles. The Tier II project limits, which lie within the Tier I corridor, begin at 41st Avenue on the east and extend a distance of 1.4 miles westward to Soquel Avenue.

Within the Tier I and Tier II project limits, Route 1 is a four-lane divided freeway with 12-foot lanes. In the southbound direction the existing inside paved shoulder width varies from approximately 4 feet to 18 feet and in the northbound direction the existing inside paved shoulder width varies from 7 feet to 18 feet. In the southbound direction in the project corridor, the outside shoulder width varies from 8 feet to 12 feet. In the northbound direction in the project corridor, the outside shoulder width varies from 6 feet to 8 feet.

The purpose of the Tier I project is to reduce congestion, promote the use of alternative transportation modes as means to increase transportation system capacity, and encourage carpooling and ridesharing. The purpose of the Tier II project is to reduce congestion, improve safety, and promote the use of alternative transportation modes as means to increase transportation system capacity.

Alternatives

This section describes the Tier I Corridor Alternatives and the Tier II Auxiliary Lane Alternative that were analyzed in this document. The Project Development Team studied various design alternatives and options. In an effort to reduce and avoid impacts, the Project Development Team also considered preliminary environmental information to better understand the impacts of those alternatives. The views of stakeholders were elicited through public information meetings and meetings with local agency staff and elected officials. From this preliminary analysis and public outreach, a longer list of alternatives and options was narrowed to include the alternatives described below.

The Tier I Corridor HOV Lane and TSM Alternatives were originally conceived as construction-level study alternatives, under the assumption that funding would be available in the near future. The Project Development Team recognized that funding sources to construct either of those alternatives would be limited in the short term and that implementation of the Tier I project would occur over a multi-year period. To make a decision on the types of transportation improvements that would occur within the corridor in the future, Tier I project implementation alternatives were identified. The team decided to study the HOV Lane and TSM Alternatives in a Tier I or Master Plan environmental document. The Tier I/II DEIR/EA will allow for the identification of a preferred corridor alternative for the 8.9-mile-long project corridor and facilitate the programming of funds. At the same time, the team also recognized that there was sufficient funding to implement a construction-level Tier II project within the corridor that would have more immediate congestion-relief benefits. Accordingly, a Tier II Auxiliary Lane and Pedestrian/Bicycle Overcrossing Alternative is also defined and analyzed in the Tier I/II DEIR/EA.

The Tier I corridor analysis includes three alternatives: a Tier I Corridor HOV Lane Alternative, a Tier I Corridor TSM Alternative, and a Tier I No Build Alternative. As funding becomes available, the high-priority improvements in the corridor would become

subsequent incremental (Tier II) construction-level projects and would be subject to separate environmental reviews.

The Tier II corridor analysis considers an Auxiliary Lane Alternative and Pedestrian/Bicycle Overcrossing, and a No Build Alternative. The Tier II project is located between 41st Avenue and Soquel Avenue/Drive. It is anticipated that construction of the Tier II project could begin in 2016.

Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives

The Tier I HOV Lane and TSM Alternatives share many features, such as: the addition of auxiliary lanes, new pedestrian/bicycle overcrossings over Route 1, and Transportation Operations System elements. These common design features are described below.

Auxiliary Lanes

Auxiliary lanes are designed to reduce conflicts between traffic entering and exiting the highway by connecting the on-ramp of one interchange to the off-ramp of the next; they are not designed to serve through traffic. Auxiliary lanes would be constructed to improve merging operations at the locations listed below:

- Freedom Boulevard and Rio Del Mar Boulevard – northbound and southbound
- Rio Del Mar Boulevard and State Park Drive – northbound and southbound
- State Park Drive and Park Avenue – both directions in the TSM Alternative; southbound only in the HOV Lane Alternative
- Park Avenue and Bay Avenue/Porter Street – northbound and southbound
- 41st Avenue and Soquel Avenue/Drive – northbound and southbound

New Pedestrian/Bicycle Overcrossings

Both Tier I alternatives would construct new pedestrian/bicycle overcrossings of Route 1 at the following locations:

- Mar Vista Drive – The crossing would start on the north side of Route 1 and parallel the highway eastward for approximately 600 feet, doubling back westward as it climbs before crossing the highway and McGregor Drive at a right angle and then descending by switchbacks to and along Mar Vista Drive for approximately 550 feet; the final design will be determined as part of the Tier II design/environmental analysis of this facility.
- Chanticleer Avenue – The crossing would start at the Chanticleer Avenue cul-de-sac on the north side of Route 1 and run parallel the highway for approximately 400 feet to the west and then cross Route 1 and Soquel Avenue (frontage road) on a curved alignment, terminating just west of Chanticleer Avenue on the south side of the highway and Soquel Avenue (frontage road).

- Trevethan Avenue – The crossing would start on the north side of Route 1 at Trevethan Avenue and parallel the highway approximately 600 feet before crossing on an angle and continuing along the banks of the western tributary to Arana Gulch to terminate close to Harbor High School; multiple configurations are possible, with the final design to be determined as part of the subsequent design/environmental analysis of this facility.

Other Common Features of the Tier I Corridor Alternatives

The Tier I Corridor Alternatives would include reconstruction of the Santa Cruz Branch Rail Line bridges over Route 1 and the State Park Drive, Capitola Avenue, 41st Avenue, and Soquel Avenue overcrossings. The Santa Cruz Branch Line railroad underpass structures are proposed to be modified or replaced to accommodate highway widening to match the ultimate six-through-lane concept, including shoulder and sidewalk facilities to accommodate pedestrians and bicycles. These modifications will lower the highway profile to provide standard clearances. In addition the Aptos Creek Bridge would be widened.

Both build alternatives would include Transportation Operations System elements such as changeable message signs, closed-circuit television, microwave detection systems, and vehicle detection systems. In addition, ramp metering and HOV on-ramp bypass lanes with highway patrol enforcement areas would be constructed on the Route 1 ramps within the Tier I project limits; however, only the HOV Lane Alternative would include HOV lanes on the mainline.

Table 1-4 summarizes the major features of the Tier I Corridor Alternatives.

Tier I Corridor HOV Lane Alternative

The Tier I Corridor HOV Lane Alternative includes the following main components, which are discussed in detail below and are shown in Figure 1-3 and in plan view in Appendix G of the EIR/EA:

- Highway mainline to include northbound and southbound HOV lanes throughout the project limits;
- Auxiliary lanes;
- Highway interchange reconfigurations and improvements such as ramp metering, on-ramp HOV bypass lanes and California Highway Patrol enforcement areas, and stormwater drainage/treatment facilities;
- Construction of three pedestrian/bicycle overcrossings;
- Reconstruction of two Santa Cruz Branch Rail Line overcrossings in Aptos;
- Widening of the Aptos Creek Bridge;
- Replacement of the Capitola Avenue overcrossing;
- Retaining walls;
- Soundwalls; and

- Traffic signal coordination and other transportation operation system improvements.

The Tier I Corridor HOV Lane Alternative would expand the existing four-lane highway to a six through-lane facility by adding HOV lanes in both the northbound and southbound directions. HOV lanes would be constructed entirely within the existing median where possible. In those areas where the median is not wide enough to accommodate additional lanes, widening would occur outside of the existing freeway footprint. The southernmost 1.5 miles of the freeway can accommodate an HOV lane inside the existing median. From approximately Freedom Boulevard to Soquel Drive, the existing median is not wide enough to accommodate an HOV lane, so the space needed for the additional lanes would be achieved through a combination of median conversion within existing right-of-way and acquisition of property adjacent to the freeway. Plan drawings depicting the Tier I Corridor HOV Lane Alternative are presented in Appendix G, Figures HOV-1 through HOV-20.

Table 1-4: Major Project Features
Tier I Project Alternatives

Project Features	HOV Lane Alternative	TSM Alternative	No Build Alternative
Highway Mainline Changes			
HOV lanes	X		
Lower highway profile at Santa Cruz Branch Line bridge crossings[1]	X	X	
Auxiliary Lane Improvements			
Northbound and southbound between Freedom Boulevard and Rio Del Mar Boulevard	X	X	
Northbound and southbound between Rio Del Mar Boulevard and State Park Drive	X	X	
Northbound between State Park Drive and Park Avenue		X	
Southbound between State Park Drive and Park Avenue	X	X	
Northbound and southbound between Park Avenue and Bay Avenue/Porter Street	X	X	
Northbound and southbound from 41st Avenue to Soquel Avenue/Drive	X	X	
Highway Interchange Improvements			
Reconfigure all nine interchanges within project limits	X		
Reconstruct State Park Drive, 41st Avenue, and Soquel overcrossings		X	
Ramp metering	X	X	
On-ramp HOV bypass lanes	X	X	
On-ramp California Highway Patrol enforcement areas	X	X	
Stormwater drainage and treatment facilities	X	X	
New Pedestrian/Bicycle Overcrossings			
Mar Vista Drive Crossing	X	X	
Chanticleer Avenue Crossing	X	X	
Trevethan Avenue Crossing	X	X	
Santa Cruz Branch Line Bridges Replacement	X	X	
Aptos Creek Bridge Widening	X	X	
Capitola Avenue Overcrossing Replacement	X	X	
Retaining Walls	X	X	
Soundwalls	X	X	
Traffic Signal Coordination	X	X	X
Transportation Operations System	X	X	X
Transit-Supportive Improvements	X		
1 Existing highway profile does not meet vertical clearance standards for railroad bridge crossings.			

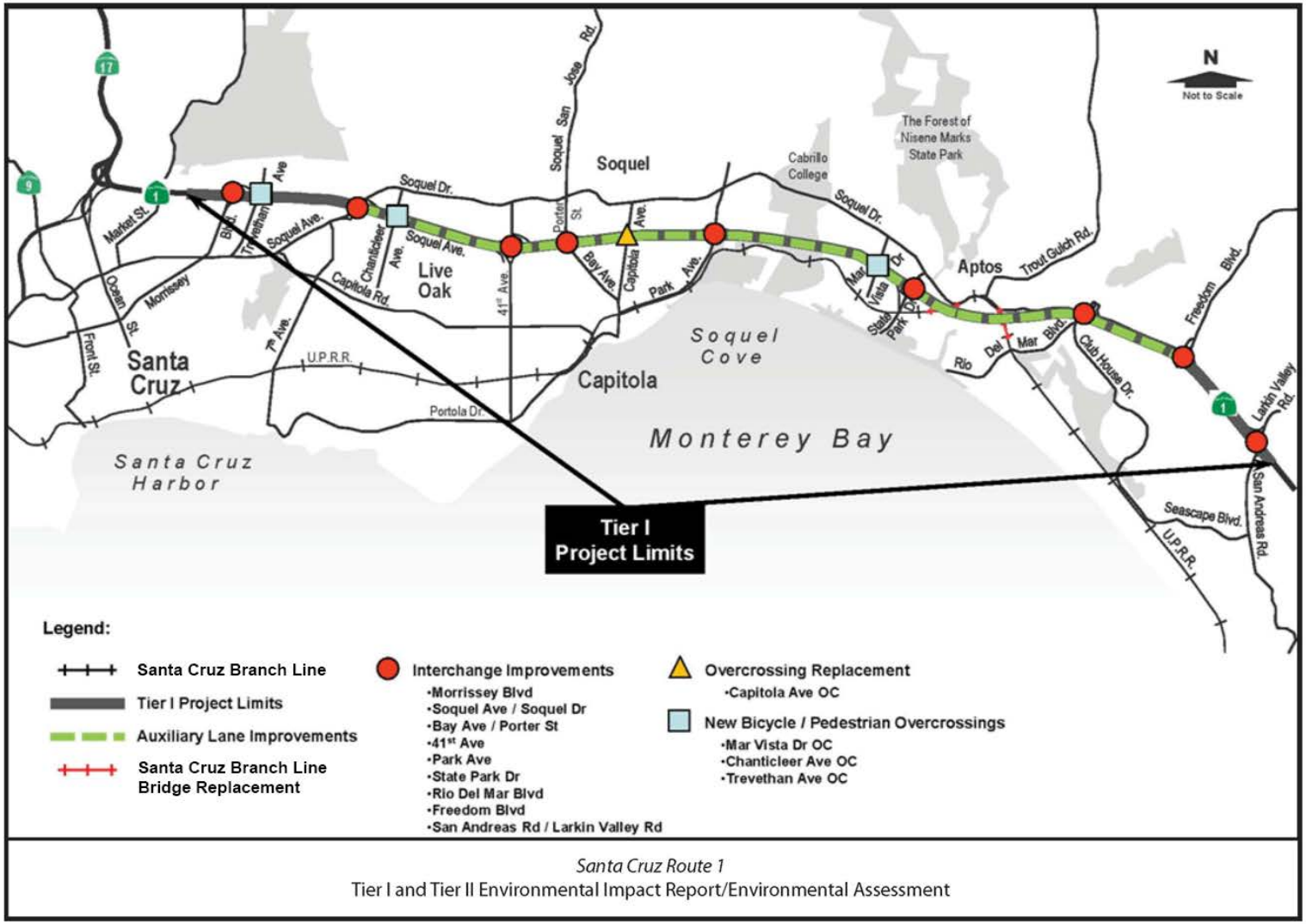


Figure 1-3: Tier I Corridor HOV Lane Alternative – Project Features

The Tier I Corridor HOV Lane Alternative would expand the existing four-lane highway to a six through-lane facility by adding HOV lanes in both the northbound and southbound directions. HOV lanes would be constructed entirely within the existing median where possible. In those areas where the median is not wide enough to accommodate additional lanes, widening would occur outside of the existing freeway footprint. The southernmost 1.5 miles of the freeway can accommodate an HOV lane inside the existing median. From approximately Freedom Boulevard to Soquel Drive, the existing median is not wide enough to accommodate an HOV lane, so the space needed for the additional lanes would be achieved through a combination of median conversion within existing right-of-way and acquisition of property adjacent to the freeway. Plan drawings depicting the Tier I Corridor HOV Lane Alternative are presented in Appendix G, Figures HOV-1 through HOV-20.

A mandatory standard median width (22 feet) set by Caltrans in its Highway Design Manual is proposed through most of the project corridor, north of Freedom Boulevard. The mandatory standard median width comprises two 10-foot-wide inside shoulders and a 2-foot-wide barrier. Where meeting the mandatory median width standard would result in acquiring property on the non-highway side of existing frontage roads, inside shoulder widths of 5 feet are proposed to reduce property requirements and impacts. Five feet is a nonstandard inside shoulder width for a Caltrans facility. This exception to shoulder-width design standards has received conceptual review in meetings between Caltrans and the project sponsor. All projects requiring design exceptions must ultimately be approved by Caltrans.

The Tier I Corridor HOV Lane Alternative would modify or reconstruct all nine interchanges within the project corridor to improve merging operations and ramp geometry by increasing the length of lanes for acceleration and deceleration, adding HOV bypass lanes and mixed-flow lanes to on-ramps, and improving sight distances. The Bay Avenue/Porter Street and 41st Avenue interchanges would be modified to operate as one interchange with frontage roads connecting the two interchanges. Where feasible, design deficiencies on existing ramps would be corrected to meet current design standards. Ramp metering and HOV bypass lanes would be provided on all Route 1 on-ramps. This alternative would include auxiliary lanes between all interchange ramps (with the exception of a northbound auxiliary lane between State Park Drive and Park Avenue) and Transportation Operations System elements, such as changeable message signs, microwave detection systems, and vehicle detection systems. Bridge structures and the Capitola Avenue overcrossing would be modified or replaced to accommodate the HOV lanes. New and widened highway crossing structures would include shoulder and sidewalk facilities to accommodate pedestrians and bicycles. The HOV Lane Alternative would include three new pedestrian/bicycle overcrossings of Route 1. The two existing Santa Cruz Branch Line structures over Route 1 in Aptos would be replaced with longer bridges at the same elevation, and the highway profile would be lowered to achieve standard vertical clearance under the bridges to make room

for the HOV and auxiliary lanes. In addition, this design configuration would reduce environmental impacts. The existing Route 1 bridge over Aptos Creek would be widened on the outside to accommodate the HOV lanes in each direction. The existing Capitola Avenue overcrossing would be replaced with a longer structure.

Retaining walls would be constructed to minimize property acquisitions and reduce environmental impacts. At locations where frontage roads are adjacent to Route 1, concrete barriers would be constructed to separate the highway and frontage road.

Changes to Highway Mainline with the Tier I Corridor HOV Lane Alternative

- Route 1 would be expanded to allow for two standard-width (12-foot) mixed-flow lanes, one standard-width (12-foot) HOV lane, and standard-width outside (10-foot) shoulders in each direction.
- The proposed lanes would be constructed within the existing 45-foot median. In locations where the existing median width is less than 45 feet, widening would occur both in the median and at the outside, generally within the existing Route 1 right-of-way.
- Where auxiliary lanes are proposed, widening by approximately 12 feet outside of the existing highway footprint would occur.
- A mandatory standard median width of 22 feet is proposed through most of the corridor.
- The highway centerline would be shifted northward in the vicinity of the Santa Cruz Branch Line crossings in Aptos to reduce impacts to wetlands. The bridge over Aptos Creek would be widened to allow for four new lanes: two HOV, two auxiliary, and pedestrian/bicycle facilities.
- Route 1 would be lowered to obtain vertical clearance at the Santa Cruz Branch Line crossings in Aptos (see Appendix G, Figures HOV-14 and HOV-15). A mandatory standard median width of 22 feet is proposed to minimize impact to the railroad bridge.
- At three locations, median and inside shoulder widths would be nonstandard to reduce impacts to adjacent streets. The three locations are: McGregor Drive, Cabrillo College Drive, and Kennedy Drive. At these three constrained locations, the inside shoulder in the constrained direction would be a nonstandard 5 feet, and the median would be a nonstandard 17 feet.

Auxiliary Lane Improvements with the Tier I Corridor HOV Lane Alternative

The auxiliary lane improvements are discussed above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives.

Interchange Improvements with the Tier I Corridor HOV Lane Alternative

All nine interchanges within the project corridor would be modified under the Tier I Corridor HOV Lane Alternative, including overcrossing and undercrossing widening or replacement. These

modifications would improve merging operations and ramp geometrics, and accessibility and safety for pedestrians and bicyclists. Major interchange improvements would include the following:

- Reconfiguration of intersections, including replacement or widening of highway overcrossings and undercrossings.
- Intersections of freeway ramps with local roads would be modified to shorten the pedestrian and bike crossing distances. Additionally, free right turns would be eliminated where feasible and traffic signals installed to improve traffic flow and slow vehicle traffic speeds through the bike and pedestrian crossing areas.
- Local roadways would be widened at the interchanges to accommodate the anticipated travel demand.
- Drainage and stormwater runoff treatment facilities would be provided.

Interchange improvements and design reconfigurations proposed for each interchange are listed in Table 1-5.

Table 1-5: Interchange Improvements and Reconfigurations
Tier I Corridor HOV Lane Alternative

Route 1 Interchange Location	Project Plan Sheet No.[1]	Tier I Corridor HOV Lane Alternative Features
San Andreas/ Larkin Valley Roads Interchange	HOV-20	The existing northbound cloverleaf off-ramp free right-turn onto Larkin Valley Road would be eliminated in favor of a signalized 90-degree intersection.
		A signalized intersection would be provided at the San Andreas Road ramps and the free right-turns would be eliminated.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		The southbound Route 1 bridge over San Andreas/Larkin Valley Road would be widened into the median to accommodate the HOV lanes.
		San Andreas/Larkin Valley Roads would be widened within the Tier I project limits to add turn lanes.
		New sidewalks would be added along San Andreas/Larkin Valley Roads within the Tier I project limits.
Freedom Boulevard Interchange	HOV-18	The existing ramp termini at Freedom Boulevard would be modified to provide less-skewed intersections with Freedom Boulevard. These intersections would be signalized, and free right-turns would be eliminated.
		The southbound off-ramp would be widened to two exit lanes.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		Freedom Boulevard would be widened within the Tier I project limits to add turn lanes.
		The Freedom Boulevard/Bonita Drive intersection would be enlarged to add turn lanes and achieve acceptable level of service.
		The Freedom Boulevard bridge would be replaced with a wider structure that would accommodate a new turn lane on Freedom Boulevard and the new HOV lanes on Route 1.
		New sidewalks would be added along Freedom Boulevard within the Tier I project limits.

Table 1-5: Interchange Improvements and Reconfigurations
Tier I Corridor HOV Lane Alternative

Route 1 Interchange Location	Project Plan Sheet No.[1]	Tier I Corridor HOV Lane Alternative Features
Rio Del Mar Boulevard Interchange	HOV-16	The northbound on-ramp would be realigned to form the north leg of a four-way intersection with Rio Del Mar Boulevard and the northbound off-ramp. This intersection would be signalized, and free right turns would be eliminated
		The northbound off-ramp would be widened to two exit lanes.
		The southbound ramps would be widened, the intersection with Rio Del Mar Boulevard signalized, and free right-turns eliminated.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		Soquel Drive would be shifted northward to accommodate the roadway widening along the northbound off-ramp.
		Rio Del Mar Boulevard would be widened within the Tier I project limits to add turn lanes and a through lane in each direction.
		The Rio Del Mar Boulevard bridge over Route 1 would be replaced with a longer, wider bridge to accommodate a new turn lane and a through lane in each direction on Rio Del Mar Boulevard and the new HOV lanes on Route 1.
		Sidewalk would be added along eastbound Rio Del Mar Boulevard within the Tier I project limits; the sidewalk on westbound Rio Del Mar Boulevard would be retained.
State Park Drive Interchange	HOV-13	The existing northbound cloverleaf on-ramp free-right turn would be changed to a signalized right turn.
		The existing northbound off-ramp terminus would be modified to form, together with the realigned northbound on-ramp terminus, the south leg of a signalized intersection with State Park Drive.
		The northbound and southbound off-ramps would be widened to two exit lanes.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		State Park Drive would be widened within the Tier I project limits to add turn lanes and a through lane in each direction.
		The State Park Drive bridge over Route 1 would be replaced with a longer, wider bridge to accommodate a new through-lane in each direction on State Park Drive and the new HOV lanes on Route 1.
		Sidewalk would be added along eastbound State Park Drive within the Tier I project limits; the sidewalk along westbound State Park Drive would be retained.
Park Avenue Interchange	HOV-10	The existing diamond interchange ramp design would be retained and ramps would be widened.
		The northbound and southbound off-ramps would be widened to two exit lanes.
		The existing on-ramps would be widened to accommodate HOV bypass lanes.
		Park Avenue would be widened within the Tier I project limits to add turn lanes.
		The two Route 1 bridges over Park Avenue would be replaced with one, wider structure to accommodate the new HOV lanes on Route 1.
		Sidewalk would be added within the Tier I project limits along westbound Park Avenue; the sidewalk along eastbound Park Avenue would be retained.
Bay Avenue/ Porter Street and 41st Avenue Interchanges	HOV-7	Improvements at the Bay Avenue/Porter Street and 41st Avenue interchanges would be designed so that these two interchanges would work as a single interchange connected by a collector/frontage road running between the interchanges.
		The freeway ramps would be reconstructed to form less-skewed intersections with Bay Avenue/Porter Street.

Table 1-5: Interchange Improvements and Reconfigurations
Tier I Corridor HOV Lane Alternative

Route 1 Interchange Location	Project Plan Sheet No.[1]	Tier I Corridor HOV Lane Alternative Features
		The existing southbound Route 1 off-ramp to Bay Avenue/Porter Street would be eliminated. Southbound traffic bound for Bay Avenue/Porter Street would exit at the 41st Avenue two-lane off-ramp and continue on a new southbound collector/frontage road to Bay Avenue/Porter Street.
		The existing two-lane on-ramp from Porter Street to northbound Route 1 would be modified to become a northbound collector/frontage road serving traffic bound for 41st Avenue or northbound Route 1.
		Northbound traffic exiting Route 1 would either bear right to intersect with Porter Street and continue north, or stay left and continue on a new structure over Porter Street, join the northbound collector/frontage road, and end at a new signalized intersection at 41st Avenue.
		At 41st Avenue, southbound on- and off-ramps would be eliminated and replaced with a diagonal off-ramp and a collector/frontage road serving traffic bound for Bay Avenue/Porter Street or southbound Route 1. The new ramp and collector/frontage road would form a signalized intersection with 41st Avenue.
		At 41st Avenue, the northbound on-ramps would be realigned.
		New on-ramps would include HOV bypass lanes.
		41st Avenue would be widened within the Tier I project limits to add turn lanes and eastbound though lanes over Route 1.
		Bay Avenue/Porter Street would be widened to add right-turn lanes at the on-ramps.
		A new bridge over Soquel Creek and Soquel Wharf Road would be constructed for the new southbound collector/frontage road from 41st Avenue to Bay Avenue/Porter Street.
		The 41st Avenue bridge over Route 1 would be replaced with a longer, wider bridge to accommodate the new eastbound through lane and turn lanes on 41st Avenue, and the new HOV lanes on Route 1. Northbound and southbound Class I bike paths would be constructed between 41st Avenue and Bay Avenue/Porter Street on either side of the new collector/frontage roads, respectively.
Soquel Avenue/ Drive Interchange	HOV-3	The northbound off-ramp would be realigned to a signalized 90-degree intersection with Soquel Drive. The existing access to Commercial Way would be eliminated.
		The westbound Soquel Drive on-ramp to northbound Route 1 would be modified to eliminate the free right-turn access.
		The existing northbound loop on-ramp from eastbound Soquel Avenue would be realigned and its free-right terminus would become a signalized 90-degree intersection.
		A new, wider southbound diagonal off-ramp that adds turn lanes at its terminus and a new loop on-ramp would form the north leg of a signalized intersection at Soquel Avenue.
		The existing southbound hook on-ramp would be widened to add an HOV bypass lane and realigned to be made standard.
		The northbound and southbound off-ramps would be widened to two exit lanes.
		All new on-ramps would include HOV bypass lanes.
		Soquel Avenue within the Tier I project limits would be widened to add an eastbound through lane and turn lanes.

Table 1-5: Interchange Improvements and Reconfigurations
Tier I Corridor HOV Lane Alternative

Route 1 Interchange Location	Project Plan Sheet No.[1]	Tier I Corridor HOV Lane Alternative Features
		Salisbury Lane would be shifted eastward to form an intersection with the realigned northbound off-ramp and loop on-ramp.
		The Soquel Drive bridge over Route 1 would be replaced with a longer, wider bridge to add an eastbound through lane and a turn lane to Soquel Drive and accommodate the new HOV lanes on Route 1.
		The culvert at Arana Gulch would be extended underneath the widened Route 1 and new southbound off-ramp.
		Sidewalk would be added along eastbound Soquel Drive within the Tier I (and Tier II) project limits; the sidewalk along westbound Soquel Drive would be retained.
Morrissey Boulevard Interchange	HOV-1	The southbound exit would be realigned to terminate at a new signalized intersection with Morrissey Boulevard.
		The existing southbound on-ramp would be eliminated and replaced with a new, wider diagonal ramp with a signalized terminus.
		The existing southbound off- and on-ramp at Elk Street would be eliminated.
		The existing northbound loop on-ramp would be eliminated, as would access to Rooney Street from this northbound loop.
		The northbound off-ramp would be widened to two exit lanes.
		New on-ramps would include HOV bypass lanes.
		Morrissey Boulevard is being replaced with a wider bridge to add an eastbound through lane and turn lanes, and realigned to form a straight line between its intersections with Fairmont Avenue and Rooney Street.
		The Morrissey Boulevard bridge is being replaced with a longer, wider bridge to accommodate a new eastbound through lane and turn lanes on Morrissey Boulevard and new HOV lanes on Route 1.
		Sidewalk would be added along eastbound Morrissey Boulevard within the Tier I project limits; the sidewalk along westbound Morrissey Boulevard would be retained.
Transit-Related Facilities	NA	Both on-ramps and both off-ramps at the reconfigured Park Avenue interchange include options for bus pads and bus shelters.
		Ramps and collectors at the Bay Avenue/Porter Street and 41st Avenue interchanges include options for bus pads and shelters.

[1] Project plan sheets are provided in Appendix G of the EIR/EA.

Transit Supportive Planning and Design

The Tier I Corridor HOV Lane Alternative would not preclude the development of the following features from being added in the future to facilitate freeway-oriented transit services and operations:

- The reconfigured Park Avenue and Bay Avenue/Porter Street/41st Avenue interchanges would allow for future bus pads and bus stop shelters to be constructed as part of a separate project.

- Future park-and-ride lots are under consideration by RTC at the Larkin Valley Road/San Andreas Road and 41st Avenue interchanges, to be coordinated with the bus facilities as part of a future project.

The aforementioned features are not part of the proposed project and would be subject to future environmental clearance. The proposed Tier I project is simply taking into consideration potential future transit projects as a collaborative planning effort.

New Pedestrian/Bicycle Overcrossings

The proposed pedestrian/bicycle overcrossings are discussed above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives.

Tier I Corridor TSM Alternative

The Tier I Corridor TSM Alternative was formulated to provide Route 1 improvements that would partially address the purpose and need, and could be achieved at lower cost and with fewer impacts than the Tier I Corridor HOV Lane Alternative. TSM strategies typically consist of improvements that can benefit the operations of existing facilities without increasing the number of through lanes.

As discussed in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives, the Tier I Corridor TSM Alternative proposes to add auxiliary lanes, ramp metering and HOV on-ramp bypass lanes; improve existing nonstandard geometric elements at various ramps; and incorporate other TSM elements, such as changeable message signs, closed circuit television, microwave detection systems, and vehicle detection systems.). In short, the TSM Alternative shares many of the Tier I Corridor HOV Lane Alternative features, except HOV lanes would not be constructed along the mainline and the Soquel Drive interchange would be the only interchange reconfigured. Plan drawings depicting the TSM Alternative are presented in Appendix H, Figures TSM-1 through TSM-20. An overview of the major features of the TSM Alternative is provided in Figure 1-4 and in plan view in Appendix H.

Auxiliary Lanes

The majority of auxiliary lane improvements are discussed above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives. In addition, the TSM Alternative would have both a southbound and northbound auxiliary lane between State Park Drive and Park Avenue — improvements that are not included in the HOV Lane Alternative.

Interchange Improvements

Improvements to interchanges proposed under the Tier I Corridor TSM Alternative include the following:

- The Soquel Avenue northbound off-ramp from Route 1 would be realigned and widened from one to two exit lanes for a distance of approximately 1,300 feet,

widening to four lanes at its intersection with Soquel Drive. The northbound off-ramp/Commercial Way connection would be eliminated, and Commercial Way would become a cul-de-sac north of the realigned ramp. The intersection of the northbound off-ramp with Soquel Drive would be enlarged to achieve an acceptable level of service for the anticipated traffic volume.

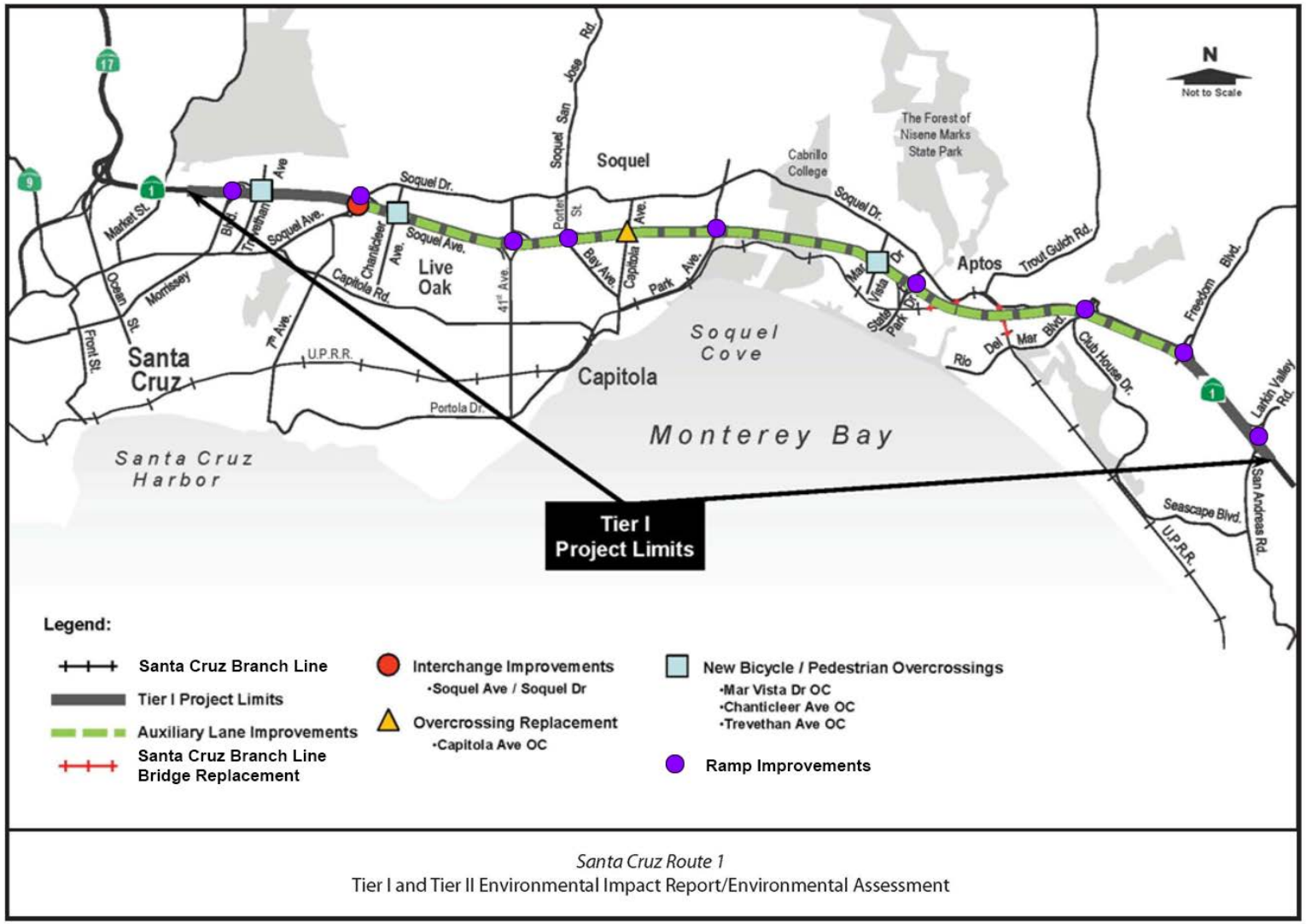
- Improve existing nonstandard geometric elements at various ramps.
- Provide HOV bypass lanes on all except northbound Morrissey Boulevard on-ramps.
- Add California Highway Patrol enforcement areas at on-ramps with HOV bypass lanes.

New Pedestrian/Bicycle Overcrossings

The proposed pedestrian/bicycle overcrossings are discussed above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives.

Other Improvements

The details of the other improvements are included above in Section 1.5 Common Design Features of the Tier I Corridor HOV Lane and TSM Alternatives.



Santa Cruz Route 1
Tier I and Tier II Environmental Impact Report/Environmental Assessment

Figure 1-4: Tier I Corridor TSM Alternative – Project Features

Tier II Auxiliary Lane Alternative

The Tier II Auxiliary Lane Alternative would construct northbound and southbound auxiliary lanes on Route 1 from 41st Avenue to Soquel Drive and make other improvements, as discussed below. Figure 1-5 shows features of the Auxiliary Lane Alternative, and Appendix I provides a plan view of the proposed Tier II project. To construct the Auxiliary Lane Alternative, right-of-way would be acquired along Soquel Avenue west of Chanticleer Avenue and at the Chanticleer Avenue cul-de-sac north of Route 1 to accommodate the bicycle/pedestrian overcrossing.

Auxiliary Lanes

The Tier II Auxiliary Lane Alternative proposes to widen Route 1 by adding an auxiliary lane in both the northbound and southbound directions between the 41st Avenue and Soquel Avenue/Drive interchanges. The total roadway widening would be approximately 1.4 miles in length. Southbound, the auxiliary lane would begin at the existing Soquel Avenue on-ramp and end at the existing off-ramp to 41st Avenue. Northbound, the auxiliary lane would begin just south of the 41st Avenue overcrossing, at the existing loop on-ramp from northbound 41st Avenue. North of the overcrossing, the on-ramp from 41st Avenue to northbound Route 1 would merge with the new auxiliary lane, approximately 1,000 feet downstream from the loop ramp.

The new auxiliary lanes would be 12 feet wide. In the southbound direction, the width needed for the new lane would be added in the median, and the median barrier would be shifted approximately 5 feet toward the northbound side of the freeway to make room for the new lane and a standard 10-foot-wide shoulder. Where the new southbound lane meets the existing ramps, outside shoulder widening would occur to achieve standard 10-foot-wide shoulders. In the northbound direction, the Tier II project proposes to pave a 10-foot-wide median shoulder and widen to the outside to add the 12-foot-wide auxiliary lane and a new 10–foot-wide shoulder.

As part of the widening in the northbound direction, the Tier II project proposes to repair an existing pavement failure in the outside lane and shoulder by improving the pavement section, installing a retaining wall and, if necessary, replacing the underlying County-owned sanitary sewer line crossing Route 1. A new concrete median battier would also be constructed.

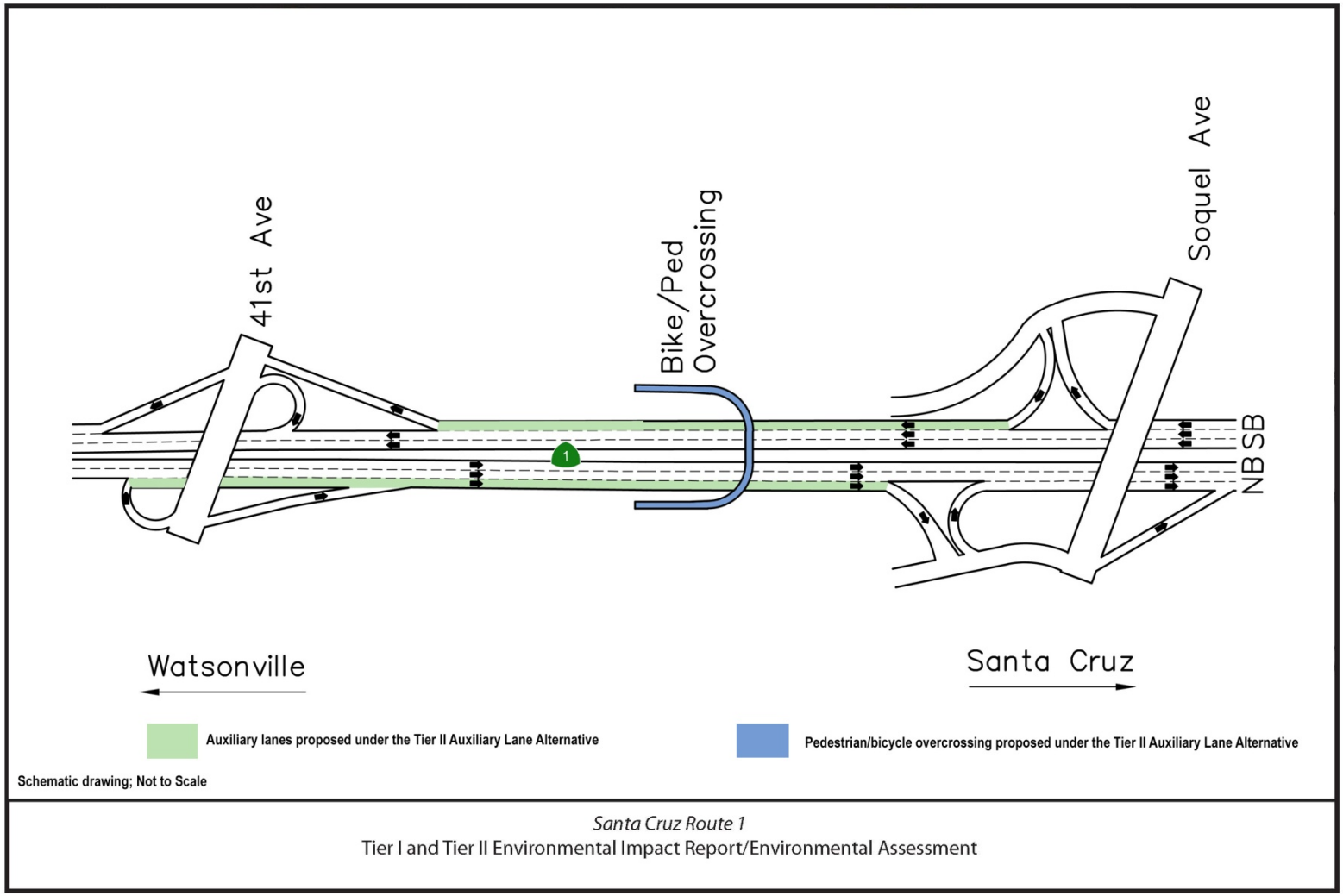


Figure 1-5: Tier II Auxiliary Lane Alternative – Project Features

Pedestrian/Bicycle Overcrossing

A new horseshoe-shaped pedestrian overcrossing is proposed over Route 1 at Chanticleer Avenue.[1] The overcrossing would vary in width from 14 feet along the ramps to 16 feet around the curves. Ramps from Chanticleer Avenue up to the overcrossing would be at approximately a 5 percent grade. Up to where the overcrossing exceeds approximately 10 feet in height, the ramp would be built on
retained fill; beyond that point, the bridge would rest on columns along the north right-of-way of Route 1, in the Route 1 median, behind the curb between Route 1 and Soquel Avenue, and along the south side of Soquel Avenue. The design of the ramps and bridge would include architectural texture or other aesthetic treatment. (See Section 2.16 for a visual simulation of the proposed Chanticleer Avenue pedestrian/bicycle overcrossing.)

In addition, a new 360-foot-long by 6-foot-wide sidewalk would be constructed along the south side of Soquel Avenue, starting at Chanticleer Avenue. The sidewalk would be separated from the street by a 4-foot-wide strip.

Retaining Walls

Retaining walls would be constructed as part of the roadway widening, with four separate walls: three on the north side of Route 1 and one on the south side. One of the retaining walls would start after the 41st Avenue on-ramp and extend approximately 150 feet; two other retaining walls on the northbound side would be 375 and 408 feet. On the southbound side, a 350-foot-long wall would be constructed along the highway mainline and Soquel Avenue, over the Rodeo Gulch culvert.

Three of the walls would be located to allow widening for an additional mainline lane on Route 1 in each direction in the future. The wall proposed along the northbound on-ramp at 41st Avenue would have to be demolished and replaced if the highway were to be widened in the future. Two of the walls would span Rodeo Creek Gulch, where there is an existing 9-foot arch concrete culvert, and one would be constructed within a narrow jurisdictional wetland area on the northbound side of Route 1, adjacent to a 39-inch culvert crossing.

No Build Alternative

The No Build Alternative offers a basis for comparing the effects of the Tier I Corridor Alternatives and the Tier II Auxiliary Lane Alternative with doing none of the proposed improvements. The No Build Alternative assumes there would be no major construction on Route 1 through the Tier I project limits other than currently planned and programmed improvements and continued routine maintenance. The following planned and programmed

[1] The overcrossing at Chanticleer is included in both the Tier I and Tier II Projects. The Tier I program of improvements encompasses the current Tier II Auxiliary Lane Project, which has been identified as the first phase of the overall program of improvements.

improvements included in the No Build Alternative are contained in the 2010 Regional Transportation Plan:

- Construction of auxiliary lanes between the Soquel Drive and Morrissey Boulevard interchanges for the Soquel to Morrissey Auxiliary Lanes Project; construction completed in December 2013.
- Replacement of the La Fonda Avenue overcrossing of Route 1, included as part of the Soquel to Morrissey Auxiliary Lanes project; construction completed in 2013.
- Reconstruction of bridges and addition of a merge lane in each direction between Highway 17 and the Morrissey/La Fonda area for the Highway 1/17 Merge Lanes Project; construction completed in 2008.
- Installation of median barrier on Route 1 from Freedom Boulevard to Rio Del Mar Boulevard.

Improvements of roadways and roadsides on Rio Del Mar Boulevard from Esplanade to Route 1, which includes the addition of bike lanes, transit turnouts, left-turn pockets, merge lanes, and intersection improvements. Roadwork includes major rehabilitation and ongoing maintenance. If the No Build Alternative is selected, it is highly likely that other improvements could be expected in the future.

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad is (Davenport (3712212) or Felton (3712211) or Laurel (3712118) or Loma Prieta (3712117) or Moss Landing (3612177) or Mt. Madonna (3712116) or Prunedale (3612176) or Santa Cruz (3612281) or Soquel (3612188) or Watsonville East (3612186) or Watsonville West (3612187))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Accipiter cooperii Cooper's hawk	ABNKC12040	None	None	G5	S4	WL
Adela oplerella Opler's longhorn moth	IILEE0G040	None	None	G2	S2	
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Endangered	G2G3	S1S2	SSC
Agrostis blasdalei Blasdale's bent grass	PMPOA04060	None	None	G2	S2	1B.2
Ambystoma californiense California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	S2S3	SSC
Ambystoma macrodactylum croceum Santa Cruz long-toed salamander	AAAAA01082	Endangered	Endangered	G5T1T2	S1S2	FP
Amsinckia lunaris bent-flowered fiddleneck	PDBOR01070	None	None	G2?	S2?	1B.2
Anniella pulchra nigra black legless lizard	ARACC01011	None	None	G3G4T2T3Q	S2	SSC
Anniella pulchra pulchra silvery legless lizard	ARACC01012	None	None	G3G4T3T4Q	S3	SSC
Anomobryum julaceum slender silver moss	NBMUS80010	None	None	G4G5	S2	4.2
Antrozous pallidus pallid bat	AMACC10010	None	None	G5	S3	SSC
Arctostaphylos andersonii Anderson's manzanita	PDERI04030	None	None	G2	S2	1B.2
Arctostaphylos glutinosa Schreiber's manzanita	PDERI040G0	None	None	G1	S1	1B.2
Arctostaphylos hookeri ssp. hookeri Hooker's manzanita	PDERI040J1	None	None	G3T2	S2	1B.2
Arctostaphylos ohloneana Ohlone manzanita	PDERI042Y0	None	None	G1	S1	1B.1
Arctostaphylos pajaroensis Pajaro manzanita	PDERI04100	None	None	G1	S1	1B.1
Arctostaphylos silvicola Bonny Doon manzanita	PDERI041F0	None	None	G1	S1	1B.2
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Arenaria paludicola marsh sandwort	PDCAR040L0	Endangered	Endangered	G1	S1	1B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Asio flammeus short-eared owl	ABNSB13040	None	None	G5	S3	SSC
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S3	SSC
Calyptridium parryi var. hesseae Santa Cruz Mountains pussypaws	PDPOR09052	None	None	G3G4T2	S2	1B.1
Campanula californica swamp harebell	PDCAM02060	None	None	G3	S3	1B.2
Carex comosa bristly sedge	PMCYP032Y0	None	None	G5	S2	2B.1
Carex saliniformis deceiving sedge	PMCYP03BY0	None	None	G2	S2	1B.2
Ceanothus ferrisiae Coyote ceanothus	PDRHA041N0	Endangered	None	G2	S2	1B.1
Central Dune Scrub Central Dune Scrub	CTT21320CA	None	None	G2	S2.2	
Central Maritime Chaparral Central Maritime Chaparral	CTT37C20CA	None	None	G2	S2.2	
Centromadia parryi ssp. congdonii Congdon's tarplant	PDAST4R0P1	None	None	G3T2	S2	1B.1
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2	SSC
Chorizanthe pungens var. hartwegiana Ben Lomond spineflower	PDPGN040M1	Endangered	None	G2T1	S1	1B.1
Chorizanthe pungens var. pungens Monterey spineflower	PDPGN040M2	Threatened	None	G2T2	S2	1B.2
Chorizanthe robusta var. hartwegii Scotts Valley spineflower	PDPGN040Q1	Endangered	None	G2T1	S1	1B.1
Chorizanthe robusta var. robusta robust spineflower	PDPGN040Q2	Endangered	None	G2T1	S1	1B.1
Cicindela hirticollis gravida sandy beach tiger beetle	IICOL02101	None	None	G5T2	S1	
Cicindela ohlone Ohlone tiger beetle	IICOL026L0	Endangered	None	G1	S1	
Clarkia concinna ssp. automixa Santa Clara red ribbons	PDONA050A1	None	None	G5?T3	S3	4.3
Coastal and Valley Freshwater Marsh Coastal and Valley Freshwater Marsh	CTT52410CA	None	None	G3	S2.1	
Coastal Brackish Marsh Coastal Brackish Marsh	CTT52200CA	None	None	G2	S2.1	
Coelus globosus globose dune beetle	IICOL4A010	None	None	G1G2	S1S2	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Collinsia multicolor San Francisco collinsia	PDSCR0H0B0	None	None	G2	S2	1B.2
Cordylanthus rigidus ssp. littoralis seaside bird's-beak	PDSCR0J0P2	None	Endangered	G5T2	S2	1B.1
Corynorhinus townsendii Townsend's big-eared bat	AMACC08010	None	Candidate Threatened	G3G4	S2	SSC
Cypseloides niger black swift	ABNUA01010	None	None	G4	S2	SSC
Dacryophyllum falcifolium tear drop moss	NBMUS8Z010	None	None	G1	S1	1B.3
Danaus plexippus pop. 1 monarch - California overwintering population	IILEPP2012	None	None	G4T2T3	S2S3	
Dipodomys venustus venustus Santa Cruz kangaroo rat	AMAFD03042	None	None	G4T1	S1	
Dudleya abramsii ssp. setchellii Santa Clara Valley dudleya	PDCRA040Z0	Endangered	None	G4T2	S2	1B.1
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Ericameria fasciculata Eastwood's goldenbush	PDAST3L080	None	None	G2	S2	1B.1
Eriogonum nudum var. decurrens Ben Lomond buckwheat	PDPGN08492	None	None	G5T1	S1	1B.1
Eryngium aristulatum var. hooveri Hoover's button-celery	PDAPI0Z043	None	None	G5T1	S1	1B.1
Erysimum ammophilum sand-loving wallflower	PDBRA16010	None	None	G2	S2	1B.2
Erysimum teretifolium Santa Cruz wallflower	PDBRA160N0	Endangered	Endangered	G2	S2	1B.1
Eucyclogobius newberryi tidewater goby	AFCQN04010	Endangered	None	G3	S2S3	SSC
Euphilotes enoptes smithi Smith's blue butterfly	IILEPG2026	Endangered	None	G5T1T2	S1S2	
Euphydryas editha bayensis Bay checkerspot butterfly	IILEPK4055	Threatened	None	G5T1	S1	
Fissidens pauperculus minute pocket moss	NBMUS2W0U0	None	None	G3?	S1	1B.2
Fissilicreagris imperialis Empire Cave pseudoscorpion	ILARAE5010	None	None	G1	S1	
Fritillaria liliacea fragrant fritillary	PMLIL0V0C0	None	None	G2	S2	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Geothlypis trichas sinuosa saltmarsh common yellowthroat	ABPBX1201A	None	None	G5T3	S3	SSC
Gilia tenuiflora ssp. arenaria Monterey gilia	PDPLM041P2	Endangered	Threatened	G3G4T2	S2	1B.2
Hesperocyparis abramsiana var. abramsiana Santa Cruz cypress	PGCUP04081	Endangered	Endangered	G1T1	S1	1B.2
Hoita strobilina Loma Prieta hoita	PDFAB5Z030	None	None	G2	S2	1B.1
Holocarpha macradenia Santa Cruz tarplant	PDAST4X020	Threatened	Endangered	G1	S1	1B.1
Horkelia cuneata var. sericea Kellogg's horkelia	PDROS0W043	None	None	G4T2	S2?	1B.1
Horkelia marinensis Point Reyes horkelia	PDROS0W0B0	None	None	G2	S2	1B.2
Lasiurus cinereus hoary bat	AMACC05030	None	None	G5	S4	
Lessingia micradenia var. glabrata smooth lessingia	PDAST5S062	None	None	G2T2	S2	1B.2
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G2G3	S2S3	
Lytta moesta moestan blister beetle	IICOL4C020	None	None	G2	S2	
Malacothamnus arcuatus arcuate bush-mallow	PDMAL0Q0E0	None	None	G1Q	S1	1B.2
Malacothamnus hallii Hall's bush-mallow	PDMAL0Q0F0	None	None	G2Q	S2	1B.2
Margaritifera falcata western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
Maritime Coast Range Ponderosa Pine Forest Maritime Coast Range Ponderosa Pine Forest	CTT84132CA	None	None	G1	S1.1	
Meta dolloff Dolloff Cave spider	ILARA17010	None	None	G1	S1	
Microseris paludosa marsh microseris	PDAST6E0D0	None	None	G2	S2	1B.2
Mielichhoferia elongata elongate copper moss	NBMUS4Q022	None	None	G4	S2	2B.2
Monardella sinuata ssp. nigrescens northern curly-leaved monardella	PDLAM18162	None	None	G3T2	S2	1B.2
Monolopia gracilens woodland woollythreads	PDAST6G010	None	None	G2G3	S2S3	1B.2
Monterey Pine Forest Monterey Pine Forest	CTT83130CA	None	None	G1	S1.1	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Neochthonius imperialis	ILARAD1010	None	None	G1	S1	
Empire Cave pseudoscorpion						
Neotoma fuscipes annectens	AMAFF08082	None	None	G5T2T3	S2S3	SSC
San Francisco dusky-footed woodrat						
North Central Coast Drainage Sacramento Sucker/Roach River	CARA2623CA	None	None	GNR	SNR	
North Central Coast Drainage Sacramento Sucker/Roach River						
North Central Coast Short-Run Coho Stream	CARA2632CA	None	None	GNR	SNR	
North Central Coast Short-Run Coho Stream						
Northern Coastal Salt Marsh	CTT52110CA	None	None	G3	S3.2	
Northern Coastal Salt Marsh						
Northern Interior Cypress Forest	CTT83220CA	None	None	G2	S2.2	
Northern Interior Cypress Forest						
Northern Maritime Chaparral	CTT37C10CA	None	None	G1	S1.2	
Northern Maritime Chaparral						
Oncorhynchus kisutch	AFCHA02034	Endangered	Endangered	G4	S2?	
coho salmon - central California coast ESU						
Oncorhynchus mykiss irideus	AFCHA0209G	Threatened	None	G5T2T3Q	S2S3	
steelhead - central California coast DPS						
Oncorhynchus mykiss irideus	AFCHA0209H	Threatened	None	G5T2Q	S2	SSC
steelhead - south/central California coast DPS						
Pandion haliaetus	ABNKC01010	None	None	G5	S4	WL
osprey						
Pedicularis dudleyi	PDSCR1K0D0	None	Rare	G2	S2	1B.2
Dudley's lousewort						
Penstemon rattanii var. kleei	PDSCR1L5B1	None	None	G4T2	S2	1B.2
Santa Cruz Mountains beardtongue						
Pentachaeta bellidiflora	PDAST6X030	Endangered	Endangered	G1	S1	1B.1
white-rayed pentachaeta						
Philanthus nasalis	IIHYM20010	None	None	G1	S1	
Antioch specid wasp						
Pinus radiata	PGPIN040V0	None	None	G1	S1	1B.1
Monterey pine						
Piperia candida	PMORC1X050	None	None	G3?	S2	1B.2
white-flowered rein orchid						
Piperia yadonii	PMORC1X070	Endangered	None	G2	S2	1B.1
Yadon's rein orchid						
Plagiobothrys chorisianus var. chorisianus	PDBOR0V061	None	None	G3T2Q	S2	1B.2
Choris' popcornflower						
Plagiobothrys diffusus	PDBOR0V080	None	Endangered	G1Q	S1	1B.1
San Francisco popcornflower						
Polygonum hickmanii	PDPGN0L310	Endangered	Endangered	G1	S1	1B.1
Scotts Valley polygonum						

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Polyphylla barbata Mount Hermon (=barbate) June beetle	IICOL68030	Endangered	None	G1	S1	
Rallus longirostris obsoletus California clapper rail	ABNME05016	Endangered	Endangered	G5T1	S1	FP
Rana boylii foothill yellow-legged frog	AAABH01050	None	None	G3	S3	SSC
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Reithrodontomys megalotis distichlis Salinas harvest mouse	AMAFF02032	None	None	G5T1	S1	
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Rosa pinetorum pine rose	PDROS1J0W0	None	None	G2Q	S2	1B.2
Senecio aphanactis chaparral ragwort	PDAST8H060	None	None	G3?	S2	2B.2
Sidalcea malachroides maple-leaved checkerbloom	PDMAL110E0	None	None	G3	S3	4.2
Spirinchus thaleichthys longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	SSC
Stebbinsoseris decipiens Santa Cruz microseris	PDAST6E050	None	None	G2	S2	1B.2
Streptanthus albidus ssp. peramoenus most beautiful jewelflower	PDBRA2G012	None	None	G2T2	S2	1B.2
Stygobromus mackenziei Mackenzie's Cave amphipod	ICMAL05530	None	None	G1	S1	
Taxidea taxus American badger	AMAJF04010	None	None	G5	S3	SSC
Thaleichthys pacificus eulachon	AFCHB04010	Threatened	None	G5	S3	SSC
Trifolium buckwestiorum Santa Cruz clover	PDFAB402W0	None	None	G2	S2	1B.1
Trifolium hydrophilum saline clover	PDFAB400R5	None	None	G2	S2	1B.2
Trimerotropis infantilis Zayante band-winged grasshopper	IIORT36030	Endangered	None	G1	S1	
Tryonia imitator mimic tryonia (=California brackishwater snail)	IMGASJ7040	None	None	G2	S2	

Record Count: 122

U.S. Fish & Wildlife Service

My project

IPaC Trust Resource Report

Generated June 10, 2015 02:13 PM MDT

US Fish & Wildlife Service

IPaC Trust Resource Report

Project Description

NAME

My project

PROJECT CODE

VTWNL-7UATZ-GY5BG-G5FPH-6KPESA

LOCATION

Santa Cruz County, California

DESCRIPTION

No description provided

U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

Ventura Fish And Wildlife Office
2493 Portola Road, Suite B
Ventura, CA 93003-7726
(805) 644-1766

Sacramento Fish And Wildlife Office
Federal Building
2800 COTTAGE WAY, ROOM W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

Amphibians

California Red-legged Frog Rana draytonii — Threatened

MANAGED BY
Ventura Fish And Wildlife Office
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=D02D

California Tiger Salamander Ambystoma californiense — Threatened

MANAGED BY
Ventura Fish And Wildlife Office
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=D01T

Santa Cruz Long-toed Salamander Ambystoma macrodactylum croceum — Endangered

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=D000

Birds

California Clapper Rail Rallus longirostris obsoletus **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B04A

California Condor Gymnogyps californianus **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B002

California Least Tern Sterna antillarum browni **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B03X

Least Bell's Vireo Vireo bellii pusillus **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B067

Marbled Murrelet Brachyramphus marmoratus **Threatened**

MANAGED BY
Ventura Fish And Wildlife Office
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B08C

Southwestern Willow Flycatcher Empidonax traillii extimus **Endangered**

MANAGED BY
Sacramento Fish And Wildlife Office
Ventura Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B094

Western Snowy Plover Charadrius alexandrinus nivosus **Threatened**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B07C

Conifers and Cycads

Santa Cruz Cypress Cupressus abramsiana **Endangered**

MANAGED BY
Sacramento Fish And Wildlife Office
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=R005

Fishes

Delta Smelt Hypomesus transpacificus **Threatened**

MANAGED BY
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E070

Steelhead Oncorhynchus (=Salmo) mykiss **Threatened**

MANAGED BY
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E08D

Tidewater Goby Eucyclogobius newberryi **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E071

Flowering Plants

Ben Lomond Spineflower Chorizanthe pungens var. hartwegiana **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q30Y

Ben Lomond Wallflower Erysimum teretifolium **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q29X

Marsh Sandwort Arenaria paludicola **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q25H

Menzies' Wallflower Erysimum menziesii **Endangered**

MANAGED BY
Sacramento Fish And Wildlife Office
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q29W

Monterey Gilia Gilia tenuiflora ssp. arenaria **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2AJ

Monterey Spineflower Chorizanthe pungens var. pungens **Threatened**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q271

San Mateo Woolly Sunflower Eriophyllum latilobum

Endangered

MANAGED BY
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2TK

Santa Cruz Tarplant Holocarpha macradenia

Threatened

MANAGED BY
Ventura Fish And Wildlife Office
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q0ZL

Scotts Valley Polygonum Polygonum hickmanii

Endangered

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q3HV

Scotts Valley Spineflower Chorizanthe robusta var. hartwegii

Endangered

MANAGED BY
Sacramento Fish And Wildlife Office
Ventura Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q3IB

White-rayed Pentachaeta Pentachaeta bellidiflora

Endangered

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2F3

Insects

Bay Checkerspot Butterfly Euphydryas editha bayensis — Threatened

MANAGED BY
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I021

Mount Hermon June Beetle Polyphylla barbata — Endangered

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I0OV

Ohlone Tiger Beetle Cicindela ohlone — Endangered

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I0OW

San Bruno Elfin Butterfly Callophrys mossii bayensis — Endangered

MANAGED BY
Sacramento Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I00Q

Smith's Blue Butterfly Euphilotes enoptes smithi — Endangered

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I00R

Zayante Band-winged Grasshopper Trimerotropis infantilis — Endangered

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I0OY

Mammals

San Joaquin Kit Fox Vulpes macrotis mutica **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A006

Southern Sea Otter Enhydra lutris nereis **Threatened**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0A7

Reptiles

Blunt-nosed Leopard Lizard Gambelia silus **Endangered**

MANAGED BY
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=C001

San Francisco Garter Snake Thamnophis sirtalis tetrataenia **Endangered**

MANAGED BY
Sacramento Fish And Wildlife Office
Ventura Fish And Wildlife Office

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=C002

Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

California Red-legged Frog Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=D02D#crithab

Marbled Murrelet Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B08C#crithab

Monterey Spineflower Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q271#crithab

Robust Spineflower Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q3O7#crithab

Santa Cruz Tarplant Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q0ZL#crithab

Scotts Valley Polygonum Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q3HV#crithab

Scotts Valley Spineflower Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q3IB#crithab

Steelhead Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E08D#crithab

Steelhead Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E08D#crithab

Tidewater Goby Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E071#crithab

Western Snowy Plover Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B07C#crithab

Zayante Band-winged Grasshopper Critical Habitat Final designated
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I0OY#crithab

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

Allen's Hummingbird Selasphorus sasin — **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0LI

Ashy Storm-petrel Oceanodroma homochroa — **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0AV

Bald Eagle Haliaeetus leucocephalus — **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

Bell's Sparrow Amphispiza belli — **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HE

Black Oystercatcher Haematopus bachmani — **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0KJ

Black Swift Cypseloides niger — **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FW

Black-chinned Sparrow Spizella atrogularis — **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0IR

Black-vented Shearwater Puffinus opisthomelas — **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0LF

Burrowing Owl Athene cunicularia — **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0NC

California Spotted Owl Strix occidentalis occidentalis — **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B08L

Cassin's Auklet Ptychoramphus aleuticus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FP

Common Yellowthroat Geothlypis trichas sinuosa **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B080

Costa's Hummingbird Calypte costae **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JE

Flammulated Owl Otus flammeolus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DK

Fox Sparrow Passerella iliaca **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0NE

Lawrence's Goldfinch Carduelis lawrencei **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0J8

Least Bittern Ixobrychus exilis **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JW

Lesser Yellowlegs Tringa flavipes **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0MD

Lewis's Woodpecker Melanerpes lewis **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HQ

Loggerhead Shrike Lanius ludovicianus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FY

Long-billed Curlew Numenius americanus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06S

Marbled Godwit Limosa fedoa **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JL

Nuttall's Woodpecker Picoides nuttallii **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HT

Oak Titmouse Baeolophus inornatus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0MJ

Olive-sided Flycatcher Contopus cooperi **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0AN

Peregrine Falcon Falco peregrinus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

Pink-footed Shearwater Puffinus creatopus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0KZ

Short-billed Dowitcher Limnodromus griseus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JK

Short-eared Owl Asio flammeus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

Swainson's Hawk Buteo swainsoni **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B070

Tricolored Blackbird Agelaius tricolor **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06P

Whimbrel Numenius phaeopus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JN

Yellow Warbler dendroica petechia ssp. brewsteri **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0EN

Red Knot Calidris canutus ssp. roselaari **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0G6

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

Ellicott Slough National Wildlife Refuge

301.21 acres

PHONE (510) 792-0222

ADDRESS
1100 Fiesta Way
Watsonville, CA 95076

http://www.fws.gov/refuges/profiles/index.cfm?id=81643

Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Wetland data is unavailable at this time.

Summary

This Natural Environment Study (NES) has been prepared to provide biological information for the State Route 1 High Occupancy Vehicle (HOV) Lane Project (project). The project currently consists of several alternative designs, and the information in this NES will be used to determine to what extent the proposed project alternatives may affect threatened and endangered species and their habitats. The evaluation in this NES is based on biological studies conducted from 2003 through 2008, a wetland verification visit in 2013, and project plans as of November 2012. The evaluation provides quantified estimates of habitat impacts within the Biological Study Area (BSA), based on those studies and plans. For the purposes of this project, the BSA is defined as the area (land and water) that may be directly, indirectly, temporarily, or permanently impacted by construction and construction-related activities. The Project Impact Area (PIA) is defined as the area that is either temporarily or permanently, but directly impacted by construction and construction-related activities. A qualitative approach has been used for identifying potential impacts to special-status species.

The Project

The California Department of Transportation (Caltrans), in cooperation with the Federal Highway Administration (FHWA) and the Santa Cruz County Regional Transportation Commission, proposes improvements to State Route 1 (Route 1) in Santa Cruz County along a distance of approximately 8.9 miles, from approximately 0.4 mile south of the San Andreas/Larkin Valley Road Interchange through the Morrissey Boulevard Interchange. This project uses a “tiered” approach to its environmental documentation. The Tier I portion of the project documentation supports informed decision making and discloses issues associated with the selection of a Tier I Corridor Alternative. As specific projects within the corridor are ready for implementation, impacts of that action will be evaluated in subsequent Tier II Alternative studies. Each Tier II segment will be within the project limits of the Tier I corridor and would collectively result in the phased implementation of transportation improvements for the 8.9-mile corridor.

The Tier I portion of this project consists of three alternatives that are under consideration, including the HOV Lane Alternative, the Transportation Systems Management (TSM) Alternative, and the No-Build Alternative. The HOV Lane Alternative includes the following main project components: changes to the Route 1 mainline to accommodate an HOV lane and auxiliary lanes, reconfiguration of

interchanges, planning for transit supportive features, and the addition of two bicycle/pedestrian overcrossings. The HOV Lane Alternative would expand the existing Route 1 four-lane roadway to a six-lane facility by adding an HOV lane next to the median in both the northbound and southbound directions. Expanding the roadway from four lanes to six lanes would be achieved by reducing the existing median width, in addition to widening the roadway footprint and right-of-way (ROW). The TSM Alternative proposes to add ramp metering and construct HOV bypass lanes on existing interchange on-ramps, improve existing nonstandard geometric elements at various ramps, and add auxiliary lanes along the mainline between major interchange pairs within the project limits.

The Tier II portion of this document examines a project-level Auxiliary Lane Alternative and a No Build Alternative. The Tier II Auxiliary Lane Alternative would add an auxiliary lane to both the northbound and southbound sides of Route 1 between the 41st Avenue and Soquel Drive/Soquel Avenue interchanges. The total Tier II project area would be approximately 1.2 miles in length, and is located outside coastal zone jurisdiction.

Habitats

Riverine, freshwater marsh, riparian forest, various woodlands, coastal scrub, annual grassland, ruderal/disturbed, landscaped/developed, and anthropogenic habitats are present within the BSA. Most of these habitats have potential to support several annual special-status plant species and/or special-status wildlife species, though these species were not observed during biological surveys for the project. According to the California Natural Diversity Database (CNDDB) and U.S. Fish and Wildlife Service (USFWS), several special-status plant and animal species have the potential for occurrence within the BSA.

As identified for this NES, approximate quantities of plant communities/habitat areas within the BSA include the following:

Table S-1: Plant Communities/Habitat Areas in the BSA

Habitat	Area in Acres	Area in Square Feet
Riverine/Freshwater Marsh	9.56	416,219
Riparian Forest	18.44	803,397
Coast Live Oak Woodland	26.77	1,166,184
Mixed Conifer Woodland	9.30	405,046
Eucalyptus Woodland	1.53	66,586

Habitat	Area in Acres	Area in Square Feet
Coastal Scrub	13.54	589,604
Annual Grassland	12.29	535,322
Ruderal Disturbed	17.18	748,232
Landscaped/Developed	152.15	6,627748
TOTAL	**260.75**	**11,358,336**

Tier I Corridor Alternatives Impacts to Habitats

The impacts to habitats for both the HOV Lane Alternative and the TSM Alternative have been quantified, based on the footprints of disturbed soil area and drainage improvements provided by the project engineers. These impact footprints represent the PIA for each project alternative, and cover potential disturbance areas for both permanent and temporary impacts, based on project plans as of November 2012. The estimates for potential impacts to habitats within the PIA include the following:

Table S-2: Tier I Corridor Alternatives - Potential Impacts to Habitat Types

Habitat Type Affected	HOV Impacts (acres / square feet)	TSM Impacts (acres / square feet)
Riverine/Freshwater Marsh	1.08 / 46,963	0.30 / 13,153
Riparian Forest	8.88 / 386,801	4.58 / 199,294
Coast Live Oak Woodland	9.45 / 411,827	4.89 / 212,910
Mixed Conifer Woodland	6.08 / 264,846	2.03 / 88,447
Eucalyptus Woodland	1.02 / 44,401	0.28 / 12,378
Coastal Scrub	2.76 / 120,416	0.87 / 37,792
Annual Grassland	4.53 / 197,475	0.58 / 25,080
Ruderal Disturbed	13.31 / 579,830	3.61 / 157,261
Landscaped/Developed	104.67 / 4,559,506	43.64 / 1,901,025

Tier II Auxiliary Lane Alternative Impacts to Habitats

Tier II Auxiliary Lane Alternative habitat impacts have been quantified for the 41st Avenue to Soquel Drive/Soquel Avenue segment, based on the proposed disturbance areas for both permanent and temporary impacts from project plans as of November 2012. Habitat areas, and estimates for potential temporary and permanent impacts to habitats from implementation of the Tier II Auxiliary Lane Alternative are as follows:

Table S-3: Tier II Auxiliary Lane Alternative - Potential Impacts to Habitat Types

Habitat Type	Present in Project Area (acres/square feet)	Permanent Impacts (acres/square feet)	Temporary Impacts (acres/square feet)
Riverine/Freshwater Marsh	0.36 / 15,005	0.02 / 1,030	0.06 / 2,670
Riparian Forest	1.07 / 46,887	0.13 / 5,620	0.09 / 3,840
Coast Live Oak Woodland	0.15 / 6,555	0.001 / 75	0.12 / 5,392
Ruderal Disturbed	0.37 / 16,414	0.19 / 8,449	0.07 / 3,013
Landscaped/Developed	27.2 / 1,186,258	5.55 / 242,058	5.22 / 227,527

Survey Results and Impact Evaluation

The locations and types of biological surveys within the BSA were based on preliminary plans of the proposed project as provided by project engineers. Fieldwork within the BSA included botanical and wildlife inventories and wetland assessments conducted in May and October 2003, with additional surveys conducted in February and May 2007. The 2007 surveys included assessment of additional wetland areas, botanical surveys, and a tree survey. Based on guidance from Caltrans staff, a site visit was also conducted in November 2013 to determine if site conditions have resulted in a change in the size of the wetlands area. Focused California red-legged frog (*Rana draytonii*; CRLF) surveys were conducted from September 30 to October 2, 2003, under the 1997 USFWS guidance/protocol (revised as of 2005). The CRLF survey also concentrated on presence/absence of the foothill yellow-legged frog (*Rana boylii*; FYLF) and other special-status aquatic species. Surveyors observed the federally threatened central California coast steelhead (*Oncorhynchus mykiss*) in Aptos, Valencia, and Soquel Creeks. Two special-status plant species, Pajaro manzanita (*Arctostaphylos pajaroensis*) and Anderson's manzanita (*Arctostaphylos andersonii*), were observed within the southern portion of the project BSA, but are not located in or adjacent to proposed impact areas. No CRLF, FYLF, or other special-status species were observed during surveys of the BSA. The federally endangered and State of California endangered and Fully Protected Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*; SCLTS) is also known to historically occur within the BSA. SCLTS species observation records exist for Valencia Lagoon, Valencia Channel, and areas to the southwest of the BSA, but SCLTS was not observed during surveys.

The Tier II Auxiliary Lane Alternative contains suitable habitat for tidewater goby (*Eucyclogobius newberryi*) and CRLF. Riparian forest habitat and roadside trees also have potential to provide nesting habitat for a variety of bird species subject to protection under the Migratory Bird Treaty Act (MBTA). No special-status plant species or suitable habitat were observed in the Tier II Auxiliary Lane Alternative project area.

Due to the extended project timeframe, additional botanical and wildlife surveys are likely to be required prior to habitat disturbance to confirm the presence or absence of special-status species within the BSA. For agency consultation purposes, surveys are likely to be required by regulatory agencies for special-status plant species (as described in Section 4.2), and as needed for tidewater goby, California tiger salamander (*Ambystoma californiense*; CTS), SCLTS, CRLF, burrowing owl (*Athene cunicularia*), and least Bell's vireo (*Vireo bellii pusillus*; LBV) (as described in Section 4.3), if suitable habitat conditions are present. Survey efforts should be scheduled and conducted during the appropriate seasons 1 to 2 years prior to anticipated construction of each Tier II segment. In general, because of its length, timeframe, and numerous stream crossings, the proposed project has the potential to impact special-status plant and animal species.

Critical Habitat

Aptos Creek occurs within tidewater goby critical habitat unit Santa Cruz (SC)-7, Aptos Creek [3 acres]. The drainages within the BSA also occur within a central California coast steelhead critical habitat unit. Since the completion of the 2003 California Red-legged Frog Survey Report for the proposed project, CRLF critical habitat units have been revised, with the nearest CRLF critical habitat unit being SCZ–2, Watsonville Slough, located north of the mouth of the Pajaro River and seaward of Route 1, and outside of the BSA. Critical habitat has also been designated for Monterey spineflower (*Chorizanthe pungens*), Scott's Valley spineflower (*Chorizanthe robusta* var. *hartwegii*), robust spineflower (*Chorizanthe robusta robusta*), Santa Cruz tarplant (*Holocarpha macradenia*), CTS, CRLF, western snowy plover (*Charadrius alexandrinus nivosus*), and LBV; however, the BSA does not occur within designated critical habitat units for these species. Following the final rule for tidewater goby released in February 2013, the Tier I portion of the BSA is located within critical habitat for this species. The Tier II Auxiliary Lane Alternative project area from 41st Avenue to Soquel Avenue does not contain any designated critical habitat areas.

Jurisdictional Areas

The project would result in temporary and/or permanent impacts to riparian, freshwater marsh, and riverine habitats within the BSA. Additionally, the project would result in temporary and/or permanent impacts to drainage ditches within the BSA. These habitats may fall under jurisdiction of the U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and Regional Water Quality Control Board (RWQCB). Within the coastal zone, these habitats may also fall under jurisdiction of the California Coastal Commission (CCC). Impacts to these habitats may consist of fill or dredging, and these activities may require permits/authorizations from these regulatory agencies.

The Wetland Assessment for the proposed project followed USACE three-parameter (hydrophytic vegetation, hydric soils, and wetland hydrology) and CCC single-parameter methods. The Wetland Assessment was conducted from September 30 to October 3, 2003. A supplemental site visit was conducted on February 21 and 22, 2007, to check minor changes in the BSA and to observe jurisdictional areas following a rainfall event. Wetland and riparian habitats associated with streams and drainages along the project route were delineated. Wetland and riparian areas within the coastal zone are under CCC jurisdiction. CCC jurisdictional areas include USACE wetlands and other waters areas. CDFW jurisdiction also includes USACE areas. The total area delineated for each jurisdiction within the BSA is summarized in the table below:

Table S-4: Tier I Corridor Alternatives - Jurisdictional Areas

Jurisdictional Area	Acres / Square Feet
USACE Jurisdictional Areas	
USACE Wetlands	9.01 / 392,475
USACE Other Waters	0.85 / 37,026
Total of Wetlands and Other Waters of the United States	*9.86 / 429,501*
Other Jurisdictional Areas	
CCC jurisdiction	15.48 / 67,308
CDFW jurisdiction	28.19 / 1,227,956

Based on coordination with Caltrans staff, another supplemental site visit was conducted on November 6, 2013, to determine if the jurisdictional boundaries have increased or decreased since 2007. Field observations concluded that the

jurisdictional features are less than (approximately <0.5 acre) those formally delineated in 2003 and 2007. One of the primary reasons for the observed reduction in jurisdictional boundaries was due to the removal of willow habitat associated with a recent housing development located on Rosemarie Court. Because the total area of jurisdictional habitat was concluded to be less than the area mapped in 2003 and 2007, a formal delineation was not conducted at this time to determine the exact quantity. Therefore, for the purposes of this analysis, the calculations of the impact areas are based on the 2003 and 2007 delineations and are considered to be conservative at this time. As quantified in the Wetland Assessment, the jurisdictional areas within the BSA are estimated as follows.

Tier I Corridor Alternatives Potential Impacts to Jurisdictional Areas

Project impacts to jurisdictional areas for both the HOV Lane Alternative and the TSM Alternative have been quantified based on the PIA consisting of the footprints of disturbed soil area and drainage improvements. The potential disturbance areas for both permanent and temporary impacts were identified within these impact footprints at each jurisdictional area. Pavement and shoulder work, new ramp/road improvements, graded cut and fill slopes, bridge construction, and sound and retaining walls were considered permanent impacts. Channel dredging areas were quantified as primarily temporary impacts for both alternatives. The estimates for potential impacts to jurisdictional areas within the PIA include the following:

Table S-5: Tier I Corridor Alternatives - Potential Impacts to Jurisdictional Areas

Jurisdictional Area	Permanent (acres / square feet)	Temporary (acres / square feet)
HOV Lane Alternative		
USACE Wetlands	0.78 / 33,976	0.22 / 9,583
USACE Other Waters	0.15 / 6,533	0.10 / 4,380
CCC jurisdiction	3.22 / 140,262	0.46 / 16,038
CDFW jurisdiction	8.98 / 391,165	1.41 / 57,317
TSM Alternative		
USACE Wetlands	0.23 / 10,019	0.03 / 1,307
USACE Other Waters	0.10 / 4,380	0.02 / 871
CCC jurisdiction	2.20 / 95,831	0.33 / 14,375
CDFW jurisdiction	3.58 / 155,943	0.95 / 41,382

Tier II Auxiliary Lane Alternative Impacts to Jurisdictional Areas

The Tier II Auxiliary Lane Alternative project would result in temporary and permanent impacts to riparian forest and freshwater marsh/riverine habitats. Areas proposed for pavement and shoulder work, graded cut and fill slopes, pedestrian bridge construction, and sound and retaining wall construction are considered permanent impacts. Disturbances necessary for access or footing excavation in areas that would be restored to natural conditions are considered to be a temporary impact. The areas of jurisdictional features, and estimates for potential impacts to those features are as follows:

Table S-6: Tier II Auxiliary Lane Alternative - Jurisdictional Areas

Jurisdictional Area	Acres / Square Feet
USACE Jurisdictional Areas	
USACE Wetlands	0.0 / 0.0
USACE Other Waters (Soquel Drive-In roadside ditch)	0.13 / 5,662
Total of Wetlands and Other Waters of the United States	*0.13 / 5,662*
Other Jurisdictional Areas	
CDFW jurisdiction (Rodeo Gulch & Soquel Drive-In roadside ditch)	1.04 / 45,302

Table S-7: Tier II Auxiliary Lane Alternative - Potential Impacts to Jurisdictional Areas

Jurisdictional Area	Permanent (acres/ square feet)	Temporary (acres / square feet)
USACE Wetlands	0.0 / 0.0	0.0 / 0.0
USACE Other Waters (Soquel Drive-in roadside ditch)	0.02 / 1,030	0.06 / 2,670
CDFW jurisdiction (Rodeo Gulch and Soquel Drive-In roadside ditch)	0.15 / 6,650	0.15 / 6,510

Invasive Exotics

Nine exotic, invasive plant species as identified by the California Invasive Plant Council were observed in the BSA, including five species on the California Invasive Plant Council's A-1 List of Most Invasive Wildland Pest Plants; Widespread, and four species included on List B – Wildland Pest Plants of Lesser Invasiveness. In

most cases these invasive plant occurrences were relatively small populations and consisted of scattered clumps rather than large areas dominated by exotics. The largest occurrences consisted of English ivy (*Hedera helix*) and blue gum eucalyptus (*Eucalyptus globulus*), located primarily in association with disturbed riparian areas.

Regulatory Oversight

Pre-construction authorizations will be required from regulatory agencies including the USACE, CDFW, CCC, and RWQCB.

Pursuant to Section 7 of the Endangered Species Act, consultation with the USFWS may be necessary for potential impacts to the following federally listed species: marsh sandwort (*Arenaria paludicola*), Monterey spineflower, robust spineflower, Santa Cruz tarplant, tidewater goby, CTS, SCLTS, CRLF, and LBV. Consultation with the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) may be necessary for potential impacts to central California coast steelhead.

Coordination with CDFW may be necessary to determine if a Section 2081 Incidental Take Permit may be required for the following state-listed species: marsh sandwort, seaside bird's beak (*Cordylanthus rigidus* ssp. *littoralis*), Santa Cruz tarplant, San Francisco popcorn flower (*Plagiobothrys diffusus*), and LBV. State incidental take authorization cannot be granted for the Fully Protected SCLTS or white-tailed kite (*Elanus leucurus*).

Several other special-status species could be impacted by the proposed project including: bent-flowered fiddleneck (*Amsinckia lunaris*), Anderson's manzanita, Pajaro manzanita, swamp harebell (*Campanula californica*), bristly sedge (*Carex comosa*), deceiving sedge (*Carex saliniformis*), San Francisco collinsia (*Collinsia multicolor*), Ben Lomond buckwheat (*Eriogonum nudum* var. *decurrens*), arcuate bush mallow (*Malacothamnus arcuatus*), Hall's bush mallow (*Malacothamnus hallii*), marsh microseris (*Microseris paludosa*), robust monardella (*Monardella villosa* ssp. *globosa*), Monterey pine (*Pinus radiata*), Choris' popcorn flower (*Plagiobothrys chorisianus* var. *chorisianus*), pine rose (*Rosa pinetorum*), Santa Cruz microseris (*Stebbinsoseris decipiens*), Santa Cruz clover (*Trifolium buckwestiorum*), saline clover (*Trifolium depauperatum* var. *hydrophilum*), monarch butterfly (*Danaus plexippus*), Moestan blister beetle (*Lytta moesta*), FYLF, western pond turtle (*Actinemys marmorata*; WPT), Cooper's hawk (*Accipiter cooperi*), tricolored blackbird (*Agelaius tricolor*), short-eared owl (*Asio flammeus*), burrowing owl, white-tailed kite, other nesting migratory birds, roosting bats, and American badger

(*Taxidea taxus*). The Monterey pines in the BSA do not comprise a recognized natural stand, and no special mitigation for this species will be required beyond restoration of mixed conifer habitat.

Impacts to natural communities/habitats and special-status species, and other areas of regulatory agency concern will be mitigated through the avoidance and minimization measures included in this NES, and through the provisions of Habitat Mitigation and Monitoring Plans, which will be prepared for each Tier II project alternative.

Table of Contents

List of Figures

List of Tables

List of Abbreviated Terms

Abbreviation	Term
BMPs	Best Management Practices
BSA	Biological Study Area
Caltrans	California Department of Transportation
CCC	California Coastal Commission
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CMIA	Corridor Mobility Improvement Account
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRLF	California red-legged frog
CSC	California Special Concern species
CTS	California tiger salamander
CWA	Clean Water Act
EFH	Essential Fish Habitat
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
FMP	Fishery Management Plan
FP	Fully Protected
FSC	Federal Species of Concern
FYLF	foothill yellow-legged frog
HAZMAT	hazardous materials
HCP	Habitat Conservation Plan
HOV	High Occupancy Vehicle
IS	Initial Study
KP	kilometer post
LBV	least Bell's vireo
LCP	Local Coastal Program
MBTA	Migratory Bird Treaty Act
mph	miles per hour
NCCP	Natural Community Conservation Plan
NEPA	National Environmental Policy Act
NES	Natural Environment Study
NOAA Fisheries	National Oceanic and Atmospheric Administration

Abbreviation	Term
	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NWP	Nationwide Permit
OHWM	ordinary high water mark(s)
PIA	Project Impact Area
PCEs	primary constituent elements
PFMC	Pacific Fishery Management Council
PM	post mile
ppt	parts-per-thousand
ROW	right-of-way
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SCLTS	Santa Cruz long-toed salamander
SCS	Soil Conservation Service
SR-	State Route
TOS	Transportation Operations System
TSM	Transportation System Management
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WPT	western pond turtle

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Chapter 1. Introduction

The purpose of this Natural Environment Study (NES) is to provide technical information and to review the proposed project in sufficient detail to determine to what extent the proposed project may affect special-status species and habitats. This NES is intended to provide information for the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) processes, with Federal Highway Administration (FHWA) and California Department of Transportation (Caltrans) regulation, policy, and guidance. The document presents technical information upon which later decisions regarding potential project impacts are developed.

1.1. Project History

Caltrans, in cooperation with the FHWA and the Santa Cruz County Regional Transportation Commission (RTC), proposes to improve State Route 1 (Route 1) in Santa Cruz County for a distance of approximately 8.9 miles, from approximately 0.4 mile south of the San Andreas/Larkin Valley Road Interchange through the Morrissey Boulevard Interchange (refer to Figures 1 through 3).

Route 1 is the primary roadway connecting communities in Santa Cruz County and is the only continuous commuter route linking Watsonville, Capitola, Aptos, Cabrillo College, Santa Cruz, and the University of California at Santa Cruz (UC Santa Cruz). Approximately one quarter of commuters using Route 1 continue on State Route 17 to jobs in Santa Clara County. Route 1 also is the southern terminus for State Routes 9 and 17, which bring heavy tourist traffic to coastal destinations in Santa Cruz and Monterey Counties. Route 1 between San Andreas Road and the Route 1/State Route 17 interchange is a four-lane divided freeway with a median varying in width from 8.2 to 62.6 feet. Within the project limits there are nine interchanges, two overcrossings, and two Santa Cruz Branch Rail Line overpass bridge structures.

The population of Santa Cruz County has doubled in the last 30 years to approximately 270,000. During this time, operational improvements have been made to the route within the project limits, but no capacity enhancements, and this segment of Route 1 has become heavily congested during morning and evening commute times. Heavy congestion is now experienced on weekdays on Route 1 for 3.5 hours in the morning from 6:30 a.m. to 10:00 a.m. and for 4.5 hours in the evening from 2:00 p.m. to 6:30 p.m. Traffic projections for the No-Build scenario in design year

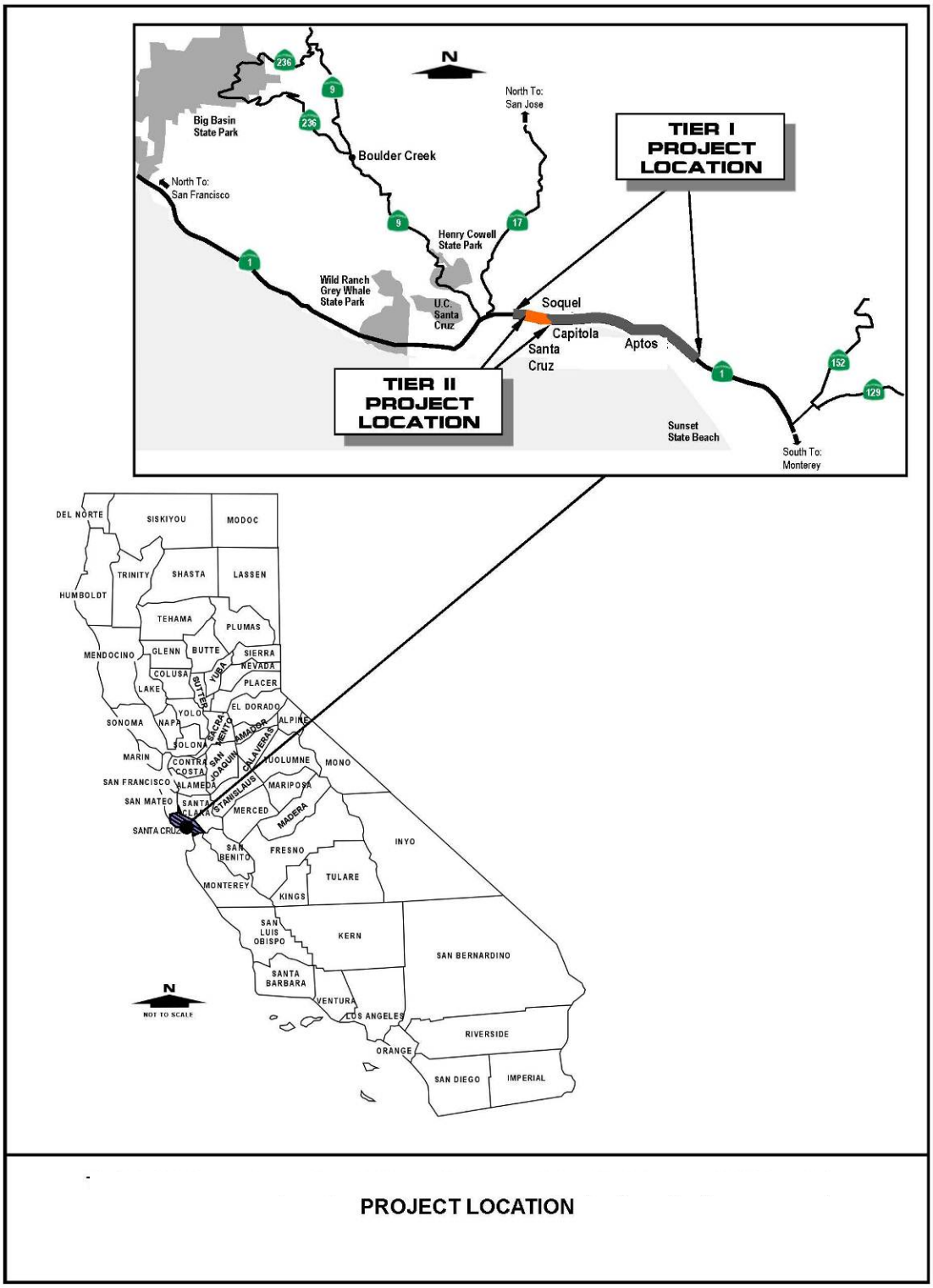
2035 show that from 6:00 a.m. to 12:00 p.m. the corridor would operate at Level of Service (LOS) F in the northbound direction. From 2:00 p.m. to 8:00 p.m., the corridor would operate at LOS F in both directions. The average northbound travel time in the AM peak hour would be as high as 59 minutes, up from 23 minutes under existing conditions. Travel time for the southbound direction during the PM peak hour would average 61 minutes, up from 27 minutes under existing conditions. In the peak commute direction in the 2035 No-Build scenario, the average travel speed would drop from 44 miles per hour (mph) to 18 mph in the AM and from 39 mph to 15 mph in the PM (State Route 1 HOV Lane Project [From Morrissey Boulevard to San Andreas Road] Traffic Operations Report; April 2012, Wilbur Smith Associates).

1.2. Tier I and Tier II Project Structure

This project uses a "tiered" approach to its environmental documentation. Tiering is a staged approach that addresses broad programs and issues related to the entire corridor in the Tier I analysis. As specific projects within the corridor are ready for implementation, impacts of that action are evaluated in subsequent Tier II studies. The tiered process supports decision making on issues that are ripe for decision and provides a means to preserve those decisions. The Tier I portion of the project documentation provides fact-based analyses that support informed decision making on the 8.9-mile corridor and discloses issues associated with the selection of a Tier I Corridor Alternative. Identification of a Tier I Corridor Alternative will not result directly in construction; however, it will provide the basis for decision makers to select a program of transportation improvements within the corridor.

The Tier II portion of the environmental documentation examines a project-level Auxiliary Lane Alternative and a No-Build Alternative. The Tier II Corridor segment is within the project limits of the Tier I Corridor and would represent the first implementation phase of transportation improvements for the 8.9-mile corridor. As mentioned above, all Tier II Corridor projects will be subject to separate environmental review.

Figure 1: Regional Location Map



PROJECT LOCATION

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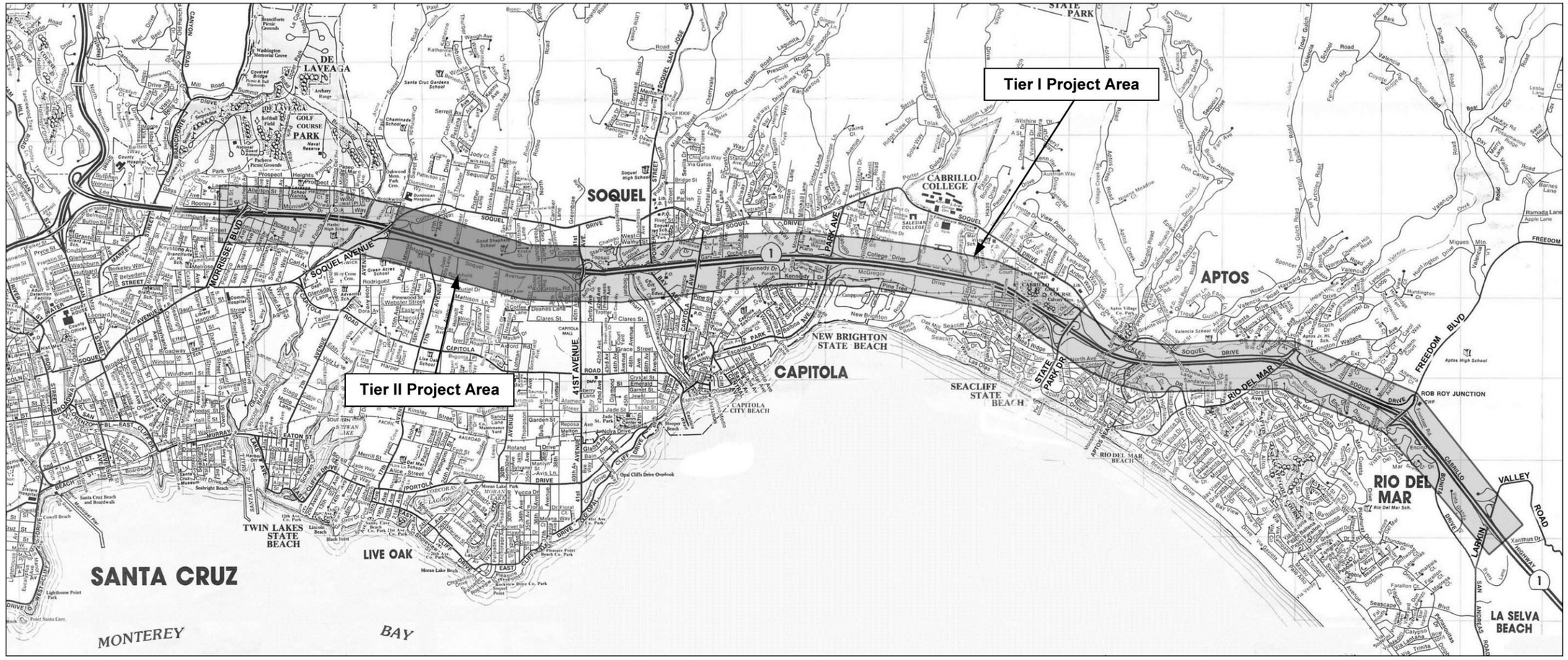
Figure 2: Project Vicinity Map



Source: Compass maps

NORTH
Not to Scale

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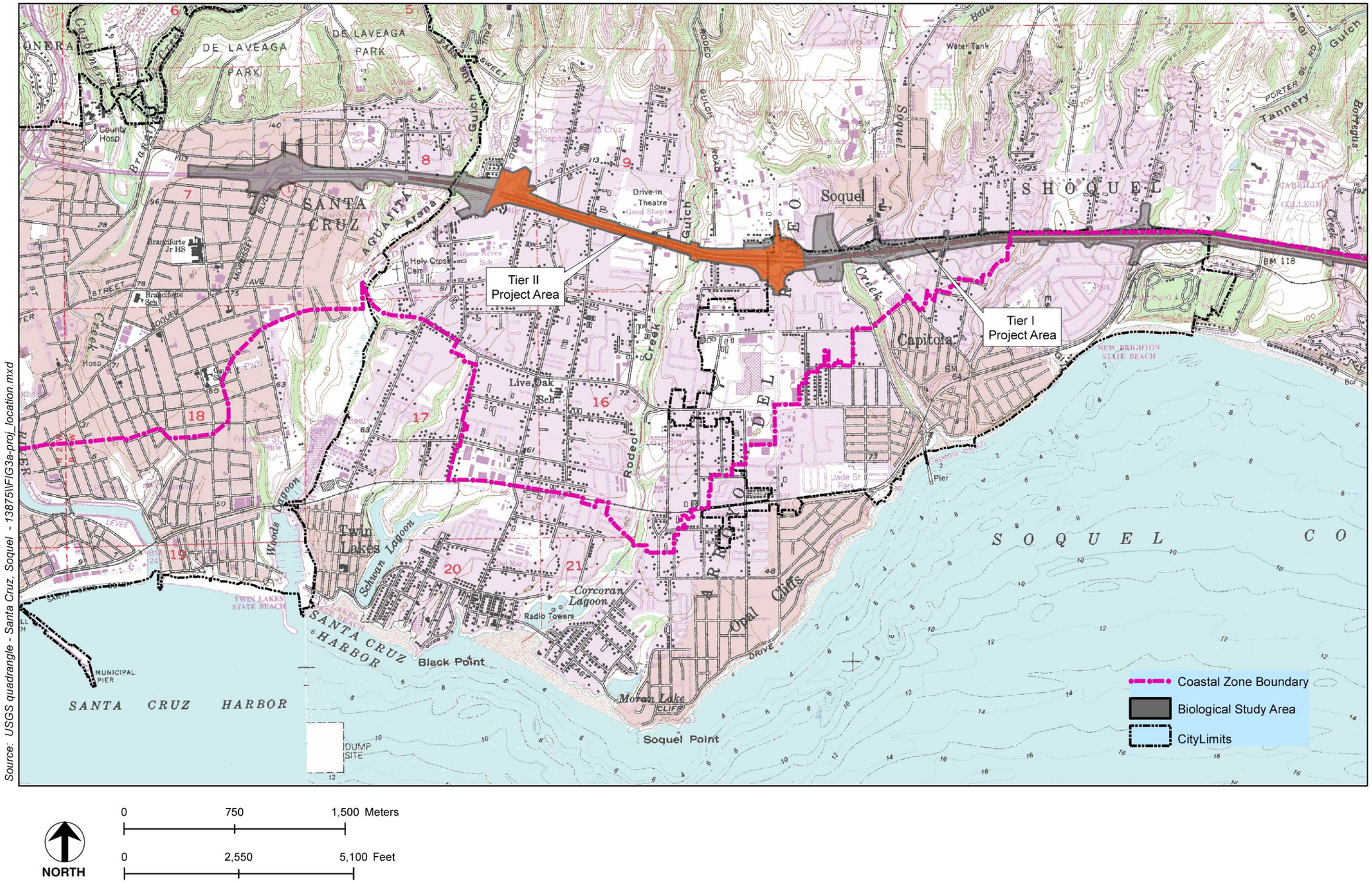
Figure 3a: Project Location Map



Source: USGS quadrangle - Santa Cruz, Soquel - 13875\\F/G3a-proj_location.mxd

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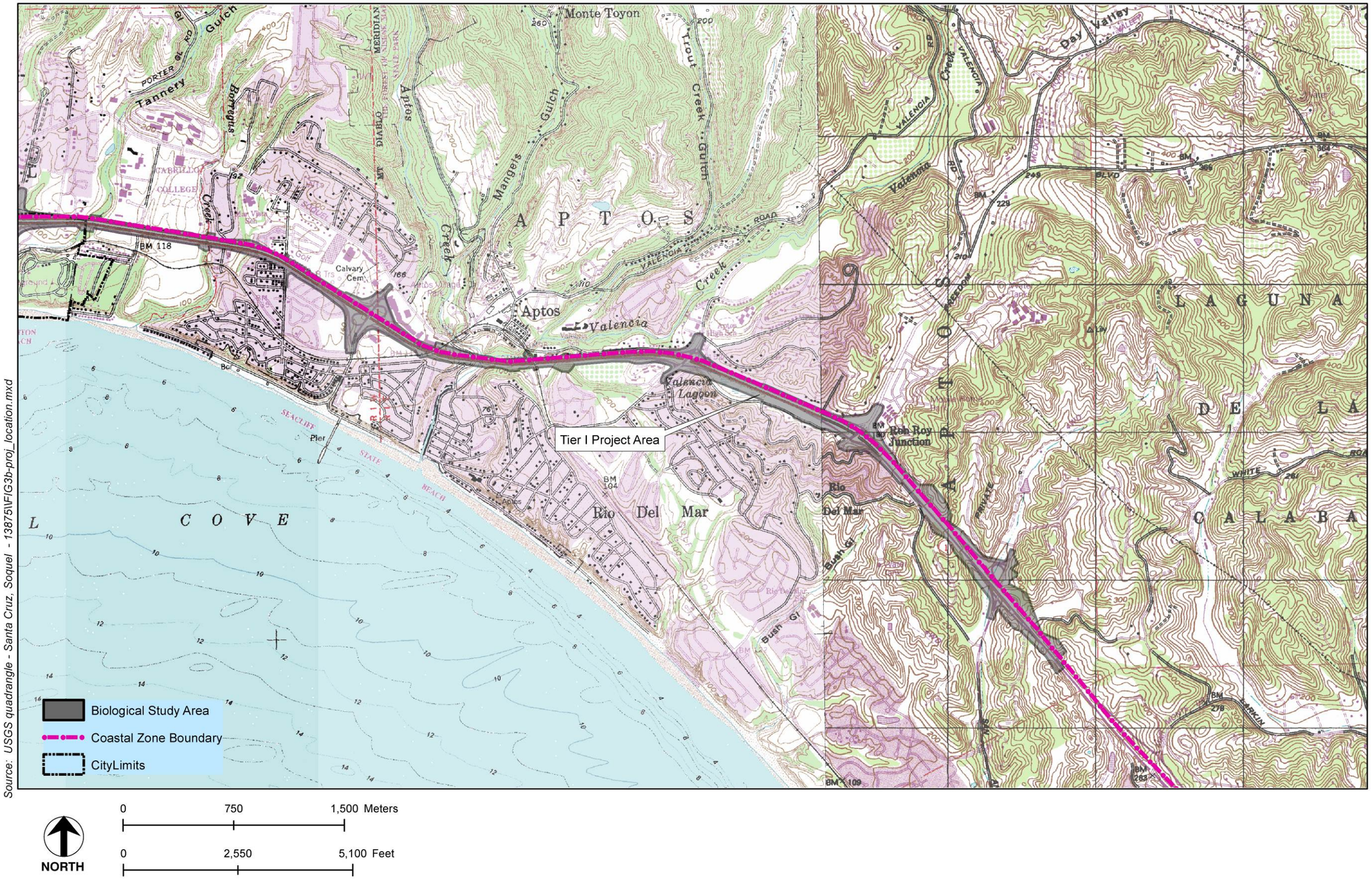
Figure 3b: Project Location Map



Source: USGS quadrangle - Santa Cruz, Soquel - 13875\IFIG3b-proj_location.mxd

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1.3. Project Description

The purpose of the proposed project is to achieve the following within the Tier I and Tier II project limits:

- Reduce congestion.
- Encourage carpooling and use of alternative transportation modes as a means to increase transportation system capacity.

The need for the project is summarized by these deficiencies on Route 1 within the project limits:

- Several bottlenecks along Route 1 in the southbound and northbound directions cause recurrent congestion during peak hours;
- Travel time delays due to congestion and related accidents;
- "Cut-through" traffic, or traffic on local streets, occurs and is increasing because drivers seek to avoid congestion on the highway;
- Limited opportunities for pedestrians and bicyclists to safely get across Route 1 within the project limits;
- Insufficient support facilities and incentives to increase transit service that operates in the Route 1 corridor because congestion threatens reliability and cost-effective transit service delivery; and,
- Inadequate facilities to support carpool and rideshare vehicles over single-occupancy vehicles; therefore, incentives, such as travel time savings, and reliability are difficult to achieve.

1.3.1. Tier I Build Alternatives

The three Tier I alternatives currently under consideration are the HOV Lane Alternative, the Transportation System Management (TSM) Alternative, and the No-Build Alternative. The two build alternatives are collectively referred to as Tier I Corridor Alternatives throughout this document. Tier I project plans are included in Appendix A.

1.3.1.1. COMMON DESIGN FEATURES OF THE BUILD ALTERNATIVES

The HOV Lane Alternative shares three primary sets of features with the TSM Alternative: new auxiliary lanes, new pedestrian/bicycle overcrossings of Route 1, and Transportation Operations System electronic equipment. These common design features are highlighted here but the auxiliary lanes are discussed in detail within the separate description of each alternative, since specifics vary.

Auxiliary Lanes

Auxiliary lanes would be constructed in the following locations under either the HOV Lane or TSM Alternative:

- Freedom Boulevard and Rio Del Mar Boulevard – northbound and southbound.
- Rio Del Mar Boulevard and State Park Drive – northbound and southbound.
- State Park Drive and Park Avenue – both directions in the TSM Alternative; southbound only in the HOV Lane Alternative.
- Park Avenue and Bay Avenue/Porter Street – northbound and southbound.
- 41st Avenue and Soquel Avenue/Soquel Drive – northbound and southbound.

New Bicycle/Pedestrian Overcrossings

Both build alternatives include construction of new bicycle/pedestrian overcrossings of Route 1 at Mar Vista Drive and Trevethan Avenue, as described under the HOV Lane Alternative.

Other Common Features of the Build Alternatives

Both the HOV Lane and TSM Alternatives include installation of ramp metering and construction of HOV bypass lanes on the Route 1 on-ramps within the project limits. Under the TSM Alternative, however, no new HOV lanes would be incorporated into the freeway mainline. California Highway Patrol enforcement areas would be included with the new HOV bypass lanes.

Both build alternatives would include reconstruction of the Santa Cruz Branch Rail Line bridges over Route 1 and the State Park Drive, Capitola Avenue, 41st Avenue, and Soquel Avenue overcrossings. Also, under both alternatives, the Aptos Creek and Soquel Creek bridges would be widened.

Both the HOV Lane and TSM Alternatives also would include Transportation Operations System equipment, described in detail within each alternative description.

1.3.1.2. HOV LANE ALTERNATIVE

The HOV Lane Alternative would widen the existing four-lane highway to a six-lane facility by adding an HOV lane next to the median in both the northbound and southbound directions. Along the southern portion of the project, the existing median generally is wide enough to add the new HOV lanes within the existing right-of-way (ROW). A mandatory standard median width (22 feet) would be used through most of the corridor, north of Freedom Boulevard. Where existing frontage roads would be impacted, non-standard inside shoulder widths of 5 feet are proposed to reduce ROW requirements and impacts. Such non-standard design features will require design exceptions when they are part of Tier II project. In some locations, widening would extend outside the existing state ROW.

The HOV Lane Alternative would modify or reconstruct all nine interchanges within the project limits to improve merging operations and ramp geometrics, lengthen acceleration and deceleration lanes, and improve sight distances. The Bay Avenue/Porter Street and 41st Avenue interchanges would be modified to operate as one interchange with a frontage road connecting the two interchanges. Where feasible, design deficiencies on existing ramps would be corrected to meet current design standards. Ramp metering and HOV bypass lanes would be provided on all Route 1 on-ramps. The HOV Lane Alternative would include auxiliary lanes between interchange ramps and Transportation Operations System electronic equipment, such as changeable message signs, closed-circuit television, microwave detection systems, and vehicle detection systems as also described under the TSM Alternative—with the exception that an auxiliary lane would not be constructed northbound between State Park Drive and Park Avenue.

Bridge structures and the Capitola Avenue Overcrossing would be modified or replaced to accommodate the new HOV lanes. New and widened highway crossing structures would include shoulder and sidewalk facilities to accommodate pedestrians and bicycles. The HOV Lane Alternative would include two new pedestrian/bicycle overcrossings of Route 1. The existing Santa Cruz Branch Rail Line structures would be replaced, not relocated or raised, to minimize environmental impacts. The Route 1 bridge over Aptos Creek would be widened on the outside to accommodate the new HOV lanes.

Retaining walls would be constructed to minimize ROW acquisition and reduce or avoid environmental impacts. At locations where frontage roads are adjacent to Route 1, concrete barriers would be constructed to separate the two facilities and

minimize ROW acquisition. The project also would include demolition and disposal, excavation, borrow and fill, sound wall ROW acquisition, and temporary easements.

Mainline Improvements with the HOV Lane Alternative

- Route 1 would be widened to allow for two standard width (12 feet) mixed-flow lanes, one standard width (12 feet) HOV lane, and standard outside (10 feet) shoulders.

- The proposed widening would be constructed into the median where the existing median width is over 45 feet. Where the existing median width is less than 45 feet, the required widening would be both into the median and at the outside shoulder, but generally within the existing Route 1 ROW.

- Where auxiliary lanes are proposed, widening to the outside would be increased by approximately 12 feet.

- A mandatory standard median width of 22 feet is proposed through most of the corridor.

- The highway centerline would be shifted northward in the vicinity of the Santa Cruz Branch Rail Line crossings to reduce impacts to wetlands. The bridge over Aptos Creek would be widened.

- Route 1 would be lowered to obtain vertical clearance at the Santa Cruz Branch Rail Line crossings in Aptos. A mandatory standard median width of 22 feet is proposed to minimize impacts to the Santa Cruz Branch Rail Line.

- Median and inside shoulder width would be non-standard to reduce impacts to these adjacent streets: McGregor Drive, Cabrillo College Drive, Kennedy Drive, and Soquel Avenue. At these four constrained locations, the inside shoulder would be a non-standard 5 feet and the median a non-standard 17 feet.

Auxiliary Lane Improvements with the HOV Lane Alternative

Auxiliary lanes are designed to reduce conflicts between traffic entering and exiting the highway by connecting from the on-ramp of one interchange to the off-ramp of the next; they are not designed to serve through traffic. Auxiliary lanes would be added at the following locations:

- Northbound and southbound between Freedom Boulevard and Rio Del Mar Boulevard;

- Northbound and southbound between Rio Del Mar Boulevard and State Park Drive;
- Southbound between State Park Drive and Park Avenue;
- Northbound and southbound from Park Avenue to Bay Avenue/Porter Street; and,
- Northbound and southbound from 41st Avenue to Soquel Drive/Soquel Avenue.

Interchange Improvements with the HOV Lane Alternative

All interchanges within the project limits would be modified to improve merging operations and ramp geometrics, and to improve accessibility and safety for pedestrians and bicyclists.

Interchange improvements would generally include the following:

- Ramp metering and HOV bypass lanes would be provided on all on-ramps.
- Ramps would be widened and their geometrics improved where feasible.
- California Highway Patrol enforcement areas would be provided at all on-ramps except Park Avenue, southbound.
- Intersections of freeway ramps with local roads would be modified to provide less-skewed intersections with crosswalks for pedestrians and bicycles; free right-turns would be eliminated where feasible and traffic signals installed.
- Local roadways would be widened at the interchanges to serve anticipated travel demand.
- Retaining walls would be constructed to minimize impacts to local roadways, development, wetlands, and waterways.
- Drainage facilities would be provided for adequate drainage and treatment of storm water runoff.
- Other specific improvements are identified by interchange area.

Changes at San Andreas/Larkin Valley Road Interchange

- The existing northbound cloverleaf off-ramp free right-turn onto Larkin Valley Road would be eliminated in favor of a signalized 90-degree intersection.
- A signalized intersection would be provided at the San Andreas Road ramps and the free right-turns eliminated.
- The existing on-ramps would be widened to accommodate HOV bypass lanes.
- The southbound Route 1 bridge over San Andreas/Larkin Valley Road would be widened into the median to accommodate the HOV lanes.
- San Andreas/Larkin Valley Roads would be widened within the project limits to add turn lanes.
- New sidewalks would be added along San Andreas/Larkin Valley Roads within the project limits.

Changes at Freedom Boulevard Interchange

- The existing ramp termini at Freedom Boulevard would be modified to provide less-skewed intersections with Freedom Boulevard. These intersections would be signalized, and free right-turns eliminated.
- The southbound off-ramp would be widened to two exit lanes.
- The existing on-ramps would be widened to accommodate HOV bypass lanes.
- Freedom Boulevard would be widened within the project limits to add turn lanes.
- The Freedom Boulevard/Bonita Drive intersection would be enlarged to add turn lanes and achieve acceptable levels of service.
- The Freedom Boulevard bridge would be replaced with a wider structure that would accommodate a new turn lane on Freedom Boulevard and the new HOV lane on Route 1.
- New sidewalks would be added along Freedom Boulevard within the project limits.

Changes at Rio Del Mar Boulevard Interchange

- The northbound on-ramp would be realigned to form the north leg of a four-way intersection with Rio Del Mar Boulevard and the northbound off-ramp. This intersection would be signalized, and free right turns eliminated.
- The northbound off-ramp would be widened to two exit lanes.
- The southbound ramps would be widened, the intersection with Rio Del Mar Boulevard signalized, and free right-turns eliminated.
- The existing on-ramps would be widened to accommodate HOV bypass lanes.
- Soquel Drive would be shifted northward to accommodate the roadway widening along the northbound off-ramp.
- Rio Del Mar Boulevard would be widened within the project limits to add turn lanes and a through lane in each direction.
- The Rio Del Mar Boulevard bridge over Route 1 would be replaced with a longer, wider bridge to accommodate a new turn lane and a through lane in each direction on Rio Del Mar and the new HOV lane on Route 1.
- A sidewalk would be added along eastbound Rio Del Mar Boulevard within the project limits; there is an existing sidewalk on westbound Rio Del Mar Boulevard.

Changes at State Park Drive Interchange

- The existing northbound cloverleaf on-ramp free-right would be changed to a signalized right turn.
- The existing northbound off-ramp terminus would be modified to form, together with the realigned northbound on-ramp terminus, the south leg of a signalized intersection with State Park Drive.
- The northbound and southbound off-ramps would be widened to two exit lanes.
- The existing on-ramps would be widened to accommodate HOV bypass lanes.
- State Park Drive would be widened within the project limits to add turn lanes and a through lane in each direction.

- The State Park Drive bridge over Route 1 would be replaced with a longer, wider bridge to accommodate a new through lane in each direction on State Park Drive, and the new HOV lane on Route 1.

- A sidewalk would be added along eastbound State Park Drive within the project limits; there is an existing sidewalk along westbound State Park Drive.

Changes at Park Avenue Interchange

- The existing diamond interchange ramp design would be retained and ramps would be widened.

- The northbound and southbound off-ramps would be widened to two exit lanes.

- The existing on-ramps would be widened to accommodate HOV bypass lanes.

- Park Avenue would be widened within the project limits to add turn lanes.

- The two Route 1 bridges over Park Avenue would be replaced with one, wider structure to accommodate the new HOV lanes on Route 1.

- A sidewalk would be added within the project limits along westbound Park Avenue; there is an existing sidewalk along eastbound Park Avenue.

Changes at Bay Avenue/Porter Street and 41st Avenue Interchanges

- Improvements at the Bay Avenue/Porter Street and 41st Avenue interchanges are designed so that these two interchanges would work as a single interchange connected by a collector/frontage road running between the interchanges.

- The ramps at Bay Avenue/Porter Street would be reconstructed to form less-skewed intersections with Bay Avenue/Porter Street.

- The existing southbound Route 1 off-ramp to Bay Avenue/Porter Street would be eliminated. Southbound traffic bound for Bay Avenue/Porter Street would exit at 41st Avenue two-lane ramp and continue on a new southbound collector/frontage road to Bay Avenue/Porter Street.

- The existing on-ramp from Porter Street to northbound Route 1 on a two-lane ramp would be modified to become a northbound collector/frontage road serving traffic bound for 41st Avenue or northbound Route 1.

- Northbound traffic exiting Route 1 would bear right to access Bay Avenue/Porter Street, or stay left and continue on a new structure over Bay Avenue/Porter Street, join the northbound collector/frontage road, and end at a new signalized intersection at 41st Avenue.

- At 41st Avenue, southbound on and off-ramps would be eliminated and replaced with a diagonal off-ramp and a collector/frontage road serving traffic bound for Bay Avenue/Porter Street or southbound Route 1. The new ramp and collector/frontage road would form a signalized intersection with 41st Avenue.

- At 41st Avenue, the northbound on-ramps would include a realigned loop and realigned diagonal.

- New on-ramps would include HOV bypass lanes.

- 41st Avenue would be widened within the project limits to add turn lanes and eastbound though lanes over Route 1.

- Bay Avenue/Porter Street would be widened to add right-turn lanes at the on-ramps.

- A new bridge over Soquel Creek and Soquel Wharf Road would be constructed for the new southbound collector/frontage road from 41st Avenue to Bay Avenue/Porter Street.

- The 41st Avenue bridge over Route 1 would be replaced with a longer, wider bridge to accommodate the new eastbound through lane and turn lanes on 41st Avenue, and the new HOV lanes on Route 1.

- Class I bike paths would be constructed between 41st Avenue and Bay Avenue/Porter Street adjacent to the new collector/frontage roads.

Changes at Soquel Drive/Soquel Avenue Interchange

- The northbound off-ramp would be realigned to a signalized 90-degree intersection with Soquel Drive. The existing access to Commercial Way would be eliminated.

- The westbound Soquel Drive on-ramp to northbound Route 1 would be modified to eliminate the free right-turn access.

- The existing northbound loop on-ramp from eastbound Soquel Avenue would be realigned and its free-right terminus would become a signalized 90-degree intersection.
- A new, wider southbound diagonal off-ramp that adds turn lanes at its terminus and a new loop on-ramp would form the north leg of a signalized intersection at Soquel Avenue.
- The existing southbound hook on-ramp would be widened to add an HOV bypass lane and realigned to be made standard.
- The northbound and southbound off-ramps would be widened to two exit lanes.
- New on-ramps would include HOV bypass lanes.
- Soquel Avenue within the project limits would be widened to add an eastbound though lane and turn lanes.
- Salisbury Lane would be shifted eastward to form an intersection with the realigned northbound off-ramp and loop on-ramp.
- The Soquel Drive/Soquel Avenue bridge over Route 1 would be replaced with a longer, wider bridge to add an eastbound through lane and a turn lane to Soquel Drive and accommodate the new HOV lane on Route 1.
- The culvert at Arana Gulch would be extended underneath the widened Route 1 and new southbound off-ramp.
- A sidewalk would be added along eastbound Soquel Drive/Soquel Avenue within the project limits; there is an existing sidewalk along westbound Soquel Drive/Soquel Avenue.

Changes at Morrissey Boulevard Interchange

- The southbound exit would be realigned to terminate at a new signalized intersection with Morrissey Boulevard.
- The existing southbound on-ramp would be eliminated and replaced with a new, wider diagonal ramp with a signalized terminus.
- The existing southbound exit and on-ramp at Elk Street would be eliminated.

- The existing northbound loop on-ramp would be eliminated, as would access to Rooney Street from this northbound loop
- The northbound off-ramp would be widened to two exit lanes.
- New on-ramps would include HOV bypass lanes.
- Morrissey Boulevard within the project limits would be widened to add an eastbound through lane and turn lanes, and realigned to form a straight line between its intersections with Fairmont Avenue and Rooney Street.
- The Morrissey Boulevard bridge would be replaced with a longer, wider bridge to accommodate a new eastbound through lane and turn lanes on Morrissey Boulevard and new HOV lanes on Route 1.
- A sidewalk would be added along eastbound Morrissey Boulevard within the project limits; there is an existing sidewalk along westbound Morrissey Boulevard.

Transit-Related Facilities

In addition to the mainline HOV through-lanes on the highway and HOV bypass lanes on the ramps, the HOV Lane Alternative could include the following features to facilitate freeway-oriented transit services and operations:

- Both on-ramps and both off-ramps at the reconfigured Park Avenue interchange include options for bus pads and bus shelters.
- Ramps and collectors at the Bay Avenue/Porter Street and 41st Avenue interchange include options for bus pads and shelters.
- A future Park and Ride lot is under consideration at the 41st Avenue interchange, to be coordinated with the bus facilities.
- Feasibility for a Park and Ride lot in the Bay Avenue/Porter Street interchange area would be investigated.

These improvements would be considered as part of the detailed Tier II design/environmental analysis of those respective facilities in the future.

New Bicycle/Pedestrian Overcrossings

The HOV Lane Alternative would construct new bicycle/pedestrian overcrossings of Route 1 at the following locations:

- Mar Vista Drive – the crossing would start on the north side of Route 1 and parallel the highway eastward for about 600 feet, doubling back westward as it climbs before crossing the highway at a right angle and then descending by switchbacks to and along Mar Vista Drive for about 550 feet; multiple configurations are under consideration, and the final design will be determined as part of the Tier II design/environmental analysis of this facility

- Trevethan Avenue – the crossing would start on the north side of Route 1 at Trevethan Avenue and parallel the highway about 600 feet before crossing on an angle and continuing along the banks of the western tributary to Arana Gulch to terminate close to Harbor High School; multiple configurations are possible, with the final design to be determined as part of the Tier II design/environmental analysis of this facility.

1.3.1.3. TRANSPORTATION SYSTEM MANAGEMENT (TSM) ALTERNATIVE

The TSM Alternative proposes to add ramp metering and construct HOV bypass lanes on existing interchange on-ramps, improve existing nonstandard geometric elements at various ramps, and add auxiliary lanes along the mainline between major interchange pairs within the project limits, as described below and summarized under Common Design Features of the Build Alternatives. It would not construct HOV lanes or any additional through lanes on the mainline.

The Common Design Features of the Build Alternatives section describes other features included in the TSM Alternative.

Auxiliary Lanes

Auxiliary lanes are designed to reduce conflicts between traffic entering and exiting the highway by connecting from the on-ramp of one interchange to the off-ramp of the next; they are not designed to serve through traffic. Auxiliary lanes to be constructed on Route 1 with the TSM Alternative consist of the following:

- Northbound and southbound between Freedom Boulevard and Rio Del Mar Boulevard.

- Northbound and southbound between Rio Del Mar Boulevard and State Park.

- Northbound and southbound between State Park Drive and Park Avenue.
- Northbound and southbound between Park Avenue and Bay Avenue/Porter Street.
- Northbound and southbound from 41st Avenue to Soquel Drive/Soquel Avenue.

New Bicycle/Pedestrian Overcrossings

The TSM Alternative would construct new bicycle/pedestrian overcrossings of Route 1 at Mar Vista Drive and Trevethan Avenue as described under the HOV Lane Alternative.

Other Improvements

- At Freedom Boulevard, the southbound off-ramp would be widened to two exit lanes.
- At State Park Drive, the northbound and southbound off-ramps would be widened to two exit lanes.
- At Park Avenue, the northbound and southbound off-ramps would be widened to two exit lanes.

Like the HOV Alternative, the TSM Alternative would widen the Soquel Avenue northbound and southbound off-ramps to provide two exit lanes, but the southbound ramp would not be realigned and the northbound ramp realignment would not be as significant as in the HOV Alternative. Also as in the HOV Alternative, the realigned northbound off-ramp would eliminate access to Commercial Way.

1.3.2. Tier I No-Build Alternative

The No-Build Alternative offers a basis of comparison with the TSM and HOV Lane Alternatives in the future analysis year of 2035. It would not address the project purpose and need. It assumes no major construction on Route 1 through the project limits other than currently planned and programmed improvements and continued routine maintenance. Planned and programmed improvements included in the No-Build Alternative are the following improvements contained in the 2010 Regional Transportation Plan:

- Installation of median barrier on Route 1 from Freedom Boulevard to Rio Del Mar Boulevard.

- Construction of auxiliary lanes between the Soquel Avenue/Soquel Drive and Morrissey Boulevard interchanges (EA 05-0F6500, completed May 2013).
- Replacement of the La Fonda Avenue overcrossing of Route 1, included as part of the Soquel-Morrissey Auxiliary Lanes project.
- Construction of auxiliary lanes between the 41st Avenue and Soquel Avenue/Soquel Drive interchanges
- Construction of a bike/pedestrian overcrossing at Chanticleer Avenue.

Also included in the No-Build Alternative are a number of locally sponsored projects for improving the local arterial network and constructing or improving bicycle lanes.

1.3.3. Tier II Build Alternative

The purpose of the Tier II Build Alternative (herein referred to as Tier II Auxiliary Lane Alternative) matches that of the Santa Cruz County Route 1 HOV project in regards to reducing congestion and encouraging use of alternative transportation modes as a means to increase system capacity, except that encouraging carpooling is not a part of the Tier II project purpose. Tier II project plans are included in Appendix B.

1.3.3.1. AUXILIARY LANES

The RTC is proposing to widen Route 1 by adding an auxiliary lane to both the northbound and southbound sides between the 41st Avenue and Soquel Drive interchanges. The total roadway widening would be approximately 1.2 miles in length. Southbound, the auxiliary lane would begin at the existing Soquel Drive on-ramp, and end at the existing off-ramp at 41st Avenue. Northbound, the auxiliary lane would begin just south of the 41st Avenue overcrossing, at the existing loop on-ramp to northbound 41st Avenue. West of the overcrossing, the on-ramp from southbound 41st Avenue to northbound Route 1 would merge with the new auxiliary lane, approximately 1,000 feet downstream from its beginning at the bottom of the loop ramp.

As part of the widening in the northbound direction, the project proposes to repair the pavement failure in the outside lane and shoulder by improving the pavement section, installing a retaining wall and, if necessary, replacing the underlying County-owned sanitary sewer.

1.3.3.2. PEDESTRIAN FEATURES

A new horseshoe-shaped pedestrian overcrossing at Chanticleer Avenue is proposed, and approximately 400 feet of sidewalk would be constructed along the south side of Soquel Avenue, starting at Chanticleer Avenue.

1.3.3.3. RETAINING WALLS

Retaining walls would be constructed as part of the roadway widening, with a total of four separate walls: three on the northbound side of the highway and one on the southbound side. Three of the walls would be located to allow widening for a future lane on the highway, in both directions. The wall proposed along the northbound on-ramp at 41st Avenue would require demolition in the event the highway was widened in the future. Two of the walls would span Rodeo Creek Gulch, where there is an existing 9-foot arch concrete culvert, and one would be constructed within a narrow jurisdictional area on the northbound side of Route 1, adjacent to a 39-inch culvert crossing.

1.3.3.4. RIGHT-OF-WAY

ROW would be acquired along Soquel Avenue west of Chanticleer Avenue and at the Chanticleer Avenue cul-de-sac north of the roadway, along with temporary construction easements on both sides of Route 1 near the proposed overcrossing

1.3.3.5. NOISE ATTENUATION

One severely affected residence would be provided noise mitigation.

1.3.4. Tier II No-Build Alternative

The No-Build Alternative offers a basis of comparison with the Tier II Auxiliary Lane Alternative. It would not address the project purpose and need, and assumes no major construction on Route 1 through the project limits other than currently planned and programmed improvements and continued routine maintenance.

Chapter 2. Study Methods

2.1. Regulatory Requirements

Identification of a Tier I Corridor Alternative will not result directly in construction; however, it will provide the basis for decision makers to select a program of transportation improvements within the corridor. Implementation of those improvements will require federal, state, and local regulatory authorizations prior to construction of each Tier II corridor segment. These authorizations may be issued in the form of legal permits, agreements, or other forms of environmental review. Authorizations will likely include numerous requirements for environmental compliance, which will be enforced through construction monitoring, documentation, and reporting.

2.1.1. Federal Policies and Regulations

2.1.1.1. NATIONAL ENVIRONMENTAL POLICY ACT

NEPA declares a continuing federal policy "to use all practicable means and measures...to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations." NEPA directs "a systematic, interdisciplinary approach" to planning and decision making and requires environmental statements for "major Federal actions significantly affecting the quality of the human environment." Implementing regulations by the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] Parts 1500-1508) requires federal agencies (such as FHWA) to identify and assess reasonable alternatives to proposed actions that will restore and enhance the quality of the human environment and avoid or minimize adverse environmental impacts. Federal agencies are further directed to emphasize environmental issues in project planning and to integrate impact studies required by other environmental laws and Executive Orders into the NEPA process. The NEPA process is considered to be an overall framework for the environmental evaluation of federal actions.

2.1.1.2. SECTION 404 OF THE CLEAN WATER ACT

The U.S. Army Corps of Engineers (USACE) is responsible for the issuance of permits for the placement of dredged or fill material into "waters of the United States" pursuant to Section 404 of the Clean Water Act (CWA) (33 United States Code [USC] 1344). As defined by USACE in 33 CFR 328.3(a)(parts 1-6), the following summarizes "waters of the United States" as:

> "Those waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; tributaries and impoundments to such waters; all interstate waters including interstate wetlands; and territorial seas."

Under federal regulations, wetlands are "waters of the United States" which are identified as:

> "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (Environmental Laboratory 1987)

In any event where project activities would result in impacts to "waters of the United States" (wetlands or non-wetland other waters), the proposed project would be subject to either an individual permit, a general permit, or may be exempt from regulatory requirements under Section 404 of the CWA based on review by the USACE. In some instances, activities have been granted a blanket authorization under the provisions of a general permit through the nationwide system.

The proposed project crosses nine named creek channels, two small, unnamed tributary drainages, and runs parallel to Valencia Creek, Valencia Lagoon, the Valencia Channel, and unnamed tributaries to Nobel Creek and Arana Gulch (refer to Figure 3 and Appendix C). In addition, several concrete lined and dirt bank roadside ditches are present along portions of the BSA, and direct stormwater into the storm drain system. Creeks and drainages along the route contain wetland and riparian habitats, and pass under Route 1 by means of existing bridges and culverts. Activities that would result in the deposition of dredged or fill material within the ordinary high water marks (OHWM) of these areas could require an USACE Section 404 permit.

2.1.1.3. SECTION 401 OF THE CLEAN WATER ACT

Section 401 of the CWA and its provisions ensure that federally permitted activities comply with the federal CWA and state water quality laws. Section 401 is implemented through a review process that is conducted by California's Regional Water Quality Control Board (RWQCB), and is triggered by the Section 404 permitting process. The RWQCB issues a Water Quality Certification via the 401

process that a proposed project complies with applicable effluent limitations, water quality standards, and other conditions of California law. Evaluating the effects of the proposed project on both water quality and quantity (runoff) falls under the jurisdiction of the RWQCB. Any activities within the project area that have the potential to result in a need for a permit from the USACE would require an RWQCB Section 401 Water Quality Certification.

2.1.1.4. FEDERAL ENDANGERED SPECIES ACT

The Federal Endangered Species Act (FESA) of 1973 provides legal protection for plant and animal taxa that are in danger of extinction, and classified as either threatened or endangered. Section 7 of the FESA requires federal agencies to make a finding on all federal actions as to the potential to jeopardize the continued existence of any listed species potentially affected by the action, including the approval by an agency of a public or private action, such as FHWA funding or the issuance of an USACE permit under Section 404 of the CWA.

Section 9 of the FESA protects federally listed plant and animal species from unlawful take. "Take" is defined by FESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) regulate activities that may result in "take" of federally endangered or threatened species, or candidate species. USFWS typically exerts jurisdiction over freshwater and terrestrial species, and NOAA Fisheries typically exerts jurisdiction over marine species and anadromous fish (such as steelhead). Project-related activities that could result in impacts to listed species (such as "take") would require any involved federal agencies to consult with the USFWS and/or NOAA Fisheries to determine the extent of impacts to listed species. The documentation submitted to USFWS and/or NOAA Fisheries analyzing impacts to federally listed species is typically a Biological Assessment. Once USFWS and/or NOAA Fisheries review a Biological Assessment for a proposed project, they may issue a federal Biological Opinion and Incidental Take Statement under FESA Section 7 that includes provisions for legal take, provided that specific mitigation measures are employed for construction.

FESA Section 7 Process

If there is the potential for a project to impact federally listed species and there is a federal nexus, a Biological Assessment must be prepared by the applicant and submitted to the federal lead agency involved with the project. The Biological

Assessment is a study analyzing specific effects on species listed under the FESA. The Biological Assessment would likely include certain recommended measures prior to construction, including, but not limited to: 1) surveying and mapping any locations where listed species are observed; 2) surveys for listed plant species during the appropriate time periods (blooming season); 3) avoidance/minimization measures for special-status plant species; 4) pre-construction surveys for special-status animal species during the appropriate time periods (protocol surveys); and 5) avoidance/minimization measures for special-status animal species.

Because there are federal funds associated with the proposed project, a federal nexus exists, and federally listed species could be impacted by project-related activities, any involved federal agencies would require a FESA Section 7 consultation with USFWS prior to construction. Pursuant to FESA Section 7, consultation with the USFWS may be necessary for potential impacts to the following federally listed species: marsh sandwort (*Arenaria paludicola*), Monterey spineflower (*Chorizanthe pungens* var. *pungens*), robust spineflower (*Chorizanthe robusta* var. *robusta*), Santa Cruz tarplant (*Holocarpha macradenia*), tidewater goby (*Eucyclogobius newberryi*), California tiger salamander (*Ambystoma californiense*; CTS), Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*; SCLTS), California red-legged frog (*Rana draytonii*; CRLF), and least Bell's vireo (*Vireo bellii pusillus*; LBV). Consultation with NOAA Fisheries may be necessary for potential impacts to central California coast steelhead (*Oncorhynchus mykiss).*

A Biological Assessment is required and would eventually need to be prepared for the Caltrans, acting on behalf of FHWA. The Biological Assessment would be submitted to USFWS and NOAA Fisheries during a consultation process to determine if a federal Biological Opinion and Incidental Take Statement would be required for the proposed project.

At this time, it is assumed that the proposed project would qualify for coverage under the Programmatic Biological Opinion for Projects Funded or Approved under the Federal Aid Program, 8-8-10-F-58 (USFWS 2011), which provides approved avoidance and minimization measures for CRLF, a federally threatened species. No other Programmatic Biological Opinions would apply at this time.

Incidental Take Authorization and Listed Species

Under FESA, all taking of federally listed fish and wildlife species as detailed in a Biological Opinion (or Habitat Conservation Plan [HCP]) must be incidental to otherwise lawful activities and not the purpose of such activities. For example,

deliberate killing of a listed species ordinarily would not be considered incidental take and would not qualify for an incidental take permit. Conversely, the injury or mortality of listed species by heavy equipment during construction or other land use activities generally would be construed as incidental and could be authorized by an incidental take permit. Incidental take permits cannot be granted for federally protected plants. Conservation measures must be established by the project proponent and USFWS prior to taking of federal plants on projects that have a federal nexus.

If USFWS determines that adverse effects to a federally listed species would likely occur as a result of a proposed project, alternatives and measures to avoid or reduce adverse effects must be identified in a federal Biological Opinion (or HCP) to allow for incidental take authorization. USFWS may also include compensatory mitigation (mitigation/conservation bank) requirements for impacts to habitat for listed plants and wildlife.

2.1.1.5. FEDERAL MIGRATORY BIRD TREATY ACT

The federal Migratory Bird Treaty Act (MBTA) protects all migratory birds, including their eggs, nests, and feathers. The MBTA was originally drafted to end the commercial trade in bird feathers popular in the latter part of the 1800s. The MBTA is enforced by the USFWS, and potential constraints to species protected under this law may be evaluated by the USFWS during the consultation process.

If feasible, removal of trees should be scheduled to occur in the fall and winter (between September 1 and February 15), outside of the typical nesting season. If any construction activities are proposed to occur during the typical nesting season (February 16 to August 31), a nesting bird survey of the area of disturbance should be conducted by qualified biologists no more than 2 weeks prior to construction to determine presence/absence of nesting birds within the project area.

2.1.2. State Policies and Regulations

2.1.2.1. CALIFORNIA ENVIRONMENTAL QUALITY ACT

Guidance for determining CEQA significance thresholds is based on Appendix G of the State CEQA Guidelines. Using these guidelines, activities requiring CEQA review within the project study area would have a significant impact on biological resources if they would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by the CDFW or the USFWS;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the CDFW or USFWS;
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA;
- Interfere substantially with the movement of any resident or migratory species of wildlife, wildlife corridors, or wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources; and/or,
- Conflict with the provisions of an adopted HCP, Natural Community Conservation Plan (NCCP) or other approved local, regional, or state habitat conservation plan.

Caltrans is the state lead agency for the proposed project, and is responsible for compliance with CEQA environmental review requirements.

2.1.2.2. CALIFORNIA ENDANGERED SPECIES ACT

California has a parallel mandate to the FESA, which is embodied in the California Endangered Species Act (CESA) of 1984 and the Native Plant Protection Act (NPPA) of 1977. The CESA ensures legal protection for plants listed as rare or endangered, and wildlife listed as threatened or endangered. The CDFW regulates activities that may result in the "take" of such species. CESA has a much less inclusive definition of "take" (limited to direct take such as hunting, shooting, capturing, etc.) that does not include the broad "harm" and "harassment" definitions in federal law. The CDFW also maintains a list of California Special Concern (CSC) species based on limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational, or educational value. Under state law, the CDFW is empowered to review projects for their potential to affect state-listed species and CSC species, and their habitats.

In addition, certain plants are listed as rare or endangered by the California Native Plant Society (CNPS), but have no designated status. The CDFW has authority during the CEQA process to review potential constraints to rare plant species and require mitigation to reduce the level of significance. CEQA Guidelines Section 15065 ("Mandatory Findings of Significance") requires that a reduction in numbers of a rare or endangered species be considered a significant effect. CEQA Guidelines Section 15380 ("Rare or endangered species") provides for assessment of unlisted species as rare or endangered under CEQA if the species can be shown to meet the criteria for listing. Unlisted plant species on the CNPS Lists 1A, 1B, and 2 are typically considered under CEQA.

"Take" of state-listed species would require a Section 2081 Incidental Take Permit from the CDFW. This process requires submittal of a sensitive species study and permit application package, and is similar to the FESA Section 10 process, except that the CDFW is the regulatory and decision-making agency. A CDFW Section 2081 Permit typically has mitigation requirements similar to a federal USFWS Biological Opinion. If CDFW concurs that take of a state-listed species would likely result from the proposed project, alternatives and measures to avoid or reduce constraints must be identified in a Section 2081 Permit to allow for incidental take authorization. The CDFW may also include compensatory mitigation (such as mitigation/conservation bank) requirements for constraints to habitat for listed plants and wildlife.

A Section 2081 Incidental Take Permit from the CDFW to comply with CESA may be necessary for marsh sandwort, seaside bird's beak (*Cordylanthus rigidus* ssp. *littoralis*), Santa Cruz tarplant, and San Francisco popcorn flower (*Plagiobothrys diffusus*). Incidental take cannot be authorized for SCLTS or white-tailed kite (*Elanus leucurus*) due to their Fully Protected status. Permission to relocate the several CSC species that may be encountered during construction may also be required, in the form of a letter of permission from CDFW.

2.1.2.3. CALIFORNIA FISH AND GAME CODE

Section 1602

Section 1602 of the State of California Fish and Game Code requires any person, state or local government agency, or public utility proposing a project that may affect a river, stream, or lake to notify the CDFW before beginning the project. If activities will result in the diversion or obstruction of the natural flow of a stream, substantially alter its bed, channel, or bank, impact riparian vegetation, or adversely affect existing

fish and wildlife resources, a Streambed Alteration Agreement is required. A Streambed Alteration Agreement lists the CDFW conditions of approval relative to the proposed project, and serves as an agreement between an applicant and the CDFW for a term of not more than 5 years for the performance of activities subject to this section. Implementation of the proposed project may require a 1602 Streambed Alteration Agreement for any impacts within the banks of drainages or outer edge of riparian vegetation (whichever is greater), if these areas are determined to be jurisdictional by CDFW.

Other Fish and Game Code Sections

California Fish and Game Code Section 3503 includes provisions to protect the nests and eggs of birds. Sections 3511, 4700, 5050, and 5515 include provisions to protect Fully Protected species, such as: 1) prohibiting take or possession "at any time" of the species listed in the statute, with few exceptions; 2) stating that "no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to "take" the species;" and 3) stating that no previously issued permits or licenses for take of the species "shall have any force or effect" for authorizing take or possession. The CDFW is unable to authorize incidental take of "fully protected" species when activities are proposed in areas inhabited by those species. Any project-related activities that could result in the take of any Fully Protected species such as SCLTS or white-tailed kite would need to be avoided.

2.1.2.4. CALIFORNIA COASTAL ACT

The proposed project is located partially within the coastal zone of California, and project implementation may require a coastal development permit to satisfy provisions of the California Coastal Act. The California Coastal Commission (CCC), which has regulatory over the coastal zone of California and issues coastal development permits, typically uses a Local Coastal Program (LCP) as the standard of review if a coastal development permit is required.

2.1.3. Local Policies and Regulations

General Plans and Coastal Zone LCPs have been developed for the jurisdictions of the County of Santa Cruz (County), City of Santa Cruz, and City of Capitola, all of which are traversed by the proposed project area (refer to following sections). The proposed project must remain in compliance with LCP requirements and, where possible, should be consistent with applicable municipal codes and local ordinances. Mitigation related to tree removal shall remain consistent with these regulations.

2.1.3.1. COUNTY OF SANTA CRUZ GENERAL PLAN

The County of Santa Cruz General Plan is a set of policies and programs to guide future growth and development in a manner consistent with the goals and quality of life desired by Santa Cruz County citizens. These policies become the basis for all decisions related to the use of land and future expansion of the community. The California Planning and Zoning Law (Section 65300 et seq. of the Government Code) requires adoption of a comprehensive long-term General Plan for the physical development of a county. Certain elements are required by law to be included in the General Plan, such as Land Use, Circulation, Housing, Conservation, Open Space, Safety, and Noise; other elements, such as Community Design, Parks and Recreation, and Public Facilities are optional. The LCP is also required, but by separate law.

The proposed project will comply with the County of Santa Cruz General Plan and LCP requirements where applicable, as detailed by the County of Santa Cruz (1994).

2.1.3.2. SANTA CRUZ COUNTY LOCAL COASTAL PROGRAM

As required by the California Coastal Act of 1976, the County prepared and adopted a LCP Land Use Plan for the coastal zone of the County. This Land Use Plan was certified by the CCC on January 12, 1982. As a part of the implementation of the Land Use Plan, the plan was adopted on November 16, 1982 as an element of the County General Plan to be effective in the unincorporated portion of the coastal zone of Santa Cruz County; and thereby amended the previous General Plan policies where the LCP policies were more stringent. The CCC certified the County's implementation program and on January 13, 1983, transferred coastal permit authority to the County. Except for coastal inundation and public trust areas, coastal development permits are issued by the County, with right of appeal to the CCC in those instances specifically defined in the County Code Chapter titled Coastal Zone Regulations). The LCP Land Use Plan was published as a separate companion volume to the 1980 General Plan, but is now incorporated into the 1994 General Plan document (County of Santa Cruz 1994).

Most of the authority vested in the CCC by the Coastal Act is to be transferred to the local governments through adoption and certification of LCPs. All of the policies of the General Plan apply in the coastal zone; however, where LCP policies are more protective of coastal resources, the LCP policies prevail.

The proposed project must remain in compliance with the County LCP, as detailed in the County of Santa Cruz General Plan (1994). Portions of the project area are within the Capitola city limits, and the project must comply with the City of Capitola LCP.

The portion of the project area within the City of Santa Cruz is outside the coastal zone; the City of Santa Cruz LCP does not apply.

2.1.3.3. SANTA CRUZ COUNTY CODE

The proposed project, where possible, should be consistent with applicable regulations of the Santa Cruz County Code (County Code) (County of Santa Cruz 2007), including, but not limited to the following regulations.

Grading Regulations

All provisions of County Code Chapter 16.20 (Grading Regulations).

Erosion Control

According to County Code Chapter 16.22 (Erosion Control), prior to issuance of a building permit, development permit, or land division, an Erosion Control Plan indicating proposed methods for the control of runoff, erosion, and sediment movement shall be submitted and approved. Erosion Control Plans may also be required by the County Planning Director for other types of applications where erosion can reasonably be expected to occur. The Erosion Control Plan may be incorporated into other required plans, provided it is identified as such.

Water Quality Control

All provisions of County Code Chapter 16.24 (Water Quality Control) to mitigate any potential project-related increases in turbidity and settleable solids in bodies of water within Santa Cruz County.

Riparian Corridor Protection

The purpose of County Code Chapter 16.30 (Riparian Corridor and Wetlands Protection) is to eliminate or minimize any development activities in the riparian corridor in order to preserve, protect, and restore riparian corridors for: protection of wildlife habitat; protection of water quality; protection of aquatic habitat; protection of open space, cultural, historical, archeological and paleontological, and aesthetic values; transportation and storage of floodwaters; prevention of erosion; and to implement the policies of the General Plan and the LCP Land Use Plan (Ordinance 2460, 7/19/77; 3335, 11/23/82).

The Santa Cruz County Riparian Corridor Protection Ordinance contains guidelines for controlling development in riparian corridors. A riparian exception is required for grading, land clearing, building, and tree or shrub removal in these areas. Deposition of debris and use of pesticides are prohibited.

The riparian corridor is determined by boundaries set by horizontal measurements. For specific widths, see County Code Section 16.30.040:

- Along Rivers and Streams: Includes a strip containing a perennial (year-round flow) stream and the land extending 50 feet from the high-water mark on each side; or, a strip containing an intermittent (seasonal) or an ephemeral (flows in response to rain) stream and the land extending 30 feet from the high-water mark on each side.

- Around Lakes, Marshes, and Lagoons: Includes an area extending 100 feet from the high-water mark of a natural standing body of water, lake, wetland, estuary, or lagoon.

- Buffers along Arroyos in Urban Areas: Includes an area extending 10 to 50 feet from the top of an arroyo, depending on the type of stream, vegetation, and slope of the arroyo banks.

Exceptions and conditioned exceptions to these provisions may be authorized in accordance with the procedures of County Code Chapter 16.30.060.

Sensitive Habitat Protection

County Code Chapter 16.32 (Sensitive Habitat Protection) includes provisions to minimize the disturbance of biotic communities that are rare or especially valuable because of their special nature or role in an ecosystem, and that could be easily disturbed or degraded by human activity; to protect and preserve these biotic resources for their genetic scientific, and educational values; and to implement policies of the General Plan and the LCP Land Use Plan (Ordinance 3342, 11/23/82; 3442, 8/23/83).

A “Sensitive Habitat” is an area that meets one or more of the following criteria:

1) Areas of special biological significance as identified by the State Water Resources Control Board.

2) Areas which provide habitat for locally unique biotic species/communities including but not limited to: oak woodlands, coastal scrub, maritime chaparral, native rhododendrons and associated elkgrass, indigenous Ponderosa pine (*Pinus ponderosa*), indigenous Monterey pine (*Pinus radiata*), mapped grassland in the coastal zone and sand parkland; and Special Forests including

San Andreas Oak Woodlands, indigenous Ponderosa Pine, indigenous Monterey Pine, and ancient forests.

3) Areas adjacent to essential habitats of rare, endangered, or threatened species as defined in (e) and (f) below.

4) Areas which provide habitat for species of special concern as listed by the CDFW in the Special Animals list, California Natural Diversity Database (CNDDB).

5) Areas which provide habitat for rare or endangered species which meet the definition of Section 15380 of the CEQA guidelines.

6) Areas which provide habitat for rare, endangered, or threatened species as designated by the State Fish and Game Commission, USFWS, or CNPS.

7) Nearshore reefs, rocky intertidal areas, seacaves, islets, offshore rocks, kelp beds, marine mammal hauling grounds, sandy beaches, shorebird roosting, resting and nesting areas, cliff nesting areas, and marine, wildlife, or educational/research reserves.

8) Dune plant habitats.

9) All lakes, wetlands, estuaries, lagoons, streams, and rivers.

10) Riparian corridors.

According to County Code Chapter 16.32.070, a biotic assessment (e.g., this NES or some variation thereof) shall be required for all development activities and applications in areas of biotic concern.

Significant Trees Protection

The purposes of County Code Chapter 16.34 (Significant Trees Protection) are:

1) The Board of Supervisors of Santa Cruz County finds that the trees and forest communities located within the County's coastal zone are a valuable resource. Removal of significant trees could reduce scenic beauty and the attractiveness of the area to residents and visitors; and,

2) The Board of Supervisors further finds that the preservation of significant trees and forest communities on private and public property is necessary to protect

> and enhance the county's natural beauty, property values, and tourist industry. The enactment of this chapter is necessary to promote the public health, safety, and general welfare of the county, while recognizing individual rights to develop, maintain, and enjoy the use of private property to the fullest possible extent (Ordinance 3341, 11/23/82; 3443, 8/23/83).

County Code Chapter 16.34 regulates the removal of trees in the coastal zone when not included in the provisions of a discretionary permit. This chapter establishes the type of trees to be protected, the circumstances under which they may be removed, and the procedures for obtaining a permit for their removal. The provisions of this chapter apply to all persons as defined herein; they also establish standards applicable to tree cutting activities of public agencies required to obtain a Coastal Zone Permit pursuant to Chapter 13.20 of the Santa Cruz County Code (Ordinance 3341, 11/23/82; 3443, 8/23/83).

Within County jurisdiction, "significant" trees are identified as single-trunk with 20-inch diameter breast height (dbh) or greater, clumps with more than four trunks of 12-inch dbh each, and all trees in designated Biotic areas.

2.1.3.4. CITY OF SANTA CRUZ GENERAL PLAN AND LOCAL COASTAL PROGRAM

The City of Santa Cruz updated its General Plan and LCP in 2005 (City of Santa Cruz 2005). The main goal of the City of Santa Cruz General Plan Environmental Quality Element pertaining to biological resources includes protection and enhancement of natural vegetation communities and wildlife habitats throughout the city. The City of Santa Cruz has developed a Coastal Land Use Plan and referenced the Regulations that form its Coastal Implementation Plan and guide both coastal planning and permit processing. This LCP is an integral part of the City of Santa Cruz's General Plan since planning and land-use policies within the coastal zone are issues of concern to the community as a whole. Adoption of the General Plan coastal policies and maps and the LCP chapter of the General Plan along with the actual Implementing Regulations by the CCC give the City of Santa Cruz the necessary policy basis and regulations to continue issuance of coastal permits under its jurisdiction.

Of particular relevance to the proposed project is City of Santa Cruz Municipal Code Section 9.56 (Preservation of Heritage Trees and Heritage Shrubs). Any tree, grove of trees, shrub, or group of shrubs growing on public or private property within the city limits of the city of Santa Cruz that meet(s) the following criteria shall have the "heritage" designation:

1) Any tree which has a trunk with a circumference of 44 inches (approximately 14 inches in diameter or more), measured at 54 inches above existing grade;

2) Any tree, grove of trees, shrub, or group of shrubs which have historical significance, including but not limited to those which were/are:

    a. Planted as a commemorative;

    b. Planted during a particularly significant historical era; or,

    c. Marking the spot of an historical event.

3) Any tree, grove of trees, shrub, or group of shrubs which have horticultural significance, including but not limited to those which are:

    a. Unusually beautiful or distinctive;

    b. Old (determined by comparing the age of the tree or shrub in question with other trees or shrubs of its species within the city);

    c. Distinctive specimen in size or structure for its species (determined by comparing the tree or shrub to average trees and shrubs of its species within the city);

    d. A rare or unusual species for the Santa Cruz area (to be determined by the number of similar trees of the same species within the city);

    e. Providing a valuable habitat; or,

    f. Identified by the City Council as having significant arboricultural value to the citizens of the city (Ordinance 94-01 §2, 1994).

Because the portion of the project within the City of Santa Cruz is outside the coastal zone, the City of Santa Cruz LCP does not apply. The proposed project, where possible, should be consistent with the City of Santa Cruz General Plan and LCP, as detailed in the City of Santa Cruz General Plan (2005).

2.1.3.5. City of Capitola General Plan and Local Coastal Program

The City of Capitola adopted its General Plan and LCP in 1989. Capitola's Zoning Ordinance/Development Code is Title 17 of the City of Capitola's Municipal Code (City of Capitola 2007). The Zoning Ordinance is the main "tool" to implement the City of Capitola's General Plan. The Zoning Ordinance "sets the land use regulations and zoning map for the city, as necessary, to encourage the most appropriate use of

land, to enhance and stabilize property values; to provide open space; …to promote the orderly growth of the community; to lessen streets congestion; to facilitate adequate provisions of utilities, transportation, schools, parks, and to promote health, safety and the welfare, now and for future generations."

The City of Capitola Municipal Code Chapter 12.12 (Community Tree and Forest Management) defines and addresses protection of trees and required mitigation for tree impacts. A tree is defined under Chapter 12.12 as "a usually tall woody plant, distinguished from a shrub by having, at maturity, comparatively greater height and characteristically, a single trunk rather than several stems, and a minimum 6-inch diameter measured at 48 inches above existing grade or at average breast height (abh). Within the boundaries of a "biologist certified environmentally sensitive habitat area" identified pursuant to Chapter 17.95, all sizes of trees, even seedlings, are subject to this chapter and all degrees of trimming shall be defined as "cutting" and shall require a permit." Replacement trees must be planted at a ratio of 2:1 as needed to ensure that a canopy coverage of at least 15% will result, or as a last resort, in-lieu fees must be paid as a condition of the tree removal permit in accordance with Section 12.12.190. Replacement trees and/or in-lieu fees are not required if post-removal tree canopy coverage on the site or parcel will be 30% or more. The City of Capitola's definition of "heritage tree" is "any locally significant, historic, scenic, and/or mature tree growing on public or private property that is listed on the city's adopted heritage tree list as set forth in this section that is supported by the property owner and by the city council" (City of Capitola Municipal Code Chapter 12.12.100).

Portions of the project are within the Capitola city limits, and those portions of the project must comply with the City of Capitola LCP.

2.2. Studies Required

Several focused biological surveys or studies were performed to satisfy the requirements of endangered species laws and/or local, CEQA–level analyses. Surveys were conducted within the Biological Study Area (BSA) (refer to Figure 3) based on lists of species obtained from the CNDDB (2007, updated 2014) and USFWS (2007, updated 2014). For the purposes of this report, the BSA encompasses an area slightly larger than that which is expected to be permanently and temporarily impacted by project-related activities, and includes all current and future Tier II project areas.

Focused CRLF surveys were conducted from September 30 to October 2, 2003 under the 1997 USFWS guidance/protocol (USFWS 1997, revised 2005). The CRLF surveys also concentrated on presence/absence of the foothill yellow-legged frog (*Rana boylii*; FYLF), and other special-status aquatic species. The results of these surveys are briefly summarized within this report.

The project site is located within the Central California Coast Distinct Population Segment (DPS) for steelhead trout. This DPS begins at Aptos Creek in Santa Cruz County, and extends north along the California coast to the Russian River. Although no protocol survey method exists for steelhead, potential for species occurrence and presence of suitable habitat were assessed during biological surveys of the BSA.

Focused surveys for rare plants known within the region were conducted on May 30 and 31, 2003, and during September and October 2003. Supplementary plant surveys were conducted in areas added to the BSA from February 21 to 23, 2007. A tree inventory was also conducted within the BSA in spring 2007 to estimate the numbers and size classes of agency-protected trees within the BSA. The Tree Survey Report is included as Appendix G.

A jurisdictional Wetland Assessment was conducted within the BSA on September 30 through October 3, 2003, with a supplemental visit conducted February 21 and 22, 2007. The routine wetland determination methodology was followed, as described in the 1987 USACE Wetlands Delineation Manual (Environmental Laboratory 1987). The Wetland Assessment was revised in 2010, following publication of the *Arid West Regional Supplement Version 2.0* (USACE 2008).

Based on coordination with Caltrans staff, another supplemental site visit was conducted on November 6, 2013, to determine if the jurisdictional boundaries have increased or decreased since 2007. Field observations concluded that the jurisdictional features are less than (approximately <0.5 acre) those formally delineated in 2003 and 2007. One of the primary reasons for the observed reduction in jurisdictional boundaries was due to the removal of willow habitat associated with a recent housing development located on Rosemarie Court. Because the total area of jurisdictional habitat was concluded to be less than the area mapped in 2003 and 2007, a formal delineation was not conducted at this time to determine the exact quantity. Therefore, for the purposes of this analysis, the impact calculations are based on the 2003 and 2007 delineations and are considered to be conservative at this time. Potential wetland areas within the coastal zone were evaluated using the

CCC/CDFW single-parameter wetland definition in addition to the USACE three-parameter definition. The full Wetland Assessment is included in Appendix D, and the results are summarized in Chapter 3 of this NES. It is anticipated that the USACE may require a new assessment be conducted as part of any application for Section 404 permits for the Tier II segments.

2.3. Personnel and Survey Dates

Table 1 summarizes survey efforts conducted to date within the BSA.

Table 1: Survey Tasks, Dates, and Personnel

Study or Survey	Date	Personnel*	Methodology
Rare Plant Botanical Surveys	May 30-31, 2003; September 30-October 2, 2003	BS	CDFW/CNPS protocol
Additional Botanical Surveys	February 21 to 23, 2007	BS, GH, TB, VA	CDFW/CNPS protocol
Tree Inventory	February 21 to 23, 2007	BS, GH, TB, VA	No formal protocol
Tree Inventory	May 11 to 13, 2007	TB, VA	No formal protocol
CRLF Survey	September 30-October 2, 2003	JW, CH, BS, DO	USFWS 1996 survey protocol
Biological Assessment/ NES Habitat Mapping	September 30-October 2, 2003, September 8, 2004	JW, CH, BS, DO	No formal protocol
Wetland Assessment	September 30-October 3, 2003, September 8, 2004	BS, JW	USACE 1987 methodology; CCC/CDFW methodology
Supplemental Wetland visit	February 21 to 23, 2007	BS, GH	USACE 1987 methodology; CCC/CDFW methodology
Supplemental Wetland visit	November 6, 2013	BH	Qualitative review of wetland delineation to determine if there are more or less jurisdictional features since the last delineation.

** Morro Group/SWCA Project Staff: BS-Bob Sloan, Senior Biologist/Wetland Specialist, GH-Geoff Hoetker, Senior Biologist/Wetland Specialist, TB-Travis Belt, Biologist, BH- Barrett Holland, Biologist, DO-Dwayne Oberhoff, Biologist, VA-Vanessa Amerson, Resource Specialist, CH-Crystahl Handel, Resource Specialist; JW-Jeremy Wiggins, Resource Specialist*

2.4. Agency Coordination and Professional Contacts

Table 2 summarizes agency coordination and professional contacts at this point in the project.

Table 2: Agency Coordination and Professional Contacts

Name	Agency	Type of Coordination	Date
Tom Edell	Caltrans	Email Re: Correspondence with Mark Allaback of Biosearch Associates regarding observation of SCLTS metamorphs along Bonita Road at Valencia Lagoon	November 9, 2002
Bryan Apper	Caltrans	Email Re: Correspondence with Caltrans Biologist Mitch Dallas stating that the Valencia Lagoon area is likely the only habitat for SCLTS in the BSA	February 20, 2003
Duane Garrett	Caltrans	Email Re: sending USFWS map of project area and request for species list to trigger opening of a formal project file; arranging a field visit to assess location of SCLTS habitat in project area; conducting a conference call with representatives of USFWS, Caltrans, and RTC	July 30, 2003
Christopher Kofron	USFWS	Letter Re: list of federal listed species request	July 14, 2003
Mark Allaback	Biosearch Associates	Meeting Re: Presence of SCLTS in Valencia Lagoon and Bonita Drive area	May 22, 2003
Tod Baroso	Caltrans	Phone conversation Re: Presence of SCLTS and CRLF in Valencia Lagoon and Valencia Channel	September 30, 2003

Name	Agency	Type of Coordination	Date
Tom Edell	Caltrans	Meeting Re: Presence of SCLTS in Valencia Lagoon and Bonita Drive area, Caltrans maintenance activities in the area	September 30, 2003
Gary Ruggerone	Caltrans	Email Re: Conversations with Caltrans Biologist Tom Edell regarding the potential mitigation measure of conducting protocol-level SCLTS presence/absence surveys during the two years prior to construction, and requesting input from USFWS on SCLTS mitigation measures	October 9, 2003
Dominic Hoang Gregg R. Albright	FHWA/Caltrans	Letter Re: Concurrence with inferring presence of SCLTS in Valencia Lagoon	November 25, 2003
Nancy Siepel	Caltrans	Phone conversation Re: Scope of wetland delineation and biological surveys	October 31, 2004
Nancy Siepel	Caltrans	Phone conversation Re: Wetland impacts and inferring presence for CRLF	September 28, 2005
Nancy Siepel	Caltrans	Phone conversation Re: Revisions of NES, Biological Assessment, Wetland Assessment, and special-status species studies	November 18, 2006
Various	Caltrans	Meeting Re: Project revisions, project boundary line changes, CCC mitigation and LCPs, separate Biological Assessments for steelhead and CRLF	January 16, 2007

Name	Agency	Type of Coordination	Date
Nancy Siepel	Caltrans	Phone conversation Re: SCLTS barrier, Section 7 consultation, Biological Assessment should be written after preferred alternative is chosen	January 23, 2007
Brian Mori	Mori Biological Consulting	Phone conversation Re: SCLTS population at Valencia Lagoon, upland habitat use, and potential for CTS in BSA	July 9, 2007
Jacob Martin	USFWS	Phone conversation Re: SCLTS at Valencia Lagoon, potential mitigation, and list of federal listed species considered	March 5, 2009
Chuck Cesena	Caltrans	Phone conversation Re: NES document	June 29, 2011
Lara Bertaina, Lisa Schicker, Brian Parker	Caltrans	Meeting Re: Project revisions and new format including Tier II discussion in the NES	September 13, 2012
Lara Bertaina	Caltrans	Phone conversation Re: NES revision issues	November 20, 2012
Chuck Cesena	Caltrans	Approval of NES and submittal of signature page to consultant team	April 15, 2014

2.5. Limitations That May Influence Results

Several special-status wildlife or plant species with the potential to occur within the vicinity of the project BSA are annual or migratory species. Population sizes and locations of annual or migratory species tend to fluctuate through time, often in response to changing environmental conditions. Given the extent of the BSA and the long project development timeframe, additional special-status wildlife and plant species surveys should be conducted for each Tier II segment prior to project construction.

Floristic surveys for rare plant species were conducted according to USFWS and CDFW guidelines in May and October 2003, with additional surveys conducted in February and May 2007. Since construction of Tier II segments will be phased over

several years, and despite the dominantly disturbed and urbanized conditions, there is the potential that special-status plant species not currently present could colonize the site. Additional pre-construction botanical surveys are likely to be required prior to any construction.

The Wetland Assessment for the HOV project was conducted in 2003, and was revised in 2010, following publication of the *Arid West Regional Supplement Version 2.0* (USACE 2008). The USACE may require a new assessment be conducted as part of any application for Section 404 permits for the Tier II segments.

Focused CRLF surveys were conducted from September 30 to October 2, 2003, under the 1997 USFWS guidance/protocol, prior to the release of the 2005 Revised Guidance on Site Assessments and Field Surveys for the CRLF (USFWS 2005). Based on the observed conditions and CNDDB records, presence of CRLF can likely be inferred in and near the project area, and additional protocol surveys are not currently necessary. Additional site assessments and possibly protocol surveys would be required for CTS and SCLTS prior to project construction. Habitat for burrowing owl (*Athene cunicularia*) in and near the project area is marginal, but protocol surveys could still be recommended by CDFW.

Chapter 3. Results: Environmental Setting

This section discusses the existing conditions over the entire Route 1 Tier I BSA. Tables 3 and 4 provide habitat types and acreage information for the Tier I BSA and for the current Tier II project area.

3.1. Description of the Existing Biological and Physical Conditions

3.1.1. Biological Study Area

The BSA for the Route 1 HOV Lane Project consists of a generally linear area within and adjacent to the Route 1 ROW from the San Andreas/Larkin Valley Road Interchange to the Morrissey Boulevard Interchange, as shown in Figure 3 and Appendix C. The BSA encompasses both the Tier I Corridor Alternatives and the Tier II Auxiliary Lane Alternative, and is defined as the area (land and water) that may be directly, indirectly, temporarily, or permanently impacted by construction and construction-related activities.

The Project Impact Area (PIA) is defined as the area that is either temporarily or permanently, but directly impacted by construction and construction-related activities.

The project BSA coincides with the archaeological Area of Potential Effect for the project, and its boundary represents the limits of habitat and wetland mapping prepared specifically for this project. The southern portion of the project area is within the coastal zone (refer to Appendix C, Key Map).

3.1.2. Physical Conditions in the Biological Study Area

The approximately 9-mile long project BSA includes riverine, freshwater marsh, riparian forest, oak woodland, eucalyptus woodland, mixed conifer woodland, coastal scrub, annual grassland, developed/landscaped areas, and ruderal/disturbed vegetation. Plant community/habitat maps of the project area are included as Appendix C. The BSA is dominated by typical freeway landscaping and ruderal habitats, with residential and commercial buildings and associated landscaping within or immediately adjacent to the BSA in many locations. Scattered areas of annual grassland habitat, coastal scrub, oak woodland habitat, eucalyptus groves, and urban tree plantings are present along upland portions of the route. Several watersheds are crossed by the BSA, and most of the associated streams and drainages enter the Pacific Ocean downstream of the BSA. No tidally influenced or brackish areas are present within the BSA. The BSA crosses nine named stream channels (Aptos Creek,

Ord Gulch, Borregas Creek, Potbelly Creek, Tannery Gulch, Nobel Creek, Soquel Creek, Rodeo Gulch, and Arana Gulch), a small tributary to Tannery Gulch, and a tributary to Arana Gulch. The BSA runs parallel to Valencia Creek, Valencia Lagoon, and the Valencia Channel (refer to Appendix C). These streams and drainages contain riverine, freshwater marsh, and/or riparian forest habitats and pass under Route 1 by means of existing bridges and culverts. Elevations range from approximately 300 feet toward the east section of the BSA to approximately 100 feet toward the west section of the BSA.

3.1.2.1. SOIL CONDITIONS

The BSA contains varied topographical features, and crosses several soil map units and numerous mapped soil types. The Soil Conservation Service (1976) mapped seven soil series containing nine soil map units within the identified potentially jurisdictional areas of the BSA. These nine soils are briefly described below, with more detailed descriptions and soils maps in the Wetland Assessment (refer to Appendix D). Soil map units present within the BSA are discussed below.

Lompico-Felton Complex, 30 to 50% Slopes

This complex consists of soils on foot slopes and wide ridges. Elevation ranges from 400 to 3,000 feet. This complex is about 35% Lompico loam and 30% Felton sandy loam.

The Lompico soil is moderately deep and well drained. It formed in residuum derived from sandstone, shale, siltstone, or mudstone. Typically, the surface layer is dark brown, slightly acid loam about 5 inches thick. The subsoil is brown, strong brown, and yellowish brown, strongly acid and medium acid clay loam, and sandy clay loam. Highly weathered sandstone is at a depth of 37 inches.

The Felton soil is deep and well drained. It formed in residuum derived from sandstone, shale, siltstone, or schist. Typically, the surface layer is very dark brown, slightly acid sandy loam about 11 inches thick. The subsoil is brown and yellowish red, slightly acid and strongly acid sandy clay loam and clay loam about 32 inches thick. The substratum is variegated light brownish gray and light olive brown, strongly acid loam and sandy loam about 20 inches thick. Weathered sandstone is at a depth of 63 inches.

Lompico-Felton Complex, 50 to 75% Slopes

This complex consists of soils that are dominantly on footslopes but are also in areas near ridgetops. Elevation ranges from 400 to 3,000 feet. This complex is about 35% Lompico loam and 30% Felton sandy loam.

The Lompico soil is moderately deep and well drained. It formed in residuum derived from sandstone, shale, siltstone, or mudstone. Typically, the surface layer is dark brown, slightly acid loam about 5 inches thick. The subsoil is brown, strong brown, and yellowish brown, strongly acid and medium acid clay loam and sandy clay loam. Highly weathered sandstone is at a depth of 37 inches.

The Felton soil is deep and well drained. It formed in residuum derived from sandstone, shale, siltstone, or schist. Typically, the surface layer is very dark brown, slightly acid sandy loam about 11 inches thick. The subsoil is brown and yellowish red, slightly acid and strongly acid sandy clay loam and clay loam about 32 inches thick. The substratum is variegated light brownish gray and light olive brown, strongly acid loam and sandy loam about 20 inches thick. Weathered sandstone is at a depth of 63 inches.

Elkhorn-Pfeiffer Complex, 30 to 50% Slopes

This complex is on dissected marine terraces and hills. Elevation ranges from about 100 to 800 feet. This complex is about 45% Elkhorn sandy loam and 25% Pfeiffer gravelly sandy loam. Elkhorn soils are on marine terraces. Pfeiffer soils are in deep cuts on marine terraces and hills.

The Elkhorn soil is very deep and well drained. It formed in alluvium derived mainly from sedimentary rock. Typically, the surface layer is very dark brown, slightly acid and medium acid sandy loam about 21 inches thick. The subsoil, to a depth of 61 inches, is pale brown and variegated light gray and very pale brown, neutral sandy clay loam.

The Pfeiffer soil is deep and well drained. It formed in residuum derived from sandstone or marine sediment. Typically, the surface layer is very dark brown, to dark brown, slightly acid gravelly sandy loam about 24 inches thick. The subsoil is brown, slightly acid gravelly sandy loam and cobbly sandy loam about 29 inches thick. The substratum is brown, slightly acid gravelly sandy loam about 13 inches thick. Weathered granodiorite bedrock is at a depth of 66 inches.

Elkhorn Sandy Loam, 2 to 9% Slopes

This very deep, well-drained soil is on old alluvial fans and marine terraces. Elevation ranges from about 20 to 800 feet. Typically, the surface layer is very dark brown (10YR 2/2 moist), slightly acid and medium acid sandy loam about 21 inches thick. The subsoil, to a depth of 61 inches, is pale brown and variegated light gray and very pale brown, neutral sandy clay loam.

Watsonville Loam, Thick Surface, 2 to 15% Slopes

This deep, somewhat poorly drained soil is on coastal terraces. It formed in alluvium. Elevation ranges from 20 to 1,200 feet. Typically, the surface layer is very dark brown, slightly acid loam about 20 inches thick. The subsurface layer is light gray, slightly acid sandy loam about 6 inches thick. The subsoil is pale brown and mixed light gray and very pale brown, slightly acid clay about 21 inches thick. The substratum to a depth of 63 inches is mixed light gray, very pale brown, and yellow, slightly acid and medium acid sandy clay loam. Watsonville loam, 2-15% slopes, is listed as a hydric soil.

Tierra-Watsonville Complex, 15 to 30% Slopes

This complex consists of soils on alluvial and marine terraces. Elevation ranges from about 20 to 1,200 feet. This complex is about 55% Tierra sandy loam and 30% Watsonville loam.

The Tierra soil is very deep and moderately well drained. It formed in alluvium derived from sedimentary rock. Typically, the surface layer is very dark grayish brown and dark gray to black, slightly acid sandy loam about 14 inches thick. The upper part of the subsoil is brown, light brownish gray, pale brown, and light gray, slightly acid sandy clay and sandy clay loam about 23 inches thick. The lower part to a depth of 66 inches is light gray and yellow, slightly acid and strongly acid clay and silty clay.

The Watsonville soil is very deep and somewhat poorly drained. It formed in alluvium derived from sedimentary rock. Typically, the surface layer is very dark brown, slightly acid loam about 12 inches thick. The subsurface layer is light gray, slightly acid sandy loam about 6 inches thick. The subsoil is pale brown and mixed light gray and very pale brown, slightly acid clay about 21 inches thick. The substratum to a depth of 63 inches is mixed light gray, very pale brown, and yellow, slightly acid and medium acid sandy clay loam.

Soquel Loam, 2 to 9% Slopes

This very deep, moderately well-drained soil is on plains. It formed in alluvium. Elevation ranges from 20 to 1,000 feet. Typically, the surface layer is very dark gray (10YR 3/1 moist), medium acid and slightly acid loam about 21 inches thick. The upper part of the underlying material is brown, neutral silt loam about 16 inches thick over a buried surface layer of brown, neutral silty clay loam about 14 inches thick. The lower part, to a depth of 62 inches, is yellowish brown, neutral loam.

Elkhorn Sandy Loam, 15 to 30% Slopes

This very deep, well-drained soil is on old alluvial fans and marine terraces. Elevation ranges from about 20 to 800 feet. Typically, the surface layer is very dark brown, slightly acid and medium acid sandy loam about 21 inches thick. The subsoil to a depth of 61 inches is pale brown and variegated light gray and very pale brown, neutral sandy clay loam.

Elder Sandy Loam, 2 to 9% Slopes

This very deep, well-drained soil is on alluvial fans and plains and in narrow valleys. It formed in mixed alluvium. Elevation ranges from 20 to 600 feet. Typically, the surface layer is very dark gray (10YR 3/1 moist), medium acid and slightly acid sandy loam about 31 inches thick. The underlying material, to a depth of 60 inches, is brown and dark grayish brown, slightly acid sandy loam and loamy sand.

3.1.2.2. UPLAND HABITATS

The upland areas of the BSA contain a mixture of oak woodland, mixed conifer woodland, eucalyptus woodland, coastal scrub, annual grassland, freeway/urban landscaping, ruderal/disturbed vegetation, associated with the predominately anthropogenic urban project surroundings (refer to Appendix C, Sheets 1-11). Oak, conifer, and eucalyptus woodland areas are mainly found outside the existing Route 1 ROW, in association with residential or undeveloped areas. Tree canopy within the ROW is composed primarily of a variety of landscape specimens, including several single-species stands of Bailey acacia (*Acacia baileyana*). Non-native annual grassland habitat intergrades with landscaping in the upland areas along Route 1 and borders riparian corridor areas in some areas. Ruderal/disturbed habitat occurs along the edge of pavement, in unpaved median strips, and in disturbed un-landscaped areas throughout the BSA. In general, upland areas of the BSA are heavily influenced by traffic, noise, and lighting associated with urban activities.

3.1.2.3. HYDROLOGIC RESOURCES/RIPARIAN HABITATS

Hydrology along the route is controlled by existing creeks and drainages, with extensive runoff occurring from urban and residential development, roadways, and parking areas. Several large watersheds are crossed by the route, and most of the creeks and drainages crossed enter the Pacific Ocean downstream of the BSA. No tidally influenced or brackish areas are present within the BSA. The creeks and drainages examined in this report contained well-defined bed and bank structure and in many cases consisted of deeply incised channels.

Manmade and maintained roadside drainage ditches consisting of dirt or concrete v-ditches, and associated culvert structures were mapped along the route. These ditches were typically less than 2 feet deep and 4 feet wide, and showed evidence of regular maintenance. In some cases storm flow from the ditches could be traced to nearby natural creek channels through culvert inlet and outlet structures. Other roadside ditches had no evidence of direct connection to identified jurisdictional areas, but did connect with the municipal storm drain system. Water entering the storm drain system is assumed to eventually reach jurisdictional waters.

The 2003 assessment was conducted at the end of the dry season, and water levels were at their lowest point. Flowing or ponded water ranging from less than 1 foot to over 5 feet deep was encountered in the majority of the creeks along the route. Ord, Potbelly, Rodeo, and Borregas Creeks, and the small tributary to Tannery Creek, were dry during the October 2003 assessment. The February 2007 supplemental visit occurred during and immediately following a rainfall event, and found ponded or flowing water in all examined areas. Flows within drainages in the project area are expected to be substantially higher during the wet season due to channelization and runoff from surrounding developed areas.

Indicators of wetland hydrology were observed in each of the creeks and drainages assessed in this report. Hydrologic indicators included established channel morphology, OHWMs consisting of shelving, vegetation lines, water marks, and debris, presence of terraced floodplain areas, and presence of flowing or ponded water.

The major creeks and drainages that cross or parallel the project BSA are described in detail below, proceeding from south to north. A complete Wetland Assessment Report has been prepared as a separate document, and contains additional information on the riparian and wetland areas within the BSA (refer to Appendix D). Photographs

of representative areas and detailed maps of each creek or drainage are included in the Wetland Assessment Report.

Valencia Lagoon and Valencia Channel

The Valencia Lagoon and Valencia Channel are located on the southern side of Route 1, between Freedom Boulevard and Rio Del Mar Boulevard (refer to Appendix C, Sheet 3). Valencia Channel is hydrologically connected to the Valencia Lagoon, and both contain riverine, freshwater marsh, scrub-shrub wetland, and riparian forest habitats, and areas known to contain the federally and state endangered SCLTS. Valencia Lagoon was constructed by Caltrans in 1978 as mitigation for previous impacts to SCLTS habitat in the area. Both areas also provide suitable foraging and breeding habitat for CRLF and FYLF, and potentially other special-status aquatic species, although none were observed during protocol surveys for CRLF conducted in September/October 2003. Steelhead are not known to occupy Valencia Lagoon or Valencia Channel.

Valencia Lagoon consists of a man-made pond located outside and to the south of the Route 1 ROW, and outside of the BSA. The Valencia Channel is an approximately 2,500-foot drainage channel within the BSA, and is maintained by Caltrans as a flood control measure. Valencia Channel ranges from 20 to 40 feet in width, and the channel and surrounding low-lying areas are densely vegetated with arroyo willow (*Salix lasiolepis*), cattail (*Typha latifolia*), bulrush (*Scirpus californicus*), California blackberry (*Rubus ursinus*), and poison oak (*Toxicodendron diversilobum*). The channel begins at a 48-inch × 72-inch concrete culvert outlet near the southbound off-ramp for Freedom Boulevard, and continues west along the southbound lanes to a concrete basin and culvert near the southbound on-ramp from Del Mar Boulevard. USACE and CCC jurisdictional wetland areas are present on the south side of Route 1 within the BSA.

Valencia Creek / Aptos Creek

Valencia Creek

The portion of Valencia Creek assessed consists of a broad, deeply to slightly incised channel, dominated by California bay (*Umbellularia californica*), big leaf maple (*Acer macrophyllum*), California redwood (*Sequoia sempervirens*), California blackberry, poison oak, stinging nettle (*Urtica dioica*), English ivy (*Hedera helix*), and arroyo willow, in a residential setting (refer to Appendix C, Sheet 4a). Valencia Creek is a blue-line stream that receives runoff from a large urban watershed area. The Valencia Creek corridor and associated riparian vegetation meander in and out of the north side of the project BSA, and join Aptos Creek approximately 100 feet north

of Route 1. The channel contained shallow pools and flowing water during the assessment. The channel exhibited a clay and sand bottom averaging 20 to 50 feet wide at the OHWM, which was approximately 4.5 feet above the thalweg. The creek passes through two long, curving concrete culverts and several sections of riprap on the banks intended to protect Route 1 from erosion. A large adjacent high flow terrace area dominated by willow and blackberry is present along the BSA, between the roadway and the large northerly bend in the creek channel. Dense riparian canopy cover is present on the north side of Route 1, within and adjacent to the BSA.

Unlined roadside ditches are present along both sides of Route 1 approximately 105 feet east of the Santa Cruz Branch Rail Line bridge crossing Valencia Creek (refer to Appendix C, Sheet 4a). The ditch on the south side of the roadway is 1 to 3 feet wide and 0.5 to 2 feet deep, and receives runoff from the adjacent tennis courts and roadside areas. This area has no riparian or wetland vegetation present, and is dominated by English ivy, annual grasses, and cypress trees. The ditch on the north side is 4 feet wide and 1 to 2 feet deep, and receives runoff from commercial and residential areas adjacent to the ROW. This area is dominated by Himalayan blackberry (*Rubus discolor*) and coast redwood trees. Stormwater from both ditches enters drop inlets, and flows through storm drains before entering Valencia Creek.

Aptos Creek

The portion of Aptos Creek assessed consists of a broad, slightly incised channel, dominated by California bay, big leaf maple, sycamore (*Platanus racemosa*), California blackberry, poison oak, stinging nettle, horsetail (*Equisetum arvense*), and arroyo willow, in a residential setting (refer to Appendix C, Sheet 4a). Aptos Creek is a blue-line stream that receives runoff from a large urban watershed area that includes the Valencia Creek watershed. Aptos Creek flows under Route 1 through a large concrete bridge. The channel contained deep pools and flowing water during the assessment. The channel exhibited a clay, sand, and cobble bottom averaging 40 to 50 feet wide at the OHWM, which was approximately 5 feet above the thalweg. Several sections of the creek bank consist of riprap or poured concrete intended to prevent erosion of adjacent residential properties within the floodplain. No adjacent wetland areas were observed within or near the project area. Dense riparian canopy cover is present on both sides of Route 1, within the BSA.

Ord Gulch and Tributary

The portion of Ord Gulch assessed consists of a small, narrow incised channel dominated by coast live oak (*Quercus agrifolia*), poison oak, English ivy, greater periwinkle (*Vinca major*), and a few arroyo willows, in a residential/commercial

setting (refer to Appendix C, Sheet 6). Ord Gulch is not a blue-line stream and is a tributary to Borregas Creek. The channel exhibited a clay and sand bottom averaging 8 to 12 feet wide at the OHWM, which was approximately 1.5 feet above the thalweg. Riprap bank protection is present on both banks south of Route 1. The creek flows under Route 1 through a 48-inch concrete culvert. Low flow conditions were observed during the assessment. No pools were observed within the channel, and no adjacent wetland areas were observed within or near the project area. Some willow canopy is present on the north side of Route 1, along the fill slope within the BSA.

A small earthen bank roadside drainage channel parallels the north side of Route 1 within the BSA, and crosses under the Mar Vista Drive cul-de-sac before entering Ord Gulch approximately 25 feet north of the culvert inlet. This channel was 2 to 3 feet wide at the OHWM. The portion west of Mar Vista Drive contained areas of standing water, and a dense cover of California blackberry and coast live oak. East of Mar Vista Drive, the channel was dry and unvegetated.

Borregas Creek

The portion of Borregas Creek assessed consists of a narrow, deeply incised channel, dominated by coast live oak, poison oak, acacia (*Acacia* sp.), arroyo willow, and kikuyu grass (*Pennisetum clandestinum*), in a residential setting (refer to Appendix C, Sheet 6). This creek is a blue-line stream that receives residential and roadway runoff from a small watershed area. The creek flows under Route 1 through a 48-inch concrete culvert. Low flow conditions were observed during the assessment. Natural channel areas exhibited a gravel bottom channel averaging 3 to 5 feet wide at the OHWM, which was approximately 16 inches above the thalweg. No pools were observed within the channel, and no adjacent wetland areas were observed within or near the project area. Willow canopy is present on the south side of Route 1, within the BSA.

Potbelly Creek

The portion of Potbelly Creek assessed consists of a small drainage that originates along Cabrillo College Drive north of Route 1 and continues south of the roadway along New Brighton Road to Potbelly Beach (refer to Appendix C, Sheet 6). Although not designated as a blue-line stream, Potbelly Creek receives residential and roadway runoff from a small watershed area that includes Cabrillo College. The creek flows under Route 1 through a 30-inch concrete culvert. Low flow conditions were observed during the assessment. The channel is narrow, and moderately incised, and is dominated by coast live oak, Monterey pine (*Pinus radiata*), arroyo willow, poison oak, California blackberry, coffeeberry (*Rhamnus californica*),

bracken fern (*Pteridium aquilinum*), and canary grass (*Phalaris californica*), in a rural residential setting. No pools were observed within the channel, and no adjacent wetland areas were observed within or near the project area. Willow canopy is present on the north side of Route 1, within the BSA. A small roadside swale/depressional area parallels the north side of Route 1 within the BSA, and is connected to Potbelly Creek by a 24-inch culvert under Route 1. This swale was 3 to 6 feet wide, but did not contain defined bed or bank structure. The swale contained arroyo willow, canary grass, poison oak, Pampas grass (*Cortederia jubata*), vinca, and coast live oak.

Tannery Gulch

The portion of Tannery Gulch assessed consists of a narrow, moderately incised channel, dominated by blue gum eucalyptus (*Eucalyptus globulus*), poison oak, dogwood (*Cornus sericea*), and arroyo willow, in a rural residential setting (refer to Appendix C, Sheet 6). This creek is a blue-line stream that receives runoff from a medium-sized urban watershed area. The creek flows under Route 1 and adjacent frontage roads through a 72-inch square concrete culvert. Channel areas up- and downstream of the culvert contained several small pools with ponded water during the assessment. Natural channel areas exhibited a sand or clay bottom averaging 3 feet wide at the OHWM, which was approximately 18 inches above the thalweg. One small depressional adjacent wetland area was observed outside the project area boundary, south of the ROW and west of the creek channel. Willow canopy is present on both sides of Route 1, within or adjacent to the BSA.

Western Tributary to Tannery Gulch

A small, moderately incised tributary to Tannery Gulch crosses under Route 1 through a 48-inch corrugated metal culvert east of Park Avenue and drains into Tannery Gulch south of the project BSA (refer to Appendix C, Sheet 6). This tributary is fed by urban runoff and is not marked as a blue-line stream. The channel north of Route 1 was dry during the assessment and was vegetated with eucalyptus, poison oak, California blackberry, and coast live oak. Channel width below the OHWM ranged from approximately 2 to 4 feet wide, with the OHWM approximately 12 inches above the thalweg. No potential pool areas were observed within the channel, and no adjacent wetland areas were observed within or near the project area. The channel north of Route 1 parallels Park Avenue and the project BSA for approximately 400 feet.

Monterey Avenue / Nobel Creek

Monterey Avenue Drainage Channel

Monterey Avenue ends at the north side of Route 1, approximately 0.25 mile east of Nobel Creek (refer to Appendix C, Sheet 7a). An unnamed drainage channel crosses under Monterey Avenue and parallels the Route 1 ROW within the BSA for approximately 348 feet before turning to the north, away from the project area and merging with Nobel Creek. A concrete v-ditch is also present along the road edge east of Monterey Avenue. The unnamed drainage channel averages 6 feet deep and 10 to 15 feet wide, and is dominated by acacia, coast live oak, poison oak, English ivy, Himalayan blackberry, and annual grasses. The OHWM in this channel was visible at approximately 1.5 feet above the thalweg. Slowly flowing and ponded water less than 12 inches deep was present in the channel during the survey of this area. No adjacent wetlands were observed within or near the project area.

The concrete v-ditch is surrounded by coast live oak, English ivy, and annual grasses. Numerous culverts enter the unnamed drainage, including one that originates on the south side of Route 1. Examination of this area found a depressional area dominated by California blackberry near a drop inlet (refer to Appendix C, Sheet 7a). No channel or evidence of ponding was observed in this area.

Nobel Creek

The portion of Nobel Creek assessed consists of a narrow, moderately incised channel, dominated by eucalyptus, coast live oak, poison oak, horsetail, and arroyo willow, in an urban setting (refer to Appendix C, Sheet 7a). This creek is a blue-line stream that receives runoff from a medium-sized urban watershed area. The creek flows under Route 1 and an adjacent frontage road through a 72-inch square concrete culvert. Channel areas up- and downstream of the culvert contained several small pools and slowly flowing water during the assessment. Natural channel areas exhibited a clay bottom averaging 2 to 3 feet wide at the OHWM, which was approximately 24 inches above the thalweg. No adjacent wetland areas were observed within or near the project area, although a broad, high flow terrace dominated by eucalyptus is present along the right creek bank north of Route 1. Dense willow canopy is present on the south side of Route 1, within and adjacent to the BSA.

Soquel Creek

The portion of Soquel Creek assessed consists of a broad, moderately incised channel, dominated by alder (*Alnus* sp.), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), redwood, coast live oak, poison oak, California blackberry, bulrush, and

arroyo willow, in an urban setting (refer to Appendix C, Sheet 8). This large creek is a blue-line stream that receives runoff from a large urban watershed area. The creek flows under Route 1 through a large open span concrete bridge. The creek channel within the project area contained deep pools and flowing water during the assessment. Natural channel areas exhibited clay, sand, and cobble bottom averaging 60 to 75 feet wide at the OHWM, which was approximately 5.5 feet above the thalweg. No adjacent wetland areas were observed within or near the project area. Dense riparian canopy cover is present on both sides of Route 1, within the BSA.

Rodeo Gulch

The portion of Rodeo Gulch assessed consists of a broad, slightly incised channel, dominated by California bay, coast live oak, California blackberry, poison oak, stinging nettle, and arroyo willow, in an urban setting (refer to Appendix C, Sheet 9a). This creek is a blue-line stream that receives runoff from a medium-sized urban watershed area. The creek flows under Route 1 and Soquel Avenue through a 72-inch concrete culvert. Channel areas up- and downstream of the culvert were dry during the assessment, with the exception of a small stagnant pool at the southern end of the culvert. The broad, flat natural channel area south of Route 1 exhibited a central flat, sandy low flow channel, surrounded by low-lying, regularly inundated flood plain areas consisting of sand or loamy soils that were densely covered with riparian vegetation. A detailed examination of this area found wetland boundaries extending across the floodplain to a width ranging between 100 to 200 feet within the creek corridor. Creek banks above the wetland floodplain area were dominated by annual grassland, coast live oak, and poison oak. Dense willow canopy is present on both sides of Route 1, within and adjacent to the BSA.

Soquel Drive-In Roadside Ditch

The Soquel Drive-In roadside ditch is located on the north side of the ROW immediately adjacent to the Drive-In (refer to Appendix C, Sheet 9a). The ditch consists of a linear depression approximately 308 feet long, 5 to 25 feet wide, and approximately 3 feet deep. The area is dominated by curly dock (*Rumex crispus*), alders, acacia, English ivy, Himalayan blackberry, annual grasses, and ice plant. A 2-feet wide earthen channel extends to the east just north of the BSA boundary, and is vegetated with annual grasses and English ivy. The ditch receives runoff from the paved Drive-In and from Route 1, and directs flows into two culverts leading south under the roadway. Water from this area likely reaches Rodeo Gulch by way of the storm drain system.

Arana Gulch and Eastern Tributary

The portion of Arana Gulch assessed consists of a broad, slightly incised channel, dominated by California bay, eucalyptus, redwood, coast live oak, California blackberry, poison oak, stinging nettle, box elder, and arroyo willow, in an urban setting (refer to Appendix C, Sheet 10). This creek is a blue-line stream that receives runoff from a large urban watershed area, including several tributary channels within or immediately adjacent to the project BSA. The creek flows under Route 1 through a 72-inch concrete culvert. Channel areas up- and downstream of the culvert contained flowing water during the assessment, with the exception of a small stagnant pool in the detention basin at the southern end of the culvert. Natural channel areas exhibited a clay or sand bottom averaging 10 to 20 feet wide at the OHWM, which was approximately 2.5 feet above the thalweg. A broad, forested floodplain terrace is present along the left creek bank north of Route 1, where it appears storm flows regularly back up behind the culvert inlet. An examination of this area found wetland boundaries extending to a width of approximately 200 feet within the creek corridor. Creek banks above the wetland area were dominated by annual grassland, coast live oak, and poison oak. The culvert outlet on the south side of Route 1 flows into a concrete detention basin, through a short culvert under a paved school access road, and then along a concrete v-ditch along the Harbor High School tennis courts. Dense willow canopy is present on both sides of Route 1, within and adjacent to the BSA.

A small, eucalyptus lined tributary channel fed by road runoff parallels the southern side of Route 1 and drains into a large depressional wetland area dominated by willows. The channel contained numerous pools 1 to 2 feet deep. Channel width below the OHWM ranged from approximately 2 feet wide at the upper end to over 10 feet wide at the lower western portion before entering the depressional area. The OHWM was approximately 2 feet above the thalweg. The depressional area is partially within the BSA, and drains into Arana Gulch at the concrete detention basin south of Route 1 through a 12-inch plastic corrugated culvert.

La Fonda Overcrossing Road Shoulder

Areas of saturated soils and wetland plants are present along the northbound Route 1 road shoulder area on the east and west sides of the La Fonda overcrossing bridge abutments (refer to Appendix C, Sheet 10). This area consists of a narrow dirt road shoulder that extends approximately 5 feet from the edge of pavement to the toe of the steep banks of the adjacent road cut.

The banks of the road cut east of the overcrossing contained several seep areas containing saturated soils and wetland vegetation consisting of tall flatsedge (*Cyperus*

eragrostis) and watercress (*Rorippa nasturtium-aquatica*), and the road shoulder west of the overcrossing contained saturated soils and shallow ponding dominated by cattail (*Typha latifolia*) and watercress. The hillside seeps appear to be the source of hydrology for wetland vegetation on the cut slope and the saturated soil areas along the road shoulder. No channel or evidence of flow along the road shoulder was observed, however, a tire rut at the base of the bank contained ponded water in this area. A storm drain inlet is present in the road shoulder 413 feet east of the overcrossing.

Western Tributaries to Arana Gulch

A small, moderately incised tributary to Arana Gulch crosses under Route 1 just west of La Fonda Avenue through a 48-inch concrete culvert and joins with a second channel that parallels the southern side of the highway for approximately 900 feet (refer to Appendix C, Sheets 10 and 11a). These tributaries are fed by residential runoff and Route 1 drop inlets, and drain into Arana Gulch south of the project area. The northern channel was 2 to 4 feet wide at the OHWM. No water was observed during the assessment. The channel along the south side of Route 1 contains several in-stream detention structures designed to detain storm flows, separated by natural channel sections. The southern channel contained several pools 1 to 2 feet deep and was densely vegetated with willow, eucalyptus, poison oak, blackberry (*Rubus ulmifolius* var. *inermis*), acacia, greater periwinkle, and coast live oak. Channel width below the OHWM ranged from approximately 10 to 20 feet wide along the southern ROW portion. The OHWM was approximately 2.5 feet above the thalweg.

3.1.3. Biological Conditions in the Biological Study Area

3.1.3.1. NATURAL COMMUNITIES

Habitat types present within the BSA include riverine/freshwater marsh, riparian forest, oak woodland, eucalyptus woodland, mixed conifer woodland, coastal scrub, annual grassland, developed/landscaped areas, and ruderal/disturbed vegetation (Holland 1986; Cowardin et al. 1979). Riverine, freshwater marsh, and riparian forest habitats are associated with the riparian corridors of the streams and drainages within and adjacent to the BSA, and typically fall under USACE, CDFW, RWQCB, and/or CCC jurisdiction. Coast live oak woodland, mixed conifer woodland, eucalyptus woodland, coastal scrub, annual grassland, developed/landscaped areas, and ruderal/disturbed areas are present in upland areas of the BSA. These habitats are mapped in Appendix C (Sheets 1-11), quantified in Table 3, and described in the following sections.

Table 3: Plant Communities/Habitat Areas in the BSA

Plant Community/Habitat	Acres	Square Feet
Riverine/Freshwater Marsh	9.56	416,219
Riparian Forest	18.44	803,397
Coast Live Oak Woodland	26.77	1,166,184
Mixed Conifer Woodland	9.30	405,046
Eucalyptus Woodland	1.53	66,586
Coastal Scrub	13.54	589,604
Annual Grassland	12.29	535,322
Ruderal / Disturbed	17.18	748,232
Landscaped/Developed	152.15	6,627748
TOTAL	**260.75**	**11,358,336**

Riverine/Freshwater Marsh

Riverine habitat and freshwater marsh habitat are two habitat types that were mapped together for the purposes of this NES.

Riverine habitat is present in the streambed of each of the creeks and drainages that traverse or parallel the BSA. Using the nomenclature of Cowardin et al. (1979), these habitats can be classified as riverine, lower perennial/intermittent, unconsolidated bottom/shore. This habitat type is seasonally variable, and includes open water components (active, flowing channel), and unvegetated sandbars and streambed areas (riverwash, active floodplain). The stream gradient of this habitat type is low, water velocities are slow, and floodplains are typically well developed. Riverine habitat is present below the OHWM within the stream channels crossed by or adjacent to the BSA. Substrate within this habitat type is variable and typically consists of consolidated sand, gravel, and cobbles in the larger, perennial streams, and mud/silt in the smaller, intermittent drainages, tributaries, and roadside drainage ditches. Seasonally emergent wetlands located below the OHWM are vegetated areas and have been mapped separately (refer to following section).

Several species of fish have potential to occur within large, well-developed riverine habitats of the BSA, specifically in Valencia, Aptos, and Soquel Creeks. These include federally endangered central California coast steelhead, speckled dace (*Rhinichthys osculus*), three-spine stickleback (*Gasterosteus aculeatus*), Pacific lamprey (*Lampetra tridentata*), and the federally endangered tidewater goby. Speckled dace and stickleback are year-round residents of suitable riverine habitats.

Steelhead, tidewater goby, and Pacific lamprey are anadromous transients. Anadromous fishes reproduce and rear for a portion of their juvenile life cycles within fresh water, but mature within ocean waters after moving downstream. Steelhead juveniles and adults were observed within Valencia, Aptos, and Soquel Creeks upstream and downstream of Route 1. Three-spine stickleback, speckled dace, and Pacific lamprey were also observed during nighttime CRLF surveys of the BSA.

Other wildlife species with potential for occurrence within riverine habitats of the BSA include Pacific treefrog (*Pseudacris regilla*), western toad (*Bufo boreas*), the federally threatened CRLF, FYLF, and western pond turtle (*Actinemys marmorata*; WPT). Marsh and shore birds such as red-winged blackbird (*Agelaius phoeniceus*), tri-colored blackbird (*Agelaius tricolor*), American coot (*Fulica americana*), great blue heron (*Ardea herodias*), great egret (*Casmerodias albus*), snowy egret (*Egretta thula*), and mallard duck (*Anus platyrhynchos*) often utilize riverine and associated freshwater marsh habitat for nesting or foraging.

Freshwater marsh communities usually occur in nutrient-rich mineral soils that are saturated or inundated on a seasonal or permanent basis. These communities can occur in areas of slow-moving or stagnant shallow water along streams, or in areas where the low-permeability of existing soils results in the prolonged presence of surface water or saturated soils. These habitat types also occur along the persistent, moist areas of existing drainages, around the perimeters of ponds, and in low topographic areas that contain standing water or moist soils due to retention of rainfall/runoff (Cowardin et al. 1979). Freshwater marsh areas of the BSA are dominated by emergent plant species, and correspond with the emergent wetland classification under Cowardin.

Freshwater marsh habitat was observed in several of the streams and drainages that cross or parallel the BSA. Annual emergent species may present in creeks on a permanent or seasonal basis. Plants observed occurring as part of freshwater marsh habitat included horsetail (*Equisetum arvense*), cattail (*Typha latifolia*), scarlet monkeyflower (*Mimulus cardinalis*), water speedwell (*Veronica anagallis-aquatica*), rabbitsfoot grass (*Polypogon monspeliensis*), tall flatsedge (*Cyperus eragrostis*), and small-fruited bulrush (*Scirpus microcarpus*). Wildlife species expected to occur in or frequent freshwater marsh habitats of the BSA would likely include the same aquatic, semi-aquatic, and terrestrial species listed above for riverine habitat.

Riverine habitat was mapped within the BSA by identification and mapping of the OHWMs along each stream or drainage. Riverine habitat as mapped, therefore, also includes areas of seasonally emergent freshwater marsh habitats located below the OHWMs. Freshwater marsh habitats were mapped contiguously with riverine habitats of the BSA (refer to Appendix C, Sheets 1-11).

Upon review by regulatory agencies, riverine/freshwater marsh habitats within the BSA may be considered waters of the United States and potentially fall under USACE, CDFW, and RWQCB jurisdiction. This habitat type may also be considered CCC-regulated wetlands within portions of the BSA located within the coastal zone.

Riparian Forest

Riparian forest habitat typically occurs within the riparian corridor adjacent to stream channels with seasonally variable depths to the water table. Riparian forest is typically dense and provides a contiguous upper canopy of larger tree species, with an herbaceous understory layer. This habitat type typically occurs as a transitional habitat between riverine/freshwater marsh and upland habitats. Riparian forest habitat was present in many of the creeks and drainages within the BSA, and was extensive within the Valencia, Aptos, and Soquel Creek corridors. Smaller amounts of riparian forest habitat also occur along Ord Gulch, Borregas Creek, Pot Belly Creek, Tannery Gulch, Nobel Creek, Soquel Creek, Rodeo Gulch, and Arana Gulch and its tributaries.

Dominant tree species of riparian forest habitats within the BSA include arroyo willow, California bay, big leaf maple, western sycamore, coast live oak, red willow (*Salix laevigata*), alder (*Alnus* sp.), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), and blue gum eucalyptus. Common understory species observed include mugwort (*Artemisia douglasiana*), brass buttons (*Cotula coronopifolia*), California blackberry, poison oak, and hedge-nettle (*Stachys bullata*).

Riparian forest provides suitable habitat for a diverse assemblage of semi-aquatic and terrestrial wildlife species. A variety of amphibian and reptile species, including those identified as having potential to occur in association with riverine and freshwater marsh communities are expected to occur in association with riparian forest areas of the BSA. Other vertebrate species observed or expected to occur in or frequent riparian forest habitats include gopher snake *(Pituophis melanoleucus*), common garter snake (*Thamnophis sirtalis*), western fence lizard *(Sceloporus occidentalis*), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), raccoon *(Procyon lotor*), California quail (*Callipepla californica*),

American goldfinch (*Carduelis tristis*), and black phoebe (*Sayornis nigricans)*, as well as numerous other birds. Riparian forest areas are expected to provide important nesting, roosting, and foraging habitat for a variety of migratory songbirds and various raptor species.

Riparian forest habitat acreage and locations were mapped within the BSA (refer to Table 3 and Appendix C, Sheets 1-11). Riparian habitat as mapped in this NES was considered to be non-freshwater marsh vegetation with close association with streams, above the OHWMs and including the outer margin of such vegetation extending out from the banks of the stream. Riparian forest areas within the BSA could potentially fall under USACE, RWQCB, and CDFW jurisdiction. This habitat type may also be considered CCC-regulated wetlands within portions of the BSA located within the coastal zone.

Coast Live Oak Woodland

Coast live oak woodland communities are dominated by the evergreen coast live oak. Coast live oak woodlands varies substantially in structure and composition and are dependent on local environmental conditions such as slope, aspect, soils, moisture conditions, microclimatic features, and level of disturbance (Holland 1986).

Oak woodland is present along upper creek bank areas and along roadsides throughout large areas of the BSA. Individual oak trees are present in many other habitat types within the BSA, both as ornamental plantings and as naturally occurring trees. Understory of oak woodland generally consists of grassy areas and woody shrubs, including milk thistle (*Silybum marianum*), poison oak, sticky monkeyflower (*Mimulus aurantiacus*), coyote brush (*Baccharis pilularis*), coffeeberry (*Rhamnus californicus*), hedge-nettle, hummingbird sage (*Salvia spathacea*), black nightshade (*Solanum douglasii*), and annual grasses such as those described in the annual grassland habitat section.

Oak woodland typically supports a wide diversity of wildlife due to the availability of important habitat features such as nesting sites, escape and thermal cover, food, and dispersal corridors. Characteristic mammals expected to occur within coast live oak woodland habitats of the project site include western gray squirrel (*Sciurus griseus*), blacktail deer (*Odocoileus hemionus columbianus*), raccoon, striped skunk, dusky-footed wood rat (*Neotoma fuscipes*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), Virginia opossum, and California ground squirrel (*Spermophilus beecheyii*). Various birds that occur within these habitats include plain titmouse (*Parus inornatus*), mourning dove, northern flicker (*Colaptes auratus*), acorn

woodpecker (*Melanerpes formicivorous*), California towhee (*Pipilo crissalis*), Stellar's jay (*Cyanocitta stelleri*), western bluebird (*Sialia mexicana*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperi*), golden eagle (*Aquilia chrysaetos*), great-horned owl (*Bubo virginianus*), and common barn-owl (*Tyto alba*). Reptiles that may occur within this habitat type include gopher snake, western fence lizard, and common kingsnake (*Lampropeltis sirtalis*).

Coast live oak woodland habitat acreage and location was mapped within the BSA (refer to Table 3 and Appendix C, Sheets 1-11). Where coast live oak woodland areas are within CDFW jurisdiction, they have been mapped as riparian forest.

Mixed Conifer Woodland

Mixed conifer woodland habitat present within and adjacent to the BSA consists of California redwood trees, Monterey pine, and Monterey cypress (*Cupressus macrocarpus*), primarily in planted or ornamental stands. In most areas of the BSA these tree species are found in planted windrows along roadways and landscaping in overpass/interchange areas. Areas of mixed conifer woodland within and adjacent to the BSA provide habitat features such as nesting and roosting sites, food, and dispersal corridors for a variety of wildlife species. Wildlife species present in conifer woodland are expected to be similar to those found in oak woodland habitats, with an increased presence of raptor species. Understory is typically composed of annual grasses and small shrubs.

Monterey pine occurs naturally in three disjunct stands along the California coast at Cambria, the Monterey peninsula (including coastal areas of Santa Cruz County), and near Año Nuevo (Holland and Keil 1995). These natural populations of Monterey pine are considered special-status plant species under CNPS guidelines (CNPS 2014). Monterey pine is commonly planted as an ornamental tree, and such plantings outside of native stands are not considered to have any special status. In some coastal areas ornamental Monterey pine plantings have become naturalized and are reproducing. Only one area within the BSA appears to contain a population of Monterey pine, mixed with other conifer species. This area is a large undisturbed hillside located on the south side of Route 1, east of Aptos Creek (refer to Appendix C, Sheet 4); these Monterey pines do not comprise a recognized natural stand. Therefore, no special mitigation would be required beyond restoration of mixed conifer habitat, to compensate for any impacts related to biological resources.

Mixed conifer woodland habitat acreage and location was mapped within the BSA (refer to Table 3 and Appendix C, Sheets 1-11). Mixed conifer woodland areas located within CDFW jurisdiction have been mapped as Riparian Forest.

Eucalyptus Woodland

Eucalyptus woodlands are the result of escaped and naturalized eucalyptus trees (typically blue gum eucalyptus), or abandoned eucalyptus plantations. Large areas of eucalyptus woodland are present along the south side of Route 1 at San Andreas Road, the west side of Union Pacific Railroad and north of Route 1, along Tannery Gulch and the Tannery Gulch unnamed tributary, the west side of Park Avenue south of Route 1, and on the north side of Route 1 at Nobel Creek. The eucalyptus woodland areas within the BSA are composed of blue gum eucalyptus, and exhibit very little understory vegetation due to the allopathic properties in the tree oils. Eucalyptus woodland habitat within the BSA has the potential to provide nesting habitat for raptors and migratory birds, as well as overwintering habitat for monarch butterfly (*Danaus plexippus*). Some foraging habitat for common wildlife species is present, but habitat values of eucalyptus woodland areas are generally low.

Eucalyptus woodland habitat acreage and location was mapped within the BSA (refer to Table 3 and Appendix C, Sheets 1-11). Where eucalyptus woodland areas are located within CDFW jurisdiction, they have been mapped as Riparian Forest.

Coastal Scrub

Coastal scrub communities typically occur in pockets in the outer and inner southern coastal ranges and in scattered areas along the immediate coast. These communities typically integrate with a variety of habitat types including annual grassland, oak woodland, and chaparral communities. Species composition is highly variable and is dependent upon topography, soils, and slope aspect. Plants occurring in coastal scrub communities are characterized as aromatic, low growing, and drought tolerant. Occurrence of coastal scrub within the BSA are limited to the southern portion of the BSA from roughly San Andreas Road to Freedom Boulevard, and a small disturbed area along the north side of Route 1 east of La Fonda Avenue and west of Arana Gulch. Coastal scrub habitat observed was fairly sparse and mixed with annual grassland.

Common plant species include coyote brush, California sagebrush, sticky monkeyflower, poison oak, and black sage (*Salvia melifera*). Understory within these communities is generally sparse and includes forbs such as plantain (*Plantago* sp.) and yarrow (*Achillea* sp.).

Mammals expected to occur in or frequent the areas of coastal scrub habitat present in the BSA, based on either direct observations or the presence of "sign," include brush rabbit (*Sylvilagus bachmanii*), various mice, Botta's pocket gopher (*Thomomys bottae*), California ground squirrel, and raccoon. Bird species that are expected to occur include American crow *(Corvus brachyrhynchos),* mourning dove (*Zenaida macroura*), California thrasher (*Toxostoma redivivum*), and scrub jay (*Aphelocoma coerulescens*). Common lizards, such as western fence lizard, are also expected to occur within coastal scrub habitats of the area.

Coastal scrub habitat acreage and location was mapped within the BSA (refer to Table 3 and Appendix C, Sheets 1-11).

Annual Grassland

Annual grassland is a common plant community regionally and statewide, and is typically found on ridges, hill slopes, and on valley floors (Holland 1986). The structure of this community varies according to soil types and land use practices. In coastal regions, annual grassland communities often form a mosaic with coastal scrub habitats. This community is mainly comprised of various non-native grasses and weedy annual forbs. Occurrence of annual grassland within the BSA is limited to the southern portion of the area near the San Andreas Road interchange. Small areas of non-native annual grassland habitat intergrade with landscaping and other upland habitats along Route 1 and borders many of the riparian corridors adjacent to the BSA. The annual grassland areas within the BSA are dominated by non-native species of common grasses, with a mixture of annual and perennial native and introduced forbs.

Dominant plant species present include soft chess brome (*Bromus mollis*), ripgut brome (*Bromus diandrus*), wild oat (*Avena fatua*), foxtail (*Hordeum leporinum*), wild rye (*Lolium multiflorum*), filaree (*Erodium* spp.), perennial mustard (*Hirschfeldia incana*), bur clover (*Medicago hispida*), telegraph weed (*Heterotheca grandiflorum*), sweetclover (*Melilotus alba),* and Bermuda grass (*Cynodon dactylon*).

Wildlife species inhabiting adjacent habitats may frequent non-native annual grassland areas for foraging or migration. Species observed directly, or by sign, within the annual grassland habitat include Botta's pocket gopher, California ground squirrel, black-tailed deer, western fence lizard, California quail, and mourning dove. Raptors, such as red-tailed hawk, Cooper's hawk, white-tailed kite, and American kestrel (*Falco sparverius*), often utilize annual grassland areas for foraging purposes, while species such as western meadowlark (*Sturnella neglecta*) often use grassland

areas for nesting. Annual grassland habitat acreage and location was mapped within the BSA (refer to Table 3 and Appendix C, Sheets 1-11).

Ruderal/Disturbed

Ruderal/disturbed vegetation occurs in areas that have been altered by construction, landscaping, or other land-clearing types of activities (Holland and Keil 1995), and is dominated by non-native plant species. Ruderal/disturbed habitats often occur in abandoned agricultural fields, along roadsides, near developments, and in other areas experiencing severe ground surface disturbance. Areas of ruderal/disturbed vegetation within the BSA occur primarily in association with median strips, road shoulders, and disturbed areas. Characteristic weedy species present include turkey mullein (*Eremocarpus setigerus*), telegraph weed (*Heterotheca grandiflora*), summer mustard (*Hirshfeldia incana*), wild radish (*Raphanus sativus*), Russian thistle (*Salsola iberica*), sweet fennel (*Foeniculum vulgare*), bull thistle (*Cirsium vulgare*), prickly wild lettuce (*Lactuca serriola*), ripgut brome, and various other annual grasses.

Ruderal/disturbed vegetation associated with high-traffic roadways does not provide the habitat complexity necessary for diverse wildlife communities. Species expected to occur within this habitat type within the BSA include various species of mice and Botta's pocket gopher. These species are preyed upon and may attract foraging raptors, including American kestrel, red-tailed hawk, and red-shouldered hawk. Ruderal/disturbed habitat acreage and location was mapped within the BSA (refer to Table 3 and Appendix C, Sheets 1-11).

Landscaped/Developed

Landscaped/Developed habitat is the dominant vegetation throughout the BSA. This habitat type consists of ornamental plantings in association with residential and commercial developments, and roadside landscape efforts. Landscaped/Developed areas are present throughout the BSA. Landscaped/Developed areas have been altered from their natural condition, and do not typically provide suitable habitat values for wildlife or native plants; however, various species of nesting migratory birds may potentially forage and/or nest in landscaped trees. SCLTS also has the potential to estivate in uplands with landscaped vegetation adjacent to Valencia Lagoon (Mori 2007). Landscaped/Developed habitat acreage and location was mapped within the BSA (refer to Table 3 and Appendix C, Sheets 1-11).

Anthropogenic Habitats

Anthropogenic habitats include the several bridges and overpasses that could be impacted by the project. These are otherwise unvegetated areas that may be utilized

by nesting birds such as swallows (mainly *Petrochelidon* spp.) and roosting bats. Anthropogenic habitats have not been mapped but are mentioned because of the potential for impacts to special-status species inhabiting these areas if bridges and other man-made structures will need to be demolished during proposed construction.

3.1.3.2. IMPORTANT NATURAL COMMUNITIES

Riparian Corridors

Riparian corridors are considered sensitive and important habitats by various regulatory agencies. Within the BSA, riparian corridor areas include the riverine, freshwater marsh, and riparian forest habitats associated with streams and drainages as mapped in Appendix C, Sheets 1-11. The diversity of wildlife species occurring within riparian habitats is typically very high and these habitats are sensitive to disturbance. Riparian vegetation provides important roosting and foraging habitat for many migratory bird species. Riparian vegetation regulates water temperatures and provides, directly or indirectly, food sources for aquatic organisms. Riparian habitats serve as migratory corridors for wildlife, and as such, are important in linking non-contiguous or fragmented wildlife habitats. Riparian corridor areas present within the BSA fall under USACE and CDFW jurisdiction, and riparian areas within the coastal zone also fall under CCC jurisdiction.

CDFW jurisdictional areas have been quantified for each survey site in the Wetland Assessment, included as Appendix D. The total area of jurisdictional features within the Tier I and Tier II areas are shown in Tables 4 and 5 below. Some jurisdictional areas overlap and, therefore, the totals of the jurisdictional areas of the respective agencies are not additive.

Table 4: Tier I Corridor Alternatives - Jurisdictional Areas

Jurisdictional Area	Acres / Square Feet
USACE Jurisdictional Areas	
USACE Wetlands	9.01 / 392,475
USACE Other Waters	0.85 / 37,026
Total of Wetlands and Other Waters of the United States	*9.86 / 429,501*
Other Jurisdictional Areas	
CCC jurisdiction	15.48 / 67,308
CDFW jurisdiction	28.19 / 1,227,956

Table 5: Tier II Auxiliary Lane Alternative - Jurisdictional Areas

Jurisdictional Area	Acres / Square Feet
USACE Jurisdictional Areas	
USACE Wetlands	0.0 / 0.0
USACE Other Waters (Soquel Drive-In roadside ditch)	0.13 / 5,662
Total of Wetlands and Other Waters of the United States	*0.13 / 5,662*
Other Jurisdictional Areas	
CDFW jurisdiction (Rodeo Gulch & Soquel Drive-In roadside ditch)	1.04 / 45,302

Wetlands and Other Waters

USACE wetlands and other waters, CDFW jurisdictional areas, and CCC jurisdictional wetlands were identified within the BSA, associated with creeks or drainages as mapped in Attachment B of the Wetland Assessment, included in Appendix D. USACE wetlands within the BSA were largely characterized by the presence of annual, herbaceous hydrophytes within riverine and freshwater marsh habitats, within or adjacent to the OHWM. USACE other waters consisted primarily of unvegetated areas within the OHWM of the creek channels. CCC wetlands were mapped to include all USACE jurisdictional areas, and all CDFW jurisdictional areas which extend to the edge of adjacent riparian canopy or top of bank outside USACE jurisdiction.

USACE, CDFW, and CCC jurisdictional areas have been quantified for each survey site in the Wetland Assessment. Total areas delineated for each jurisdiction are summarized in Tables 4 and 5.

3.1.3.3. MIGRATION AND TRAVEL CORRIDORS

The larger stream channels within the BSA may provide migration and travel routes for steelhead trout, tidewater goby, CRLF, and other aquatic species. The riparian corridor areas of the BSA contain tree and/or shrub canopy and therefore provide suitable travel corridors for various birds and terrestrial wildlife species passing through surrounding developed areas. More mobile animal species may traverse surrounding developed areas, but at a greater risk of exposure. Soquel, Aptos, and Valencia Creeks are perennial through the BSA, and may therefore support year round movement of aquatic species. No apparent barriers to aquatic species migration were observed within the BSA.

3.1.3.4. INVASIVE SPECIES

Nine exotic, invasive plant species as identified by the California Invasive Plant Council were observed in the BSA. Five of these species are included on the California Invasive Plant Council's A-1 List of *Most Invasive Wildland Pest Plants; Widespread*: French broom (*Genista monspessulana*), Cape ivy (*Delairea odorata*), Pampas grass, blue gum eucalyptus, and sweet fennel. List A-1 species have been documented as aggressive invaders that displace native species and disrupt natural habitats.

Four invasive species observed within the BSA are included on List B-*Wildland Pest Plants of Lesser Invasiveness*: English ivy, greater periwinkle, Italian thistle (*Carduus pycnocephalus*), and poison hemlock (*Conium maculatum*). List B includes invasive pest plants that spread less rapidly and cause a lesser degree of habitat disruption than List A plants.

Arana Gulch and surrounding areas contained French broom, English ivy, and periwinkle. Soquel Creek and surrounding areas contained French broom, English ivy, and pampas grass. The Tannery Gulch area contained English ivy, Cape ivy, and blue gum eucalyptus. Ord Gulch contained English ivy and blue gum eucalyptus. Nobel Creek contained blue gum eucalyptus. The Valencia Channel area contained English ivy, poison hemlock, and Italian thistle. Scattered occurrences of sweet fennel, blue gum eucalyptus, and Italian thistle are present in many other areas of the BSA, in clusters too small to map.

3.2. Regional Species and Habitats of Concern

"Regional species and habitats of concern," as used within this NES, is a term synonymous with "special-status" or "sensitive" species and habitats. Special-status species include taxa that are: 1) federally or state listed as endangered, threatened, or rare; 2) candidates for federal or state listing as endangered, threatened or rare; 3) proposed for federal or state listing as endangered, threatened, or rare; or, 4) considered special concern species by the federal government (i.e., former USFWS Federal Species of Concern [FSC]) or the CDFW (i.e., CSC species) or that appear on the CNDDB Special Animals List (CDFW 2014). Sensitive species also include taxa afforded protection or considered sensitive under various laws (e.g., CEQA, MBTA) or under sections of the California Fish and Game Code (e.g., nesting birds), and those taxa recognized as locally important or sensitive by the CNPS (2014) or the scientific community. Sensitive habitats include those that are regulated or considered sensitive by federal, state, and/or local agencies or CEQA.

The known occurrences of sensitive species and sensitive habitats have been inventoried and mapped, to varying degrees of accuracy, by the CNDDB (2014). Ecological and life history information for sensitive species treated within this NES were summarized by referencing the pertinent literature (cited in text).

3.2.1. Regional Plant Species of Concern

The CNDDB (2014) lists 63 special-status (federally listed, state listed, and/or CNPS List 1B or 2) plant species as occurring within the Santa Cruz, Soquel, and Watsonville West quadrangles and the eight surrounding quadrangles. One additional special-status plant species was included for potential for occurrence based on the USFWS federal species list for Santa Cruz County accessed online (USFWS 2014). The names and legal status of each of these 64 species are identified in Table 6, as well as a general description of the habitat requirements for each species, and whether suitable habitat is present (P) or absent (A) in the BSA. The general habitat description is based on information provided by the California Native Plant Society. The rationale section presents closest known species occurrences, and summarizes the potential for each species to occur within the BSA or be affected by the project.

3.2.2. Regional Animal Species of Concern

The CNDDB (2014) lists 40 special-status animal species (federally listed, state-listed, California Fully Protected, California Special Concern species, CNDDB Special Animals, and/or protected by the MBTA and California Fish and Game Code) as occurring within the Santa Cruz, Soquel, and Watsonville West quadrangles and the eight surrounding quadrangles. The USFWS federal species list for Santa Cruz County accessed online (USFWS 2014) contained 18 species not on the CNDDB list. The combined CNDDB/USFWS species lists included two marine gastropods (abalone), five species of whales, four species of sea turtles, a fur seal, a sea otter, and a sea lion. These 14 marine species have no potential to be present in the project area, and are not discussed further in this document.

The “other nesting birds” category has been added for the numerous species of birds with potential for occurrence in the BSA protected by the MBTA and California Fish and Game Code Section 3503, and the “roosting bats” category has been added for the several CSC bat species and CNDDB Special Animal bat species that could potentially roost within the BSA.

Table provides the name and legal status of each of the 55 non-marine species found on the combined list, including a general description of the habitat requirements for each species, and whether suitable habitat is present (P) or absent (A) in the BSA.

The rationale section presents closest known species occurrences, and summarizes the potential for each species to occur within the BSA or be affected by the project.

3.2.3. Regional Habitats of Concern

The CNDDB (2014) lists 11 sensitive habitats as occurring within the Santa Cruz, Soquel, and Watsonville West quadrangles and the eight surrounding quadrangles. The names of each of these sensitive habitats are identified in Table 8, including a general description of the habitat characteristics. Of these 11 habitat types, only Coastal and Valley Freshwater Marsh and Monterey Pine Forest are present or have potential to be present within the BSA. Monterey pines, while present in the BSA, do not comprise one of the three recognized native stands for the species (CNDDB 2014). Listed regional habitats of concern not present within the BSA are: Central Dune Scrub, Central Maritime Chaparral, Coastal Brackish Marsh, Maritime Coast Range Ponderosa Pine Forest, North Central Coast Drainage Sacramento Sucker/Roach River, North Central Coast Short-Run Coho Stream, Northern Coastal Salt Marsh, Northern Interior Cypress Forest, and Northern Maritime Chaparral.

Table 6: Special-status Plant Species Potentially Occurring in the BSA

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Blasdale's bent grass	*Agrostis blasdalei*	-- / -- / 1B.2	• Coastal bluff scrub, coastal dunes, coastal prairie • Flowers May to July • Elevation: 5-150 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 14.8 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.
bent-flowered fiddleneck	*Amsinckia lunaris*	-- / -- / 1B.2	• Coastal bluff scrub, cismontane woodland, valley and foothill grassland • Flowers March to June • Elevation: 3-500 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 5.1 miles north of the Morrissey Boulevard/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
slender silver moss	*Anomobryum julaceum*	-- / -- / 2.2	• Broadleafed upland forest, lower montane coniferous forest, and North Coast coniferous forest • Flowering n/a • Elevation: 100-1000 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 6 miles NW of the Morrissey Boulevard/Route 1 intersection. • Species not likely to occur in low elevation of BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Anderson's manzanita	*Arctostaphylos andersonii*	-- / -- / 1B.2	• Broadleaf upland forest, chaparral, scrub, north coast coniferous forest/openings, edges. • Flowers November to April • Elevation: 60-760 meters	P	• Several mature individuals were observed on a steep hill at the southern end of the BSA, well outside the area of impact. • Species unlikely to be affected by project – no mitigation proposed. • Nearest previously known occurrences are approximately 3.1 miles to the west of the Morrissey/Route 1 intersection and 2.1 miles north of the intersection of State Park Drive/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
Schreiber's manzanita	*Arctostaphylos glutinosa*	-- / -- / 1B.2	• Closed-cone coniferous forest, chaparral / diatomaceous shale • Flowers November to April • Elevation: 170-685 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 13.3 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Soils not suitable for this species in BSA. • Not likely to occur in low elevation of BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Hooker's manzanita	*Arctostaphylos hookeri* ssp. *hookeri*	-- / -- / 1B.2	• Closed-cone coniferous forests, chaparral, coastal scrub, cismontane woodland • Flowers January to June • Elevation: 85-300 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 0.98 mile southeast of San Andreas Road/Route 1 intersection. • Suitable habitat is present, but Hooker's manzanita was not observed during surveys.
Ohlone manzanita	*Acrtostaphylos ohlense*	-- / -- / 1B.1	• Siliceous shale in closed-cone coniferous forest and coastal scrub. • Flowers February to March • Elevation: 450-530 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 14 miles NW of the Morrissey Boulevard/Route 1 intersection. • Siliceous soils not present in the BSA. • Not likely to occur in low elevation of BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Pajaro manzanita	*Arctostaphylos pajaroensis*	-- / -- / 1B.1	• Sandy soils in scrub and oak woodland habitats. • Flowers December to March • Elevation: 30-760 meters	P	• Several individuals were observed on a steep hill at the southern end of the BSA, well outside the area of impact. • Species unlikely to be affected by project – no mitigation proposed. • Nearest previously known occurrence is approximately 1.5 miles east of the San Andreas Road/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
Kings Mountain manzanita	*Arctostaphylos regismontana*	-- / -- / 1B.2	• Broadleafed upland forest, chaparral, North Coast coniferous forest/granitic or sandstone. • Flowers January to April • Elevation: 305-730 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 9.5 miles east of the San Andreas Road/Route 1 intersection. • Soils not suitable for this species in BSA. • Not likely to occur in low elevation of BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Bonny Doon manzanita	*Arctostaphylos silvicola*	-- / -- / 1B.2	• Chaparral, closed-cone coniferous forest, lower montane coniferous forest/inland marine sands • Flowers February to March • Elevation: 120-600 meters	A	• Not known to occur within the BSA. • Closest known occurrence is approximately 3.1 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Soils not suitable for this species in BSA. • Species unlikely to be affected by project.
marsh sandwort	*Arenaria paludicola*	FE / SE / 1B.1	• Coastal bogs and fens, marshes and swamps • Flowers May-August • Elevation: 3-170 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 3.1 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Last observed in the region in 1947 and the area where it was is now a trailer park. • Species unlikely to be affected by project, but floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
Santa Cruz Mountains pussypaws	*Calyptridium parryi* var. *hesseae*	-- / -- / 1B.1	• Sandy or gravelly openings in chaparral and cismontane woodland. • Flowers May to August • Elevation: 305-1550 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 10 miles NE of the Porter Street/Route 1 intersection. • Species not likely to occur in low elevation of BSA.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
swamp harebell	*Campanula californica*	-- / -- / 1B.2	• Bogs and fens, closed-cone coniferous forest, coastal prairie, meadows and seeps, marshes and swamps, north coast coniferous forest • Flowers June to October • Elevation: 1-405 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 3.1 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
bristly sedge	*Carex comosa*	-- / -- / 2.1	• Coastal prairie, marshes and swamps, valley and foothill grassland • Flowers May to September • Elevation: 0-625 meters	P	• Not known to occur within the BSA. • Nearest known occurrences are approximately 4.8 miles to the north of the intersection of State Park Drive/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
deceiving sedge	*Carex saliniformis*	-- / -- / 1B.2	• Coastal prairie, coastal scrub, meadows and sweeps, marshes and seeps/mesic • Flowers in June • Elevation: 3-230 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 3.2 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
coyote ceanothus	*Ceanothus ferrisae*	FE / -- / 1B.1	• Chaparral, coastal scrub, valley and foothill grassland/serpentine • Flowers January to May • Elevation: 120-460 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 8.4 miles northeast of the San Andreas Road/Route 1 intersection. • Serpentine soils not present in BSA. • Not likely to occur in low elevation of BSA • Species unlikely to be affected by project.
Congdon's tarplant	*Centromadia parryi* ssp. *Congdonii*	-- / -- / 1B.2	• Depressional areas within valley and foothill grassland • Flowers May-November • Elevation: 1-230 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 6.4 miles east of the San Andreas Road/Route 1 intersection. • No depressional areas in grasslands present in BSA. • Species unlikely to be affected by project.
Ben Lomond spineflower	*Chorizanthe pungens* var. *hartwegiana*	FE / -- / 1B.1	• Lower montane coniferous forests, particularly maritime ponderosa pine sandhills • Flowers April to June • Elevation: 90-610 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 4.1 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Monterey spineflower	*Chorizanthe pungens* var. *pungens*	FT, CH / -- / 1B.2	• Maritime chaparral, cismontane woodlands, coastal dunes, coastal scrub, valley and foothill grasslands; sandy soils • Flowers April to June (July) • Elevation: 3-450 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 1.48 miles southeast of the San Andreas Road/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence. • The BSA is located outside of critical habitat for the species.
Scott's Valley spineflower	*Chorizanthe robusta* var. *hartwegii*	FE, CH / -- / 1B.1	• Meadows and seeps on sandy soils, and valley and foothill grassland on mudstone and Purisima outcrops • Flowers April to July • Elevation: 230-245 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 5.5 miles north of the Morrissey Boulevard/Route 1 intersection. • Soils not suitable for this species in BSA. • Not likely to occur in low elevation of BSA. • Species unlikely to be affected by project. • The BSA is located outside of critical habitat for the species.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
robust spineflower	*Chorizanthe robusta* var. *robusta*	FE, CH / -- / 1B.1	• Cismontane woodland, coastal dunes, coastal scrub; gravelly or sandy soils • Flowers April to September • Elevation: 3-300 meters	P	• Occurrences in the vicinity of the BSA include: 1) Approximately 0.39 mile northwest of the 41st Avenue/Route 1 intersection; 2) approx. 0.62 mile northeast of the intersection of Freedom Boulevard/Route 1; and 3) approx. 1.97 miles south of the San Andreas Road/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence. • The BSA is located outside of critical habitat for the species.
Santa Clara red ribbons	*Clarkia concinna* ssp. *automixa*	-- / -- / 4.3	• Annual herb that occurs in chaparral and cismontane woodland. • Flowers April to July • Elevation: 90-1500 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 10 miles NE of the Porter Street /Route 1 intersection.
San Francisco collinsia	*Collinsia multicolor*	-- / -- / 1B.2	• Closed-cone coniferous forest, coastal scrub/sometimes serpentinite • Flowers March to May • Elevation: 30-250 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 16 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
seaside bird's-beak	*Cordylanthus rigidus* ssp. *littoralis*	-- /SE/1B.1	• Annual herb that occurs in closed-cone coniferous forest, chaparral, cismontane woodland, coastal dunes, and coastal scrub with sandy soils. Often found in disturbed sites. • Flowers April-October • Elevation: 0-425 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 17 miles SE of the Porter Street /Route 1 intersection. • Species unlikely to be affected by project, but floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
tear drop moss	*Dacryophyllum falcifolium*	-- / -- / 1B.3	• North coast coniferous forest (carbonate) • Flowering n/a • Elevation: 50-275 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 3.5 miles west of the Morrissey Boulevard/Route 1 intersection. • Soils not suitable for this species in BSA. • Species unlikely to be affected by project.
Norris' beard moss	*Didymodon norrisii*	-- / -- / 2.2	• Cismontane woodland and lower montane coniferous forest (intermittently mesic, rock) • Flowering n/a • Elevation: 600-1973 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 5.7 miles north of the Morrissey Boulevard/Route 1 intersection. • Soils not suitable for this species in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Santa Clara Valley dudleya	*Dudleya setchellii*	FE / -- / 1B.1	• Cismontane woodland, valley and foothill grassland/serpentine, rocky • Flowers April to July • Elevation: 60-455 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 14 miles northeast of the San Andreas Road/Route 1 intersection. • No serpentine soils present in BSA. • Species unlikely to be affected by project.
Eastwood's goldenbush	*Ericameria fasciculata*	-- / -- / 1B.1	• Closed cone coniferous forest, chaparral, coastal dunes, coastal scrub/sandy openings • Flowers July to October • Elevation: 30-275 meters	A	• Not known to occur within the BSA • Nearest known occurrence is approximately 14.7 miles southeast of the San Andreas Road/Route 1 intersection • Soils not suitable for this species in BSA • Species unlikely to be affected by project.
San Mateo woolly sunflower	*Eriophyllum latilobum*	FE/SE/1B.1	• Cismontane woodland (often in road cuts, serpentine) • Flowers May-June • Elevation: 45-150 meters	A	• Not known to occur in the BSA. • Nearest known occurrence is approximately 25 miles northwest of the Morrissey Boulevard/Route 1 intersection. • No serpentine soils present in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Ben Lomond buckwheat	*Eriogonum nudum* var. *decurrens*	-- / -- / 1B.1	• Chaparral, cismontane woodland, lower montane coniferous forest/sandy • Flowers June to October • Elevation: 50-800 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 4.1 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
coast wallflower	*Erysimum ammophilum*	-- / -- / 1B.2	• Maritime chaparral, coastal dunes, coastal scrub; open areas of sandy soils • Flowers February to June • Elevation: 0-60 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 6.8 miles southeast of the San Andreas Road/Route 1 intersection. • Soils not suitable for this species in BSA. • Species unlikely to be affected by project.
Ben Lomond (Santa Cruz) wallflower	*Erysimum teretifolium*	FE / SE / 1B.2	• Chaparral, lower montane coniferous forest/inland marine sands • Flowers March to July • Elevation: 120-610 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 5.1 miles north of the Morrissey Boulevard/Route 1 intersection. • Soils not suitable for this species in BSA. • Not likely to occur in low elevation of BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
fragrant fritillary	*Fritillaria liliacea*	-- / -- / 1B.2	• Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland/often serpentine • Flowers February to April • Elevation: 3-410 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 13.5 miles southeast of the San Andreas Road/Route 1 intersection. • No serpentine soils present in BSA. • Species unlikely to be affected by project.
Monterey (sand) gilia	*Gilia tenuiflora* ssp. *arenaria*	FE / ST / 1B.2	• Chaparral, cismontane woodland, coastal scrub, coastal dunes; on sandy soil, in openings • Flowers April to June • Elevation: 0-45 meters	A	• Not known to occur within the BSA. • Closest known occurrence is approximately 6.2 miles southeast of the San Andreas Road/Route 1 intersection. • Soils not suitable for this species in BSA. • Species unlikely to be affected by project.
Loma Prieta hoita	*Hoita strobilina*	-- / -- / 1B.1	• Chaparral, cismontane woodland, riparian woodland/usually serpentinite, mesic • Flowers May-July (August to October) • Elevation: 30-600 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 0.76 mile northwest of the Morrissey Boulevard/Route 1 intersection. • No serpentine soils present in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Santa Cruz cypress	*Hesperocyparis abramsiana* var. *abramsiana*	FE/SE/1B.2	• Closed-cone coniferous forest, chaparral, lower montane coniferous forest (sandstone or granitic). • Flowering n/a • Elevation: 280-800 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 4.3 miles northwest of the Morrissey Boulevard/Route 1 intersection. • No sandstone or granitic soils present in BSA. • Species not likely to occur in low elevation of BSA. • Species unlikely to be affected by project.
Santa Cruz tarplant	*Holocarpha macradenia*	FT, CH / SE / 1B.1	• Coastal prairie, coastal scrub, valley and foothill grassland; often clay or sandy soils • Flowers June to October • Elevation: 10-220 meters	P	• Several documented occurrences within 1.5 miles of BSA. • Species could be affected by project. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence. • BSA is located 0.25 mile north of critical habitat for the species, but CH is not likely to be affected.
Kellogg's horkelia	*Horkelia cuneata* ssp. *sericea*	-- / -- / 1B.1	• Closed-cone coniferous forests, maritime chaparral, coastal scrub; often in sandy or gravelly openings • Flowers April to September • Elevation: 10-200 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 2.46 miles east of the San Andreas Road/Route 1 intersection. • Soils not suitable for this species in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Point Reyes horkelia	*Horkelia marinensis*	-- / -- / 1B.2	• Coastal dunes, coastal prairie, coastal scrub/sandy • Flowers May to September • Elevation: 5-350 meters	A	• Not known to occur within the BSA • Nearest known occurrence is approximately 4.4 miles northwest of the Morrissey Boulevard/Route 1 intersection • Soils not suitable for this species in BSA. • Species unlikely to be affected by project
smooth lessingia	*Lessingia micradenia* var. *glabrata*	-- / -- / 1B.2	• Chaparral, cismontane woodland/serpentinite, often roadsides • Flowers July to November • Elevation: 120-420 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 9.7 miles east of the San Andreas Road/Route 1 intersection. • No serpentine soils present in BSA. • Species unlikely to be affected by project.
Tidestrom's lupine	*Lupinus tidestromii*	FE / SE / 1B.1	• Coastal dunes	A	• Not known to occur within the BSA. • No nearby occurrences for the species. • No suitable dune habitat present in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
arcuate bush mallow	*Malacothamnus arcuatus*	-- / -- / 1B.2	• Chaparral, cismontane woodland • Flowers April to September • Elevation: 15-355 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 9.5 miles north of the San Andreas Road/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
Hall's bush mallow	*Malacothamnus hallii*	-- / -- / 1B.2	• Chaparral, coastal scrub • Flowers May to September • Elevation: 10-760 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 14.3 miles east of the San Andreas Road/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
marsh microseris	*Microseris paludosa*	-- / -- / 1B.2	• Closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill grassland • Flowers April to June (July) • Elevation: 5-300 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 1.67 mile northwest of the Morrissey Boulevard/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
elongate copper moss	*Mielichhoferia elongate*	-- / -- / 2.2	• Cismontane woodland (metamorphic, rock, usually vernally mesic) • Flowering n/a • Elevation: 500-1300 meters	A	• Not known to occur within the BSA. • Nearest occurrence is approximately 11.7 miles west of the Morrissey Boulevard/Route 1 intersection. • Species not likely to occur in low elevation of BSA. • Soils not suitable for this species in BSA. • Species unlikely to be affected by project.
woodland woolythreads	*Monolopia gracilens*	-- / -- / 1B.2	• Occurs on serpentine soils in broadleafed upland forest (openings), chaparral (openings), cismontane woodland, North Coast coniferous forest (openings), and valley and foothill grassland. • Flowers February to July • Elevation: 100-1200 meters	A	• Not known to occur within the BSA. • Nearest occurrence is approximately 0.7 mile southwest of the Morrissey Boulevard/Route 1 intersection. • Species not likely to occur in low elevation of BSA. • Serpentine soils not present in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Dudley's lousewort	*Pedicularis dudleyi*	-- / SR / 1B.2	• Chaparral, cismontane woodland, north coast coniferous forest, valley and foothill grassland • Flowers April to June • Elevation: 60-900 meters	P	• There is a CNDDB record of an 1884 collection in or near the BSA from the vicinity of Valencia Lagoon to Aptos Creek. • Species is possibly extirpated in the area. • Species unlikely to be affected by project, but floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
Santa Cruz Mountains beardtongue	*Penstemon rattanii* var. *kleei*	-- / -- / 1B.2	• Chaparral, lower montane coniferous forest, north coast coniferous forest • Flowers May to June • Elevation: 400-1,100 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 4.8 miles to the north of the intersection of State Park Drive/Route 1 intersection. • Not likely to occur in low elevation of BSA. • Species unlikely to be affected by project.
white-rayed pentachaeta	*Pentachaeta bellidiflora*	FE / SE / 1B.1	• Valley and foothill grassland on serpentine soils • Flowers March to May • Elevation: 35-620 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 10.3 miles northwest of the Morrissey Road/Route 1 intersection. • No serpentine soils present in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Monterey pine	*Pinus radiata*	-- / -- / 1B.1	• Closed cone coniferous forest, cismontane woodland • Flowering n/a • Elevation: 25-185 meters	P	• One area within the BSA contains a large population of Monterey pines, mixed with other conifer species along a large hillside located on the south side of Route 1, east of Aptos Creek. These trees are not identified as a native stand, and no impacts or mitigation measures are proposed. • Several non-native stands of planted Monterey pines could be affected by the project, but these stands are not considered sensitive. • No further survey efforts required.
white-flowered rein orchid	*Piperia candida*	-- / -- / 1B.2	• North Coast coniferous forest, lower montane coniferous forest, broadleafed upland forest (sometimes serpentinite) • Flowers March-September • Elevation: 30-1310 meters	A	• Not known to occur within the BSA. • Nearest occurrence is approximately 10.6 miles northwest of the Morrissey Boulevard/Route 1 intersection. • No serpentinite soils present in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Yadon's rein orchid	*Piperia yadonii*	FE / -- / 1B.1	• Coastal bluff scrub, closed-cone coniferous forest, chaparral/sandy • Flowers May to August • Elevation: 10-415 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 9.4 miles northeast of the San Andreas Road/Route 1 intersection. • Soils not suitable for this species in BSA. • Species unlikely to be affected by project.
Choris' popcorn flower	*Plagiobothrys chorisianus* var. *chorisianus*	-- / -- / 1B.2	• Chaparral, coastal prairie, coastal scrub/mesic • Flowers March to June • Elevation: 15-160 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 4.5 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
San Francisco popcorn flower	*Plagiobothrys diffusus*	-- / SE / 1B.1	• Coastal prairie, valley and foothill grassland • Flowers March to June • Elevation: 60-360 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 1.18 miles north of the Park Avenue/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Scott's Valley polygonum	*Polygonum hickmanii*	FE / SC / 1B.1	• Valley and foothill grassland • Flowers May to August • Elevation: 210-250 meters	A	• Not known to occur within the BSA. • Multiple occurrences are approximately 5.1 miles north of the Morrissey Boulevard/Route 1 intersection. • Not likely to occur in low elevation of BSA. • Species unlikely to be affected by project.
pine rose	*Rosa pinetorum*	-- / -- / 1B.2	• Closed-cone coniferous forest • Flowers May to July • Elevation: 2-300 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 9.4 miles southeast of the San Andreas Road/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
chaparral ragwort	*Senecio aphanactis*	-- / -- / 2.2	• Chaparral, cismontane woodland, and coastal scrub (sometimes alkaline) • Flowers January to April • Elevation: 15-800 meters	P	• Not known to occur within the BSA. • Nearest occurrence is approximately 7.9 miles northwest of the Morrissey Blvd./Route 1 intersection. • Species unlikely to be affected by project, but floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
maple-leaved checkerbloom	*Sidalcea malachroides*	-- / -- / 4.2	• Broadleafed upland forest, coastal prairie, coastal scrub, North Coast coniferous forest, and riparian woodland (often disturbed areas) • Flowers March-August • Elevation: 0-730 meters	P	• Not known to occur within the BSA. • Nearest occurrence is approximately 0.7 mile southwest of the Morrissey Boulevard/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
Santa Cruz microseris	*Stebbinsoseris decipiens*	-- / -- / 1B.2	• Broadleafed upland forest, closed-cone coniferous forest, chaparral, coastal prairie, coastal scrub, valley and foothill grassland/open areas, sometimes serpentinite • Flowers April to May • Elevation: 10-500 meters	P	• Not known to occur within the BSA. • Nearest known occurrence within BSA is approximately 13.5 miles northwest of the intersection of Morrissey Boulevard/Route 1. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.
most beautiful jewel-flower	*Streptanthus albidus* ssp. *peramoenus*	-- / -- / 1B.2	• Chaparral, cismontane woodland, and valley and foothill grassland habitats on serpentine soil. • Flowers April to June • Elevation: 110-1,000 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 16 miles northeast of the San Andreas Road/Route 1 intersection. • No serpentine soils present in BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Metcalf Canyon jewelflower	*Streptanthus albidus* ssp. *albidus*	FE/ -- /1B.1	• Valley and foothill grassland (serpentinite) • Flowers April to July • Elevation: 45-800 meters	A	• Not known to occur within the BSA. • Nearest occurrence is approximately 18 miles northeast of the Porter Street/Route 1 intersection. • No serpentine soils present in BSA. • Species unlikely to be affected by project.
Santa Cruz clover	*Trifolium buckwestiorum*	-- / -- / 1B.1	• Broadleafed upland forests, cismontane woodland, coastal prairie • Flowers April to October • Elevation: 105-610 meters	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 1.48 miles north of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.
saline clover	*Trifolium depauperatum* var. *hydrophilum*	-- / -- / 1B.2	• Marshes and swamps, valley and foothill grassland, vernal pools • Flowers April to June • Elevation: 0-300 meters	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 10.5 miles southeast of the San Andreas Road/Route 1 intersection. • Floristic surveys should be conducted during the flowering period prior to start of construction to confirm presence/absence.

Common Name	Scientific Name	Status Federal / State / CNPS Status & Threat Code	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					

Federal:
FE *= Federal Endangered*
FT *= Federal Threatened*
FC *=Federal Candidate Species*
CH *= Federally Designated Critical Habitat*

State:
SE *= State Endangered*
ST *= State Threatened*
SR *= State Rare*
SC *= State Candidate Species*

California Native Plant Society (CNPS):
List 1B *= rare, threatened, or endangered in California and elsewhere.*
List 2 *= rare, threatened, or endangered in California, but more common elsewhere.*
List 4 *= limited distribution (Watch List).*

Threat Code:
.1 *= Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)*
.2 *= Fairly endangered in California (20-80% occurrences threatened)*
.3 *= Not very endangered in California (<20% of occurrences threatened or no current threats known)*

Habitat: Presence/Absence
Absent [A] means no further work needed. Present [P] means general habitat is present and species may be present.

Table 7: Special-status Animal Species Potentially Occurring in the BSA

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Invertebrates					
Opler's longhorn moth	*Adela oplerella*	-- / -- / SA	Open serpentine grassland and meadows.	A	• Not known to occur within BSA. • Nearest known occurrence approximately 15 miles northeast of the Morrissey Boulevard/Route 1 intersection. • Serpentine soils not present in BSA. • No suitable habitat occurs within the BSA. • Species unlikely to be affected by project.
sandy beach tiger beetle	*Cicindela hirticollis gravida*	-- / -- / SA	Inhabits areas adjacent to non-brackish water along the coast of California from San Francisco Bay to northern Mexico.	A	• Not known to occur within BSA. • Nearest known occurrence approximately 4 miles southeast of the Morrissey Boulevard/Route 1 intersection. • No suitable habitat occurs within the BSA. • Species unlikely to be affected by project.
Ohlone tiger beetle	*Cicindela ohlone*	FE / -- / --	Coastal terraces supporting remnant patches of native grassland habitat on Watsonville loam or Bonnydoon soil types.	A	• Not known to occur within BSA. • Nearest known occurrence is approximately 2.1 miles west of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.
globose dune beetle	*Coelus globosus*	-- / -- / SA	Foredunes and sand hummocks; it burrows beneath the sand surface and is most common beneath dune vegetation.	A	• Not known to occur within BSA. • Nearest known occurrence is approximately 6.6 miles south of the San Andreas Road/Route 1 intersection. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
monarch butterfly	*Danaus plexippus*	-- / -- / SA	Coastal eucalyptus and Monterey cypress stands.	P	• Nine documented roosting occurrences within 2 miles of the BSA. • Two of the nine documented roosting occurrences near the vicinity of the BSA; 1) along the east boundary of New Brighton State Beach west of New Brighton Road; and 2) Borregas Creek, east rim of canyon wall near Maple and Cedar Streets. • Suitable habitat for the species in the BSA. • Species could be affected by project-refer to Section 4.3.1 for mitigation requirements.
Smith's blue butterfly	*Euphilotes enoptes smithi*	FE / -- / --	Coastal dunes and coastal dune scrub plant communities in Monterey and Santa Cruz Counties.	A	• Not known to occur within BSA. • Nearest occurrence is approximately 5.2 miles west of the Morrissey Boulevard/Route 1 intersection. • No suitable habitat occurs within the BSA. • Species unlikely to be affected by project.
Bay checkerspot butterfly	*Euphydryas editha bayensis*	FT, CH / -- / --	Native grassland on outcrops of serpentine soil in the vicinity of San Francisco Bay.	A	• Not known to occur within BSA. • Nearest known occurrence is approximately 13.3 miles northeast of the San Andreas Road/Route 1 intersection. • Serpentine soils not present in BSA. • No suitable habitat occurs within the BSA. • Species unlikely to be affected by project. • BSA located outside critical habitat for the species.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Empire Cave pseudoscorpion	*Fissilicreagris imperialis*	-- / -- / SA	Found only in Empire Cave, Santa Cruz County.	A	• Not documented as present within BSA. • Known only from Empire Cave 4 miles west of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.
California linderiella	*Linderiella occidentalis*	-- / -- / SA	Seasonal pools in unplowed grasslands with old alluvial soils underlain by hardpan or in sandstone depressions	P	• Documented as occurring within the BSA in Valencia Lagoon, between Bonita Drive and Route 1. • Suitable habitat for the species in the BSA. • No construction is proposed to occur in aquatic areas of Valencia Lagoon; therefore, the species will not be affected by project.
moestan blister beetle	*Lytta moesta*	-- / -- / SA	Adults can be found on flowers in coastal areas.	A	• Not documented as present within BSA. • Found in areas of Santa Cruz west of the BSA. • No suitable habitat for the species in the BSA. • Species unlikely to be affected by project.
Dolloff cave spider	*Meta dolloff*	-- / -- / SA	Empire Cave, Santa Cruz County.	A	• Not documented as present within BSA. • Found in Empire Cave 4 miles west of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.
unnamed pseudoscorpion	*Neochthonius imperialis*	-- / -- / SA	Known only from Empire Cave, Santa Cruz County. Found under rocks and wood in the dark to twilight zones of cave.	A	• Not documented as present within BSA. • Found in Empire Cave 4 miles west of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Mt. Hermon (= barbate) june beetle	*Polyphylla barbata*	FE / -- / --	Sandy soils associated with the Zayante Sand Hills formation in the Santa Cruz mountains.	A	• Not documented as present within BSA. • Nearest known occurrence is approximately 4.5 miles northwest of the Morrissey Boulevard/Route 1 intersection in the Zayante Sand Hills. • Species unlikely to be affected by project.
Mackenzie's cave amphipod	*Stygobromus mackenziei*	-- / -- / SA	Found only in Empire Cave, Santa Cruz County.	A	• Not documented as present within BSA. • Found in Empire Cave 4 miles west of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.
Zayante band-winged grasshopper	*Trimerotropis infantilis*	FE, CH / -- / --	Sandy soils associated with the Zayante Sand Hills formation in the Santa Cruz mountains. Northern maritime chaparral and maritime coast range ponderosa pine forest overlap to form a mosaic of communities.	A	• The western portion of the BSA from roughly Soquel Creek to areas west traverses an area mapped as potentially occupied by the species. • No Zayante sands or Zayante sand hills ecosystems occur within the BSA. • Species unlikely to be affected by project. • BSA located outside critical habitat for the species.
mimic tryonia (= California brackishwater snail)	*Tryonia imitator*	-- / -- / SA	Coastal lagoons, estuaries, and salt marshes from Sonoma County, south to San Diego County	A	• Documented as occurring at the mouth of Soquel Creek, approximately 0.5 mile downstream of the Route 1 bridge. • No saline marsh habitat is located within BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Fish					
tidewater goby	*Eucyclogobius newberryi*	FE, PCH / -- / CSC	Brackish shallow lagoons and lower stream reaches where water is fairly still, but not stagnant.	P	• Two documented occurrences within the BSA. • The nearest occurrences are: in Soquel Creek at Route 1; and in Aptos Creek at Route 1. • Other occurrences include: Rodeo Gulch, approx. 0.6 mile south of Route 1 bridge; and Woods Lagoon, approx. 0.7 mile downstream of Route 1. • Suitable habitat for the species in the BSA. • Species could be affected by project. • Aptos Creek occurs within proposed critical habitat unit SC-4 for the species. • The project may affect, but is not likely to adversely affect tidewater goby critical habitat. Refer to Section 4.3.2 for mitigation requirements.
Delta smelt	*Hypomesus transpacificus*	FT / SE	Euryhaline species (tolerant of a wide salinity range) that occurs in estuarine waters up to 14 ppt salinity. Found only from the Suisun Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties	A	• Not documented as present within BSA. • Nearest known occurrence is approximately 64 miles north of the Porter Street/Route 1 intersection. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
coho salmon - central California ESU	*Oncorhynchus kisutch*	FT, CH / SE /-	Anadromous. Freshwater habitat includes slow moving water with fine gravels.	A	• The Coho salmon central California DPS ends at the San Lorenzo River, 1.7 miles west of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project. • BSA located outside critical habitat for the species.
steelhead - central California coast ESU	*Oncorhynchus mykiss*	FT, CH / --/ CSC	Optimally, clear, cool water with abundant instream cover, well-vegetated stream margins, relatively stable water flow, and a 1:1 pool-to-riffle ratio.	P	• Three documented occurrences within the BSA. • Occurrences documented in Arana Gulch at Route 1, Aptos Creek and tributaries, and Soquel Creek and tributaries; steelhead were observed in Aptos Creek, Valencia Creek, and Soquel Creek during CRLF surveys for this NES. • Suitable aquatic habitat for the species in the BSA. • Species could be affected by project. • Arana Gulch, Aptos Creek, and Soquel Creek and tributaries occur within the critical habitat unit defined as Big Basin Hydrologic Unit 3304. • The project may affect, but is not likely to adversely affect steelhead critical habitat. Refer to Section 4.3.3 for mitigation requirements.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
steelhead - south-central California coast ESU	*Oncorhynchus mykiss*	FT, CH / -- / CSC	Optimally, clear, cool water with abundant instream cover, well-vegetated stream margins, relatively stable water flow, and a 1:1 pool-to-riffle ratio.	A	• The south/central California Coast DPS does not inhabit drainages north of the Pajaro River, approximately 8 miles southeast of the eastern end of the BSA. • Species unlikely to be affected by project. • BSA located outside critical habitat for the species.
Central valley spring-run Chinook salmon ESU	*Oncorhynchus tshawytscha*	FT, CH / ST	Occurs in cool, clean water with appropriate depth, quantity and flow velocities; clean gravels for spawning and egg-rearing; large woody debris; varied channel forms; and adequate food.	A	• The Central valley spring-run Chinook DPS is located in the Sacramento River and tributaries. • Nearest known occurrence is approximately 100 miles north of the Morrissey Boulevard/Route 1 intersection. • Species unlikely to be affected by project.
Amphibians					
California tiger salamander (Central California DPS)	*Ambystoma californiense*	FT, CH / ST	Vernal pools, seasonal water, ground squirrel burrows or other underground refuges.	P	• Not known to occur within BSA. • Nearest known occurrence is approximately 3.5 miles southeast of the BSA at Ellicott Pond. • Marginal habitat occurs within the BSA. • Species could be affected by project. • BSA located outside critical habitat for the species. • A site assessment may be required by USFWS.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
Santa Cruz long-toed salamander	*Ambystoma macrodactylum croceum*	FE/SE, FP / --	Wet meadows near sea level in restricted locales in Santa Cruz and Monterey counties. Inhabits temporary ponds for breeding (Nov-Mar) and adjacent upland scrub and woodland areas during non-breeding season, including upland chaparral and woodland areas of coast live oak, Monterey pine, and riparian vegetation.	P	• Four documented occurrences near the BSA. • Nearest occurrence at Valencia Lagoon, adjacent to Route 1, between Del Mar and Freedom. • Other occurrences within the BSA are 0.8 mile east, 0.5 mile southwest, and 1.2 miles northeast of the San Andreas Road/Route 1 intersection. • Suitable habitat for the species in the BSA. • Species could be affected by project. • A site assessment may be required by USFWS.
California red-legged frog	*Rana draytonii*	FT, CH / -- / CSC	Aquatic habitats with little or no flow, the presence of surface water to at least early June, surface water depths to at least 2.3 feet, and the presence of fairly sturdy underwater supports such as cattails.	P	• Not known to occur within BSA. • Nearest known occurrence is approximately 2 miles southeast of the San Andreas Road/Route 1 intersection. • Suitable aquatic habitat for the species in the BSA. • Species could be affected by project - Caltrans has inferred presence of CRLF within the project BSA. • The BSA is located between critical habitat units SCZ-1 and SCZ-2 but outside of these units. Refer to Section 4.3.6 for mitigation requirements.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
foothill yellow-legged frog	*Rana boylii*	-- / -- / CSC	Pebble/cobble river bars along riffles and pools with shade. Occasionally in moderately vegetated backwaters, isolated pools, and slow moving rivers with mud substrates.	P	• Not known to occur within BSA. • Nearest known occurrence is on Soquel Creek, approximately 0.16 mile from the Porter Street/Route 1 intersection. • Suitable aquatic habitat for the species in the BSA. • Species could be affected by project. Refer to Section 4.3.7 for mitigation requirements.
Reptiles					
black legless lizard	*Anniella pulchra nigra*	-- / -- / CSC	Sandy or loose loamy soils (dunes) under sparse vegetation. Soils with high moisture content.	A	• Exact location information is suppressed. • Known to occur in dunes within the Watsonville West quadrangle. • No suitable habitat occurs within the BSA. • Species unlikely to be affected by project.
silvery legless lizard	*Anniella pulchra pulchra*	--/--/SSC	Sandy or loose loamy soils with high moisture content under sparse vegetation.	A	• Not known to occur within BSA. • Nearest occurrence is approximately 15 miles southwest of the Porter Street/Route 1 intersection. • No suitable habitat occurs within the BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
western pond turtle	*Actinemys marmorata*	-- / -- / CSC	Quiet waters of ponds, lakes, streams, and marshes. Typically in the deepest parts with an abundance of basking sites.	P	• Not known to occur within BSA. • Nearest occurrence is 5.8 miles east of BSA. • Suitable aquatic habitat for the species in the BSA. • Species could be affected by project. Refer to Section 4.3.8 for mitigation requirements.
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	FE / SE, FP /-	Densely vegetated ponds near open hillsides for sun, feeding, and rodent burrows for cover. Temporary ponds and seasonal freshwater bodies also used. Emergent and bankside vegetation such as cattails, bulrush, and spike rush.	A	• Not known to occur within BSA. • Listed by USFWS as occurring in Santa Cruz County, specifically the eastern and western bases of the Santa Cruz Mountains, and along the coast south to Año Nuevo Point, San Mateo County, and Waddell Creek. • BSA is likely too far south to support the species, according to USFWS. • Species unlikely to be affected by project.
Birds					
Cooper's hawk	*Accipiter cooperii*	-- / -- / CSC	Typically broken riparian woodlands in canyons and floodplains usually below 6,000 feet.	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 0.75 mile east of Henry Cowell Redwoods State Park. • Suitable habitat for the species is in the BSA. • Species could be affected by project. Refer to Section 4.3.9 for mitigation requirements.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
tricolored blackbird	*Agelaius tricolor*	-- / -- / CSC	Open water, tall and dense cattails or tules. Large nesting colonies near cropland and insect prey base.	P	• Not known to occur within the BSA. • Known to nest at Neary's Lagoon in Santa Cruz. • Suitable nesting habitat for the species is in BSA. • Species could be affected by project. Refer to Section 4.3.9 for mitigation requirements.
great blue heron	*Ardea herodias*	MBTA/--/--	Colonial nester in tall trees, cliff sides, and areas near marshes. Nest sites located in close proximity to foraging areas (marshes, lake margins, rivers and streams, and meadows.	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 1 mile south of the Morrissey Blvd./Route 1 intersection. • No suitable nesting habitat occurs within the BSA. • Species may occur as an infrequent forager within the BSA, but is unlikely to be affected by project.
short-eared owl	*Asio flammeus*	-- / -- / CSC	(Nesting) found in swamp lands (both fresh and salt); lowland meadows, irrigated alfalfa fields; tule patches/tall grass needed for nesting/daytime seclusion; nests on dry ground in depression.	P	• Not known to occur within the BSA. • Nearest known occurrence is 10.75 miles south of the San Andreas Rd/Route 1 intersection. • Marginal habitat for the species in the BSA. • Species could be affected by project. Refer to Section 4.3.9 for mitigation requirements.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
burrowing owl	*Athene cunicularia*	-- / -- / CSC	Burrows in open dry grassland, agricultural and rangelands, and desert habitats; often associated with ground burrowing rodents such as prairie dogs and ground squirrels. Also found in airports and golf courses.	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 3.5 miles west of the Morrissey Boulevard/Route 1 intersection. • Annual grassland west of Freedom Blvd and the BSA provide marginal habitat for the species. • Species could be affected by project. Refer to Section 4.3.10 for mitigation requirements.
marbled murrelet	*Brachyramphus marmoratus marmoratus*	FT/SE/--	Spends most of the non-breeding season in off shore or near shore environments near coniferous forests. Typically nests in the upper branches of redwoods or doug-fir forests.	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 17 miles northwest of the Morrissey Boulevard/Route 1 intersection. • No suitable nesting habitat occurs within the BSA. • Species unlikely to be affected by project.
western snowy plover	*Charadrius alexandrinus nivosus*	FT, CH / --/ CSC	Sandy marine and estuarine shores.	A	• Not known to occur within the BSA. • Nearest known nesting occurrence is 1.7 miles southwest of the Morrissey Boulevard/Route 1 intersection. • No suitable habitat occurs within BSA. • Species unlikely to be affected by project. • BSA located outside critical habitat for the species.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
black swift	*Cypseloides niger*	-- / -- / CSC	Areas with rocky cliffs available for nesting, nests almost exclusively behind waterfalls. Ocean cliffs to mountain ledges (0-3,000 meters).	A	• Not known to occur within the BSA. • Nearest known nesting occurrence is approximately 2.8 miles southwest of the Morrissey Boulevard/Route 1 intersection. • No suitable nesting habitat occurs within the BSA. • Species unlikely to be affected by project.
white-tailed kite	*Elanus leucurus*	-- / FP / --	Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	P	• Not known to occur within the BSA. • Nearest known nesting occurrence is approximately 3 miles northwest of the Morrissey Boulevard/Route 1 intersection. • Small areas of nesting and foraging habitat located from west of Freedom Blvd to western boundary of the BSA. • Any potential impacts to species would be avoided. Refer to Section 4.3.9 for mitigation requirements.
saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	-- / -- / CSC	Thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	A	• Not known to occur within the BSA. • Nearest known nesting occurrence is approximately 3 miles northwest of the Morrissey Boulevard/Route 1 intersection. • No suitable nesting habitat occurs within the BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
osprey	*Pandion haliaetus*	-- / -- / CSC	(Nesting) ocean shore, bays, freshwater lakes, and larger streams. Large nests are built in treetops within 15 miles of good fish-producing bodies of water.	A	• Not known to occur within the BSA. • Nearest known nesting occurrence is approximately 9 miles northwest of the BSA. • No suitable nesting habitat occurs within the BSA. • Species unlikely to be affected by project.
brown pelican	*Pelicanus occidentalis*	FE / SE, FP /-	Estuarine, marine subtidal, and marine pelagic waters along coast. Rests on water or inaccessible rocks.	A	• Not known to occur within BSA. • Listed by USFWS as occurring in Santa Cruz County. • No suitable nesting habitat occurs within the BSA. • Species unlikely to be affected by project.
California clapper rail	*Rallus longirostris obsoletus*	FE / SE, FP /-	Saltwater and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds on mud-bottomed sloughs.	A	• Not known to occur within the BSA. • Nearest known nesting occurrence is approximately 11.5 miles southeast of the BSA at Elkhorn Slough. • No suitable nesting habitat occurs within the BSA. • Species unlikely to be affected by project.
bank swallow	*Riparia riparia*	-- / ST / --	(Nesting) vertical banks/cliffs with soft, fine-textured/sandy soils near streams, rivers, lakes, or the ocean to dig a nesting hole.	A	• Not known to occur within BSA. • Nearest known nesting occurrence is approximately 8 miles southeast of the BSA at the mouth of the Pajaro River. • No suitable nesting habitat occurs within the BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
California least tern	*Sterna antillarum brownie*	FE/SE/--	Largely a coastal species that feed on fish and nest on sandy dunes or beaches. Once a common species in California; currently nesting colonies are isolated to Southern California and scattered Bay Area beaches.	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 31 miles north of the Soquel Boulevard/Route 1 intersection. • No suitable nesting habitat occurs within the BSA. • Species unlikely to be affected by project.
least Bell's vireo	*Vireo bellii pusillus*	FE, CH / SE /-	(Nesting) summer resident of southern California in low riparian habitats near water or in dry river bottoms, below 2,000 feet. Nests placed along margins of bushes or on twigs projecting into pathways, usually willows, coyote brush, or mesquite.	P (riparian habitat present but not suitable)	• Not known to occur within BSA; no CNDDB occurrences within Santa Cruz County. • Included by USFWS on their on-line species list as a species that may occur Santa Cruz County. • Riparian habitat occurs in the BSA, but is not suitable for nesting for this species and there are no known nesting locations near the BSA. • Species unlikely to be affected by project. Refer to Section 4.3.12 for mitigation requirements.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
other nesting migratory birds	Class Aves	MBTA / CA Fish and Game Code Section 3503	Birds may nest in urban habitats, windrows, non-native annual grasslands, chenopod scrub, coastal and valley freshwater marshes, and riparian habitats.	P	• Not observed within BSA but expected to occur. • Suitable nesting habitat occurs in the BSA. • Numerous nesting bird species could be affected by project if trees must be removed, but avoidance and minimization measures will avoid impacts to bird species. Refer to Section 4.3.9.3 for mitigation requirements.
Mammals					
pallid bat	*Antrozous pallidus*	-- / -- / CSC	Inhabits deserts, grasslands, shrublands, woodlands, and forests. Most common in open, dry habitats with rocky areas for roosting.	P	• According to CNDDB, the nearest known occurrence is from Soquel Creek within the BSA. • Marginal bat roosting habitat in trees within the BSA. • Bat species could be affected by project if trees and anthropogenic habitats must be removed, but avoidance and minimization measures will avoid impacts to the species.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
hoary bat	*Lasiurus cinereus*	-- / -- / CSC	Prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees.	P	• According to CNDDB, the nearest known occurrence is from Soquel Creek, within the BSA. • Marginal bat roosting habitat in trees within the BSA. • Bat species could be affected by project if trees and anthropogenic habitats must be removed, but avoidance and minimization measures will avoid impacts to the species.
other roosting bats	Order Chiroptera	-- / -- / several CSC and SA	Bats may potentially roost in trees and in anthropogenic habitats (e.g., bridges) within the BSA.	P	• Not observed within BSA but expected to occur. • Marginal bat roosting habitat in trees within the BSA. • Bat species could be affected by project if trees and anthropogenic habitats must be removed, but avoidance and minimization measures will avoid impacts to the species.
Santa Cruz kangaroo rat	*Dipodomys venustus venustus*	-- / -- / SA	Silverleaf manzanita mixed chaparral in the Zayante Sand Hills of the Santa Cruz mountains. Needs soft, well-drained soil.	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 3 miles northeast of the San Andreas Road/Route 1 intersection. • No suitable habitat for the species in the BSA. • Species unlikely to be affected by project.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
southern sea otter	*Enhydra lutris nereis*	FT / -- / --	Marine-dweller, usually within 1.5 miles from coastline. Inhabits kelp forests/beds.	A	• Listed by USFWS as occurring in Santa Cruz County; occurs in the ocean, which is approximately 0.4 mile from the BSA at the nearest point. • No suitable habitat for the species in the BSA. • Species unlikely to be affected by project.
Salinas harvest mouse	*Reithrodontomys megalotis distichlis*	-- / -- / SA	Fresh and brackish water wetlands and probably in the adjacent uplands around the mouth of the Salinas River.	A	• Not known to occur within the BSA. • Nearest known occurrence is approximately 12.7 miles southeast of the BSA near the mouth of the Salinas River at Moss Landing. • No suitable habitat for the species in the BSA. • Species unlikely to be affected by project.
American badger	*Taxidea taxus*	-- / -- / CSC	Drier open stages of shrub, forest, and herbaceous habitats, with friable soils; needs sufficient food and open, uncultivated ground; digs burrows.	P	• Not known to occur within the BSA. • Nearest known occurrence is approximately 2.5 miles west of the Morrissey Boulevard/Route 1 intersection at UC Santa Cruz. • Marginal grassland habitat for the species toward the southern end of BSA. • Species could be affected by project. Refer to Section 4.3.14 for mitigation requirements.

Common Name	Scientific Name	Status Federal/ State/ Other	General Habitat Description	Habitat Present/ Absent	Rationale
Note: Shaded rows indicate that habitat for this species is present in the BSA.					
San Joaquin kit fox	*Vulpes macrotis mutica*	FE/ST/--	The historic range included most of the San Joaquin Valley from San Joaquin County south to southern Kern County. Currently, kit foxes occur in the remaining native valley and foothill grasslands and saltbush scrub communities of the valley floor and surrounding foothills from southern Kern County north to Merced County.	A	• Not known to occur within BSA; no CNDDB occurrences within Santa Cruz County. • Nearest known occurrence is approximately 21 miles northeast of the 41st Avenue/Route 1 intersection. • Included by USFWS on their on-line species list as a species that may occur in Santa Cruz County. • No habitat occurs in the BSA for the species. • Species unlikely to be affected by project.

Federal:
FE = Federal Endangered
FT = Federal Threatened
FC =Federal Candidate Species
MBTA = Protected by Federal Migratory Bird Treaty Act

State:
SE = State Endangered
ST = State Threatened
FP = Fully Protected

California Department of Fish and Wildlife:
CSC = California Special Concern species
CA Fish and Game Code Section 3503 = Protected by Section 3503 of CDFW code
SA = CNDDB Special Animal
Habitat: Presence/Absence
Absent [A] means no further work needed. Present [P] means general habitat is present and species may be present.

Table 8: Sensitive Habitats Potentially Occurring in the BSA

Name	General Description	Habitat Present / Absent	Rationale
CNDDB Sensitive Habitats			
Central Dune Scrub	A dense coastal scrub community of scattered shrubs, subshrubs, and herbs, generally less than 1 meter tall, often with considerable cover. Characteristic species include *Ericameria ericoides, Lupinus chamissonis*, and *Artemisia pycnocephala*.	A	This habitat does not occur within the BSA.
Central Maritime Chaparral	A variable sclerophyllous (thick-leaved) scrub of moderate to high cover (50 to 100%) dominated by forms of *Arctostaphylos tomentosa* and other manzanita species.	A	This habitat does not occur within the BSA.
Coastal Brackish Marsh	Dominated by perennial, emergent, herbaceous monocots to 2 meters tall. Cover is often complete and dense. Similar to salt marshes and freshwater marshes; brackish from freshwater input. Usually at the interior edges of coastal bays and estuaries or in coastal lagoons.	A	This habitat does not occur within the BSA.
Coastal and Valley Freshwater Marsh	Dominated by perennial, emergent monocots 4 to 5 meters tall such as *Scirpus* and *Typha*, often forming closed canopies. Occurs in quiet sites (lacking current) permanently flooded by fresh water (rather than brackish, alkaline, or variable).	P	Freshwater marsh habitat was observed within six of drainages that cross or parallel the BSA. Annual and perennial herbaceous hydrophytes were present within Valencia Channel, Valencia, Aptos, Nobel, and Soquel Creeks, and Arana Gulch.

Name	General Description	Habitat Present / Absent	Rationale
Maritime Coast Range Ponderosa Pine Forest	An open, park-like forest of scattered ponderosa pines occurring as either an open savannah of widely spaced trees or denser stands with *Quercus agrifolia* and sometimes *Pinus attenuata*. Understory in savannah phase consists of introduced grasses and native forbs, while the dense phase understory consists of shrubs. Restricted to sterile marine sand deposits (Santa Margarita Formation exposures) within the summer coastal fog incursion zone, particularly near the Scotts Valley-Ben Lomond and Bonny Doon areas.	A	This habitat does not occur within the BSA.
Monterey Pine Forest	Dominated by *Pinus radiata*, where canopies may reach 30 meter and be 80% Monterey pine. *Quercus agrifolia* is usually the next most abundant tree. Understories are variable in both composition and density. Limited to well-drained, sandy soils within the limits of summer marine fog incursion zone. Three natural stands occur in California, including one near Año Nuevo Point.	P	One area within the BSA appears to contain a population of Monterey pine, mixed with other conifer species. This area is a large undisturbed hillside located on the south side of Route 1, east of Aptos Creek, and is apparently not a native population (CNDDB 2007).
North Central Coast Drainage Sacramento Sucker/Roach River	Includes San Lorenzo River and tributaries, north of Santa Cruz, from headwaters to mouth on Pacific Ocean. Also includes Kings, Boulder, Bear, Fall, Zayante, and Bean Creeks.	A	This habitat does not occur within the BSA.
North Central Coast Short-run Coho Stream	Includes lower 6 miles of Scott Creek, about 4 miles northwest of Davenport in Santa Cruz County. Also includes lower reaches lower reaches of Mill Creek and Big Creek.	A	This habitat does not occur within the BSA.

Name	General Description	Habitat Present / Absent	Rationale
Northern Coastal Salt Marsh	A highly productive, herbaceous and succulent, salt-tolerant hydrophytic community that forms modern to dense cover up to 1 meter tall. Most species are active in summer and dormant in winter. Usually segregated horizontally with *Spartina* nearer the open water, *Salicornia* at mid-littoral elevations, and a richer mixture closer to high ground. Usually found along sheltered inland margins of bays, lagoons, and estuaries.	A	This habitat does not occur within the BSA.
Northern Interior Cypress Forest	An open, fire-maintained scrubby forest dominated by one of several *Cupressus* spp. Stands may be as much as 15 meters tall, but usually are lower.	A	This habitat does not occur within the BSA.
Northern Maritime Chaparral	A fairly open chaparral with 50 to 80% cover. Dominated by several narrowly restricted manzanita or ceanothus species. Associated with sandy substrates within the zone of coastal fog incursion, usually on rolling to hilly terrain. From Santa Cruz north to Sonoma County near the coast.	A	This habitat does not occur within the BSA.

Chapter 4. Results: Biological Resources, Discussion of Impacts and Mitigation

This section of the NES summarizes impacts to sensitive habitats and species known or expected to be or present in the BSA, and the mitigation measures proposed. Biological resource impacts of the Tier II Auxiliary Lane Alternative project area are discussed under applicable headings in this section. Due to the small size and lack of habitat diversity present in the Tier II Auxiliary Lane Alternative project area, sensitive species and habitat occurrences are limited. The Tier II Auxiliary Lane Alternative project area contains suitable habitat for tidewater goby and CRLF. Rodeo Gulch provides potential habitat for both species, while the Drive-in ditch could provide seasonal habitat for CRLF. The riparian forest habitat associated with Rodeo Gulch and roadside trees also provide potential nesting habitat for a variety of bird species protected under the MBTA. No special-status plant species or suitable habitat was observed in the Tier II Auxiliary Lane Alternative project area.

4.1. Natural Communities of Special Concern

"Natural communities of special concern" that have been identified within the BSA include areas that are: considered 'sensitive' by the regulatory agencies; habitats that are regulated by the USACE; locally sensitive communities; or identified as critical habitat for listed species. Theses natural communities of special concern often provide suitable habitat for a spectrum of wildlife species, or the habitat type is considered sensitive due to a limited distribution or other reasons.

For the purposes of this study, natural communities of special concern were initially identified from a query of the CNDDB. The results of this query identified eleven sensitive habitats (communities) within a 10-mile radius of the BSA (refer to Table 8). Of these eleven communities, coastal and valley freshwater marsh was the only sensitive habitat that was determined to be present within the project site. Although not included within the CNDDB query, coast live oak woodland is considered a sensitive natural community both statewide and locally (refer to Appendix D). Therefore, this habitat type has also been included within this section.

In addition, jurisdictional wetlands and other waters have been evaluated within this section as natural communities of special concern. These areas often overlap habitat types that are considered sensitive by other regulatory agencies (e.g., coastal and valley freshwater marsh).

In general, the following sensitive communities discussed below are largely limited to drainages and other water features and riparian areas within the BSA. These areas would be regulated through compliance with CWA Section 401 and 404 permits and the Fish and Game Code Section 1602 Streambed Alteration Agreement process. Areas of coast live oak woodland within drainages have been mapped as riparian forest and would also be regulated by these permits; whereas, upland areas of coast live oak woodland habitat would be regulated in a manner that is consistent with local tree ordinance and policies.

Below is a summary of impacts to all habitat types found within the BSA. For those that are considered to be "natural communities of special concern," these are discussed in more detail within the subsections below.

Tier I Corridor Alternatives Impacts to Habitats

The impacts to habitats for both the HOV Lane Alternative and the TSM Alternative have been quantified, based on the footprints of disturbed soil area and drainage improvements provided by the project engineers. These impact footprints represent the PIA for each project alternative, and cover potential disturbance areas for both permanent and temporary impacts, based on project plans as of November 2012. Once a preferred alternative is selected through the environmental documentation process, impact quantities will be recalculated based on more detailed plans. The current estimates for potential impacts to habitats within the PIA include the following:

Table 9: Tier I Corridor Alternatives - Potential Impacts to Habitat Types

Habitat Type Affected	HOV Impacts (acres / square feet)	TSM Impacts (acres / square feet)
Riverine/Freshwater Marsh	1.08 / 46,963	0.30 / 13,153
Riparian Forest	8.88 / 386,801	4.58 / 199,294
Coast Live Oak Woodland	9.45 / 411,827	4.89 / 212,910
Mixed Conifer Woodland	6.08 / 264,846	2.03 / 88,447
Eucalyptus Woodland	1.02 / 44,401	0.28 / 12,378
Coastal Scrub	2.76 / 120,416	0.87 / 37,792
Annual Grassland	4.53 / 197,475	0.58 / 25,080
Ruderal Disturbed	13.31 / 579,830	3.61 / 157,261
Landscaped/Developed	104.67 / 4,559,506	43.64 / 1,901,025

Tier II Auxiliary Lane Alternative Impacts to Habitats

Tier II Auxiliary Lane Alternative habitat impacts have been quantified for the 41st Avenue to Soquel Drive/Soquel Avenue segment, based on the proposed disturbance areas for both permanent and temporary impacts from project plans as of November 2012. Habitat areas, and estimates for potential temporary and permanent impacts to habitats from Tier II implementation are as follows:

Table 10: Tier II Auxiliary Lane Alternative - Potential Impacts to Habitat Types

Habitat Type Affected	Present in Project Area (acres / square feet)	Permanent Impacts (acres / square feet)	Temporary Impacts (acres / square feet)
Riverine/Freshwater Marsh	0.36 / 15,005	0.02 / 1,030	0.06 / 2,670
Riparian Forest	1.07 / 46,887	0.13 / 5,620	0.09 / 3,840
Coast Live Oak Woodland	0.15 / 6,555	0.001 / 75	0.12 / 5,392
Ruderal Disturbed	0.37 / 16,414	0.19 / 8,449	0.07 / 3,013
Landscaped/Developed	27.2 / 1,186,258	5.55 / 242,058	5.22 / 227,527

4.1.1. Jurisdictional Wetlands and Other Waters

Jurisdictional wetlands and other waters are considered sensitive and important habitats by USACE, CCC, and other regulatory agencies. A delineation of these jurisdictions within the BSA has been completed (refer to Appendix D). For the purposes of this discussion, the term "jurisdictional wetlands and other waters" also includes areas of coastal and valley freshwater marsh, which is considered a sensitive community type by CDFW (CNDDB 2014). Therefore, the impact analysis and measures described below are considered to be applicable to both of these natural communities of special concern.

Wildlife species diversity within wetland habitats can be very high and these habitats are sensitive to disturbance. Wetlands are those areas transitional between open water and upland habitats. Wetlands function to improve water quality, detain storm water runoff, recharge groundwater, and provide wildlife habitats.

Wetlands and other waters are typically within USACE and RWQCB jurisdiction below the OHWMs. CDFW also maintains jurisdiction of streams and drainages to the upper extent of stream banks. In order to meet the three-parameter USACE definition of wetlands, an area must exhibit wetland hydrology, hydric soils, and

hydrophytic vegetation. Aquatic areas that exhibit OHWMs but lack one or more of these three parameters are considered other waters. Areas with at least one of these parameters within the coastal zone also fall under the jurisdiction of the CCC.

Impacts to wetlands and other waters that require regulatory agency permits typically require in-kind, on-site or off-site mitigation (restoration or creation of habitat), with mitigation for wetlands impacts requiring a higher mitigation ratio than impacts to other waters.

4.1.1.1. SURVEY RESULTS

As stated previously in Section 3.1.3.1, freshwater marsh wetland habitats are present in the streambed of each of the creeks and major tributary drainages that traverse or parallel the BSA. Freshwater marsh wetland habitat identified as USACE jurisdictional wetlands were observed within the following streams and drainages of the BSA: Valencia Channel, Valencia Lagoon, Aptos Creek, Ord Gulch, Borregas Creek, Pot Belly Creek, Tannery Gulch, Nobel Creek, Soquel Creek, Rodeo Gulch, and Arana Gulch and its tributary. As shown in maps in Appendix C, a number of these areas are also CCC wetlands.

USACE other waters areas and CCC wetlands are present in roadside ditches that are tributaries to Valencia Creek and Ord Gulch, at Monterey Avenue, and near the Soquel Drive-in.

4.1.1.2. AVOIDANCE AND MINIMIZATION MEASURES

The proposed project has the potential to impact wetlands and other waters within the BSA, which includes both Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative project areas. Recommended avoidance and minimization measures for both Tier I and Tier II activities include the following:

1) A qualified biological monitor(s) will ensure compliance with mitigation measures within the project environmental documents. Monitoring shall occur throughout the length of construction or as directed by the regulatory agencies. Full-time monitoring shall occur during vegetation removal, water diversion, and temporary erosion control installation. Monitoring may be reduced to part time once construction activities are underway and the potential for additional impacts are reduced.

2) During project activities, the biological monitor(s) shall coordinate with federal, state, and local agencies and the construction contractor to ensure construction schedules comply with biological mitigation requirements.

3) Prior to project implementation, the project site shall be clearly flagged or fenced so that the contractor is aware of the limits of allowable site access and disturbance. Areas within the designated project site that do not require regular access shall be clearly flagged as off-limit areas to avoid unnecessary damage to sensitive habitats or existing vegetation within the project site.

4) Prior to project implementation, a project Erosion Control Plan shall be prepared.

5) During project activities, erosion control measures shall be implemented. Silt fencing, fiber rolls, and barriers (e.g., hay bales) shall be installed between the project site and adjacent wetlands and other waters. At a minimum, silt fencing shall be checked and maintained on a daily basis throughout the construction period. The contractor shall also apply adequate dust control techniques, such as site watering, during construction.

6) To control erosion during and after project implementation, implementation of standard Caltrans Best Management Practices (BMPs) shall be implemented.

7) During project activities, work occurring within stream channels shall be conducted during the dry season if possible (April 15 – October 15). If in-stream work will be necessary a Diversion and Dewatering Plan shall be prepared and implemented.

8) Prior to the onset of work, a Hazardous Materials (HAZMAT) Response Plan shall be prepared to allow a prompt and effective response to any accidental spills. All workers shall be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

9) During project activities, the cleaning and refueling of equipment and vehicles shall occur only within a designated staging area and at least 20 meters from wetlands, other waters, or other aquatic areas. This staging area shall conform to BMPs applicable to attaining zero discharge of stormwater runoff. At a minimum, all equipment and vehicles shall be checked and maintained on a daily basis to ensure proper operation and avoid potential leaks or spills.

10) During project activities, all project-related hazardous materials spills within the project site shall be cleaned up immediately. Spill prevention and cleanup materials shall be on-site at all times during construction.

11) The biological monitor(s) shall ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project site shall be removed and properly disposed.

12) During construction, trash shall be contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris shall be removed from work areas.

13) During project activities, no pets shall be allowed on the construction site.

4.1.1.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Based on the current HOV Lane and TSM Alternative designs (refer to Appendix A), permanent and temporary impacts to jurisdictional areas have been identified and quantified for each alternative, based on the PIA consisting of the footprints of disturbed soil area and drainage improvements provided by the project engineers. The potential disturbance areas for both permanent and temporary impacts were identified within these impact footprints, in the vicinity of each jurisdictional area. Permanent impacts would result from changes in bank configuration, loss of riparian habitat associated with road widening and culvert extensions, realignment of existing roadways, and construction of new road sections. Temporary impacts would result from stream diversion installation and removal, streambed disturbance during culvert removal and replacement, removal and reconstruction of roadside ditches, vegetation removal, and road construction. Once a preferred alternative is selected through the environmental documentation process, impact quantities will be recalculated based on more detailed plans. Potential impacts to jurisdictional impacts resulting from the two alternatives are quantified in Table 11 below.

Table 11: Tier I Corridor Alternatives - Potential Impacts to Jurisdictional Areas

Jurisdictional Area	Permanent (acres / square feet)	Temporary (acres / square feet)
HOV Lane Alternative		
USACE Wetlands	0.78 / 33,976	0.22 / 9,583
USACE Other Waters	0.15 / 6,533	0.10 / 4,380
CCC jurisdiction	3.22 / 140,262	0.46 / 16,038
CDFW jurisdiction	8.98 / 391,165	1.41 / 57,317

Jurisdictional Area	Permanent (acres / square feet)	Temporary (acres / square feet)
TSM Alternative		
USACE Wetlands	0.23 / 10,019	0.03 / 1,307
USACE Other Waters	0.10 / 4,380	0.02 / 871
CCC jurisdiction	2.20 / 95,831	0.33 / 14,375
CDFW jurisdiction	3.58 / 155,943	0.95 / 41,382

Tier II Auxiliary Lane Alternative Impacts

The Tier II Auxiliary Lane Alternative project area contains elements of freshwater marsh/riverine habitat and riparian forest habitat in association with Rodeo Gulch and the Soquel Drive-in roadside ditch. Areas of freshwater marsh/riverine habitat associated with Rodeo Gulch are mapped as USACE jurisdictional wetlands; the Soquel Drive-in roadside ditch is mapped as USACE other waters.

Permanent and temporary project impacts to jurisdictional areas for the Tier II build alternative have been quantified based on current project plans. Areas proposed for pavement and shoulder work, graded cut and fill slopes, pedestrian bridge construction, and sound and retaining wall construction are considered permanent impacts. Disturbances necessary for access or footing excavation in areas that would be restored to natural conditions are considered to be a temporary impact. The areas of jurisdictional features and estimates for potential impacts to those features are quantified in Table 12 below.

Table 12: Tier II Auxiliary Alternative - Potential Impacts to Jurisdictional Areas

Jurisdictional Area	Permanent (acres/ square feet)	Temporary (acres / square feet)
USACE Wetlands	0.0 / 0.0	0.0 / 0.0
USACE Other Waters (Soquel Drive-in roadside ditch)	0.02 / 1,030	0.06 / 2,670
CDFW jurisdiction (Rodeo Gulch and Soquel Drive-In roadside ditch)	0.15 / 6,650	0.15 / 6,510

4.1.1.4. COMPENSATORY MITIGATION

The goal of compensatory mitigation is to prevent a net loss of wetlands, riparian, or other aquatic resource acreage, function, and value. Several types of compensatory

mitigation are available to offset impacts to jurisdictional areas, including creation, restoration, enhancement, replacement, and preservation. For all impacts related to Tier I and Tier II activities, the following compensatory mitigation is proposed:

1) Affected wetlands shall be mitigated at a 1:1 restoration ratio for temporary impacts and a 3:1 enhancement ratio for permanent impacts to wetlands and other waters. Compensatory mitigation for Tier I Corridor Alternatives impacts shall include in-kind, *on-site and/or off-site* replacement of vegetation. Compensatory mitigation for Tier II Auxiliary Lane Alternative impacts shall include in-kind, *on-site* replacement of vegetation. At a minimum, both Tier I and Tier II restoration and/or enhancement efforts shall be achieve a 75% success ratio at the end of a 5-year period, and require no further maintenance for survival. All mitigation activities will be conducted within the watershed that is being impacted, if feasible. The compensatory mitigation will be implemented immediately following project completion. Compensatory mitigation plantings shall be monitored on a quarterly basis. Any required maintenance shall also occur on a quarterly basis. Maintenance activities will include weeding, debris removal, replanting (if necessary), repair of any vandalism, fertilizing, and/or pest control. Maintenance activities will be dictated by the results of the quarterly monitoring effort. Quarterly reports and annual monitoring reports shall be submitted to Caltrans, the RTC, and the affected regulatory agencies. The annual monitoring report submitted at Year 5 shall serve as a final completion report should the mitigation be successful.

4.1.1.5. CUMULATIVE EFFECTS

It has been estimated that California has lost approximately 90% of its historic wetland and riparian resources to alternative land use. Regulatory agencies have sought to offset the additional loss of riparian areas and wetlands with restoration and revegetation requirements for projects within their respective jurisdictions. It is anticipated that any cumulative effects to jurisdictional wetlands or other waters within the BSA as a result of implementing the proposed project are likely to be minimal, as impacts to these resources will be mitigated with the previously mentioned mitigation measures and the implementation of BMPs.

4.1.2. Riparian Forest

Within the BSA, the term “riparian forest” generally describes what can also be referred to as Central Coast Arroyo Willow Riparian Forest due to the dominance of arroyo willow within the habitat composition and the influence of coastal fog that is prevalent along the central coast of California. Based on the CNDDB data, this

habitat type has a "G3" Global Ranking. NatureServe (NatureServe 2014) lists the G3 ranking as "vulnerable," which is defined as "at moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors." The diversity of wildlife species occurring within riparian habitats is typically very high and these habitats can be sensitive to disturbance. Riparian vegetation provides important migration corridors, roosting and foraging habitat, and helps to regulate water temperatures. Riparian habitats serve as migratory corridors for wildlife and, as such, are important in linking non-contiguous or fragmented wildlife habitats. Riparian areas often fall within USACE and CDFW regulatory jurisdiction. Riparian habitats within the coastal zone also fall under the jurisdiction of the CCC. A detailed Wetland Assessment was conducted to determine the extent of jurisdictional riparian habitat within the BSA (refer to Appendix D).

4.1.2.1. SURVEY RESULTS

As stated previously in Section 3.1.3.1, riparian forest habitat occurs along many of the creeks and drainages within the BSA, and is extensive within the Valencia, Aptos, and Soquel Creek corridors. Riparian forest habitat also occurs along Ord Gulch, Borregas Creek, Pot Belly Creek, Tannery Gulch, Nobel Creek, Rodeo Gulch, Arana Gulch, and the western tributary to Arana Gulch.

4.1.2.2. AVOIDANCE AND MINIMIZATION MEASURES

The proposed project has the potential to impact riparian habitats within the BSA. The mitigation measures described previously in Section 4.1.1.2 are recommended to avoid, minimize, and compensate for any potential riparian habitat impacts resulting from the project.

4.1.2.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Impacts to riparian forest for both the HOV Lane and TSM Alternatives have been quantified, based on the footprints of disturbed soil area and drainage improvements provided by the project engineers. These impact footprints represent the PIA for each project alternative, and cover potential disturbance areas for both permanent and temporary impacts, based on project plans as of November 2012. Potential riparian forest habitat impacts resulting from the HOV Lane and TSM Alternatives are quantified in Table 13.

Table 13: Tier I Corridor Alternatives - Potential Impacts to Riparian Forest

Habitat Affected	HOV Impacts (acres / square feet)	TSM Impacts (acres / square feet)
Riparian Forest	8.88 / 386,801	4.58 / 199,294

Tier II Auxiliary Lane Alternative Impacts

Proposed permanent and temporary impact areas at Rodeo Gulch consist of roadway widening and retaining wall construction on existing road berm areas directly above and draining into the channel of Rodeo Gulch. This area contains riparian forest canopy, and all jurisdictional impacts will consist of loss of riparian trees and riparian canopy area on upper banks and adjacent to the banks (CDFW jurisdiction). Potential riparian forest habitat impacts resulting from the Tier II Auxiliary Lane Alternative are quantified in Table 14.

Table 14: Tier II Auxiliary Lane Alternative - Potential Impacts to Riparian Forest

Habitat Affected	Permanent (acres / square feet)	Temporary (acres / square feet)
Riparian Forest	0.13 / 5,620	0.09 / 3,840

4.1.2.4. COMPENSATORY MITIGATION

Impacts to riparian vegetation will be offset by replacement planting on-site using a 3:1 ratio for each individual riparian tree removed greater than 6 inches dbh, and for all riparian habitat acreage that is lost.

Compensatory mitigation for Tier I Corridor Alternatives impacts shall include in-kind, *on-site and/or off-site* replacement of riparian vegetation. Compensatory mitigation for Tier II Auxiliary Lane Alternative impacts shall include in-kind, *on-site* replacement of riparian vegetation. At a minimum, both Tier I and Tier II restoration and/or enhancement efforts shall be achieve a 75% success ratio at the end of a 5-year period, and require no further maintenance for survival. All mitigation activities will be conducted within the watershed that is being impacted. The compensatory mitigation will be implemented immediately following project completion. Compensatory mitigation plantings shall be monitored on a quarterly basis. Any

required maintenance shall also occur on a quarterly basis. Maintenance activities will include weeding, debris removal, replanting (if necessary), repair of any vandalism, fertilizing, and/or pest control. Maintenance activities will be dictated by the results of the quarterly monitoring effort. Quarterly reports and annual monitoring reports shall be submitted to Caltrans, the RTC, and the affected regulatory agencies. The annual monitoring report submitted at Year 5 shall serve as a final completion report should the mitigation be successful.

4.1.2.5. CUMULATIVE EFFECTS

It has been estimated that California has lost approximately 90% of its historic wetland and riparian resources to alternative land use. Regulatory agencies have sought to offset the additional loss of riparian areas and wetlands with restoration and revegetation requirements for projects within their respective jurisdictions. It is anticipated that any cumulative effects to jurisdictional wetlands or other waters within the BSA as a result of implementing the proposed project are likely to be minimal, as impacts to these resources will be mitigated with the previously mentioned mitigation measures and the implementation of BMPs.

4.1.3. Coast Live Oak Woodland

Coast live oak woodlands are characterized by dense cover of coast live oaks. The tree canopy may reach up to 75 feet and the shrub layer is usually poorly developed. Coast live oak woodlands typically grow on north-facing slopes and shaded ravines, intergrading with coastal scrub and chaparral communities on xeric (dry) sites and coast live oak forest or mixed evergreen forest on mesic (moist) sites (Holland 1986).

Coast live oak woodlands are considered sensitive under CEQA Section 21083.4. In addition, coast live oak woodlands are considered sensitive by local policies (refer to Appendix G).

4.1.3.1. SURVEY RESULTS

Based on habitat mapping within the BSA, a total of 26.77 acres of coast live oak woodland is present. A distribution of coast live oak woodland within the BSA can be found in Appendix F. Individual coast live oaks that are considered significant under local jurisdiction definitions were also documented within a Tree Survey Report found in Appendix G.

4.1.3.2. AVOIDANCE AND MINIMIZATION MEASURES

In addition to the measures described previously in Section 4.1.1.2, the following measures are recommended to avoid and minimize any potential impacts to coast live oak woodland habitat.

1) All coast live oak woodland and individual oaks that are not planned for removal shall be delineated on the project plans and provided protective fencing at a distance no less than the dripline of the affected tree canopy. Project equipment shall not be permitted to enter the dripline of the coast live oak dripline canopy at any time during the length of the project.

2) During project activities, erosion control measures shall be implemented. Silt fencing, fiber rolls, and barriers (e.g., hay bales) shall be installed between the project site and adjacent coast live oak woodlands. At a minimum, silt fencing shall be checked and maintained on a daily basis throughout the construction period. The contractor shall also apply adequate dust control techniques, such as site watering, during construction.

3) During project activities, the cleaning and refueling of equipment and vehicles shall occur only within a designated staging area and at least 20 meters from coast live oak woodlands. This staging area shall conform to BMPs applicable to attaining zero discharge of stormwater runoff. At a minimum, all equipment and vehicles shall be checked and maintained on a daily basis to ensure proper operation and avoid potential leaks or spills.

The measures described previously in Section 4.1.1.2 are restated below, to affirm that these measures will address the impacts to coast live oak woodland:

4) A qualified biological monitor(s) will ensure compliance with mitigation measures within the project environmental documents. Monitoring shall occur throughout the length of construction or as directed by the regulatory agencies. Full-time monitoring shall occur during vegetation removal, water diversion, and temporary erosion control installation. Monitoring may be reduced to part time once construction activities are underway and the potential for additional impacts are reduced.

5) During project activities, the biological monitor(s) shall coordinate with federal, state, and local agencies and the construction contractor to ensure construction schedules comply with biological mitigation requirements.

6) Prior to project implementation, the project site shall be clearly flagged or fenced so that the contractor is aware of the limits of allowable site access and disturbance. Areas within the designated project site that do not require regular access shall be clearly flagged as off-limit areas to avoid unnecessary damage to sensitive habitats or existing vegetation within the project site.

7) Prior to project implementation, a project Erosion Control Plan shall be prepared.

8) To control erosion during and after project implementation, implementation of standard Caltrans BMPs shall be implemented.

9) Prior to the onset of work, a HAZMAT Response Plan shall be prepared to allow a prompt and effective response to any accidental spills. All workers shall be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

10) During project activities, all project-related hazardous materials spills within the project site shall be cleaned up immediately. Spill prevention and cleanup materials shall be on-site at all times during construction.

11) The biological monitor(s) shall ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project site shall be removed and properly disposed.

12) During construction, trash shall be contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris shall be removed from work areas.

13) During project activities, no pets shall be allowed on the construction site.

4.1.3.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Potential coast live oak woodland impacts resulting from the HOV Lane and TSM Alternatives are quantified in Table 15.

Table 15: Tier I Corridor Alternatives - Potential Impacts to Coast Live Oak Woodland

Habitat Affected	HOV Impacts (acres / square feet)	TSM Impacts (acres / square feet)
Coast live oak woodland	9.45 / 411,827	4.89 / 212,910

Tier II Auxiliary Lane Alternative Impacts

Potential coast live oak woodland impacts resulting from the Tier II Auxiliary Lane Alternative are quantified in Table 16.

Table 16: Tier II Auxiliary Lane Alternative - Potential Impacts to Coast Live Oak Woodland

Habitat	Present in Project Area (acres / square feet)	Permanent Impacts (acres / square feet)	Temporary Impacts (acres / square feet)
Coast live oak woodland	0.15 / 6,555	0.001 / 75	0.12 / 5,392

4.1.3.4. COMPENSATORY MITIGATION

For all impacts related to Tier I and Tier II activities, the following compensatory mitigation is proposed:

1) Any coast live oak tree that is removed as part of Tier I or Tier II activities shall be replaced at a 10:1 ratio. Oak tree replacement efforts shall achieve 75% success at the end of a 5-year period, and require no further maintenance for survival. The location of these replacement plantings shall be on-site and closely associated with existing coast live oak woodland habitat for the purposes of providing continuity with the existing coast live oak woodland habitat. The compensatory mitigation will be implemented immediately following project completion. Compensatory mitigation plantings shall be monitored on a quarterly basis. Any required maintenance shall also occur on a quarterly basis. Maintenance activities will include weeding, debris removal, replanting (if necessary), repair of any vandalism, fertilizing, and/or pest control. Maintenance activities will be dictated by the results of the quarterly monitoring effort. Quarterly reports and annual monitoring reports and a final completion report will be submitted to Caltrans, the RTC, and the affected regulatory

agencies. The annual monitoring report submitted at Year 5 shall serve as a final completion report should the mitigation be successful.

4.1.3.5. CUMULATIVE EFFECTS

Avoidance, minimization, and/or mitigation measures will provide for the protection and planting of additional oak trees in the BSA; therefore, cumulative effects to oak woodlands and individual oak trees are not anticipated.

4.1.4. Critical Habitat

When a species is proposed for listing as endangered or threatened under FESA, the federal government must consider whether there are areas of habitat that are essential to the species' conservation. These areas may be proposed for designation as "critical habitat." According to FESA, critical habitat is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. An area is designated as "critical habitat" after a proposed federal regulation is published in the Federal Register and then the public comments on the proposal. The final boundaries of the critical habitat area are also published in the Federal Register.

Federal agencies are required to consult with USFWS and NOAA Fisheries on federal actions to ensure that their actions will not destroy or adversely modify critical habitat. In this way, a critical habitat designation protects areas that are necessary for the conservation of the species.

The Tier I Corridor Alternatives project area contains critical habitat units for two species: tidewater goby and central California coast steelhead. Critical habitat has also been designated for Monterey spineflower, Scott's Valley spineflower, robust spineflower, Santa Cruz tarplant, Zayante band-winged grasshopper (*Trimeroptropis infantilis*), coho salmon (*Oncorhynchus kisutch*), south-central California coast steelhead DPS (*Oncorhynchus mykiss*), CTS, CRLF, western snowy plover (*Charadrius alexandrinus nivosus*), and LBV, but the Tier I Corridor Alternatives project area does not occur within designated critical habitat units for any of these species. It is important to note that the California Red-legged Frog Survey Report for the proposed project (Morro Group 2004) indicated that the southern portion of the project, south of Valencia Lagoon, was located within proposed CRLF critical habitat unit 17. None of the surveyed drainages included within this report were within proposed critical habitat unit 17. Since the preparation of the 2004 CRLF survey

report, CRLF critical habitat units have been revised to include two units in Santa Cruz County: SCZ-1 – North Coastal Santa Cruz County and SCZ-2 – Watsonville Slough (USFWS 2010). The project BSA is situated between critical habitat units SCZ-1 and SCZ-2 but does not fall within either of these units; therefore, no CRLF critical habitat will be affected.

The following sections provide a description of critical habitat units that occur within the Tier I Alternatives project area that could be affected by the proposed project. No critical habitat is present in the Tier II Auxiliary Lane Alternative project area. Therefore, no impacts to critical habitat would occur.

4.1.5. Discussion of Critical Habitat for Tidewater Goby

The current final rule for tidewater goby critical habitat was published on February 6, 2013. The current critical habitat rule designates eight critical habitat units (Santa Cruz County Critical Habitat Unit [SC]-1 through SC-8) in Santa Cruz County (USFWS 2013). The proposed project is located in the Aptos Creek (SC-7) Critical Habitat Unit which is situated between units SC-6 (Corcoran Lagoon) and SC-8 (Pajaro River).

The primary constituent elements (PCEs) for tidewater goby as defined by USFWS (2013) include:

1) Persistent, shallow (in the range of about 0.3-6.6 feet), still-to-slow-moving, aquatic habitat most commonly ranging in salinity from less than 0.5 parts-per-thousand (ppt) to about 10-12 ppt, which provides adequate space for normal behavior and individual and population growth;

2) Substrates (e.g., sand, silt, mud) suitable for the construction of burrows for reproduction;

3) Submerged and emergent aquatic vegetation, such as *Potamogeton pectinatus* and *Ruppia maritima*, *Typha latifolia*, and *Scirpus* spp. that provides protection from predators; or,

4) Presence of a sandbar(s) across the mouth of a lagoon or estuary during the late spring, summer, and fall that closes or partially closes the lagoon or estuary, thereby providing relatively stable water levels and salinity.

The final rule is designed for the conservation of areas supporting PCEs that exist at coastal lagoons, estuaries, backwater marshes, and associated freshwater tributaries,

and that are necessary to support the life history functions. Units for the final rule are based on sufficient PCEs being present to support the life processes of the species. Some lands contain all PCEs and support multiple life processes. Some lands contain only a portion of the PCEs necessary to support the particular use of that habitat. Because not all life history functions require all the PCEs, not all revised critical habitat may contain each of the PCEs. For example, the presence of PCE 4 at a given location will, in general, only be applicable to locations where a sandbar forms due to natural processes.

4.1.5.1. SURVEY RESULTS

The portion of Aptos Creek within the BSA is part of a proposed tidewater goby critical habitat unit defined as SC-7, Aptos Creek (3 acres). This unit occurs within the limits of the town of Aptos, 4.1 miles east of Corcoran Lagoon (SC-6) and in Monterey Bay. It is believed that unit SC-7 will reduce the chance of losing the tidewater goby along this portion of the coast and help facilitate colonization of currently unoccupied locations (USFWS 2008b).

PCEs 1, 2, and 3 are present throughout the unit, although their precise location during any particular time period may change in response to seasonal fluctuations in precipitation and tidal inundation (USFWS 2006a). SC-7 was occupied by tidewater gobies at the time of listing, is currently occupied, and is likely a source population for this region. The BSA appears to support critical habitat PCEs 1, 2, and 3. While it may also support PCE 4 downstream during certain times of the year, there is currently no information that confirms that PCE 4 (a sandbar(s) across the mouth of the lagoon or estuary) is present within this unit on at least an intermittent basis (USFWS 2008). The tidewater goby is usually associated with lagoons and, although the species was not observed during the limited reconnaissance survey effort of the BSA, it has been documented in ponded freshwater areas as far as 5 miles upstream from lagoon habitats.

4.1.5.2. AVOIDANCE AND MINIMIZATION EFFORTS

Incorporating the avoidance and minimization measures in Section 4.1.1.2 and 4.1.1.4 will serve to avoid or minimize effects on aquatic habitats. Other avoidance and minimization measures for protection of tidewater goby are included in Section 4.3.2.2. In addition, the following measures have been incorporated into the project description in order to avoid or minimize impacts to tidewater goby and its critical habitat:

1) If in-stream work is proposed to occur in coastal drainages, incidental take authorization from USFWS through a FESA Section 7 Biological Opinion and Incidental Take Statement shall be acquired, if determined necessary by the USFWS.

2) Any construction activities within the banks of Aptos Creek shall take place between June 15 and October 31 of any given year, when the surface water within Aptos Creek is likely to be at its seasonal minimum.

3) If dewatering/stream diversion is necessary, a Diversion and Dewatering Plan shall be prepared and implemented.

4) If dewatering/stream diversion is necessary, flow will be maintained through the work area via pipes or culverts to allow for fish passage.

5) The form and function of all pumps used during the dewatering activities shall be checked twice daily, at a minimum, by the biological monitor(s) to ensure a dry work environment and minimize adverse effects to aquatic species and habitats.

6) During project activities, if pumps are incorporated to assist in temporarily dewater/divert stream flow from the site, intakes shall be completely screened with no larger than 0.2 inch wire mesh to prevent tidewater goby and other aquatic vertebrate species from entering the pump system. Pumps shall release the additional water to a settling basin to allow suspended sediment to settle out prior to release of pumped water to the drainage.

7) During project activities, if tidal fluctuations breach any dewatered/diverted project sites, a USFWS-approved biologist shall supervise site dewatering and relocate all aquatic species.

8) Upon project completion, all material used for dewatering/diversion shall be removed from creek corridor under the supervision of the biological monitor(s) or USFWS-approved biologist.

4.1.5.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Known threats in critical habitat unit SC-7 that may require special management consideration or protection of the PCEs include (USFWS 2006a):

1) Coastal development projects that result in the loss or alteration of coastal wetland habitat affecting PCEs 1, 2, 3, and 4;

2) Water diversions, alterations of water flows, and groundwater overdrafting upstream of coastal lagoons and estuaries that negatively impact the species' breeding and foraging activities and PCEs 1, 2, and 3; and,

3) Non-point and point source pollution or discharge of agricultural and sewage effluents that are likely to impact the species health or breeding and foraging activities and PCE 1.

The Tier I Corridor Alternatives may result in temporary and/or permanent impacts to vegetation along Aptos Creek, which may offer shading and microhabitat temperature regulation in the channel. With the implementation of avoidance, minimization, and/or mitigation measures, impacts to riparian vegetation would be minimized and would be temporary in nature as overhanging vegetation would be restored and fish refugia maintained. Construction impacts, dewatering/diversion, and streambank erosion could result in the introduction of silt/sedimentation into Aptos Creek, which could have detrimental effects on downstream water quality and habitat for tidewater goby. Implementation of the proposed avoidance and minimization measures and BMPs would avoid permanent impacts and result in no adverse modification to tidewater goby critical habitat. Therefore, the effects determination is the Tier I Corridor Alternatives may affect, but is not likely to adversely affect, proposed tidewater goby critical habitat.

Tier II Auxiliary Lane Alternative Impacts

The Tier II Auxiliary Lane Alternative project will not affect tidewater goby critical habitat.

4.1.5.4. COMPENSATORY MITIGATION

The above mitigation measures for impacts to aquatic habitats will mitigate impacts to tidewater goby critical habitat. In addition, loss of any freshwater marsh vegetation will be replaced as detailed in previously mentioned avoidance and minimization measures in Section 4.1.1.2, and mitigation measures in Section 4.1.1.4 as directed by regulatory agencies.

4.1.5.5. CUMULATIVE EFFECTS

Cumulative effects to tidewater goby critical habitat are expected to be minimal because impacts will be mostly temporary, permanent impacts will be minimal, and

the above mitigation measures for impacts to aquatic habitats are anticipated to be sufficient to mitigate impacts.

4.1.6. Discussion of Critical Habitat – Central California Coast Steelhead

NOAA Fisheries designated critical habitat for 19 ESUs for salmon and steelhead on March 17, 2000 (NOAA Fisheries 2000). On April 30, 2002, the U.S. District Court for the District of Columbia approved the NOAA Fisheries consent decree withdrawing the March 2000 critical habitat designation for steelhead. A revised critical habitat designation for seven ESUs of Pacific salmon and steelhead in California was finalized on September 2, 2005 (NOAA Fisheries 2005).

On January 5, 2006, NOAA Fisheries posted a Final Rule that West Coast steelhead would now be recognized as 10 Distinct Population Segments (DPS), which is the currently recognized terminology. NOAA Fisheries does continue to implement previously existing policies (critical habitat) that utilize the term Evolutionary Significant Unit (ESU), since ESU is considered to be a "distinct population segment" (and thus a "species") under the ESA. The primary constituent elements of this critical habitat designation include the following:

1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development;

2) Freshwater rearing sites with:

   (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;

   (ii) Water quality and forage supporting juvenile development; and,

   (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

4) Estuarine areas free of obstruction and excessive predation with:

(i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater;

(ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and

(iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

4.1.6.1. SURVEY RESULTS

The drainages within the BSA occur within the central California coast steelhead critical habitat unit defined as Big Basin Hydrologic Unit 3304 – (ii) *San Lorenzo Hydrologic Sub-area 330412* (including Arana Gulch) and (iii) *Aptos-Soquel Hydrologic Sub-area 330413* (including Aptos and Soquel Creeks and tributaries).

Based on surveys within the BSA, it is determined that the BSA contains the PCEs for steelhead critical habitat. Essential spawning sites, rearing sites, suitable water quality, and migration corridors occur within the BSA, and suitable estuarine parameters presumably occur in downstream areas, although such areas were not surveyed for this study. No barriers to fish passage were noted in the BSA.

4.1.6.2. AVOIDANCE AND MINIMIZATION EFFORTS

Incorporating the measures in Section 4.1.1.2 and 4.1.5.2 will serve to avoid or minimize effects on aquatic habitats and central California coast steelhead critical habitat. Other avoidance and minimization measures for protection of central California coast steelhead are included in Section 4.3.3.2. In addition, the following measure is recommended:

1) If in-stream work is proposed to occur in coastal streams, incidental take authorization from NOAA Fisheries through a FESA Section 7 Biological Opinion and Incidental Take Statement shall be acquired, if determined necessary by NOAA Fisheries. Formal consultation between USACE and NOAA Fisheries may be necessary if a Section 404 permit is issued.

4.1.6.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

The proposed project may result in temporary and/or permanent impacts to vegetation along Arana Gulch, Aptos Creek, and Soquel Creek and tributaries, which may offer shading and microhabitat temperature regulation in the channel. With the implementation of avoidance, minimization, and/or mitigation measures, impacts to

riparian vegetation would be minimized and would be temporary in nature as overhanging vegetation would be restored and fish refugia maintained. Construction impacts, dewatering/diversion, and streambank erosion would temporarily result in "loss of service" of steelhead habitat and could result in the introduction of silt/sedimentation into Aptos Creek, which could have detrimental effects on downstream water quality and habitat for steelhead. Implementation of the proposed avoidance and minimization measures and BMPs would avoid permanent impacts and result in a no adverse modification to steelhead critical habitat; therefore, the effects determination is the Tier I project may affect, but is not likely to adversely affect, central California coast steelhead critical habitat.

Tier II Auxiliary Lane Alternative Impacts

The Tier II Auxiliary Lane Alternative will not affect central California coast steelhead critical habitat.

4.1.6.4. COMPENSATORY MITIGATION

Implementation of avoidance and minimization measures will reduce impacts to steelhead critical habitat for Tier I and Tier II activities. Any loss of riparian vegetation or wetland habitat within central California coast steelhead critical habitat will be mitigated by replacement of these habitats as detailed in Section 4.1.1.4 and 4.1.2.4. Additional mitigation may be directed by regulatory agencies.

4.1.6.5. CUMULATIVE EFFECTS

Cumulative effects to steelhead critical habitat are expected to be minimal because impacts will be mostly temporary, permanent impacts will be minimal, and the above mitigation measures for impacts to aquatic habitats are anticipated to be sufficient to mitigate impacts.

4.1.7. Executive Order 13112: Invasive Species

EO 13112 is a directive aimed at preventing the introduction and spread of invasive species as a result of federal agency actions. This EO requires federal agencies to work cooperatively to prevent and control the spread of invasive plants and animals. On August 10, 1999, FHWA issued implementing guidance on EO 13112. On October 22, 1999, Caltrans issued a memo to implement the FHWA guidance (found in SER Policy Memo Section). The guidance provides that a NEPA analysis for an action include an analysis of the probability of the action to cause or promote the introduction or spread of invasive species. If analysis indicates that disturbances caused by the action have the potential to promote the introduction or spread of

invasive species, all feasible and prudent measures must be taken to minimize this likelihood.

4.1.7.1. SURVEY RESULTS

Refer to Section 3.1.3.4.

4.1.7.2. AVOIDANCE AND MINIMIZATION EFFORTS

The following Avoidance and Minimization Efforts are proposed for maintaining compliance with EO 13112.

1) To avoid the spread of invasive species, the contractor will stockpile topsoil and redeposit the stockpiled soil on the slopes after construction of the new bridge is complete, or transport all topsoil to a certified landfill for disposal.

2) During construction, the project will make all reasonable efforts to limit the use of imported soils for fill. Soils currently existing on-site should be used for fill material. If the use of imported fill material is necessary, the imported material must be obtained from a source that is known to be free of invasive plant species; or the material must consist of purchased clean material such as crushed aggregate, sorted rock, or similar.

3) The landscape and restoration planting plans must emphasize the use of native species expected to occur in the area. Project plans must avoid the use of plant species that the Cal-IPC, Cal-EPPC, CDFW, or other resource organizations considers to be invasive or potentially invasive. Prior to issuance grading, all project landscape and restoration plans shall be verified to ensure that the plans do not include the use of any species considered invasive by the Cal-IPC, Cal-EPPC, or CDFW.

4.1.7.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Implementation of Tier I Corridor Alternatives projects are anticipated to have the same project impacts as described below under Tier II Auxiliary Alternative Impacts.

Tier II Auxiliary Lane Alternative Impacts

Project activities would include construction of the access road, bridge construction, bridge demolition, and site reconstruction. Implementation of these project elements would require removing vegetation with invasive plant species and replacing soil that contains seeds of invasive plant species. Disturbance of the soil containing invasive species seeds could facilitate the spread of invasive species in the BSA.

The Tier II Auxiliary Lane Alternative will involve installation of landscape materials in reconstructed areas. Many potentially invasive plant species are available on the nursery trade market. Installation of these materials could result in the inadvertent introduction of invasive species.

4.1.7.4. COMPENSATORY MITIGATION

With implementation of the Avoidance and Minimization Measures, compensatory mitigation will not be necessary.

4.1.7.5. CUMULATIVE EFFECTS

No cumulative effects are expected in regards to invasive species

4.2. Special-status Plant Species

Suitable habitat conditions occur within the BSA for numerous special-status plant species. The special-status plant species listed in Table 6 as present or with potential to occur within the BSA have been addressed as a group for conciseness, because they will be subjected to similar potential project-related impacts, and because they will be protected by similar avoidance and minimization measures.

4.2.1. Discussion of Special-status Plant Species

Bent-flowered fiddleneck (*Amsinckia lunaris*) is an annual herb in the borage (Boraginaceae) family that is endemic to California. The species occurs in coastal bluff scrub, cismontane woodland, and valley and foothill grassland. It blooms from March to June at an elevation of 10 to 1,640 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Anderson's manzanita (*Arctostaphylos andersonii*) is a shrub in the heath (Ericaceae) family that is endemic to California. The species occurs in sandy soils in chaparral. It blooms from December to March at an elevation of 100 to 2,500 feet. The CNPS considers this species as rare and seriously endangered in California (List 1B.1).

Pajaro manzanita (*Arctostaphylos pajaroensis*) is a shrub in the heath family that is endemic to California. The species occurs in broadleafed upland forest, chaparral, and north coast coniferous forest, particularly in openings and edges. It blooms from November to April typically at an elevation of 1,970 to 2,400 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Marsh sandwort is a perennial herb in the pink (Caryophyllaceae) family that is native to California. The species occurs in bogs and fens, marshes, and swamps. It blooms

from May to August at an elevation of 10 to 560 feet. It is federally and state listed as endangered, and the CNPS considers this species as rare and seriously endangered in California (List 1B.1). This species was last observed in the region in 1947 and the area where it was collected (Camp Evers near Scott Valley Junction) is now a trailer park (USFWS 1998a; CNDDB 2014). The only known extant California occurrences are in Mendocino and San Luis Obispo Counties (CNPS 2014). The species is not expected to occur within the BSA, but additional surveys may be necessary to confirm presence or absence.

Swamp harebell (*Campanula californica*) is a perennial herb (rhizomatous) in the bellflower (Campanulaceae) family that is endemic to California. The species occurs in bogs and fens, closed-cone coniferous forest, coastal prairie, meadows and seeps, marshes and swamps, and north coast coniferous forest. It blooms from June to October at an elevation of 3 to 1,330 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Bristly sedge (*Carex comosa*) is a perennial herb (rhizomatous) in the sedge (Cyperaceae) family that is native to California and found elsewhere. The species occurs in coastal prairie, marshes and swamps, and valley and foothill grassland. It blooms from May to September at an elevation of 0 to 2,050 feet. The CNPS considers this species as rare, threatened, or endangered in California, but more common elsewhere (List 2.1).

Deceiving sedge (*Carex saliniformis*) is a perennial herb in the sedge family that is endemic to California. The species occurs in coastal prairie, coastal scrub, meadows and sweeps, and marshes and seeps in mesic areas. It blooms in June at an elevation of 10 to 755 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Monterey spineflower is an annual herb in the buckwheat (Polygonaceae) family that is endemic to California. The species occurs in maritime chaparral, cismontane woodlands, coastal dunes, coastal scrub, and valley and foothill grasslands, primarily in sandy soils. It blooms from April to June (sometimes July) at an elevation of 10 to 1,475 feet. It is federally listed as threatened, and the CNPS considers this species as rare and fairly endangered in California (List 1B.2). Habitat loss and conversion for agricultural and residential development, activities at military institutions, and invasions by non-native plants have been identified as the primary threats in the species recovery plan (USFWS 1998b). Recommended recovery actions for conservation of the species include protecting available habitat, minimizing threats,

develop management strategies, manage occurrences and habitats, monitoring, coordinating recovery actions, and develop and implement outreach programs (USFWS 1998b).

Robust spineflower is an annual herb in the buckwheat family that is endemic to California. The species occurs in cismontane woodland, coastal dunes, and, primarily, in gravelly or sandy soils. It blooms from April to September at an elevation of 10 to 985 feet. It is federally listed as endangered, and the CNPS considers this species as rare and seriously endangered in California (List 1B.1). Although there are several historic records for the species in the area, it is currently known to inhabit four sites (USFWS 2004a). The recovery plan for robust spineflower indicates that the species is threatened by urban development, recreational activities, and competition with nonnative vegetation (USFWS 2004a). Actions needed to protect the species include: 1) protect existing habitat; 2) manage existing habitat through implementation plans; 3) conduct management-oriented research on the taxonomy, ecology, biology, and management of the species; 4) establish new populations within the historical range of the species; 5) review and revise recovery guidelines; and 6) develop and implement an outreach program (USFWS 2004a).

San Francisco collinsia (*Collinsia multicolor*) is an annual herb in the figwort (Scrophulariaceae) family that is endemic to California. The species occurs in closed-cone coniferous forest and coastal scrub, sometimes on serpentinite soils. It blooms from March to May at an elevation of 100 to 820 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Seaside bird's-beak (*Cordylanthus rigidus* ssp. *littoralis*) is an annual herb in the figwort (Scrophulariaceae) family that is endemic to California. This species occurs in closed-cone coniferous forest, chaparral, cismontane woodland, coastal dunes, and coastal scrub with sandy soils. It is often found in disturbed areas. It blooms from April to October at an elevation of 0 to 1,400 feet. It is state listed as endangered, and the CNPS considers this species as rare and seriously endangered in California (List 1B.1).

Ben Lomond buckwheat (*Eriogonum nudum* var. *decurrens*) is a perennial herb in the buckwheat family that is endemic to California. The species occurs in chaparral, cismontane woodland, and lower montane coniferous forest, in primarily sandy soils. It blooms from June to October at an elevation of 165 to 2,625 feet. It is federally

listed as threatened, and the CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Santa Cruz tarplant is an annual herb in the sunflower (Asteraceae) family that is endemic to California. The species occurs in coastal prairie, coastal scrub, and valley and foothill grassland, often on clay or sandy soils. It blooms from June to October at an elevation of 30 to 720 feet. It is federally listed as threatened and state listed as endangered, and the CNPS considers this species as rare and seriously endangered in California (List 1B.1).

Arcuate bush mallow (*Malacothamnus arcuatus*) is a shrub in the mallow (Malvaceae) family that is endemic to California. The species occurs in chaparral and cismontane woodland. It blooms from April to September at an elevation of 30 to 2,500 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Hall's bush mallow (*Malacothamnus hallii*) is a shrub in the mallow family that is endemic to California. The species occurs in chaparral and coastal scrub. It blooms from May to September at an elevation of 30 to 2,500 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Marsh microseris (*Microseris paludosa*) is a perennial herb in the sunflower family that is native to California. The species occurs in closed-cone coniferous forest, cismontane woodland, coastal scrub, and valley and foothill grassland. It blooms from April to June (sometimes July) at an elevation of 16 to 985 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Dudley's lousewort (*Pedicularis dudleyi*) is a perennial herb in the figwort family that is native to California. The species occurs in chaparral, cismontane woodland, north coast coniferous forest, and valley and foothill grassland. It blooms from April to June at an elevation of 195 to 2,950 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2). This species was last observed in the region in 1884 and it may now be extirpated (CNDDB 2007; updated 2014). The species is not expected to occur within the BSA, but additional surveys may be necessary to confirm presence or absence.

Monterey pine is a conifer tree in the pine family (Pinaceae) that is native to California and Baja California. The species occurs in closed cone coniferous forest, cismontane woodland at an elevation of 80 to 605 feet. The CNPS considers this species as rare and seriously endangered in California (List 1B.1). Based on the

CNDDB, Monterey pine within the BSA is not considered native population (CNDDB 2012; updated 2014).

Choris' popcorn flower (*Plagiobothrys chorisianus* var. *chorisianus*) is an annual herb in the borage family that is native to California. The species occurs in chaparral, coastal prairie, and coastal scrub, primarily in mesic areas. It blooms from March to June at an elevation of 50 to 525 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

San Francisco popcorn flower is an annual herb in the borage family that is native to California. The species occurs in coastal prairie and valley and foothill grassland. It blooms from March to June at an elevation of 200 to 1,180 feet. It is state listed as endangered, and the CNPS considers this species as rare and seriously endangered in California (List 1B.1).

Pine rose (*Rosa pinetorum*) is a shrub in the rose (Rosaceae) family that is endemic to California. The species occurs in closed-cone coniferous forest. It blooms from May to July at an elevation of 7 to 985 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Chaparral ragwort (*Senecio aphanactis*) is an annual herb in the sunflower (Asteraceae) family that is not endemic to California. This species occurs in chaparral, cismontane woodland, and coastal scrub, sometimes within alkaline soils. It blooms from January to April at an elevation from 50 to 5,900 feet. The CNPS considers this species as fairly endangered in California (List 2B.2).

Maple-leaved checkerbloom (*Sidalcea malachroides*) is a perennial herb in the mallow (Malvaceae) family that is not endemic to California. This species occurs in broadleafed upland forest, coastal prairie, coastal scrub, North Coast coniferous forest, and riparian woodland. It blooms from March to August at an elevation from 0 to 2,400 feet. The CNPS considers this species uncommon in California (List 4.2).

Santa Cruz microseris (*Stebbinsoseris decipiens*) is an annual herb in the sunflower family that is endemic to California. The species occurs in broadleafed upland forest, closed-cone coniferous forest, chaparral, coastal prairie, coastal scrub, and valley and foothill grassland, typically in open areas and sometimes on serpentinite. It blooms from April to May at an elevation of 33 to 3,230 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

Saline clover (*Trifolium depauperatum* var. *hydrophilum*) is an annual herb in the legume family that is endemic to California. The species occurs in marshes and swamps, valley and foothill grassland, and vernal pools. It blooms from April to June at an elevation of 0 to 985 feet. The CNPS considers this species as rare and fairly endangered in California (List 1B.2).

4.2.1.1. SURVEY RESULTS

Tier I Corridor Alternatives Potential Impacts

Anderson's manzanita, Pajaro manzanita, and Monterey pine are the only special-status plant species that were observed in the BSA during surveys. Mature Anderson's manzanita and Pajaro manzanita were observed growing on a steep hill toward the southern end of the BSA, southeast of the intersection of Route 1 and San Andreas Road. The area where they were observed is well outside the PIA within the BSA and unlikely to be affected by project-related activities, but it remains possible that these species could occur within other areas of the BSA with the passage of time. One area within the BSA appears to contain a large population of Monterey pines, mixed with other conifer species along a large undisturbed hillside located on the south side of Route 1, east of Aptos Creek. This occurrence is not a native population (CNDDB 2012) and is not considered sensitive.

No other special-status plant species were observed within the BSA, and additional occurrences would be considered rare to unlikely, given the disturbance associated with potential habitat throughout the majority of the project area. The nearest known populations for each species are included in Table 6.

Tier II Auxiliary Lane Alternative Impacts

No special-status plants were observed in the Tier II project area. However, due to the long project timeframe, and despite the primarily urban or disturbed conditions present, there is a potential that other special-status species included in Table 6 within the BSA could be present, or could become established before project construction. Consequently, prior to the release of the Tier I/Tier II Final environmental document, additional floristic surveys would be conducted in areas of the BSA that will be temporarily and/or permanently impacted. The floristic surveys will accommodate the flowering/identification period for each of the special-status plant species in Table 6 that have suitable habitat present within the BSA. Any areas with special-status plant species shall be mapped and their population numbers estimated. If special-status plant species are found as a result of these surveys, avoidance and minimization measures described below will be implemented.

4.2.1.2. AVOIDANCE AND MINIMIZATION EFFORTS

1) An environmental training program shall be developed to educate construction personnel about special-status plant species with potential to be encountered during construction, and the avoidance and minimization measures being employed to prevent or reduce impacts to these species.

2) If federally listed plant species are determined to occur within the BSA and cannot be avoided, the project must obtain incidental take authorization from USFWS through a FESA Section 7 Biological Opinion and Incidental Take Statement.

3) If feasible, avoid disturbance in areas with special-status plant species. Areas with special-status plant species to be avoided shall be marked on project plans and marked in the field with flagging and/or brightly colored fencing to facilitate plant recognition and avoidance.

4) If plant species listed by the state as endangered or threatened are determined to occur within the BSA and cannot be avoided, the project must obtain incidental take authorization from CDFW through a CESA Section 2081 Incidental Take Permit. Species that are considered State Rare by CDFW must be completely avoided since CDFW currently does not have a legal mechanism to allow for "take."

5) Plants listed as rare by the CNPS that have no state or federal status are not protected under CESA. During CEQA project analysis, CDFW may require implementation of specific mitigation measures for impacts to rare plants found within the BSA.

6) If it is determined by the biological monitor(s) or the agency-approved biologist(s) that impacts to special-status plant species exceed the levels that are authorized by the affected regulatory agency, they will notify the resident engineer (the engineer that is directly overseeing and in command of construction activities) immediately. The resident engineer will resolve the situation immediately by eliminating the cause of the identified effect to special-status species or require that all actions that are causing these effects be halted until coordination with the appropriate resource agency is completed. No work will resume until the issue is resolved.

7) As future Tier II projects are advanced to the environmental review phase, floristic surveys will need to be conducted and documented in each future Tier II environmental document.

4.2.1.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Heavy equipment operation, worker foot-traffic, and other disturbance of vegetated areas could potentially lead to injury or mortality of special-status plant species. Loss of suitable habitat could reduce the amount of habitat that could be colonized by special-status plant species in the future. Temporary and permanent impacts for the Tier I Corridor Alternatives cannot be quantified at this time, and will not be able to be quantified until project design is finalized and appropriate floristic surveys of the BSA are conducted to confirm presence or absence of special-status plant species.

The project may affect, but is not likely to adversely affect, Anderson's manzanita, Pajaro manzanita, Monterey spineflower, robust spineflower, and Santa Cruz tarplant. The basis for this determination for Anderson's manzanita and Pajaro manzanita is that the identified occurrences are well outside of proposed project disturbance areas. The basis for this determination for Monterey spineflower, robust spineflower, and Santa Cruz tarplant is that although no populations are known to occur within the BSA and these species were not observed during surveys of the BSA, suitable habitat for these plant species is present within the BSA. Floristic surveys for these species may need to be completed prior to construction. Potential adverse effects to these species resulting from construction activities can also be avoided or minimized through the implementation of the measures discussed in Section 4.2.1.2.

Tier II Auxiliary Lane Alternative Impacts

No special-status plant species or suitable habitat have been observed in the Tier II project area during past botanical surveys. It is unlikely that special-status species will occur within the Tier II project area; however, absence of these species cannot be confirmed at this time as the botanical survey results are outdated. Therefore, temporary and permanent impacts for the Tier II Auxiliary Alternative cannot be quantified at this time, and will not be able to be quantified until updated floristic surveys of the BSA are conducted prior to the final environmental document to confirm presence or absence of special-status plant species.

4.2.1.4. COMPENSATORY MITIGATION

The above avoidance and minimization measures will minimize impacts to special-status plant species and their habitats.

Should special-status species be identified during surveys conducted prior to the release of the Tier I/Tier II Final environmental document, the following measures shall be implemented.

1) If areas with special-status plant species cannot be avoided, impacts to special-status plant species will be mitigated by implementing the following measures, which are provided on a conceptual basis for the Tier I Corridor Alternatives and will be considered mitigation commitments for the Tier II Auxiliary Lane Alternative for any impacts to special-status plant species that may be identified in future botanical surveys: 1) replacement of species within the project ROW through installation of plantings/seed material; and/or 2) retaining topsoil and duff material from the project site, or mitigation bank within the known geographic range of the species, for re-distribution on the site following construction. A minimum replacement ratio of 2:1 shall be provided. Planting materials and methods, short- and long-term maintenance requirements, success criteria, and monitoring and reporting methodology shall be implemented such that replacement plantings shall have 75% survivability goal for perennial species in 5 years. For annual species, seeding of the targeted special-status species shall achieve 15% relative cover within 5 years. The percent cover shall be determined using a recognized methodology, selected by the project biologist in coordination with the appropriate resource agencies; however, the Daubenmire or point intercept methods as described by Sampling Vegetation Attributes (Natural Resources Conservation Service 1996) are recommended. Compensatory mitigation plantings shall be monitored on a quarterly basis. Any required maintenance shall also occur on a quarterly basis. Maintenance activities will include weeding, debris removal, replanting (if necessary), repair of any vandalism, fertilizing, and/or pest control. Maintenance activities will be dictated by the results of the quarterly monitoring effort. Quarterly reports and annual monitoring reports shall be submitted to Caltrans, the RTC, and the affected regulatory agencies. The annual monitoring report submitted at Year 5 shall serve as a final completion report should the mitigation be successful.

4.2.1.5. CUMULATIVE EFFECTS

If project-related impacts to special-status plant species were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of any of the special-status plant species in Table 6. Cumulative effects to special-status species are expected to be minimal because impacts will be mostly temporary, and permanent impacts will be minimal with implementation of avoidance and minimization

measures. In addition, the above compensatory measures are anticipated to be sufficient to mitigate impacts.

4.3. Special-status Animal Species Occurrences

Suitable habitat conditions occur within the BSA for numerous special-status animal species. The special-status animal species listed in Table 7 as present or with potential for occurrence within the BSA are discussed in more detail below.

4.3.1. Discussion of Monarch Butterfly (*Danaus plexippus*)

The monarch butterfly is an easily recognized orange and black butterfly that aggregates in large groups, participating in lengthy migrations. Monarch butterfly winter roosting habitat is considered rare under CEQA Guidelines Section 15380 because of declining availability, and the species is included on the CDFW Special Animals List (CDFW 2014).

Monarch butterflies from west of the Rocky Mountains spend the winter along the California coast. Overwintering sites occur in dense, wind-protected tree groves (e.g., eucalyptus [*Eucalyptus* spp.], Monterey pine, and Monterey cypress) near the coast from northern Mendocino to Baja California (Sakai 2007; CNDDB 2012). Monarch butterflies are typically attracted to groves along coastal areas of California that feature high moisture content, filtered sunlight, and protection from freezing temperatures and gusty winds. Monarchs start arriving at the coast in late September/early October and begin to form clusters by November, remaining throughout the winter (Sakai 2008). They begin mating in February and leave soon after.

The monarch butterfly life cycle to adulthood is completed in 30 to 40 days. Milkweed (*Asclepias* spp.) serves as the host plant for monarch butterfly larvae. Eggs are laid on the undersides of leaves and hatch 3 to 6 days after females deposit them. Caterpillars reach full size at about 14 days, crawl away from the host plant, pupate, and metamorphose in about 14 days. Adults mate within 4 to 6 days after emerging from their chrysalis.

4.3.1.1. SURVEY RESULTS

No monarch butterflies or monarch butterfly roosts were observed during reconnaissance surveys. There are two documented monarch butterfly roosting occurrences near the vicinity of the BSA: 1) along the east boundary of New Brighton State Beach west of New Brighton Road; and 2) at Borregas Creek (Gulch), east rim of canyon wall, near Maple and Cedar Streets.

As stated previously, areas of eucalyptus woodland are present along the south side of Route 1 at San Andreas Road, the west side of Union Pacific Railroad and north of Route 1, the west side of Park Avenue south of Route 1, along Tannery Gulch and the Tannery Gulch unnamed tributary, and on the north side of Route 1 at Nobel Creek. These areas have not been identified as monarch butterfly roosting sites (CNDDB 2012; updated 2014).

No monarch butterfly winter roosting habitat is present in the Tier II project area.

4.3.1.2. AVOIDANCE AND MINIMIZATION EFFORTS

1) If feasible, avoid eucalyptus tree removal or other disturbance of eucalyptus habitat from November 1 to March 1 to avoid potential impacts to winter roosting monarch butterflies.

2) If construction activities are scheduled to impact suitable monarch butterfly overwintering habitat between November 1 and March 1, a qualified biologist shall conduct pre-construction surveys for overwintering monarch butterflies in appropriate habitat. Overwintering monarch butterfly surveys shall consist of a pre-construction survey prior to eucalyptus tree removal, with weekly surveys continuing thereafter until March 1. If no roosts are observed within the project site, then construction will be allowed to proceed. If active roosts are observed, tree removal activities shall be delayed and an appropriate setback for other construction-related activities shall be maintained until monarch butterflies have migrated from the site. All tree removal shall be monitored and documented by the biological monitor(s) regardless of time of year.

4.3.1.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

The removal of eucalyptus and other suitable roosting trees during the monarch butterfly winter roosting season could impact potential winter roosting habitat, and could directly impact monarch butterflies if monarch butterflies are found to be utilizing eucalyptus trees on-site as winter roosts, which could result in stress, injury, or mortality to butterflies. Indirect impacts could result from the reduction of potential winter roosting habitat, which would require monarch butterflies to find alternative roosting sites.

Tier II Auxiliary Lane Alternative Impacts

No overwintering habitat occurs within the Tier II Auxiliary Lane Alternative. Therefore, no impacts to monarch butterfly winter roosting habitat are anticipated.

4.3.1.4. COMPENSATORY MITIGATION

A pre-construction survey will be conducted to identify any non-native eucalyptus trees or other tree species that provide suitable roosting habitat for monarch butterfly. The removal of such trees shall be offset with the planting of native tree species, such as Monterey pine or Monterey cypress, which are utilized by monarch butterfly for overwintering. Replacement of any lost overwintering habitat would occur at a 1:1 ratio and be monitored for success following criteria outlined in Section 4.2.1.4. Additional mitigation may be directed by regulatory agencies during the permitting phase.

4.3.1.5. CUMULATIVE EFFECTS

If project-related impacts to monarch butterfly overwintering habitat were to occur, it is estimated that the cumulative effects would not result in jeopardy of the species, because the loss of suitable habitat for this species is likely to be minimal, and the above compensatory mitigation for impacts to habitat are anticipated to be sufficient to mitigate impacts.

4.3.2. Discussion of Tidewater Goby

The tidewater goby is a small (up to 2 inches), euryhaline (salt-tolerant) member of the Gobiidae family endemic to coastal lagoons of California. The tidewater goby was listed as federally endangered by the USFWS in 1994 and is considered a CSC species by CDFW. The tidewater goby, found only in California, is almost unique among fish along the Pacific coast in its restriction to brackish waters of coastal wetlands. This species is typically found within the estuarine habitat of lower reaches of coastal streams (Swift et al. 1989). It historically occurred in at least 87 California coastal lagoons from San Diego County to Humboldt County, but has disappeared from most of these sites.

Common features of tidewater goby habitat include shallow water with little to no flow, low to moderate salinities (2-15 ppt), and fine sediment such as sand, mud, or muddy gravel. Tidewater gobies regularly range upstream into fresh water, and downstream into water of up to 28 ppt salinity (Worcester 1992). Tidewater gobies have been documented in water with temperature levels from 35 to 73 degrees Fahrenheit, and water depths from 5 to 7.5 feet.

4.3.2.1. SURVEY RESULTS

No tidewater gobies were observed during reconnaissance surveys of the BSA; however, no netting or other sampling/focused surveys were conducted for tidewater goby. The nearest occurrences for the species are: 1) in Soquel Creek at Route 1; and

2) in Aptos Creek at Route 1 (CNDDB 2012; updated 2014). Other occurrences include: 1) Moran Lake, approximately 1.8 miles south of the 41st Avenue/Route 1 intersection; 2) Rodeo Gulch, approximately 0.6 mile south of the Route 1 bridge; and 3) Woods Lagoon, approximately 0.7 mile downstream of Route 1 (CNDDB 2012; updated 2014). Tidewater gobies have been documented as far as 1 mile upstream in some of these areas (CNDDB 2012; updated 2014).

Critical habitat unit SC-7, which includes Aptos Creek, was occupied by tidewater gobies at the time of listing, is currently occupied, and is likely a source population for this region (USFWS 2008b).

The Rodeo Gulch portion of the Tier II project has potential to contain tidewater goby. Since a focused survey for this species was not conducted, it is assumed that potential impacts to habitat for this species would be equal to the calculations related to in-stream habitat (delineated as USACE wetland).

4.3.2.2. AVOIDANCE AND MINIMIZATION EFFORTS

The measures in Section 4.1.5.2 have been recommended to avoid or minimize impacts to tidewater goby critical habitat, and can be applied to include all aquatic areas within the BSA that could support tidewater goby.

In addition, the following measures will serve to further avoid or minimize impacts to tidewater goby:

1) If in-stream work is proposed to occur in Arana Gulch or its tributaries, Soquel Creek, Aptos Creek, or Rodeo Gulch, incidental take authorization from USFWS through a FESA Section 7 Biological Opinion and Incidental Take Statement shall be acquired, if deemed necessary by the USFWS. Formal consultation with USFWS may be necessary if a Section 404 permit is issued.

2) A component including a description of tidewater goby, its ecology, and the need for conservation of the species will be integrated into the worker environmental training program.

3) Prior to construction, if it is necessary to dewater/divert areas within Soquel Creek, Aptos Creek, or Rodeo Gulch prior to project implementation, a USFWS-approved biologist shall conduct a pre-construction survey for tidewater goby and use seining, dip-nets, or other approved methods to capture and relocate tidewater goby from the areas to be dewatered to areas with suitable habitat outside of the area of proposed disturbance.

4) If dewatering/stream diversion is necessary, a Diversion and Dewatering Plan shall be prepared and implemented to allow for passage of aquatic species through the site during construction. The form and function of all pumps used during the dewatering activities shall be checked twice daily, at a minimum, by the biological monitor(s) to ensure a dry work environment and minimize adverse effects to aquatic species and habitats.

5) During project activities, if pumps are incorporated to assist in temporarily dewatering the site, intakes shall be completely screened with no larger than 0.2-inch wire mesh to prevent tidewater goby and other sensitive aquatic species from entering the pump system. Pumps shall release the additional water to a settling basin allowing the suspended sediment to settle out prior to re-entering the stream(s) outside of the isolated area.

6) During dewatering/diversion activities, or if tidal fluctuations breach a formerly dewatered and isolated project site, the USFWS-approved biological monitor(s) or other USFWS-approved biologist(s) shall supervise site dewatering and relocate tidewater goby and other stranded aquatic species.

7) If it is determined by the biological monitor(s) or the USFWS-approved biologist(s) that impacts to tidewater goby have the potential to exceed the levels authorized by the USFWS, they will notify the resident engineer (the engineer that is directly overseeing and in command of construction activities) immediately. The resident engineer will either resolve the situation immediately by eliminating the cause of the identified effect to the species or require that all actions that are causing these effects be halted until coordination with the appropriate resource agency is completed. No work will resume until the issue is resolved.

8) Following construction, temporary impacts to streamside vegetation used as sheltering areas or streambed sandbars, gravels, and cobbles used by fish species will be restored to their pre-construction conditions, at a minimum.

4.3.2.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Dewatering/diversion and construction in aquatic areas inhabited by tidewater goby could result in direct impacts to the species in the form of injury or mortality. Dewatering/diversion could result in individual tidewater gobies stranded in dewatered areas, which could result in mortality if animals are not detected and safely

captured and relocated promptly. Construction leading to the placement of fill for bridges or other structures within the wetted portions of streams could result in the permanent loss of tidewater goby habitat. There could be indirect impacts as well. The act of dewatering/diversion and its eventual dismantling and restoration of normal flows is likely to temporarily and perhaps permanently affect the structure of the streambed substrate, which could affect tidewater goby microhabitats. Permanent impacts are likely to be minimal.

Tier II Auxiliary Lane Alternative Impacts

Due to the potential presence of tidewater goby in Rodeo Gulch, the Tier II project has potential to affect but not adversely affect the species.

The basis for this determination is that it is unexpected that tidewater goby would occupy the upstream reaches of the drainages within the BSA, which are upstream from its preferred brackish lagoon habitat. In addition, construction within drainages would be timed to occur during the driest portion of the year. Potential adverse effects to the tidewater goby resulting from construction activities occurring when flow is in the creek can also be avoided or minimized through the implementation of the measures discussed in Sections 4.1.1.2, 4.1.5.2, and 4.3.3.2.

4.3.2.4. COMPENSATORY MITIGATION

Compensatory mitigation of impacted freshwater marsh habitat described in Sections 4.1.1.2 and 4.1.1.4 will mitigate impacts to tidewater goby and its habitat since compensatory mitigation will occur on-site. Specifically, any impacts to Rodeo Gulch would be mitigated directly on-site. FESA Section 7 formal consultation will also be conducted for all federally listed species that could be affected by the proposed project. No additional compensatory mitigation is proposed.

4.3.2.5. CUMULATIVE EFFECTS

If project-related impacts to tidewater goby were to occur, it is anticipated that the cumulative effects would not result in jeopardy or extinction of the species, because impacts will be mostly temporary, permanent impacts will be minimal, and the above avoidance and minimization measures and compensatory mitigation are anticipated to be sufficient to mitigate impacts.

4.3.3. Discussion of Central California Coast Steelhead (*Oncorhynchus mykiss*)

Steelhead are the anadromous form of rainbow trout, spending a portion of their life cycle in freshwater and a portion in the marine environment. Steelhead historically

ranged from Alaska southward to the California-Mexico border, though current data suggest that the Ventura River is presently the southernmost drainage supporting substantial steelhead runs. Steelhead are important in that they represent the southernmost portion of the native steelhead range in North America, having ecologically and physiologically adapted to seasonally intermittent coastal California streams.

All populations of steelhead occurring within the central California coast DPS, which is defined as that geographic region from the Russian River, south to Aptos Creek and to, but not including, the Pajaro River (also the San Francisco and San Pablo Bay basins), were originally listed as federally threatened by the USFWS in 1997. Steelhead are also considered a CSC species by the CDFW.

General trends inferred from the comparison of 1960s and 1990s abundance estimates indicate substantial rates of decline in the two largest steelhead stocks (Russian and San Lorenzo Rivers) for this DPS (NOAA Fisheries 1996). NOAA Fisheries, which has jurisdiction over the species, has stated that streams in this region probably suffer from a variety of habitat factors, including urbanization and poor land management practices in both forestry and agriculture (NOAA Fisheries 1996). Habitat throughout the north coast of California, including portions occupied by this DPS, was severely impacted by catastrophic flooding in 1964. Damage from this flood was probably exacerbated by poor land use practices prior to the event, and forest practices have also contributed to incremental degradation of stream habitats (McEwan and Jackson 1996). Dewatering due to irrigation and urban water diversions is also a problem, as well as potential genetic interaction with hatchery rainbow trout.

Optimal habitat for steelhead throughout its entire range on the Pacific Coast can generally be characterized by clear, cool water with abundant instream cover (i.e., submerged branches, rocks, and logs), well-vegetated stream margins, relatively stable water flow, and a 1:1 pool-to-riffle ratio (Raleigh et al. 1984). Steelhead are occasionally found in reaches of streams containing habitat which would be considered less than optimal. Steelhead along the central coast of California typically begin migrating up coastal drainages following the first substantial rainfall of the fall season. Spawning typically occurs during the spring in riffle areas that contain clean, coarse gravels. Deposited eggs incubate for approximately 3 to 4 weeks, with hatched fry rearing within the gravel interstices for an additional 2 to 3 weeks. Emergent fry rear at the stream margins near overhanging vegetation. Juveniles (smolts), after rearing for one to three years within fresh water, and post-spawning adults outmigrate to the ocean from March to July, depending on streamflows.

4.3.3.1. SURVEY RESULTS

Within the Tier I Corridor Alternatives, steelhead were observed in Aptos Creek, Valencia Creek, and Soquel Creek during surveys within the BSA. Steelhead are also known to occur in Arana Gulch at Route 1.

No habitat for steelhead is present in the Tier II Auxiliary Alternative project area.

4.3.3.2. AVOIDANCE AND MINIMIZATION EFFORTS

The measures in Section 4.1.6.2 have been recommended to avoid or minimize impacts to tidewater goby and steelhead critical habitat, and can be applied to include all aquatic areas within the BSA that could support steelhead.

In addition, the following measures will serve to further avoid or minimize impacts to steelhead:

1) If in-stream work is proposed to occur in coastal streams, incidental take authorization from NOAA Fisheries shall be acquired through a FESA Section 7 Biological Opinion and Incidental Take Statement. Formal consultation with NOAA Fisheries may be necessary if a Section 404 permit is issued.

2) A component including a description of central California coast steelhead, its ecology, and the need for conservation of the species will be integrated into the worker environmental training program.

3) If dewatering/stream diversion is necessary, a Diversion and Dewatering Plan shall be prepared and implemented to allow for passage of aquatic species through the site during construction. The form and function of all pumps used during the dewatering activities shall be checked twice daily, at a minimum, by the biological monitor(s) to ensure a dry work environment and minimize adverse effects to aquatic species and habitats.

4) During project activities, if pumps are incorporated to assist in temporarily dewatering the site, intakes shall be completely screened with no larger than 0.2-inch wire mesh to prevent steelhead and other sensitive aquatic species from entering the pump system. Pumps shall release the additional water to a settling basin allowing the suspended sediment to settle out prior to re-entering the stream(s) outside of the isolated area.

5) During dewatering/diversion activities, or if tidal fluctuations breach a formerly dewatered and isolated project site, a NOAA Fisheries-approved biological

monitor(s) or other NOAA Fisheries-approved biologist(s) shall supervise site dewatering and relocate steelhead and other stranded aquatic species.

6) If it is determined by the biological monitor(s) or the NOAA Fisheries-approved biologist(s) that impacts to steelhead would have the potential to exceed the levels authorized by NOAA Fisheries, they will notify the resident engineer (the engineer that is directly overseeing and in command of construction activities) immediately. The resident engineer will resolve the situation immediately by eliminating the cause of the identified effect to the species or require that all actions that are causing these effects be halted until coordination with the appropriate resource agency is completed. No work will resume until the issue is resolved.

7) Following construction, temporary impacts to streamside vegetation used as sheltering areas or streambed sandbars, gravels, and cobbles used by fish species will be restored to their pre-construction conditions, at a minimum.

4.3.3.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Potential project-related impacts to steelhead are expected to be similar to those described for tidewater goby in Section 4.3.2.1. Dewatering/diversion and construction in aquatic areas inhabited by steelhead could result in direct impacts to the species in the form of injury or mortality. Dewatering/diversion could result in stranding of individual steelhead trout in dewatered areas, which could result in mortality if animals are not detected promptly and safely captured and relocated. Construction leading to the placement of fill for bridges or other structures within the wetted portions of streams could result in the permanent loss of steelhead habitat. The act of dewatering/diversion and its eventual dismantling and restoration of normal flows could result in indirect impacts that could affect the structure of the streambed substrate. This could be particularly detrimental to steelhead, which use streambed gravels and cobbles for spawning and rearing of young. These impacts would likely be temporary.

Work in creek channels required by any activities conducted to implement the Tier I Corridor Alternatives project as a result of bridge work or drainage work may affect, and is likely to adversely affect, steelhead. The basis for this determination is that steelhead are known to inhabit streams within the BSA and there would be potential for take of the species during construction and dewatering/ diversion activities. As mentioned previously, the proposed project may result in temporary and/or permanent

impacts to vegetation along streams occupied by steelhead, which may offer shading and microhabitat temperature regulation in the channel.

Tier II Auxiliary Lane Alternative Impacts

No habitat for steelhead is present within the Tier II Auxiliary Lane Alternative project area. Therefore, the Tier II Auxiliary Lane Alternative will not affect steelhead.

4.3.3.4. COMPENSATORY MITIGATION

Avoidance, minimization, and/or mitigation of impacted riparian vegetation will mitigate impacts to steelhead and its habitat. FESA Section 7 formal consultation will be conducted for all federally listed species that could be affected by the proposed project. No additional compensatory mitigation is proposed.

4.3.3.5. CUMULATIVE EFFECTS

If project-related impacts to steelhead were to occur, it is estimated that the effects would not result in jeopardy or extinction of the species, because impacts will be mostly temporary, permanent impacts will be minimal, and implementation of the above avoidance, minimization, and mitigation measures are anticipated to be sufficient to mitigate impacts.

4.3.4. Discussion of California Tiger Salamander (*Ambystoma californiense*)

The CTS, central California Distinct Population Segment (DPS), is a federal and state threatened species. Critical habitat has been designated for the species, but not within the BSA. It is a large terrestrial salamander with several white or pale yellow spots or bars on jet-black skin. The species ranges from Sonoma County, south to northwest Tulare County, and in the Coast Range south to Buellton and Lompoc in the Santa Ynez drainage. In the Central Valley and surrounding Sierra Nevada foothills and Coast Range, the species occurs from northern Yolo County southward to northwestern Kern County and northern Tulare and Kings Counties. The CTS can be found from sea level to about 3,600 feet (Shaffer et al. 1993; Jennings and Hayes 1994; CNDDB 2014).

Adult CTS spend most of their life in upland habitats with burrows. They cannot dig their own burrows, and as a result their presence is associated with burrowing mammals such as ground squirrels. CTS use both occupied and unoccupied burrows (USFWS 2004b). During the mating season, these salamanders move to nearby vernal pools and similar water bodies. Breeding pools are typically large, and may

include stock ponds if they are managed to preclude predatory fish species such as sunfish (Family Centrarchidae) (USFWS 2004b).

4.3.4.1. SURVEY RESULTS

No CTS were observed during reconnaissance surveys of the BSA; however, no USFWS protocol CTS surveys were conducted. According to the CNDDB (2014), the nearest occurrence of CTS is from Ellicott pond, approximately 3.5 miles southeast of the BSA. There is no known CTS population in or near the BSA (Mori 2007). There may be marginal habitat for this species in Valencia Lagoon, but there are no records for the species at this location (USFWS 2009; CNDDB 2014) and it was not observed during surveys there for SCLTS.

4.3.4.2. AVOIDANCE AND MINIMIZATION EFFORTS

The measures discussed in previous sections for aquatic species are also applicable to CTS to avoid or minimize impacts to the species. In addition, the following measures applying specifically to CTS are recommended.

1) If construction in Valencia Lagoon cannot be avoided, USFWS and CDFW shall be consulted to determine if protocol CTS surveys are necessary.

2) If protocol CTS surveys are necessary, qualified biologists shall conduct protocol surveys in accordance with the USFWS and CDFW *Interim Guidelines on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (USFWS and CDFW 2003) to determine the potential for the federally listed CTS within the proposed project site.

3) If CTS is determined to occur within the BSA during protocol surveys, incidental take authorization from USFWS shall be acquired through a FESA Section 7 Biological Opinion and Incidental Take Statement. Authorization from CDFW will also be necessary through a Section 2081 Incidental Take Permit.

4) If a FESA Section 7 Biological Opinion and Incidental Take Statement are issued for the project, a USFWS-approved biological monitor shall be retained to ensure compliance with all mitigation measures included in these documents. Monitoring shall occur at a frequency deemed appropriate by USFWS. The biologist is approved by the CDFW to ensure compliance with all measures included within the 2081 Incidental Take Permit.

5) If CTS is determined to occur within the project area, a component including a description of CTS, its ecology, and the need for conservation of the species will be integrated into the worker environmental training program.

6) If project-related construction will impact aquatic areas of Valencia Lagoon and if regulatory agency approval allows, agency-approved biologists shall employ dip-netting to capture and relocate any CTS larvae or adults (if present) or other sensitive aquatic species to suitable habitat outside of the area of impact. This relocation activity shall be timed to occur prior to construction in Valencia Lagoon, if possible. Any other CTS observed during the course of construction will be relocated as necessary in the same manner as described above.

7) If it is determined by the biological monitor(s) or the agency-approved biologist(s) that CTS would be potentially impacted to a degree that exceeds the levels authorized CDFW and the USFWS, they will notify the resident engineer (the engineer that is directly overseeing and in command of construction activities) immediately. The resident engineer will resolve the situation immediately by eliminating the cause of the identified effect to the species or require that all actions that are causing these effects be halted until coordination with the appropriate resource agency is completed. No work will resume until the issue is resolved.

4.3.4.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

The project may affect, but is not likely to adversely affect, CTS. Construction in or near Valencia Lagoon as well as dewatering activities could result in direct impacts to CTS if they inhabit areas in or near the lagoon. Such activities could result in injury or death to individual salamanders if they are found to be breeding in the lagoon. Grading or other earthwork in adjacent uplands could impact burrows and possibly result in injured or entombed animals that are estivating. Temporary loss of aquatic habitat for CTS could result if dewatering in Valencia Lagoon is necessary for construction. Project-related construction in Valencia Lagoon could result in the placement of permanent structures that would displace aquatic habitat, resulting in loss of available habitat for the species.

Tier II Auxiliary Lane Alternative Impacts

The Tier II project will not affect CTS. The basis for this determination is that it is unexpected that CTS use Valencia Lagoon or other aquatic areas within the BSA for breeding and/or adjacent uplands for estivation. In addition, construction would be

timed to occur during the driest portion of the year. Protocol surveys for CTS may be required prior to construction to confirm.

4.3.4.4. COMPENSATORY MITIGATION

Avoidance, minimization, and/or mitigation measures for direct Tier I Corridor Alternatives impacts to CTS habitat or individuals would reduce impacts to this species and its habitat. Compensatory mitigation for loss of habitat shall include permanent protection and perpetual management of compensatory habitat. Compensatory mitigation habitat shall be determined based on the factors including an assessment of the importance of the habitat in the project area, the extent to which the activities will impact the habitat, and the regulatory agencies estimate of the acreage required to provide for adequate compensation. Compensatory mitigation for loss of habitat shall be negotiated with resource agencies, but a mitigation ratio of 2:1 for permanent impacts and a ratio of 0.75:1 for temporary impacts is recommended.

4.3.4.5. CUMULATIVE EFFECTS

If project-related impacts to CTS were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of the species, because impacts will be mostly temporary, permanent impacts will be minimal, and the above avoidance, minimization, and/or mitigation measures are anticipated to be sufficient to mitigate impacts.

4.3.5. Discussion of Santa Cruz Long-toed Salamander (*Ambystoma macrodactylum croceum*)

The SCLTS is a federal and state endangered species, and it is also recognized as a State of California Fully Protected species. This salamander has a black body with broken yellow or orange irregular striping along its spine. It also has a well-designed tail fin for swimming. It is typically found near pools or slow moving streams and is very secretive, making detection difficult.

The SCLTS was originally discovered in 1954 at Valencia Lagoon, Santa Cruz County, California (Russell and Anderson 1956). In 1955, this breeding pond was reduced in size by roadway construction along Route 1. When Caltrans converted Route 1 to a freeway in 1969, it eliminated the Valencia Lagoon breeding pond (Bury and Ruth 1972). This small seasonal lagoon with cattails in Aptos, California measured only about 30 meters by 150 meters at the time. The project eliminated the breeding site; and there have been mitigation efforts to attempt to offset these impacts. CDFW has since purchased the remainder of Valencia Lagoon. Another

mitigation pond was constructed along Bonita Road in the same drainage and has demonstrated some breeding success.

The SCLTS is one of the "mole" salamanders in the family Ambystomatidae. It spends much of its life underground in small mammal burrows. The subspecies is among the smallest members of the Ambystomatidae, with adults reaching lengths of up to 2.8 inches and weighing up to 0.4 ounce. Males can migrate distances of more than 1 mile to breeding ponds with the first large autumn rains. The males arrive from November through March, with most arrivals in January and February when peak breeding occurs. The males are soon joined by migrating females.

Courtship and mating takes place in the ponds, where males deposit packets of sperm that females pick up and insert to fertilize eggs. Inbound and outbound migrations typically occur during night rains. Eggs are laid singly on submerged stalks of spikerush (*Eleocharis* spp.) or other vegetation about 1 inch apart. Larvae hatch 1 to 2 months later and feed until metamorphosis is triggered by drying of the pond. Outbound migration of juveniles is also on rainy nights, and they do not return until they reach maturity after 3 years.

SCLTS are found among root systems of plants in upland chaparral and woodland areas of coast live oak or Monterey pine, and in strips of riparian vegetation such as arroyo willows, cattails, and bulrush, where they are protected from heat and direct sunlight (USFWS 1999). Larvae are preyed upon by exotics such as mosquitofish (*Gambusia affinis*) and crayfish (*Procambarus* spp.). Adults are preyed upon likely by a wide variety of amphibians, reptiles, and birds (USFWS 1999). The salamanders primarily feed on copepods (sow bugs).

Recovery actions needed for the conservation of SCLTS include actions that will: 1) perpetuate self-sustaining breeding populations; 2) conduct surveys in the general area of each complex to locate additional breeding sites and upland habitat areas; 3) assess the distribution and population status of SCLTS at other known sites and new locations found through surveys, then plan and implement appropriate management strategies and actions; 4) conduct research on which to base management of SCLTS habitats and populations; and 5) continue and expand public education and information programs used by USFWS and CDFW (USFWS 1999).

4.3.5.1. SURVEY RESULTS

No SCLTS were observed during reconnaissance surveys of the BSA; and no surveys per the *Sampling Procedures for Determining Presence or Absence of the Santa Cruz*

Long-toed Salamander (*Ambystoma macrodactylum croceum*) (Brode 1993) or other methodologies were conducted for this project.

The nearest occurrence of SCLTS is at Valencia Lagoon directly south and adjacent within 100 feet of the BSA at Valencia Channel. Older USFWS records indicate that there has been essentially very little reproduction at the lagoon since 1978 and the last time the species was detected was in 1997 (USFWS 1999; CNDDB 2012). However, three SCLTS metamorphs were observed in 2002 along Bonita Road at Valencia Lagoon adjacent to the main pond where CDFW owns most of the land (Allaback 2002). Also, based on surveys conducted in and near the lagoon by other investigators in 2007, the length of habitat along the channel currently supports a notable breeding population (Mori 2007). Not many upland surveys have been conducted in the vicinity of Valencia Lagoon, and while use of upland habitats between the lagoon and Route 1 may be limited, there is a high possibility that salamanders estivate within these vegetated areas (Mori 2007).

Caltrans recently funded a study with Biosearch Associates to determine SCLTS breeding population size and activity patterns (Mori 2007). Aquatic sampling for SCLTS larvae was conducted at both the Valencia Lagoon Pond and the drainage channel during the spring and summer in 2007 and 2008, and successful breeding was confirmed at both sites. Successful breeding in the channel was restricted to one depression, referred to as the Drainage Channel Pond, which is situated approximately 200 feet southeast of the Valencia Lagoon Pond.

Mark-recapture pitfall trapping for SCLTS at the Valencia Lagoon Pond and the drainage channel was performed from October 10, 2007, through April 3, 2008. This study was designed to be comparable to the most recent population studies conducted at the site, in 1977-78 and 1978-79 (Reed, 1978; 1981). A total of 226 adult female, 162 adult male, and 19 subadult SCLTS were captured in 2007-08. Of these, 73 (50 females, 23 males) were subsequently recaptured. A Lincoln-Peterson model generated a breeding adult population estimate of 734. A total of 134 post-metamorphic juveniles (metamorphs) were captured, primarily in October and November.

USFWS Biologist Jacob Martin stated that the species is accepted as inhabiting Valencia Lagoon and everything within a 1-mile radius could be considered dispersal habitat.

4.3.5.2. AVOIDANCE AND MINIMIZATION EFFORTS

The measures discussed in previous sections for tidewater goby, steelhead, and CTS are also applicable to SCLTS to avoid or minimize impacts to the species. In addition, the following measures applying specifically to SCLTS are recommended.

1) If construction in Valencia Lagoon or adjacent upland habitats cannot be avoided, the USFWS and CDFW shall be consulted to determine if protocol SCLTS surveys are necessary.

2) If protocol SCLTS surveys are necessary, qualified biologists shall conduct protocol surveys in accordance with the *Sampling Procedures for Determining Presence or Absence of the Santa Cruz Long-toed Salamander* (*Ambystoma macrodactylum croceum*) (Brode 1993) or subsequent approved methodologies to determine the potential for the SCLTS within the project site.

3) If the SCLTS is determined to occur within the BSA during protocol surveys, coordination with USFWS and CDFW shall occur to ensure avoidance of take for this State of California Fully Protected species.

4) If SCLTS is determined to occur within the project area, a component including a description of SCLTS, its ecology, and the need for conservation of the species will be integrated into the worker environmental training program.

5) If project-related construction will impact aquatic areas of Valencia Lagoon and if regulatory agency approval allows, coordination with USFWS and CDFW shall occur to determine an appropriate capture and relocation program for SCLTS.

6) If it is determined by the biological monitor(s) or the USFWS-approved biologist(s) that SCLTS would be potentially impacted to a degree that exceeds the levels authorized the USFWS, they will notify the resident engineer (the engineer that is directly overseeing and in command of construction activities) immediately. The resident engineer will resolve the situation immediately by eliminating the cause of the identified effect to the species or require that all actions that are causing these effects be halted until coordination with the appropriate resource agency is completed. No work will resume until the issue is resolved.

4.3.5.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

The Tier I project may affect, and is likely to adversely affect, SCLTS. Similar to the potential impacts to CTS, construction in Valencia Lagoon or dewatering activities could result in direct impacts to SCLTS, which could result in injury or death to individual salamanders if they are found to be breeding in the lagoon. Grading or other earthwork in adjacent uplands could impact burrows and possibly result in injured or entombed animals that are estivating. Temporary loss of aquatic habitat for SCLTS could result if dewatering in Valencia Lagoon is necessary for construction. Project-related construction in Valencia Lagoon could result in the placement of permanent structures that would displace aquatic habitat, resulting in loss of available habitat for the species. In addition, individuals could potentially inhabit uplands between and lagoon and Route 1, where Caltrans proposes shoulder improvements for the proposed project. Individuals could therefore be subjected to injury or mortality as a result of ground-disturbing activities along the Route 1 road shoulder. Protocol surveys for the species have not been conducted to verify presence or absence within the BSA. Additional surveys for SCLTS may be required prior to construction near Valencia Lagoon.

Tier II Auxiliary Lane Alternative Impacts

The Tier II project will not affect SCLTS. The basis for this determination is that the species is known to inhabit and breed in Valencia Lagoon, which is located 4.5 miles west of the Tier II project area. The project area is separated from the lagoon by urban development associated with the towns of Aptos and Soquel.

4.3.5.4. COMPENSATORY MITIGATION

Implementation of compensatory mitigation described within Section 4.3.4.4 should be sufficient to mitigate for any impacts to SLCTS habitat. Avoidance and minimization measures described above should be sufficient to minimize any loss of individuals.

4.3.5.5. CUMULATIVE EFFECTS

The cumulative effects to SCLTS resulting from loss of habitat at or near Valencia Lagoon could be considerable, since it is one of few known historical breeding locations in the region. These effects may need to be countered with the creation of new habitat as directed by regulatory agencies, similarly to the means in which impacts to SCLTS habitat have been mitigated for other large-scale projects in the region.

4.3.6. Discussion of California Red-legged Frog (*Rana draytonii*)

The CRLF was formally listed by the USFWS as federally threatened in 1996, and is considered a CSC species by CDFW. Critical habitat has been designated for the subspecies, but not within the BSA. It is recognized by the reddish color that forms on the underside of its legs and belly and the presence of a diagnostic dorsolateral fold. It historically ranged from Marin County southward to northern Baja California (Stebbins 1972; 2003). Presently, Monterey, San Luis Obispo, and Santa Barbara Counties support the largest remaining CRLF populations within California.

The CRLF prefers aquatic habitats with little or no flow, the presence of surface water to at least early June, surface water depths to at least 2.3 feet, and the presence of fairly sturdy underwater supports such as cattails. The largest densities of this subspecies are typically associated with dense stands of overhanging willows and an intermixed fringe of sturdy emergent vegetation (Jennings and Hayes 1994). The CRLF typically breeds from January to July, with peak breeding occurring in February. Eggs are attached to subsurface vegetation, and hatched tadpoles require 11 to 20 weeks to metamorphose. It is estimated that only 1% of eggs actually reach adulthood. Riparian habitat degradation, urbanization, predation by bullfrogs, and historic market harvesting has all reportedly contributed to population declines in this subspecies.

4.3.6.1. Survey Results

Focused CRLF surveys were conducted in suitable habitat within the BSA from September 30 to October 2, 2003, under the 1997 USFWS guidance/protocol (USFWS 1996). Suitable habitat areas included all riparian areas within the BSA, including all nine named creek channels and two unnamed tributaries to the Valencia Channel. No CRLFs were observed during this survey effort. Detailed discussion of the CRLF survey effort is provided in the California Red-legged Frog Survey Report for the proposed project (Morro Group 2004).

The nearest known CRLF occurrence is approximately 2 miles southeast of the intersection of San Andreas Road and Route 1, 0.8 mile northwest of Ellicott Pond. While there are no other CNDDB records for CRLF between UC Santa Cruz and Ellicott Pond (CNDDB 2012), presence of CRLF has been inferred in the BSA by Caltrans.

4.3.6.2. Avoidance and Minimization Efforts

Although CRLF has not been observed in the BSA during project-related surveys, there is suitable habitat and CRLF presence should be inferred within the BSA. The

proposed project has the potential to impact CRLF and its habitat. For the purposes of this analysis, impacts to CRLF habitat would include habitat that was previously mapped as jurisdiction of CDFW, which delineates all riparian habitat or top of bank. The following measures are provided by the Programmatic Biological Opinion for Projects Funded or Approved under the Federal Aid Program, 8-8-10-F-58 (USFWS 2011). These measures have been included exactly as they are shown within the Programmatic Biological Opinion.

1) Only USFWS-approved biologists will participate in activities associated with the capture, handling, and monitoring of CRLF.

2) Ground disturbance will not begin until written approval is received from the USFWS that the biologist is qualified to conduct the work.

3) An USFWS-approved biologist will survey the project area 48 hours before the onset of work activities. If any life stage of the CRLF is found and these individuals are likely to be killed or injured by work activities, the approved biologist will be allowed sufficient time to move them from the site before work activities begin. The USFWS-approved biologist will relocate the CRLFs the shortest distance possible to a location that contains suitable habitat and will not be affected by the activities associated with the proposed project. The relocation site should be in the same drainage to the extent practicable. Coordination with the USFWS shall occur with regards to the relocation site prior to the capture of any CRLFs.

4) Before any construction activities begin, an USFWS-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the CRLF and its habitat, the specific measures to be implemented to conserve the CRLF during the project, and all project boundary limits. Brochures, books, and briefings may be used in the training session, provided that a qualified person is on hand to answer questions.

5) An USFWS-approved biologist will be present at the work site until all CRLFs have been removed, workers have been instructed, and disturbance of the habitat has been completed. After this time, the state or local sponsoring agency will designate a person to monitor on-site compliance with all minimization measures. The USFWS-approved biologist will ensure that this monitor receives the training outlined in measure 4 and in the identification of CRLFs. If the monitor or the USFWS-approved biologist recommends that work be

stopped because CRLFs would be affected to a degree that exceeds the levels anticipated by the FHWA and the USFWS during the review of the proposed action, they will notify the resident engineer (the engineer that is directly overseeing and in command of construction activities) immediately. The resident engineer will either resolve the situation by eliminating the effect immediately or require that all actions that are causing these effects be halted. If work is stopped, the USFWS will be notified as soon as is reasonably possible.

6) During project activities, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas.

7) All refueling, maintenance and staging of equipment and vehicles will occur at least 60 feet from the riparian habitat or water bodies and not in a location from where a spill would drain directly toward aquatic habitat. The monitor will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, FHWA will ensure that a plan is in place for prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures to take shall a spill occur.

8) Habitat contours will be returned to their original configuration at the end of the project activities. This measure will be implemented in all areas disturbed by activities associated with the project, unless the USFWS and FHWA determine that it is not feasible or modification of original contours would not benefit the CRLF.

9) The number of access routes, size of staging areas, and the total area of activity will be limited to the minimum necessary to achieve the project goal. Environmentally Sensitive Areas will be established to confine access routes and construction areas to the minimum area necessary to complete construction, and minimize the impact to CRLF habitat; this goal includes locating access routes and construction areas outside of wetlands and riparian areas to the maximum extent practicable.

10) FHWA will attempt to schedule work activities for times of the year when impacts to the CRLF would be minimal. For example, work that would affect large pools that may support breeding would be avoided, to the maximum degree practicable, during the breeding season (November through May).

Isolated pools that are important to maintain CRLFs through the driest portions of the year would be avoided, to the maximum degree practicable, during the late summer and early fall. Habitat assessments, surveys, and informal consultation between FHWA and the USFWS during project planning shall be used to assist in scheduling work activities to avoid sensitive habitats during key times of year.

11) To control sedimentation during and after project implementation, FHWA and sponsoring agency will implement BMPs outlined in any authorizations or permits issued under the authorities of the Clean Water Act that it receives for the specific project. If BMPs are ineffective, FHWA will attempt to attempt to remedy the situation immediately, in consultation with the USFWS.

12) If a work site is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh not larger than 0.2 inch to prevent CRLFs from entering the pump system. Water will be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. The methods and materials used in any dewatering will be determined by FHWA in consultation with the USFWS on a site-specific basis. Upon completion of construction activities, any diversions or barriers to flow will be removed in a manner that would allow flow to resume with the least disturbance to the substrate. Alteration of the streambed will be minimized to the maximum extent possible; any imported material will be removed from the streambed upon completion of the project.

13) Unless approved by the USFWS, water will not be impounded in a manner that may attract CRLFs.

14) An USFWS-approved biologist will permanently remove any individuals of exotic species, such as bullfrogs (*Rana catesbeiana*), crayfish, and centrarchid fishes from the project area, to the maximum extent possible. The USFWS-approved biologist will be responsible for ensuring his or her activities are in compliance with the California Fish and Game Code.

15) If FHWA demonstrates that disturbed areas have been restored to conditions that allow them to function as habitat for the CRLF, these areas will not be included in the amount of total habitat permanently disturbed.

16) To ensure that diseases are not conveyed between work sites by the USFWS-approved biologist, the fieldwork code of practice developed by the Declining Amphibian Populations Task Force will be followed at all time.

17) Project sites will be re-vegetated with an assemblage of native riparian, wetlands, and upland vegetation suitable for the area. Locally collected plant materials will be used to the extent practicable. Invasive, exotic plants will be controlled to the maximum extent practicable. These measures will be implemented in all areas disturbed by activities associated with the project, unless the USFWS and FHWA determine that it is not feasible or practical.

18) FHWA will not use herbicides as the primary method used to control invasive, exotic plants. However, if FHWA determines the use of herbicides is the only feasible method for controlling invasive plants at a specific project site, it will implement the following additional protective measures for the CRLF:

    a) FHWA will not use herbicides during the breeding season for the CRLF;

    b) FHWA will conduct surveys for the CRLF immediately prior to the start of any herbicide use. If found, CRLFs will be relocated to suitable habitat far enough from the project area that no direct contract with herbicides would occur;

    c) Giant reed and other invasive plants will be cut and hauled out by hand and the stems painted with glyphosate or glyphosate-based products, such as Aquamaster or Rodeo.

    d) Licensed and experienced FHWA staff or a licensed and experience contractor will use a hand-held sprayer for foliar application of Aquamaster or Rodeo where large monoculture stands occur at an individual project site;

    e) All precautions will be taken to ensure that no herbicide is applied to native vegetation;

    f) Herbicides will not be applied on or near open water surfaces (no closer than 60 feet from open water).

    g) Foliar applications of herbicide will not occur when wind speeds are in excess of 3 miles per hour.

h) No herbicides will be applied within 24 hours of forecasted rain.

i) Application of all herbicides will be done by a qualified FHWA staff or contractors to ensure that overspray is minimized, that all application is made in accordance with label recommendations, and with implementation of all required and reasonable safety measures. A safe dye will be added to the mixture to visually denote treated sites. Application of herbicides will be consistent with the U.S. Environmental Protection Agency's Office of Pesticide Programs, Endangered Species Protection Program county bulletins.

j) All herbicides, fuels, lubricants, and equipment will be stored, poured, or refilled at least 60 feet from riparian habitat or water bodies in a location where a spill would not drain directly toward aquatic habitat. FHWA will ensure that contamination of habitat does not occur during such operations. Prior to the onset of work, FHWA will ensure that a plan is in place for a prompt and effective response to accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

19) Upon completion of any project for which this programmatic consultation is used, FHWA will ensure that a Project Completion Report is completed and provided to the Ventura Fish and Wildlife Office. FHWA should include recommended modification of the protective measures if alternative measures would facilitate compliance with the provisions of this consultation. In addition, FHWA will reinitiate formal consultation in the event any of the following thresholds are reached as a result of projects conducted under the provisions of this consultation:

FHWA will reinitiate consultation when, as a result of projects conducted under the provisions of this consultation:

a) 10 CRLF adults or juveniles have been killed or injured in a given year (for this and all other standards, an egg mass is considered to be one CRLF);

b) 50 CRLFs have been killed or injured in total;

c) 20 acres of critical habitat for the CRLF that include the primary constituent elements of aquatic breeding and non-breeding aquatic

habitat and upland and dispersal habitat have been permanently lost in any given year;

d) 100 acres of critical habitat for the CRLF that include the primary constituent elements of aquatic breeding and non-breeding aquatic habitat and upland and dispersal habitat have been permanently lost in total;

e) 100 acres of critical habitat for the CRLF that include the primary constituent elements of aquatic breeding and non-breeding aquatic habitat and upland and dispersal habitat have been temporarily disturbed in any given year; or,

f) 500 acres of critical habitat for the CRLF that include the primary constituent elements of aquatic breeding and non-breeding aquatic habitat and upland and dispersal habitat have been temporarily disturbed in total.

4.3.6.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Construction or dewatering activities in aquatic habitats within the BSA could result in direct impacts to CRLF, which could result in injury or death to individual CRLFs, if they are found to be breeding in these areas or estivating in adjacent uplands. Temporary loss of CRLF habitat could result from dewatering/diversion of aquatic areas required for construction.

Project-related construction could result in the placement of permanent structures that would displace aquatic habitat, resulting in loss of available habitat for the species. Areas with the greatest potential for impacts to CRLF would be along Valencia Lagoon, Aptos Creek, Ord Gulch, Nobel Creek, Soquel Creek, and Arana Gulch, which have the largest concentrations of freshwater marsh habitat. The project may affect, but is not likely to adversely affect, CRLF.

Tier II Auxiliary Lane Alternative Impacts

Due to the potential presence of CRLF in Rodeo Gulch and the Soquel Drive-in roadside ditch, the Tier II project has potential to affect, but not adversely affect the species.

Although no CRLF were observed during the protocol survey effort or other reconnaissance surveys within the BSA and there are no nearby CNDDB records,

Caltrans has indicated that there is suitable habitat for the species within the BSA and presence should be inferred.

4.3.6.4. COMPENSATORY MITIGATION

On-site mitigation for, and on-site replacement of, freshwater marsh and riparian vegetation per the project compensatory mitigation for wetlands and riparian habitat (described in Sections 4.1.1.2 and 4.1.1.4) will also mitigate any impacts to CRLF and its habitat. Compensatory mitigation for Tier I may occur on-site and/or off-site depending upon impacts from future projects, whereas, Tier II mitigation will be on-site within the area that is affected. Impacted habitat areas will be fully restored and surrounding areas that are not impacted will be enhanced. FESA Section 7 formal consultation will also be conducted for all federally listed species that could be affected by the proposed project. No additional compensatory mitigation is proposed.

4.3.6.5. CUMULATIVE EFFECTS

If project-related impacts to CRLF were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of the species. Potential impacts will be mostly temporary, permanent impacts will be minimal, with implementation of the above avoidance and minimization measures. Furthermore, implementation of compensatory mitigation for loss of any wetlands or riparian areas are anticipated to be sufficient to mitigate potential impacts to CRLF habitat.

4.3.7. Discussion of Foothill Yellow-legged Frog *(Rana boylii)*

The FYLF is considered a CSC species by CDFW. It differs from the CRLF in that it features yellow color on its underparts and lacks the CRLF's diagnostic dorsolateral fold. The FYLF has historically ranged from Oregon south to the San Gabriel Mountains and Sierra Nevada of California. It has been found as far south as Baja California, but not since 1965. Stebbins (2003) states that the species is apparently extinct from the southern border of Monterey County throughout southern California. In areas where they persist, they are known to range from near sea level to 6,693 feet (Stebbins 2003).

FYLFs are frequently found in shallow, flowing water, in small to moderate-sized streams with at least some cobble-sized substrate. The species is rarely observed far from permanent water, unlike most ranid frogs in California. FYLFs are typically found in or near rocky streams in a variety of habitats, including, but not limited to, valley foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types. Breeding usually commences at the end of spring flooding, typically from May to early June.

4.3.7.1. SURVEY RESULTS

As previously mentioned, focused FYLF surveys were conducted concurrently with protocol CRLF surveys in suitable habitat within the BSA from September 30 to October 2, 2003. No FYLFs were observed within Tier I or Tier II areas during this survey effort. Detailed discussion of the survey effort is provided in the California Red-legged Frog Survey Report (Morro Group 2004).

The nearest known FYLF occurrences are from Soquel Creek 0.3 mile upstream from the BSA. There are no other CNDDB records for FYLF within the BSA (CNDDB 2007). There is also a 1998 CNDDB record from an upstream reach of Aptos Creek 4.2 miles from the BSA (CNDDB 2014).

4.3.7.2. AVOIDANCE AND MINIMIZATION EFFORTS

The avoidance and minimization measures described in Section 4.3.6.2 for CRLF will also be applicable for FYLF. In addition, the following mitigation measure specifically applies to FYLF.

1) If project-related construction will impact aquatic areas and if regulatory agency approval allows, qualified biologists shall conduct a pre-construction survey for FYLF in aquatic areas where construction will occur. The qualified biologists shall capture and relocate any FYLF (if present) or other sensitive aquatic species to suitable habitat outside of the area of impact. A letter of permission will be obtained from CDFW to relocate FYLF and other CSC species from work areas encountered during construction within the BSA as necessary.

4.3.7.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Although FYLF were not identified during focused surveys for CRLF within the BSA, there is a potential for this species to occur. Therefore, temporary loss of habitat could result from dewatering/diversion of aquatic areas required for construction. Construction or dewatering activities in aquatic habitats within the BSA could also result in direct impacts to FYLF, which could result in injury or death to individual FYLF, if they are found to be breeding in these areas. Areas with the greatest potential for impacts to FYLF would be along Aptos Creek, Soquel Creek, and Arana Gulch, which support high quality riverine habitat.

Tier II Auxiliary Lane Alternative Impacts

Although FYLF were not identified during focused surveys for CRLF within the BSA, there is a potential for this species to occur in Rodeo Gulch and the Soquel Drive-in roadside ditch. Therefore, temporary loss of habitat could result from

dewatering/diversion of aquatic areas required for construction. Construction or dewatering activities in aquatic habitats within the BSA could also result in direct impacts to FYLF, which could result in injury or death to individual FYLF, if they are found to be breeding in these areas.

4.3.7.4. COMPENSATORY MITIGATION

Mitigation for any loss of freshwater marsh and riparian vegetation will also mitigate any impacts to FYLF and its habitat. No additional compensatory mitigation is proposed.

4.3.7.5. CUMULATIVE EFFECTS

If project-related impacts to FYLF were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of the species, because impacts will be mostly temporary, permanent impacts will be minimal, and the above mitigation measures and implementation of the compensatory mitigation for loss of any wetland or riparian habitat are also anticipated to be sufficient to minimize any impacts to FYLF.

4.3.8. Discussion of Western Pond Turtle (*Actinemys marmorata*)

The WPT is considered a CSC species by the CDFW. Pond turtles live where water persists year-round in ponds along foothill streams or in broad washes near the coast. The ponds favored by turtles typically support emergent and floating vegetation such as cattails and algal mats.

The WPT historically has been present in most Pacific slope drainages between the Oregon and Mexican borders (Jennings and Hayes 1994). It is mostly aquatic, leaving its aquatic site to reproduce, estivate, and over-winter. Pond turtles also bask on half-submerged logs, rocks, or flat shorelines close to the edge of water. Pond turtles may overwinter on land or in water, but may remain active in water during the winter season. In warmer areas along the central and southern California coast, pond turtles may be active all year (Zeiner et al. 1990).

The WPT prefers quiet waters of ponds, lakes, streams, and marshes. This subspecies inhabits reaches of streams that contain deep pools, from 3 to 5.2 feet in depth (Stebbins 1972). They typically inhabit the largest and deepest pools along streams containing large amounts of basking sites, including fallen trees and boulders. This species can occasionally be found crawling across creek riffles or traversing open fields during transient movements. Upland nesting sites are required near the aquatic site, and nests are typically located in open, clay or silt slopes to ensure proper

incubation temperature (Jennings and Hayes 1994). Nesting sites may be more than 1,312 feet from the aquatic site, but most nests are within 656 feet.

4.3.8.1. SURVEY RESULTS

Although suitable aquatic habitat occurs within the several drainages within the BSA, no WPTs were observed during protocol CRLF surveys or other reconnaissance surveys conducted within the BSA.

4.3.8.2. AVOIDANCE AND MINIMIZATION EFFORTS

The measures discussed in previous sections for aquatic special-status species are also applicable to WPT to avoid or minimize impacts to the subspecies. In addition, the following measure applying specifically to WPT is recommended.

1) If project-related construction will impact aquatic areas and if regulatory agency approval allows, qualified biologists shall conduct a pre-construction survey for WPT in aquatic areas where construction will occur. The qualified biologists shall capture and relocate any WPT (if present) or other sensitive aquatic species to suitable habitat outside of the area of impact. A letter of permission will be obtained from CDFW to relocate WPT and other CSC species from work areas encountered during construction within the BSA as necessary.

4.3.8.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Construction or dewatering activities in aquatic habitats within the BSA could result in direct impacts to WPT, which could result in injury or death to individual pond turtles if they are found inhabiting aquatic areas or estivating along the banks of drainages. Temporary loss of WPT habitat could result from dewatering/diversion of aquatic areas required for construction. Project-related construction could result in the placement of permanent structures that would displace aquatic habitat, resulting in loss of available habitat for the species.

Tier II Auxiliary Lane Alternative Impacts

Although it is very unlikely, WPT could occur within Rodeo Gulch and the Soquel Drive-in roadside ditch. Construction or dewatering activities in aquatic habitats within the BSA could result in direct impacts to WPT, which could result in injury or death to individual pond turtles if they are found inhabiting aquatic areas or estivating along the banks of drainages. Temporary loss of WPT habitat could result from dewatering/diversion of aquatic areas required for construction. Project-related construction could result in the placement of permanent structures that would displace aquatic habitat, resulting in loss of available habitat for the species.

4.3.8.4. COMPENSATORY MITIGATION

Compensatory mitigation for any loss of wetland or riparian habitat would also compensate for any impacts to habitat for WPT. No additional compensatory mitigation is proposed.

4.3.8.5. CUMULATIVE EFFECTS

If project-related impacts to WPT were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of the species. Potential impacts will be mostly temporary, permanent impacts will be minimal, with implementation of the above mitigation measures. Furthermore, implementation of compensatory mitigation for any loss of wetland or riparian habitat would be sufficient to minimize impacts.

4.3.9. Discussion of Cooper's Hawk (*Accipiter cooperii*), Tricolored Blackbird (*Agelaius tricolor*), Short-eared Owl (*Asio flammeus*), White-tailed Kite (*Elanus leucurus*), and Other Nesting Migratory Birds

These bird species have been addressed as a group because it is expected that bird species would be subjected to similar potential project-related impacts, particularly during the nesting season. This discussion covers the project BSA, and includes the Tier II project area.

The Cooper's hawk is considered a CSC species by CDFW. It is a fairly large accipiter hawk that ranges throughout the United States and is widely distributed throughout California, though its numbers are declining. Adults are slender, crow-sized birds with short, rounded wings and a long, white-tipped tail rounded at the tip. The Cooper's hawk occupies forests and woodlands, especially near edges. It is rarely found in areas without dense tree stands or patchy woodland habitat. This species nests and forages in and near deciduous riparian areas. Breeding occurs March to August, peaking from May to July (Baicich and Harrison 1997). Incubation lasts approximately 36 days, and young hatch and fledge approximately 5 to 8 weeks later. Prey includes mostly birds and small mammals.

The tricolored blackbird (*Agelaius tricolor*) is considered a CSC species by the CDFW. This species is similar to the more common red-winged blackbird, except for a prominent white stripe under the red wing patch, and more pointed wings and bill. It is common locally throughout California, particularly the Central Valley, breeding near fresh water, preferably in emergent wetlands. It forages in grasslands and croplands. Tricolored blackbirds usually nest in dense cattails or bulrushes. They

also nest in thickets of willows, blackberry, wild rose (*Rosa californica*), and tall forbs. Mud or plant material nests are usually located a few feet over, or near, fresh water, or may be hidden on the ground among low vegetation. The typical breeding season for tricolored blackbirds is mid-April into late July. A colony varies in size from a minimum of about 50 nests to over 20,000 in an area of 10 acres or less.

The short-eared owl (*Asio flammeus*) is considered a CSC species by the CDFW. It is a widespread winter migrant, found primarily in the Central Valley, in the western Sierra Nevada foothills, and along the coast (Zeiner et al. 1990). The short-eared owl is usually found in open areas with few trees, such as annual and perennial grasslands, prairies, dunes, meadows, irrigated lands, and saline and fresh emergent wetlands. Zeiner et al. (1990) indicate that the breeding range includes the San Francisco Bay Delta and areas north, northeastern Modoc plateau, the eastern Sierra from Lake Tahoe south to Inyo County, and the San Joaquin Valley, but there is a CNDDB nesting record at the mouth of the Salinas River, approximately 11 miles south of the BSA.

The white-tailed kite is recognized as a State of California Fully Protected species. A medium-sized white raptor, the white-tailed kite is a yearlong resident ranging throughout the San Joaquin Valley and coastal lowlands in California, and most commonly, near agricultural areas. It is generally found in open cultivated and marshy bottomlands with scattered trees, savannahs, agricultural areas with windbreaks, orchards, and roadsides. Nesting and roosting occurs in dense, broad-leafed deciduous groves of trees. The nest is made of loosely piled sticks and twigs and lined with grass, straw, or rootlets. Nests are located near open foraging areas. Breeding occurs from February-October, peaking in May-August, where three to six eggs are typically laid. White-tailed kites prey mostly on voles and other small, diurnal mammals, and occasionally on birds, insects, reptiles, and amphibians. Its Fully Protected status means no take authorization can be granted by the State of California for the species, other than for scientific purposes; therefore, take must be completely avoided.

Numerous other nesting migratory bird species protected by the MBTA and California Fish and Game Code Section 3503 have the potential to nest within artificial structures, riparian trees, landscaped trees, freshwater marsh, and other vegetation within the BSA.

4.3.9.1. SURVEY RESULTS

No special-status bird species or active nests of any migratory bird species were observed during surveys of the BSA. There are CNDDB records and suitable habitat for several CSC bird species in or near the BSA (CNDDB 2014).

4.3.9.2. AVOIDANCE AND MINIMIZATION EFFORTS

The following measures apply to the bird species previously discussed and all other birds protected by the MBTA and California Fish and Game Code. The list of birds protected by these regulatory laws is extensive, and not all birds protected by these laws are included in Table 7. There are no formal survey protocols for most of these bird species, but CDFW typically requires pre-construction nesting bird surveys and avoidance of impacts to active bird nests.

1) If feasible, removal of trees shall be scheduled to occur in the fall and winter (between September 1 and February 15), outside of the typical nesting season.

2) If any construction activities are proposed to occur during the typical nesting season (February 16 to August 31), a nesting bird survey of the area of disturbance shall be conducted by qualified biologists no more than two weeks prior to construction to determine presence/absence of nesting birds within the project area.

3) If evidence of migratory bird nesting that may be impacted by construction activities is discovered, or when birds are injured or killed as a result of construction activities, the contractor shall immediately notify the engineer or biological monitor. At a minimum, a 500-foot radius of the nest shall be designated an ESA for nesting raptors, and a 250-foot radius shall be designated an ESA for other nesting avian species, unless otherwise directed by USFWS or CDFW. Nests, eggs, or young of birds covered by the MBTA and California Fish and Game Code would not be moved or disturbed until the end of the nesting season or until young fledge, whichever is later, nor would adult birds be killed, injured, or harassed at any time. The ESA shall remain in place until such time that the nest is no longer considered active by the qualified biologist. Written notification shall be provided to Caltrans, the RTC, and the resource agencies by the qualified biologist.

4) If white tailed kite is identified within the BSA at any time during the proposed project, the biological monitor shall thoroughly document the species activity and ensure that immediate project activities avoid any impacts to the species. If

there is a potential for take, CDFW shall be contacted immediately to ensure that avoidance of take is maintained throughout the duration of project activities.

5) Vegetation removal in potential nesting habitats shall be monitored and documented by the biological monitor(s) regardless of time of year.

4.3.9.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

The removal of vegetation and/or the removal of nests could directly impact bird nests and any eggs or young residing in nests. As birds can be sensitive to noise disturbance, temporary indirect impacts could also result from noise and disturbance associated with construction, which could alter perching, foraging, and/or nesting behaviors.

Tier II Auxiliary Lane Alternative Impacts

The discussion above for Tier I Corridor Alternatives impacts also applies to the Tier II Auxiliary Lane Alternative.

4.3.9.4. COMPENSATORY MITIGATION

Most project impacts to nesting migratory bird species are anticipated to be temporary. Compensatory mitigation for any permanent impacts to wetland or riparian habitat that may be utilized by nesting migratory bird species will be mitigated with implementation of compensatory mitigation described in Sections 4.1.1.4 and 4.1.2.4. No additional compensatory mitigation is proposed.

4.3.9.5. CUMULATIVE EFFECTS

If project-related impacts to nesting bird species were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of any bird species. Potential impacts will be mostly temporary, permanent impacts will be minimal, with implementation of the above mitigation measures. Furthermore, compensatory mitigation for any impacts to wetland or riparian habitat would be sufficient to minimize impacts.

4.3.10. Discussion of Burrowing Owl (*Athene cunicularia*)

The burrowing owl is considered a CSC species by the CDFW. Burrowing owls are small, brown, long-legged owls that inhabit open, dry grasslands, agricultural areas, rangelands, and desert habitats often associated with burrowing animals. They can also inhabit grass, forbs, and shrub stages of pinyon and ponderosa pine habitats at elevations ranging from 200 feet below sea level to 9,000 feet. This owl commonly perches on fence posts or on the top of mounds outside its burrow. Burrowing owls

are active day and night, but are usually less active in the peak of the day. They tend to be opportunistic feeders. As their name suggests, burrowing owls nest in burrows in the ground, often in old ground squirrel burrows or badger dens. They can dig their own burrows, but prefer deserted excavations of other animals. They are also known to use artificial burrows. Breeding occurs from March through August, with peak in April and May. Prey items commonly include small rodents, mice, and insects.

4.3.10.1. SURVEY RESULTS

No burrowing owls were observed during reconnaissance surveys of the BSA; however, no CDFW protocol burrowing owl surveys were conducted. According to the CNDDB, the nearest occurrence of burrowing owl is approximately 3.5 miles west of the BSA at UC Santa Cruz, where 14 owls have been documented to overwinter (CNDDB 2014). Marginal annual grassland habitat is located west of Freedom Blvd west of the BSA.

4.3.10.2. AVOIDANCE AND MINIMIZATION EFFORTS

1) If construction activities are proposed to occur within annual grassland habitat, coordination with CDFW shall occur regarding protocol surveys, mitigation guidance, and authorization to passively relocate burrowing owls, if necessary.

2) If CDFW requires protocol surveys, surveys shall be conducted as outlined in the protocol *Burrowing Owl Survey Protocol and Mitigation Guidelines* (California Burrowing Owl Consortium 1993) and CDFW Staff Report on Burrowing Owl Mitigation (refer to Appendix H; CDFW 2012), or the most recent guidelines, prior to project approvals.

3) If protocol surveys confirm occupied burrowing owl habitat, mitigation actions shall be carried out prior to the burrowing owl breeding season, as outlined in California Burrowing Owl Consortium (1993) and CDFW Staff Report on Burrowing Owl Mitigation (2012).

4) As required by the burrowing owl protocol, if burrowing owls are discovered in the BSA a burrowing owl monitoring plan shall be prepared. Prior to implementation the Plan shall be reviewed and approved by CDFW.

4.3.10.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Construction in grassland habitat within the Tier I Corridor Alternatives project area could result in direct impacts to small mammal burrows such as ground squirrel

burrows. If these burrows are occupied by burrowing owls, grading, and other clearing activities associated with construction could entomb owls, resulting in injury or mortality. The noise and disturbance associated with construction could also drive owls away from burrows, which could alter foraging and breeding behaviors and could be particularly detrimental during the nesting season.

Tier II Auxiliary Lane Alternative Impacts

Although small mammal burrows are present within the Tier II Auxiliary Lane Alternative, no suitable annual grassland habitat is present with this area. Therefore, potential impacts to burrowing owl associated with Tier II activities are not anticipated.

4.3.10.4. COMPENSATORY MITIGATION

No additional compensatory mitigation is proposed beyond any regulatory agency-mandated requirements outlined in the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012), which is included as Appendix H.

4.3.10.5. CUMULATIVE EFFECTS

If project-related impacts to burrowing owl were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of the species. Potential impacts will be mostly temporary, permanent impacts will be minimal with implementation of the above mitigation measures.

4.3.11. Discussion of Least Bell's Vireo (*Vireo bellii pusillus*)

The LBV is a federal and state endangered species. Critical habitat has been designated for the species, but not within the BSA. It is one of four recognized subspecies of Bell's vireo and is the western-most subspecies, breeding entirely within California and northern Baja California. Historically, the LBV was a common to locally abundant species in lowland riparian habitat, ranging from coastal southern California through the Sacramento and San Joaquin Valleys as far north as Tehama County (Kus 2002). It has also occurred in foothill streams of the Sierra Nevada and Coast Ranges, and in Owens Valley, Death Valley, and scattered locations in the Mojave Desert. Grinnell and Miller (1944) reported elevation ranges extremes of -175 feet in Death Valley to 4,100 feet at Bishop, Inyo County.

By the time the species was listed by the USFWS in 1986, the LBV had been extirpated from most of its historic range, and numbered just 300 pairs statewide (Kus 2002). Populations were confined to eight counties south of Santa Barbara, with the majority of birds occurring in San Diego County. Since its listing, LBV numbers have

increased 600%, and the species is expanding into its historic range. In 1998, the population size was estimated at 2,000 pairs. Roughly half of the current vireo population occurs on drainages within Marine Corps Base Camp Pendleton in San Diego County (USFWS 1998b).

LBVs usually arrive in California during mid- to late-March. They build their nests in a variety of plants that provide concealment in the form of dense foliage. The most frequently used species include willows (*Salix* spp.), mulefat (*Baccharis glutinosa*), California wild rose, poison oak, mugwort, and cottonwood (*Populus* spp.). Nests are typically placed within 1 meter of the ground (Kus 2002). The nests are open-cup nests placed in the horizontal fork of a tree or shrub branch and bound at the rim. Females typically lay clutches of two to four eggs, and incubation takes 14 days. Nestlings fledge 10-12 days after hatching. Vireos usually leave breeding grounds by September, but will occasionally overwinter in California. Their primary diet is insects.

Recovery efforts for LBV focus on addressing two major causes of decline: 1) habitat loss and degradation; and 2) brown-headed cowbird nest parasitism. Specific LBV recovery actions include: 1) protect and manage riparian and adjacent upland habitats within the LBV's historical range; 2) conduct LBV research; 3) develop and evaluate LBV habitat restoration techniques; 4) reintroduce LBVs to unoccupied habitat in the historical range through translocation; 5) evaluate progress of recovery, effectiveness of management and recovery actions, and revise management plans; and 6) provide public information and education (USFWS 1998b).

4.3.11.1. SURVEY RESULTS

The species was included for consideration because it appears on the on-line USFWS federally listed species list for species potentially occurring in Santa Cruz County (USFWS 2007, 2014). There are no CNDDB records for the species in or near the BSA, nor are there any known recent nesting records in the vicinity of the BSA. No LBVs were observed during reconnaissance surveys of the BSA.

Biologist Jim Greaves was contacted on May 29, 2008, for his professional opinion in regards to the potential for LBV nesting activity in the region of Santa Cruz (Greaves 2008a). Mr. Greaves is a respected LBV biologist who has conducted numerous LBV protocol surveys throughout California. Mr. Greaves conducted background research and conducted a site visit of riparian habitats within the BSA on June 12, 2008. Several disjunct, narrow riparian segments of Arana Gulch along Route 1 between Morrissey Blvd. and Soquel Ave. were examined to determine whether or

not riparian habitats there are suitable for LBV and whether or not a protocol-level series of surveys for the bird should be conducted. Refer to the 2009 Highway 1 Soquel to Morrissey Auxiliary Lanes Project NES for complete results of this study, summarized below.

Habitats at the several Arana Gulch fragments did not appear to be of the type preferred by LBV (Greaves 2008b). Generally, LBV breed in broad floodplain forests or tributaries fairly near such forests, but not in isolated patches of disjunct habitat or steeply incised areas such as those along Route 1.

There are no recent records of other "extra-limital" breeding sites in California, and none along the Salinas River Valley and associated areas of Monterey and Santa Cruz Counties (Greaves 2008b). The species is virtually limited during the breeding season to riparian habitats in interior central Santa Barbara, southward along several major coastal counties' rivers (Ventura, Santa Clara, and southward through San Diego), in a few southern California desert riparian areas of California, USA, and northern Baja California, Mexico (Greaves 2008b).

The investigation by Mr. Greaves ultimately determined that protocol-level surveys are not warranted for this project (Greaves 2008b). While some plant species (e.g., willows, nettles, blackberry) and vegetative features (shrubs, forbs) that occur along Arana Gulch are also present where LBV typically occur, their presence alone does not predict the presence of LBV. Other features of the study site must also be considered when making recommendations to conduct protocol-level surveys: habitat breadth, ravine depth, canopy density, etc. Other factors may be equally important in helping determine whether or not an area might also harbor LBV, including riparian width and vegetation, plant species composition, and avian communities.

Based on features that do exist at Arana Gulch, and its isolation from historical and currently known LBV sites, as well as the absence of so many avian associates, it was concluded that LBV will not be present in Arana Gulch near Route 1 and that it is unlikely LBV will ever be in the area, in addition to and regardless of the current and/or future urban pressures put on the place, or even if they are all removed (Greaves 2008b).

No LBVs were observed during reconnaissance surveys of the BSA; however, no protocol surveys were conducted for the species. There are no CNDDB records for the species within the BSA. The species was included for consideration because it appears on the USFWS federally listed species list for Santa Cruz County. Habitat in

the BSA is considered to be marginal because rather than low-growing, dense riparian scrub, the riparian corridors of the BSA feature mainly a riparian forest overstory composition. There are no known recent nesting records in the vicinity of the BSA.

4.3.11.2. AVOIDANCE AND MINIMIZATION EFFORTS

The measures included in Section 4.3.9.2 can be applied to avoid or minimize impacts to LBV. No additional avoidance or minimization measures are necessary for LBV because the species is not expected to occur in or near the BSA, which includes the Tier I Corridor Alternatives or the Tier II Auxiliary Lane Alternative.

4.3.11.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

The proposed project will have no effect on LBV. Riparian habitat in the Tier I Corridor Alternatives project area is unsuitable and there are no known nesting records in or near the BSA.

Tier II Auxiliary Lane Alternative Impacts

The proposed project is expected to have no effect on LBV. Riparian habitat in the BSA Tier II Auxiliary Lane Alternative project area is unsuitable and there are no known nesting records in or near the BSA.

4.3.11.4. COMPENSATORY MITIGATION

Compensatory mitigation for impacts to wetland and riparian habitat will also mitigate potential impacts to nesting bird habitat. No additional compensatory mitigation is proposed.

4.3.11.5. CUMULATIVE EFFECTS

There will be no cumulative effects to LBV resulting from the project.

4.3.12. Discussion of Roosting Bats (Order Chiroptera)

Several species of bats may potentially roost within trees or anthropogenic habitats (e.g., bridges) within the BSA.

4.3.12.1. SURVEY RESULTS

No roosting bats were observed during reconnaissance surveys of the BSA. No focused surveys for roosting bats were conducted. Staining observed underneath the bridge at Soquel Creek Bridge possibly indicate bat roosting has taken place at this bridge at some time in the past (refer to Photo 12 in Appendix E). Consequently, prior to the release of the Tier I/Tier II Final environmental document, focused surveys for bats would be conducted in portions of the Tier II Auxiliary Lane

Alternative project area that will be temporarily and/or permanently impacted. If roosting bat species are found as a result of these surveys, avoidance and minimization measures described below will be implemented.

4.3.12.2. AVOIDANCE AND MINIMIZATION EFFORTS

The following measures are recommended to avoid and minimize any potential impacts.

1) A qualified biologist shall conduct pre-construction surveys the year prior to construction for bats species that could be utilizing existing structures or trees for roosting habitat. If bats are identified as utilizing areas within the BSA for day or night roosting, the qualified biologist shall identify the species of bat present. The biologist(s) conducting the pre-construction surveys shall also identify the nature of the bat utilization of the bridge (i.e., maternity roost, day roost, night roost).

2) If bat species are identified as roosting in areas that will be impacted, prior to construction, a plan to exclude bat species from impact areas shall be prepared. This plan shall discuss methods of eliminating bat access to the identified roosting habitat prior to construction so that bats are not able to return to and occupy the roost. The appropriate timing for exclusion implementation shall be determined upon the species identified as occurring within the project site. Roost areas shall be surveyed by a qualified biologist prior to implementing exclusion methods to ensure that no bats are trapped within. Exclusion methods may include, but are not limited to, wire mesh, spray foam, or fabric placement. This plan shall be submitted to the appropriate regulatory agency for approval.

3) Demolition of existing structures and vegetation removal shall occur outside of the bat maternity roosting season, typically during the spring and summer months.

4) If bats cannot be excluded from bat roosts, work activities shall be avoided within 100 feet of active maternity roosts until bats pups have been weaned and are deemed independent by a qualified biologist. Regulatory agencies shall be contacted for additional guidance if roosting bats are observed within the BSA during construction.

5) A qualified biologist shall be present periodically during construction activities to monitor the bat populations, which may be utilizing the bridge and to ensure that all practicable measures are employed to avoid incidental disturbance to

special-status bat species. Monitoring would be timed to occur during key construction events (e.g., removal of existing structures or trees with roosting habitat).

4.3.12.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Temporary and permanent impacts for the Tier I Corridor Alternatives cannot be quantified at this time, and will not be able to be quantified until focused surveys within the BSA are conducted to confirm presence or absence of roosting bat species. These surveys will be conducted prior to circulation of environmental documents for future Tier II projects. The Tier I Corridor Alternatives have the potential to impact bat species that may utilize existing structures or trees as roosting habitat. Removing structure or vegetation with roosting bats could lead to direct impacts to bat species. As bats can be sensitive to noise disturbance, indirect impacts could also result from noise and disturbance associated with construction, which could alter roosting behaviors. Potential adverse effects resulting from construction activities can be avoided or minimized through the implementation of the measures discussed in Section 4.3.12.2.

Tier II Auxiliary Lane Alternative Impacts

The Tier II Auxiliary Lane Alternative would not remove structures that have the potential to provide suitable roosting habitat; however, Tier II activities will result in impacts to vegetation that have the potential to provide suitable roosting habitat for bat species. The Tier II activities have the potential to impact bat species that may utilize trees as roosting habitat. Removing vegetation with roosting bats could lead to direct impacts to bat species. Bats can be sensitive to noise disturbance; indirect impacts could also result from noise and disturbance associated with construction, which could alter roosting behaviors. Prior to circulation of the final environmental document, focused surveys within the Tier II Auxiliary Lane Alternative project area will be conducted to confirm presence or absence of roosting bat species. Potential adverse effects resulting from construction activities can be avoided or minimized through the implementation of the measures discussed in Section 4.3.12.2.

4.3.12.4. COMPENSATORY MITIGATION

If the proposed project permanently affects a major roost location, compensatory mitigation would be required. Compensatory mitigation shall include replacement of suitable habitat that follows the guidance included within *California Bat Mitigation Techniques, Solutions and Effectiveness*, prepared for Caltrans (H.T. Harvey 2004). Refer to Appendix I.

4.3.12.5. CUMULATIVE EFFECTS

If project-related impacts to roosting bats were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of bat species. Potential impacts will be mostly temporary, permanent impacts will be minimal with implementation of the above avoidance and minimization measures.

4.3.13. Discussion of American Badger (*Taxidea taxus*)

The American badger (*Taxidea taxus*) is considered a CSC species by CDFW. It is a stocky, medium-sized mammal, with a body form that is low to the ground. The badger's head is dark with contrasting white stripes, and it has long, thick claws used for digging. It is an uncommon, permanent resident found throughout most of the state, and is most abundant in drier open stages of most shrub, forest, and herbaceous habitats with friable soils (Zeiner et al. 1990). Badgers dig burrows in friable soil for cover, and frequently reuse old burrows. The species is non-migratory, and has a confined home range in the winter. They are active year-round, diurnally and nocturnally. Badgers mate in summer and early fall. They are carnivorous, feeding on burrowing rodents such as rats and mice, and especially ground squirrels and gophers.

4.3.13.1. SURVEY RESULTS

No American badgers were observed during reconnaissance surveys of the BSA. The nearest known CNDDB occurrence record for the species is approximately 2.5 miles west of the BSA at UC Santa Cruz. No suitable annual grassland habitat areas are present within the BSA. Annual grassland present in the southern portion of the project is located within or immediately adjacent to Route 1 on/off ramp areas.

4.3.13.2. AVOIDANCE AND MINIMIZATION EFFORTS

1) Prior to construction, if annual grassland habitat will be impacted, qualified biologists shall conduct surveys for American badger dens in annual grassland habitat. If American badger dens are identified, CDFW shall be contacted immediately. Dens must either be avoided, or badgers trapped and relocated. If badgers are to be relocated, a letter of permission will need to be acquired from CDFW.

4.3.13.3. PROJECT IMPACTS

Tier I Corridor Alternatives Potential Impacts

Grading or other earthwork in annual grasslands could impact badger dens and possibly result in injured or entombed animals. Badgers can be sensitive to noise disturbance, and indirect impacts could also occur from noise and disturbance

associated with construction, which could alter foraging, denning, or reproductive behaviors. The potential for impacts to American badger are expected to be minimal, and limited to a small patch of marginal annual grassland habitat at the southern end of the BSA.

Tier II Auxiliary Lane Alternative Impacts

No suitable habitat for this species occurs within the Tier II Auxiliary Lane Alternative project area; therefore, the project would have no effect on this species.

4.3.13.4. COMPENSATORY MITIGATION

No compensatory mitigation is proposed.

4.3.13.5. CUMULATIVE EFFECTS

If project-related impacts to American badger were to occur, it is estimated that the cumulative effects would not result in jeopardy or extinction of the species. Potential impacts will likely be temporary, permanent impacts will be minimal, with implementation of the above avoidance and minimization measures.

Chapter 5. Results: Permits & Technical Studies for Special Laws or Conditions

5.1. Federal Endangered Species Act Consultation Summary

No formal FESA consultation with USFWS or NOAA Fisheries has been conducted for the Tier I project because no impacts will result from Tier I project approval. The Tier II project has the potential to affect two federally listed species, CRLF and tidewater goby. Formal FESA consultation will need to be completed prior to Tier II project implementation.

5.2. Federal Fisheries and Essential Fish Habitat Consultation Summary

The Pacific Fishery Management Council (PFMC) is one of eight regional fishery management councils created by the 1976 Magnuson Fisheries Conservation and Management Act, renamed Magnuson Stevens Fisheries Conservation and Management Act in 1996, to manage living marine resources within that area (NOAA Fisheries 2007).

The PFMC is responsible for the creation of management plans for fishery resources (FMPs) in federal waters off the coast of California, and regulation for federally protected Essential Fish Habitat (EFH). These FMPs are for: Pacific coast groundfish, commercial and recreational west coast salmon fisheries, and northern anchovy/coastal pelagics. EFH descriptions and identifications for the Pacific's FMPs were approved on: September 27, 2000, for west coast salmon fisheries; June 10, 1999, for northern anchovy/coastal pelagics; and March 3, 1999, for Pacific coast groundfish.

No federal fisheries and EFH consultation has been conducted to date. As there is no habitat for Pacific coast groundfish, salmon fisheries, and northern anchovy/coastal pelagics within the BSA, no such consultation should be required for the Tier I and Tier II projects.

5.3. California Endangered Species Act Consultation Summary

No formal CESA consultation with CDFW has been conducted for the proposed Tier I Corridor Alternatives. Coordination with CDFW may be necessary to determine if a

Section 2081 Incidental Take Permit may be required for the following state listed species: marsh sandwort, seaside bird's beak, Santa Cruz tarplant, and San Francisco popcorn flower. State incidental take authorization cannot be granted for the Fully Protected SCLTS or white-tailed kite.

The Tier II Auxiliary Lane Alternative is not likely to adversely affect state listed species; however, in the unlikely event that state-listed species are identified during surveys prior to implementation, CESA consultation will need to be completed prior to Tier II project implementation.

5.4. Wetlands and Other Waters Coordination Summary

No wetlands and other waters coordination with USACE, RWQCB, CDFW, or CCC, have been conducted for the proposed Tier I project. A Wetland Assessment has been prepared for the Tier I project (refer to Appendix D). The proposed Tier II project has potential to affect wetlands and other waters identified in the Wetland Assessment. Consultation with the aforementioned regulatory agencies, the acquisition of appropriate permits and agreements, and implementation of the above avoidance and minimization measures will need to be completed prior to Tier II project implementation.

5.5. Invasive Species

As stated previously, nine exotic, invasive plant species as identified by the California Invasive Plant Council were observed in the BSA. On February 3, 1999, Executive Order 13112 was signed establishing the National Invasive Species Council. The Executive Order requires that a Council of Departments dealing with invasive species be created. Each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law:

1) Identify such actions;

2) (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them; and,

3) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species.

Measures designed to avoid inadvertent spread or introduction of invasive species are proposed in Section 4.1.2.7 of this document.

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LIST OF PREPARERS

Geoff Hoetker, Senior Biologist, SWCA (NES)

Bob Sloan, Senior Biologist, SWCA (NES and Wetland Assessment)

Travis Belt, Senior Biologist, SWCA (Tree Survey)

Deborah Hollowell, GIS/Graphics Specialist, Morro Group (NES and Wetland Assessment)

Jon Claxton, Natural Resources Team Leader, SWCA (NES Revisions 2014)

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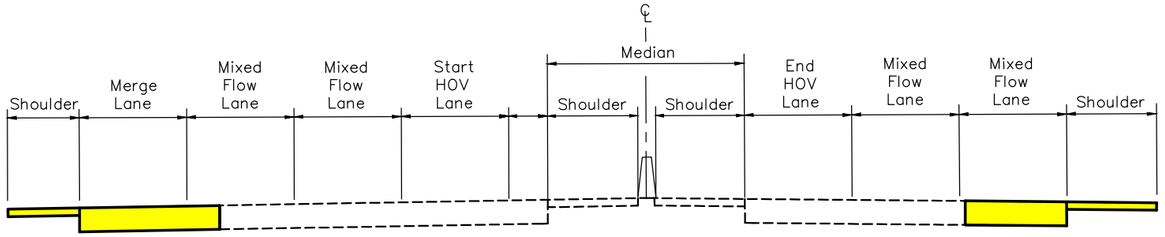
Appendix A. Tier I Project Plans

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	1	20

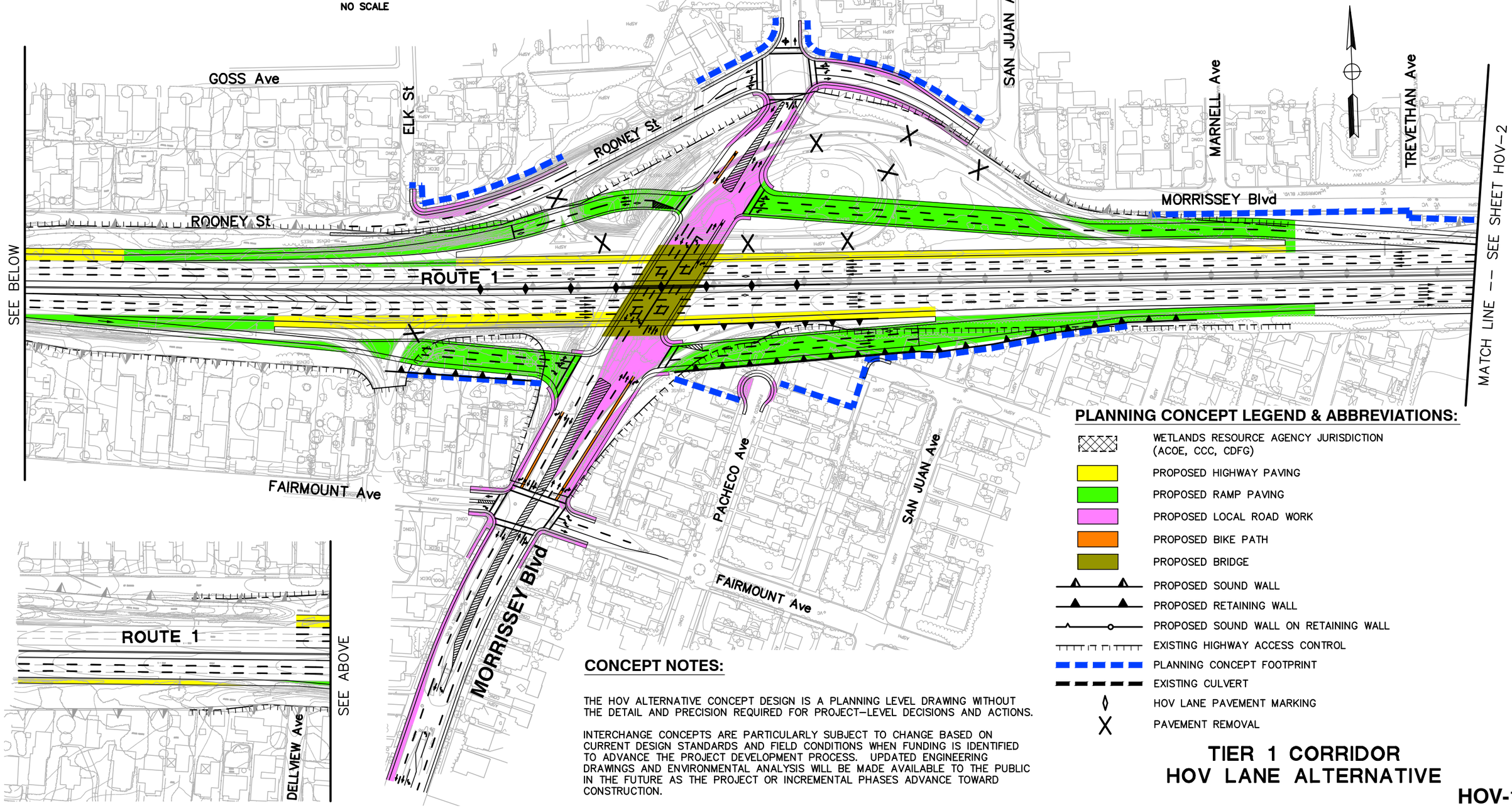


TYPICAL SECTION – NO RAMPS SHOWN

NO SCALE

GENERAL NOTES:

1. ALL EXISTING BIKE LANES AND BIKE PATHS WILL BE MAINTAINED IN PLACE, UNLESS OTHERWISE NOTED.
2. SECTION SHOWN ON PLANS ARE FOR LANE CONFIGURATION PURPOSE ONLY
3. ALL CURB RETURNS WHERE SIDEWALKS ARE PRESENT WILL HAVE CURB RAMPS.
4. ALL R/W LINES THAT ARE ACCESS CONTROLLED WILL HAVE WALLS OR FENCING.
5. SEE SHEET HOV–2 FOR ABBREVIATIONS.



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- X PAVEMENT REMOVAL

CONCEPT NOTES:

THE HOV ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT–LEVEL DECISIONS AND ACTIONS.

INTERCHANGE CONCEPTS ARE PARTICULARLY SUBJECT TO CHANGE BASED ON CURRENT DESIGN STANDARDS AND FIELD CONDITIONS WHEN FUNDING IS IDENTIFIED TO ADVANCE THE PROJECT DEVELOPMENT PROCESS. UPDATED ENGINEERING DRAWINGS AND ENVIRONMENTAL ANALYSIS WILL BE MADE AVAILABLE TO THE PUBLIC IN THE FUTURE AS THE PROJECT OR INCREMENTAL PHASES ADVANCE TOWARD CONSTRUCTION.

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

HOV-1

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	2	20

CONCEPT NOTES:

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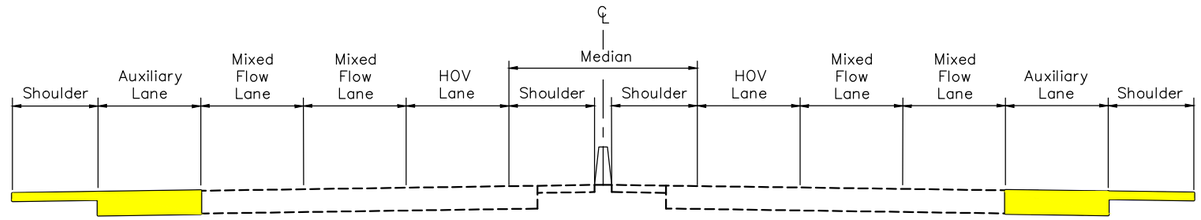

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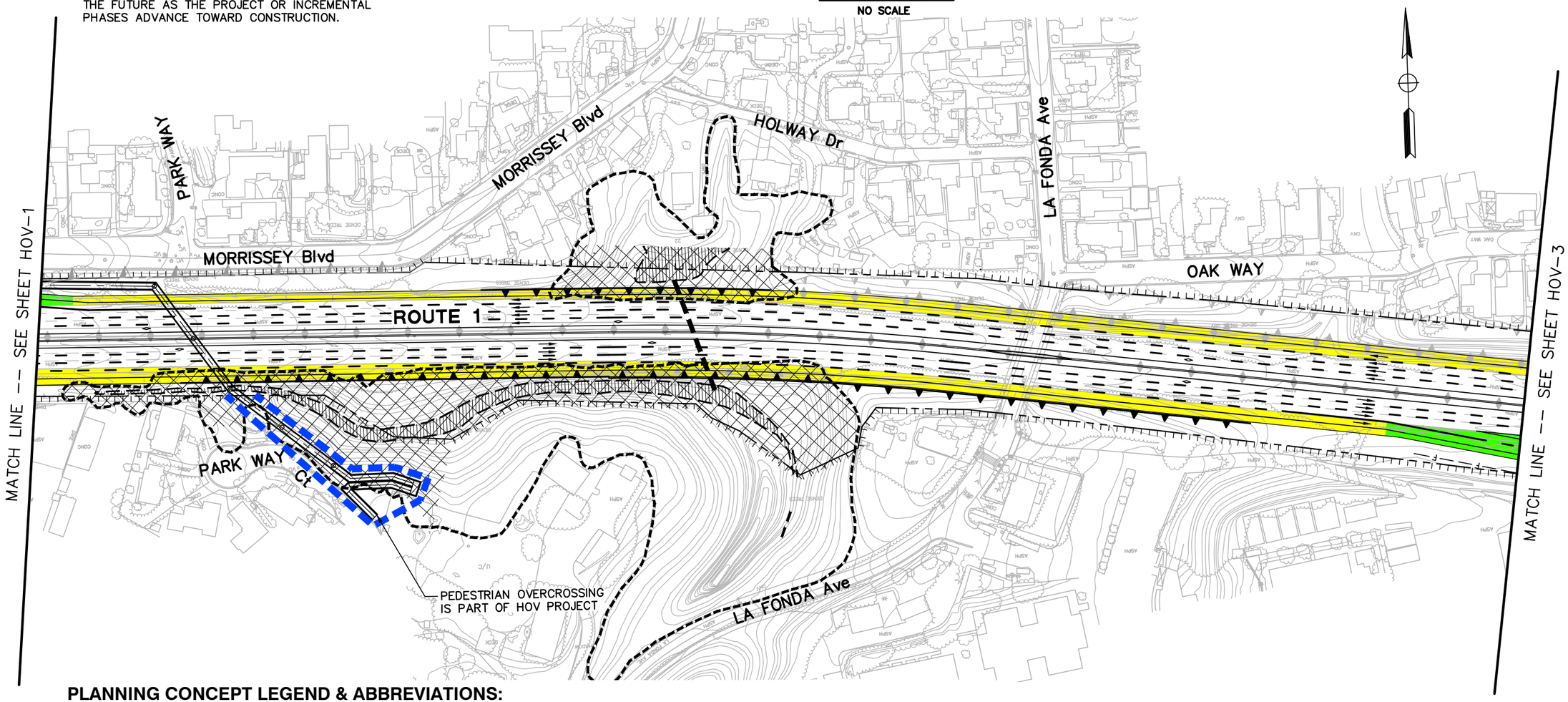

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

HOV-2

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	3	20

CONCEPT NOTES:

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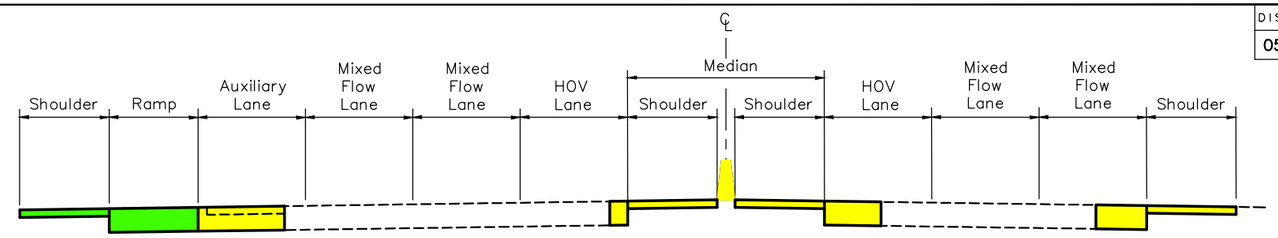

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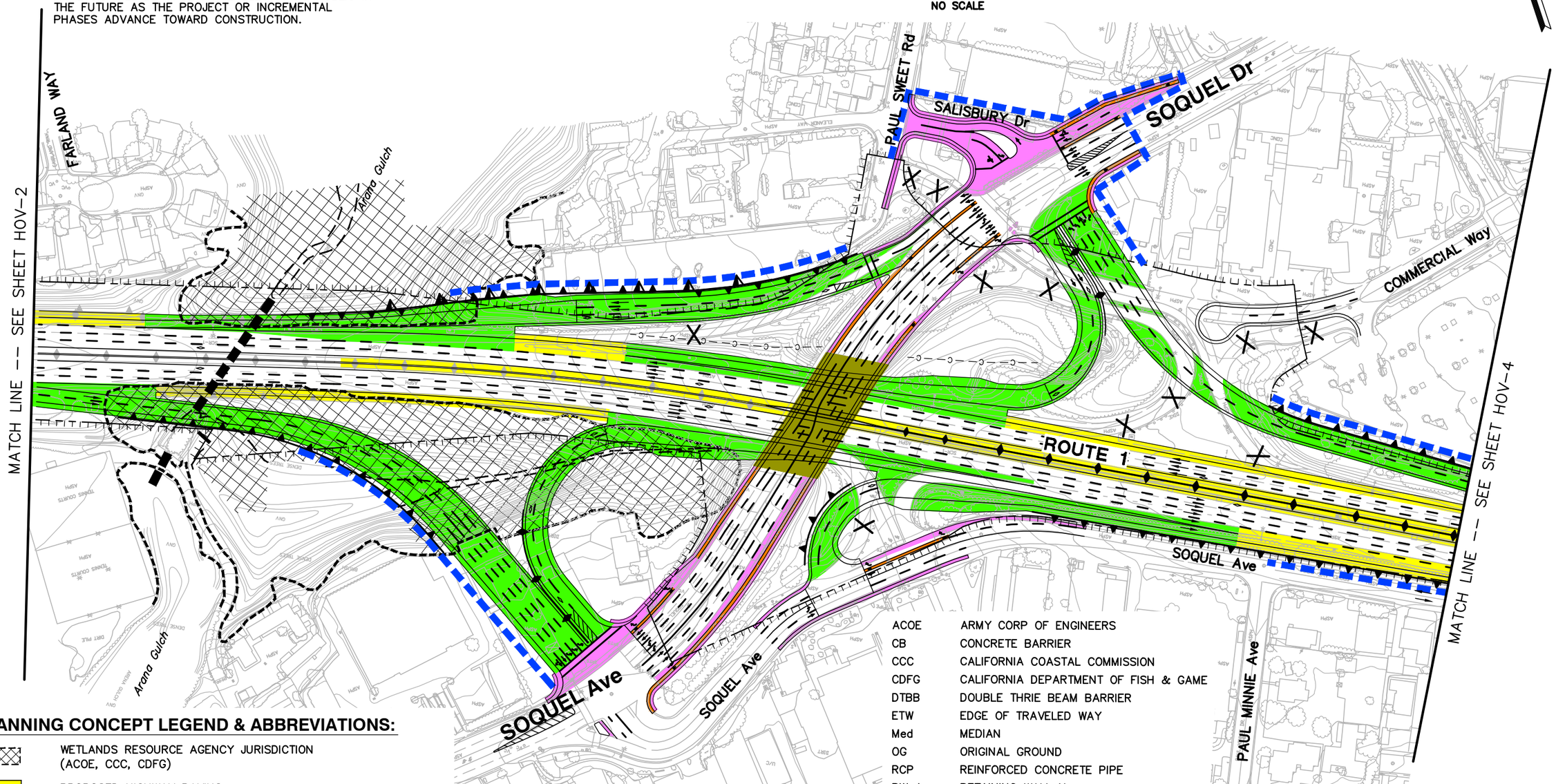

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED
	EXISTING CULVERT
	HOV LANE PAVEMENT MARKING
	PAVEMENT REMOVAL

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

HOV-3

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	4	20

CONCEPT NOTES:

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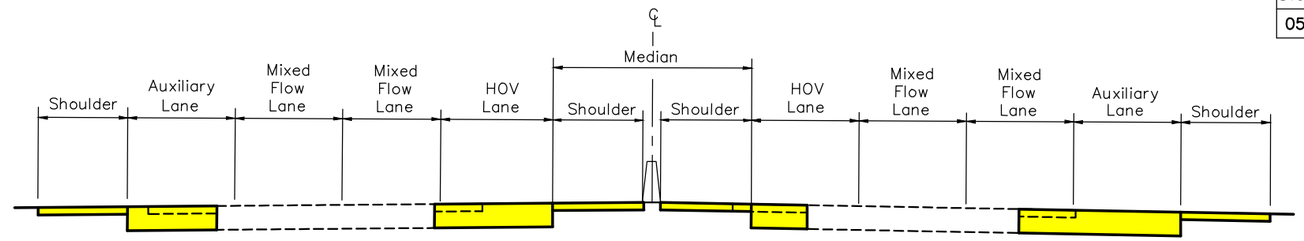

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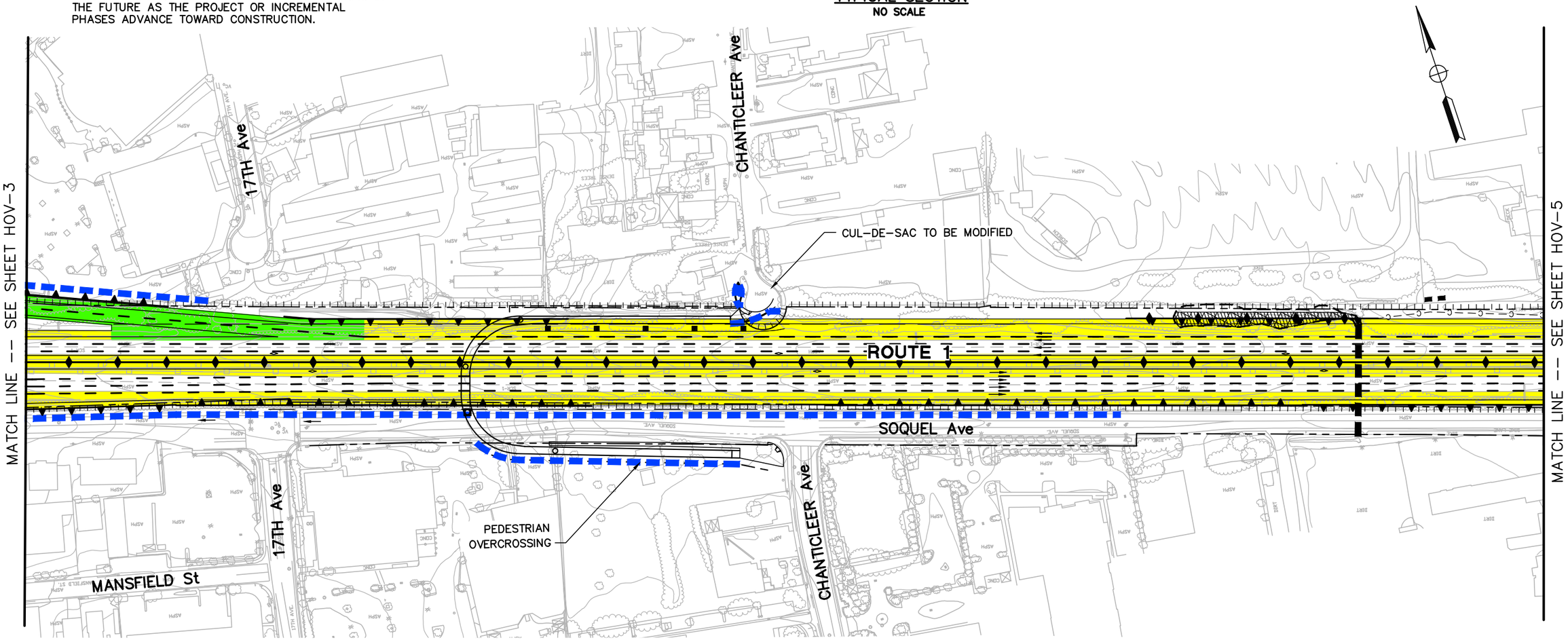

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
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- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

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DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

HOV-4

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	5	20

CONCEPT NOTES:

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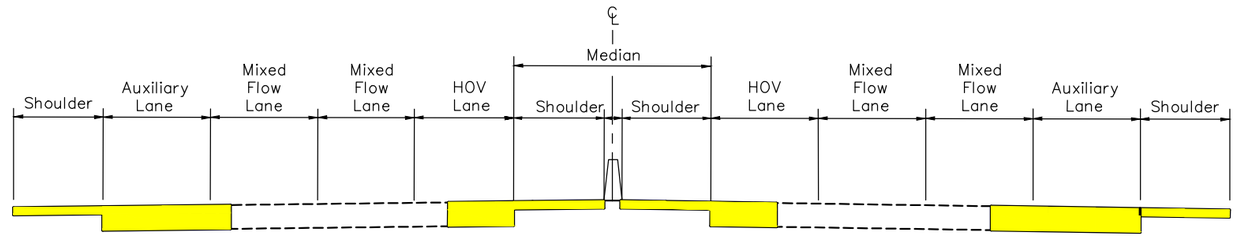
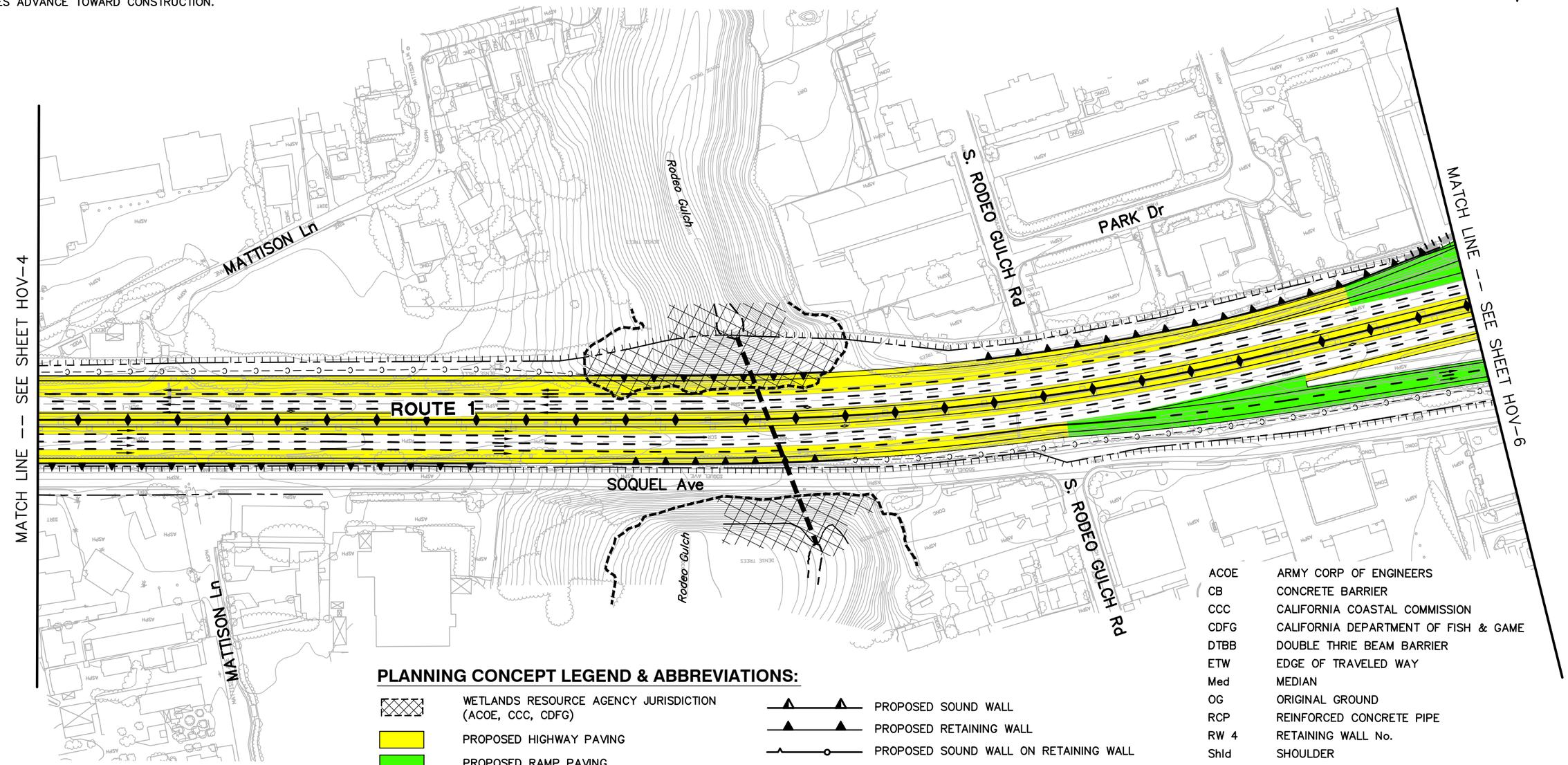


TYPICAL SECTION – NO RAMPS SHOWN

NO SCALE



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- PROPOSED HIGHWAY PAVING
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- PROPOSED SOUND WALL ON RETAINING WALL
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TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	6	20

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
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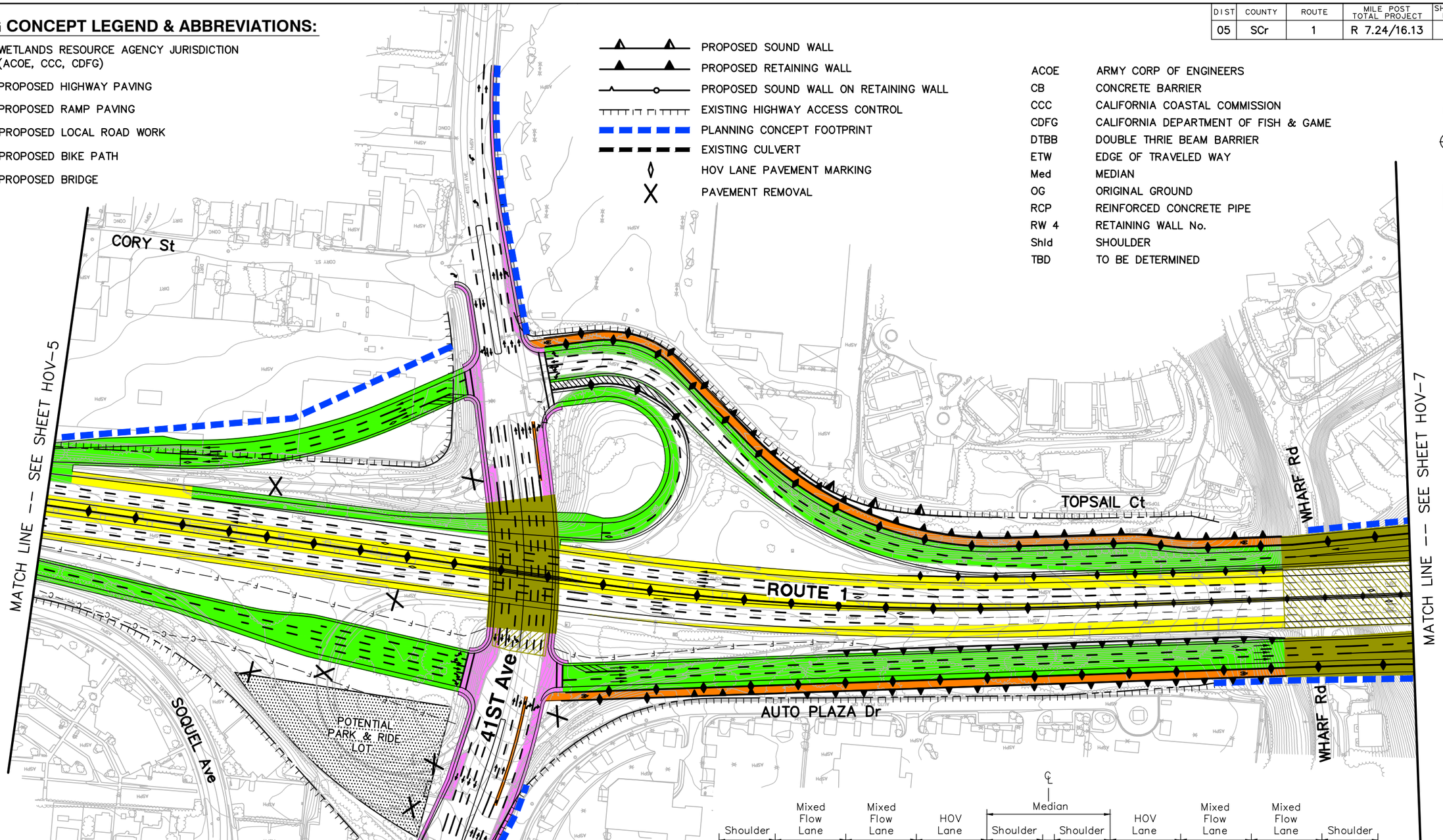
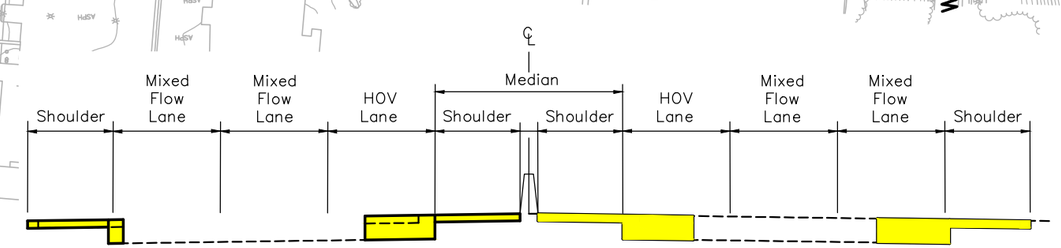
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED





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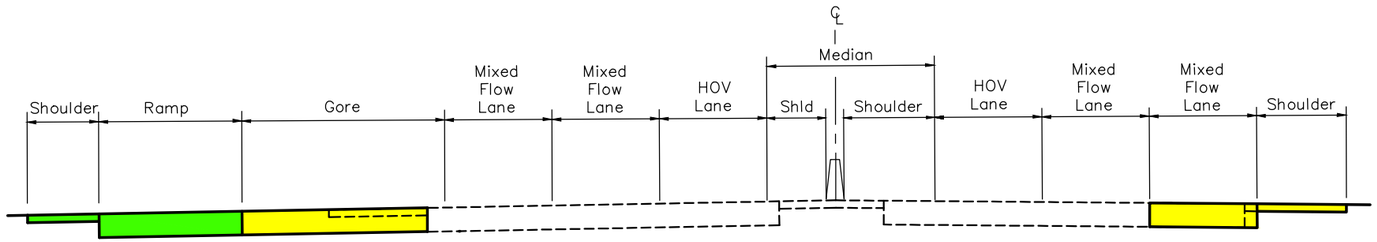
TIER 1 CORRIDOR HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	7	20



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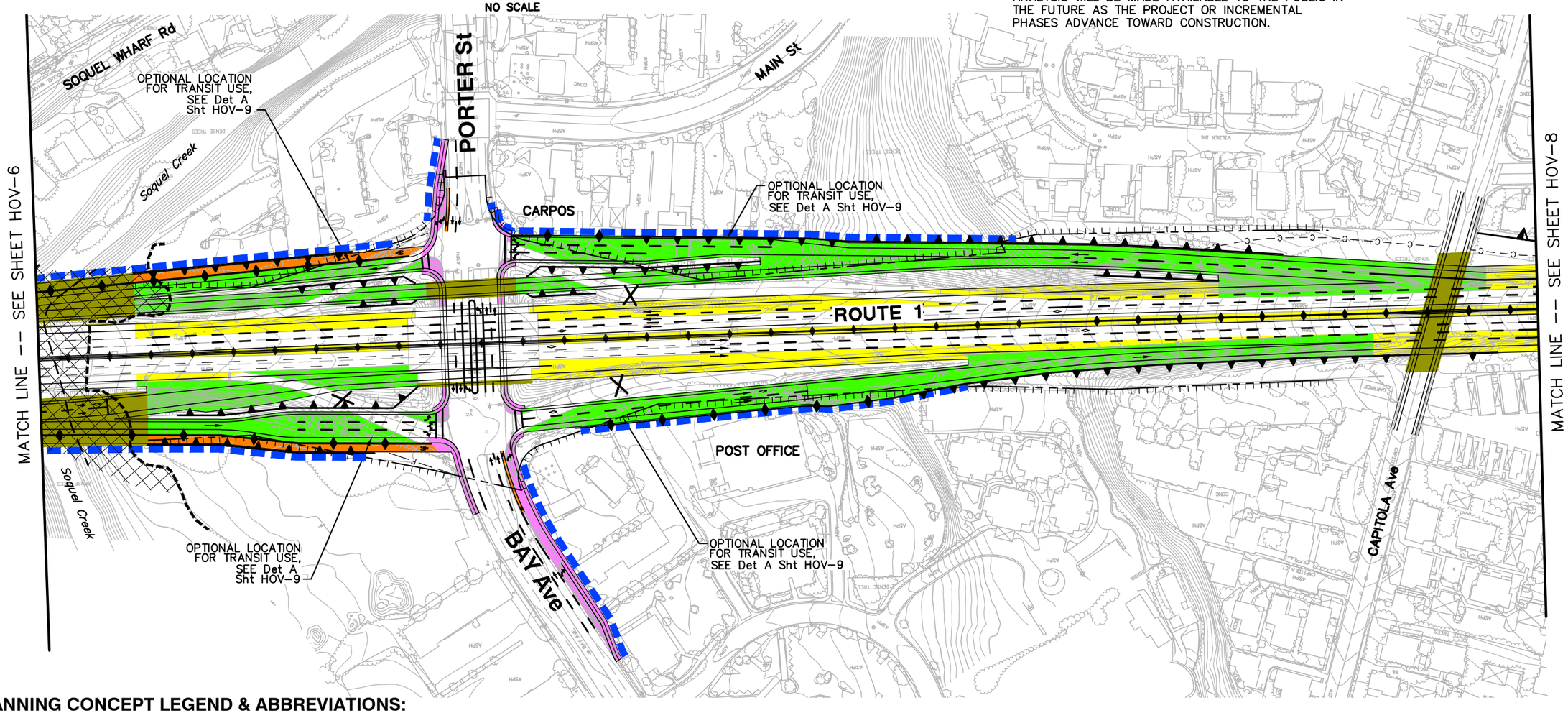

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- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
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- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

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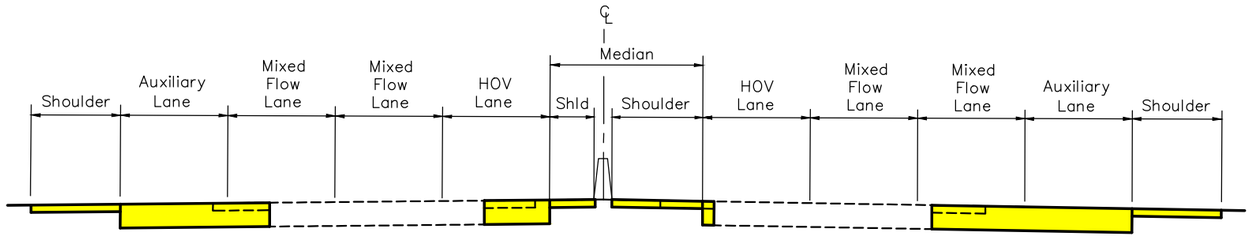
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

*** MINIMUM CLEARANCE OVER WHARF ROAD

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

HOV-7

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	8	20



TYPICAL SECTION
NO SCALE

CONCEPT NOTES:

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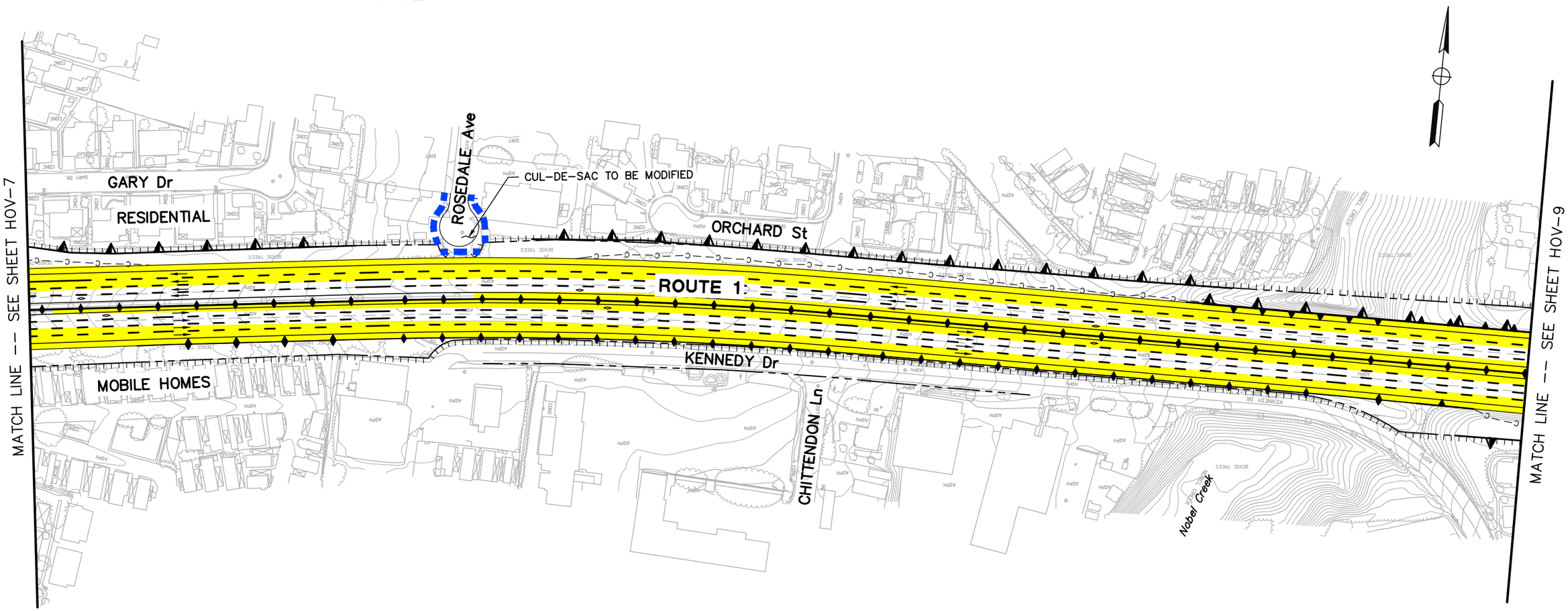


PLANNING CONCEPT LEGEND & ABBREVIATIONS:

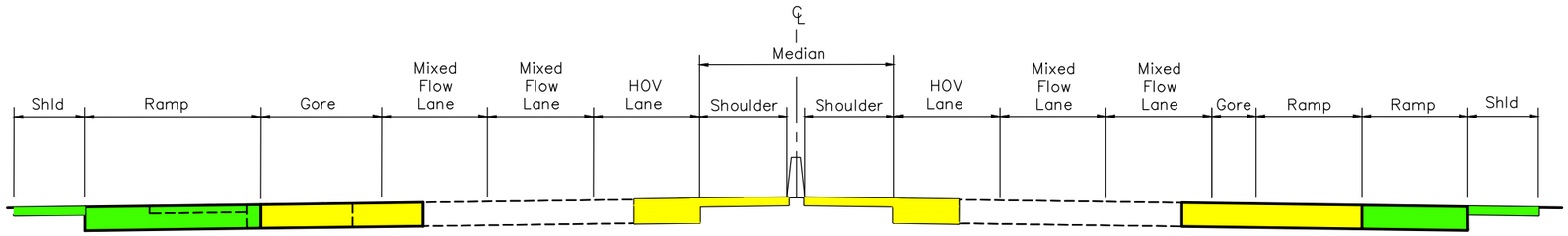
- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

HOV-8

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	9	20



TYPICAL SECTION
NO SCALE

DETAIL A
NO SCALE

CONCEPT NOTES:

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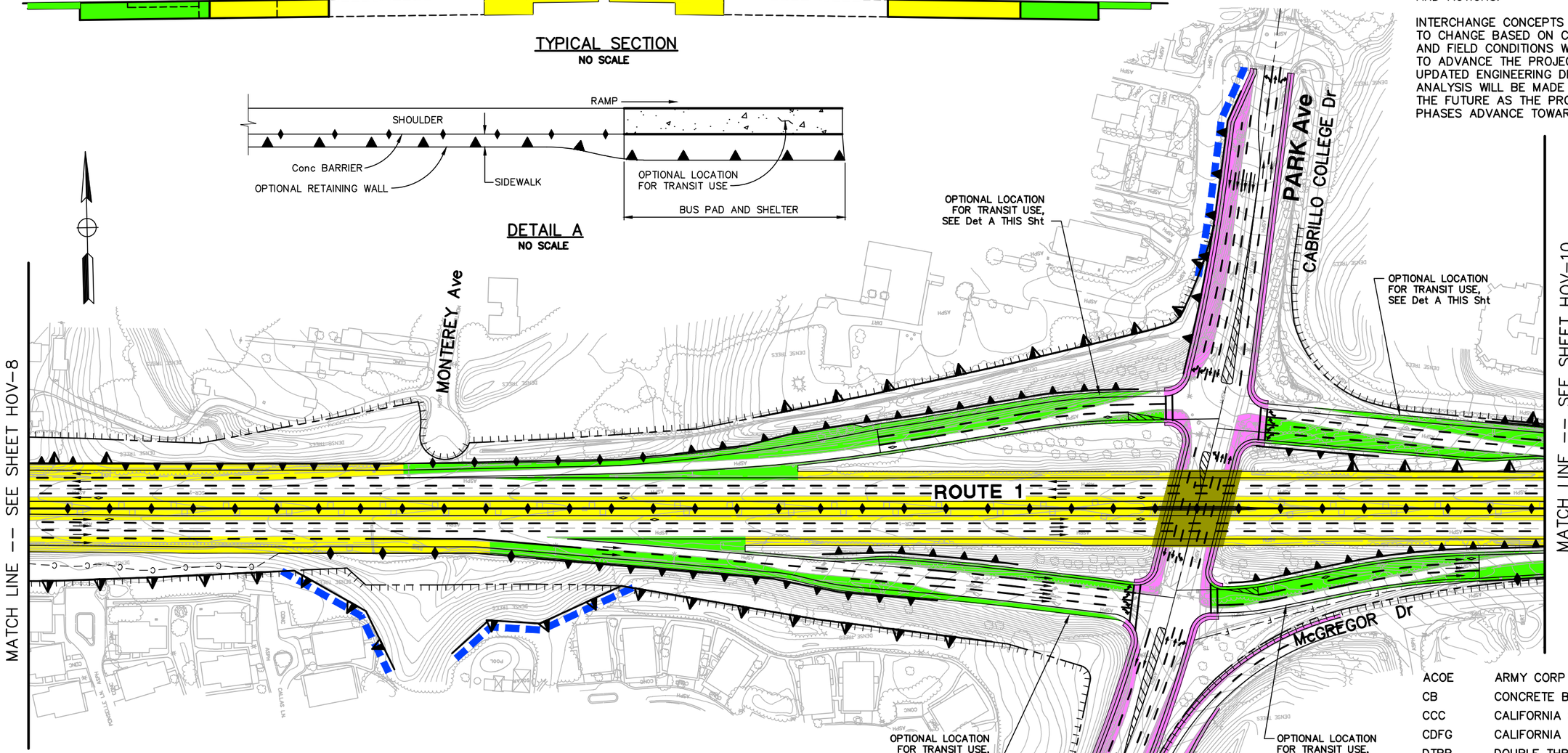

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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- PROPOSED HIGHWAY PAVING
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- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
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- HOV LANE PAVEMENT MARKING
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ACOE	ARMY CORP OF ENGINEERS
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DTBB	DOUBLE THRIE BEAM BARRIER
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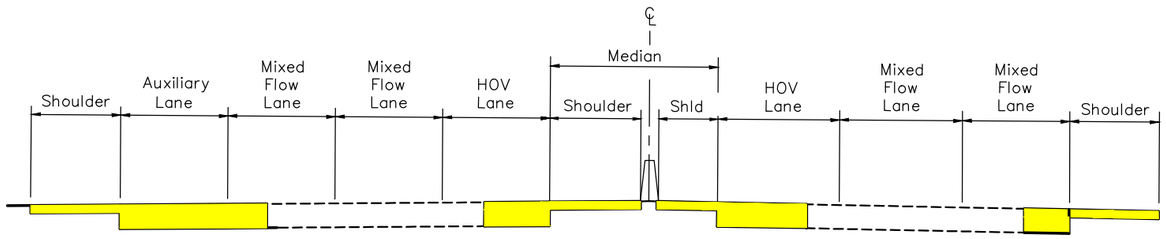
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	10	20



TYPICAL SECTION
NO SCALE

CONCEPT NOTES:

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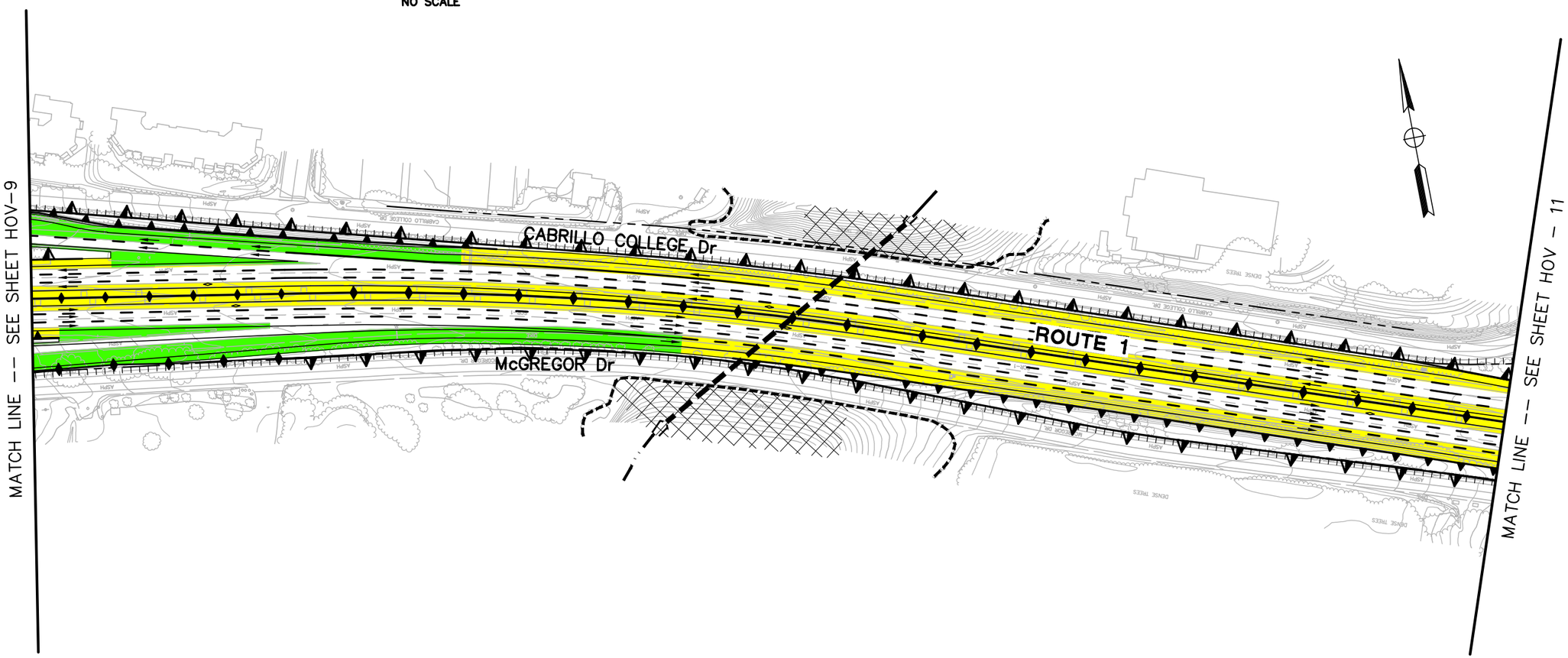

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- EXISTING CULVERT
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ACOE	ARMY CORP OF ENGINEERS
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CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
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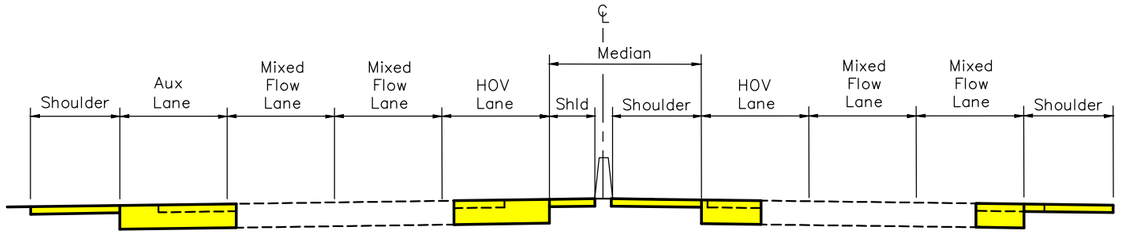
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

HOV-10

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	11	20



TYPICAL SECTION
NO SCALE

CONCEPT NOTES:

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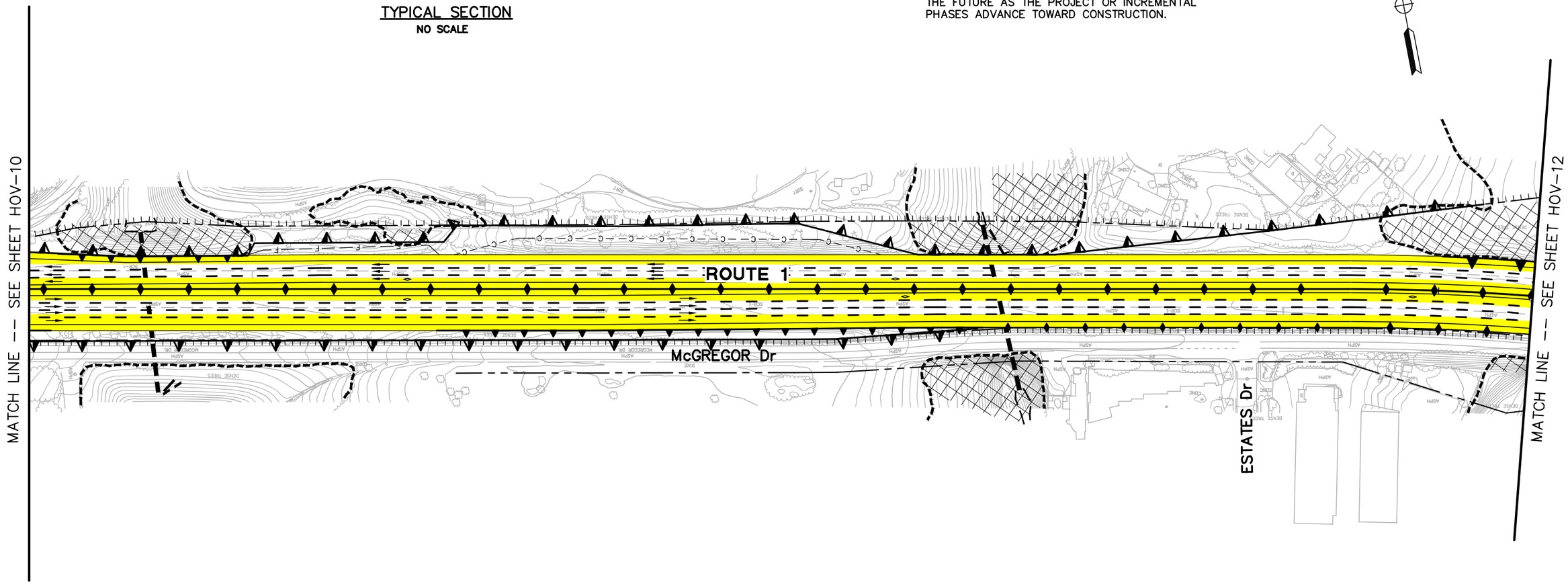

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
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- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
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- PLANNING CONCEPT FOOTPRINT
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- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
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CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

HOV-11

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	12	20

CONCEPT NOTES:

THE HOV ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT-LEVEL DECISIONS AND ACTIONS.

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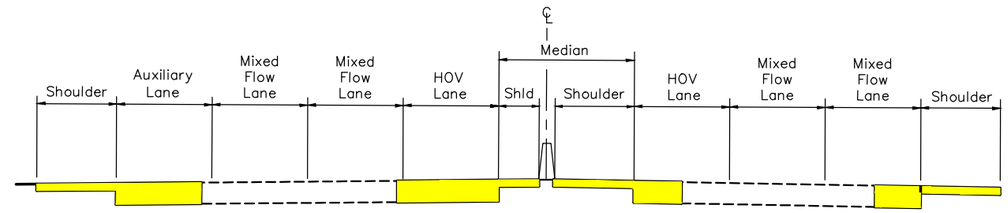
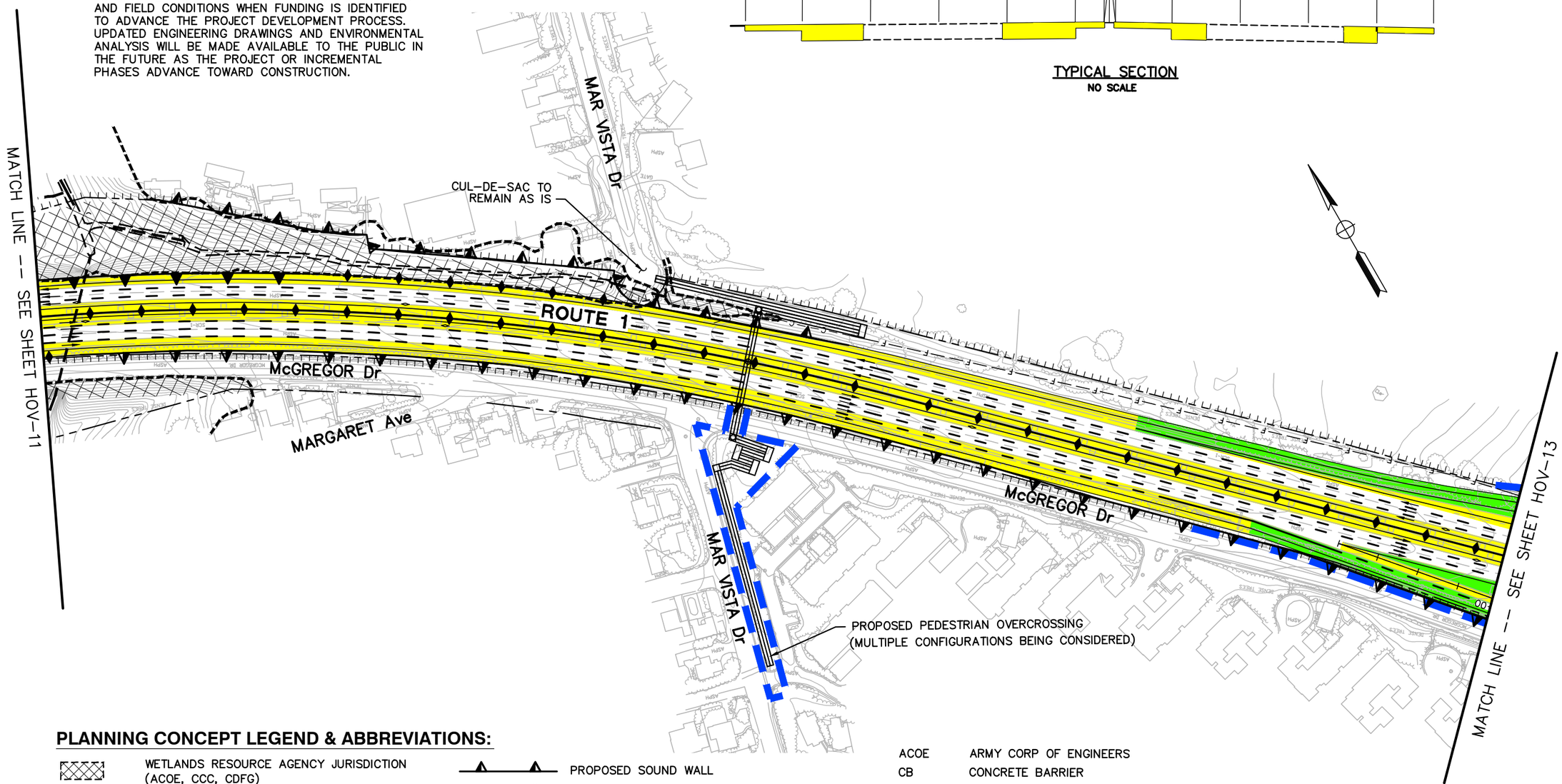


TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
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- EXISTING CULVERT
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- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
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DTBB	DOUBLE THRIE BEAM BARRIER
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Med	MEDIAN
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RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	13	20

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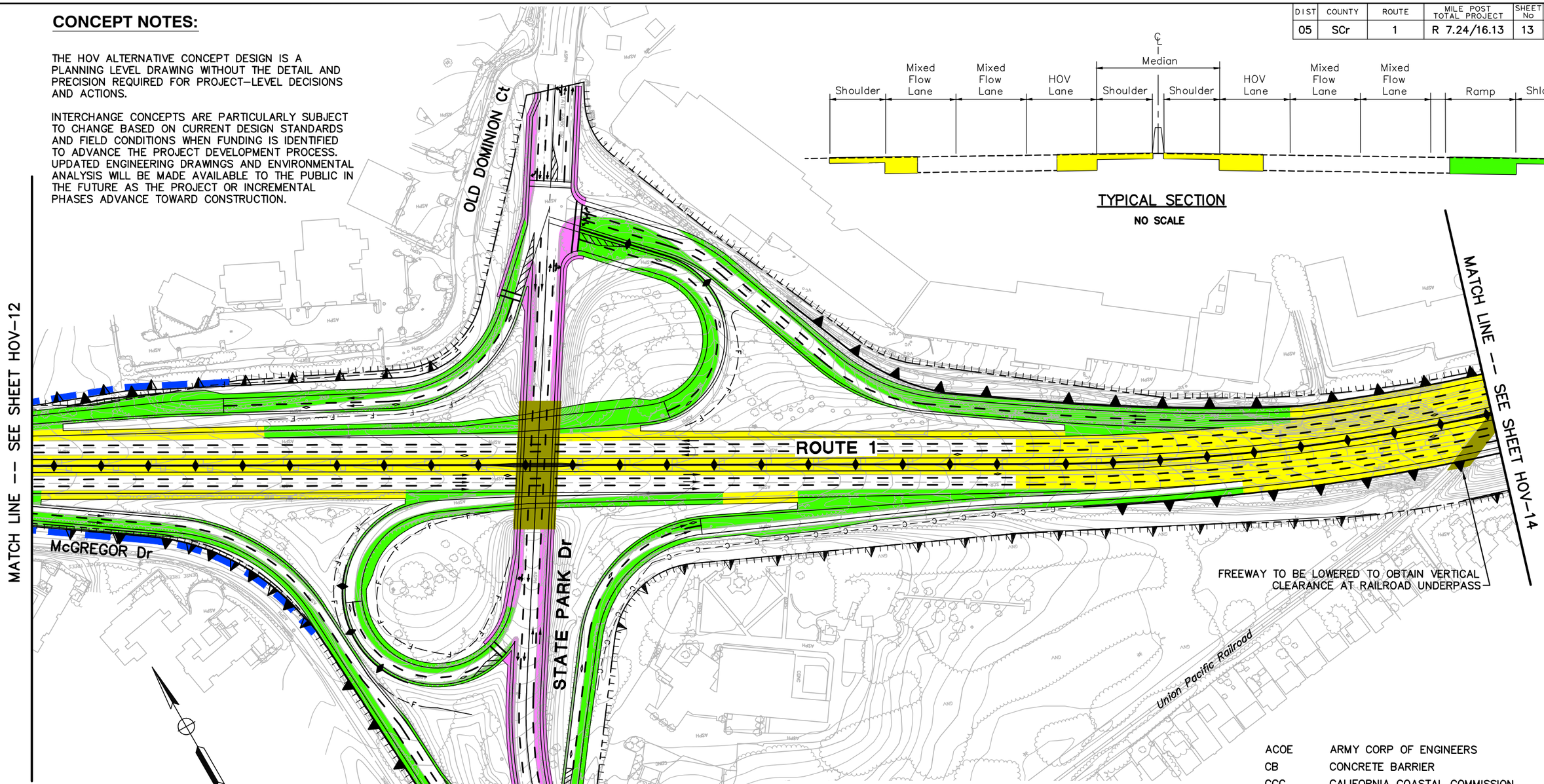
TYPICAL SECTION

NO SCALE



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RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

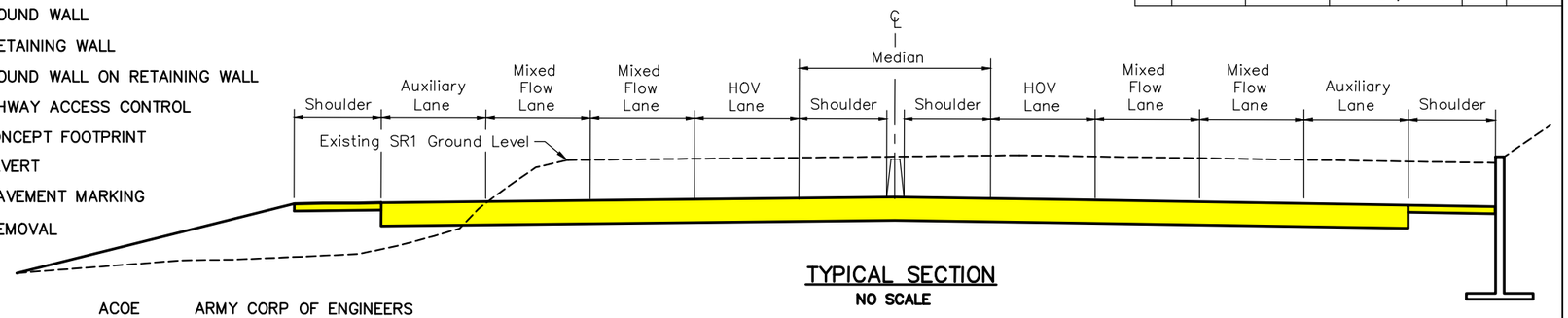
TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

HOV-13

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	14	20

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL



TYPICAL SECTION
NO SCALE

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
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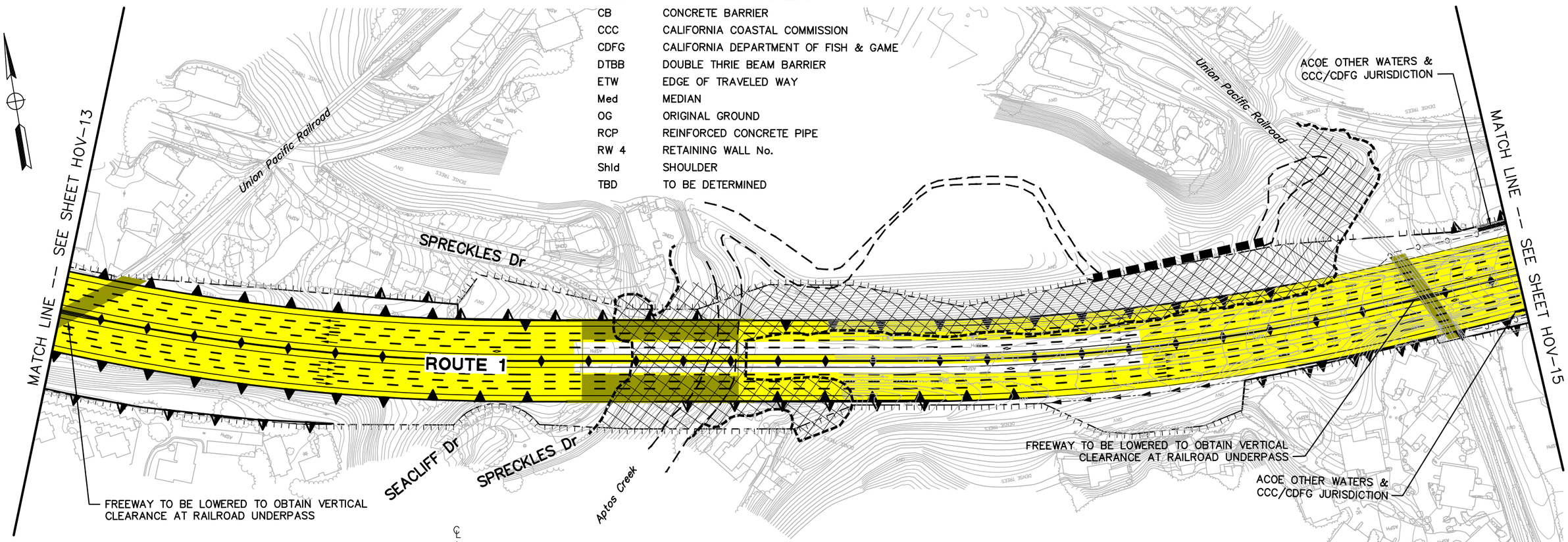
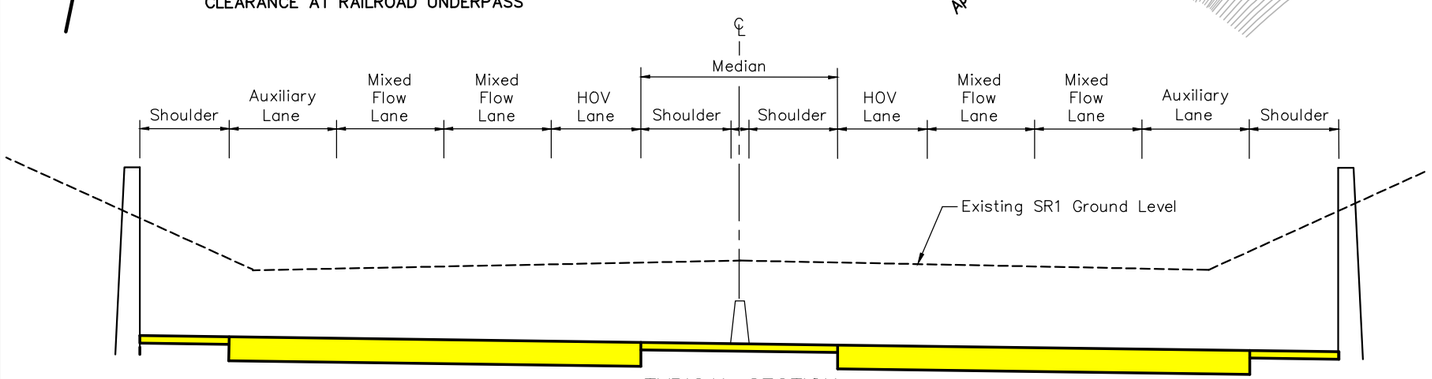
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED





TYPICAL SECTION
NO SCALE

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TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	15	20

CONCEPT NOTES:

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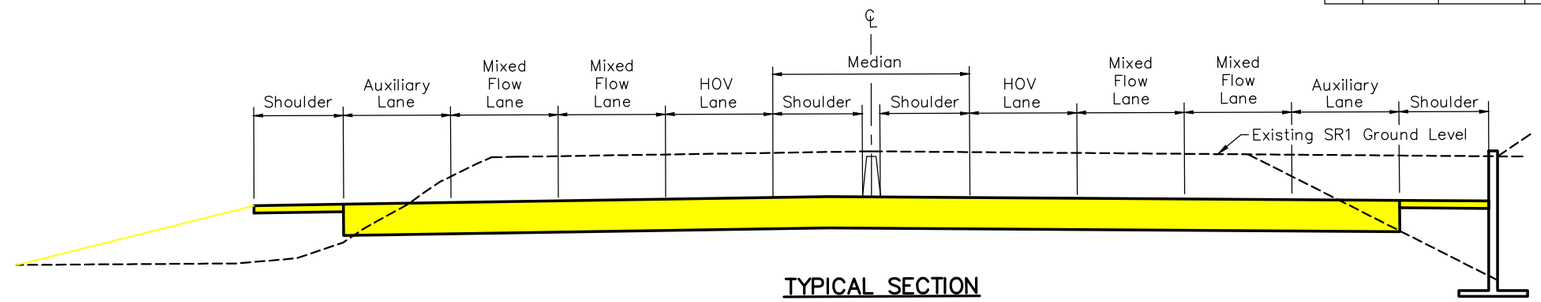
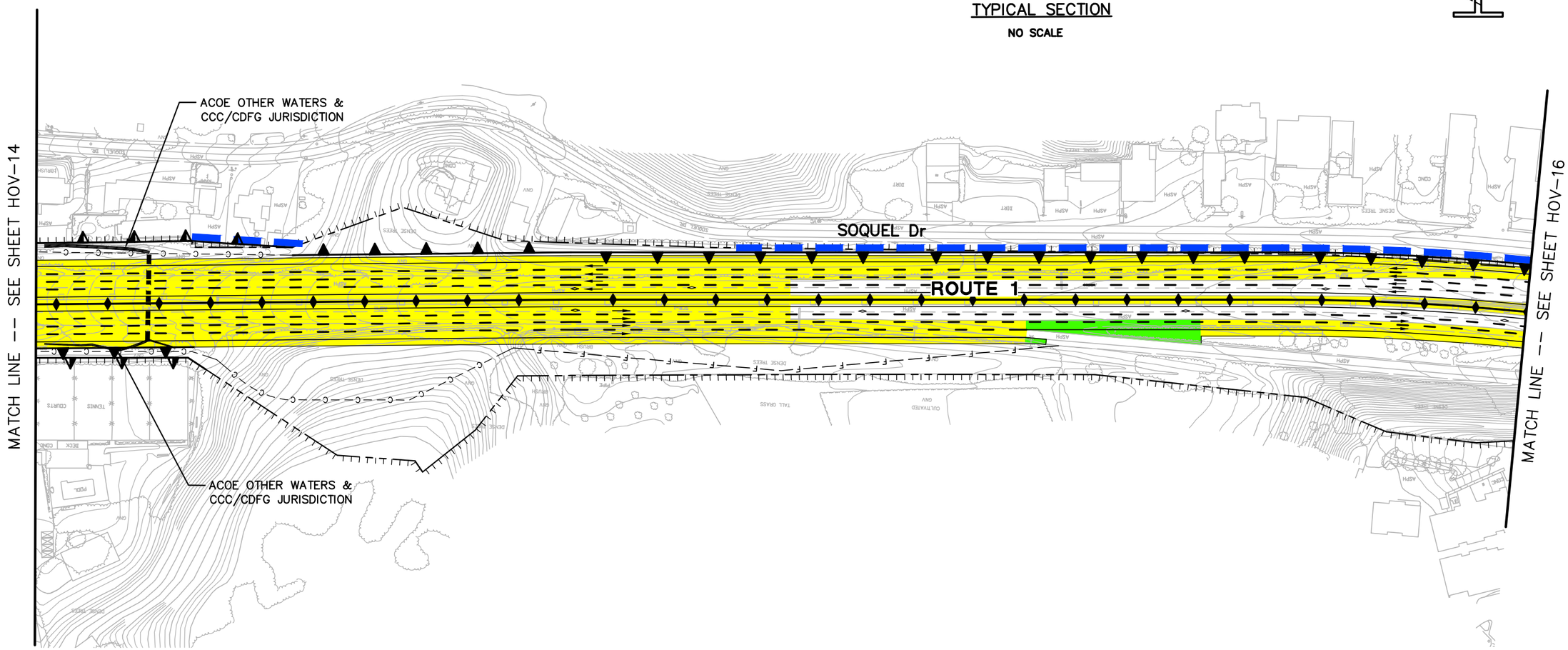


TYPICAL SECTION

NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

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Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

HOV-15

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	16	20

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
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- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

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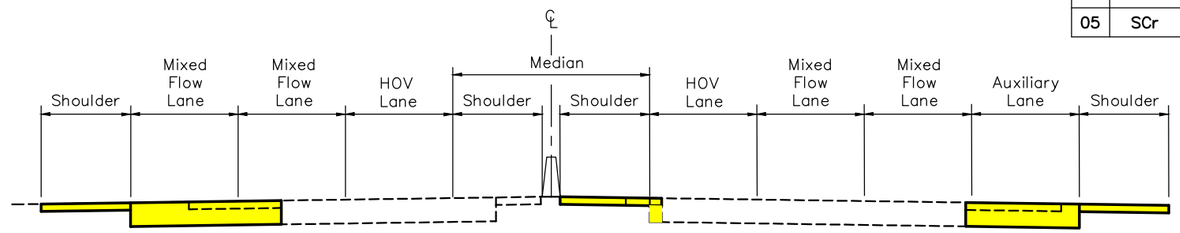
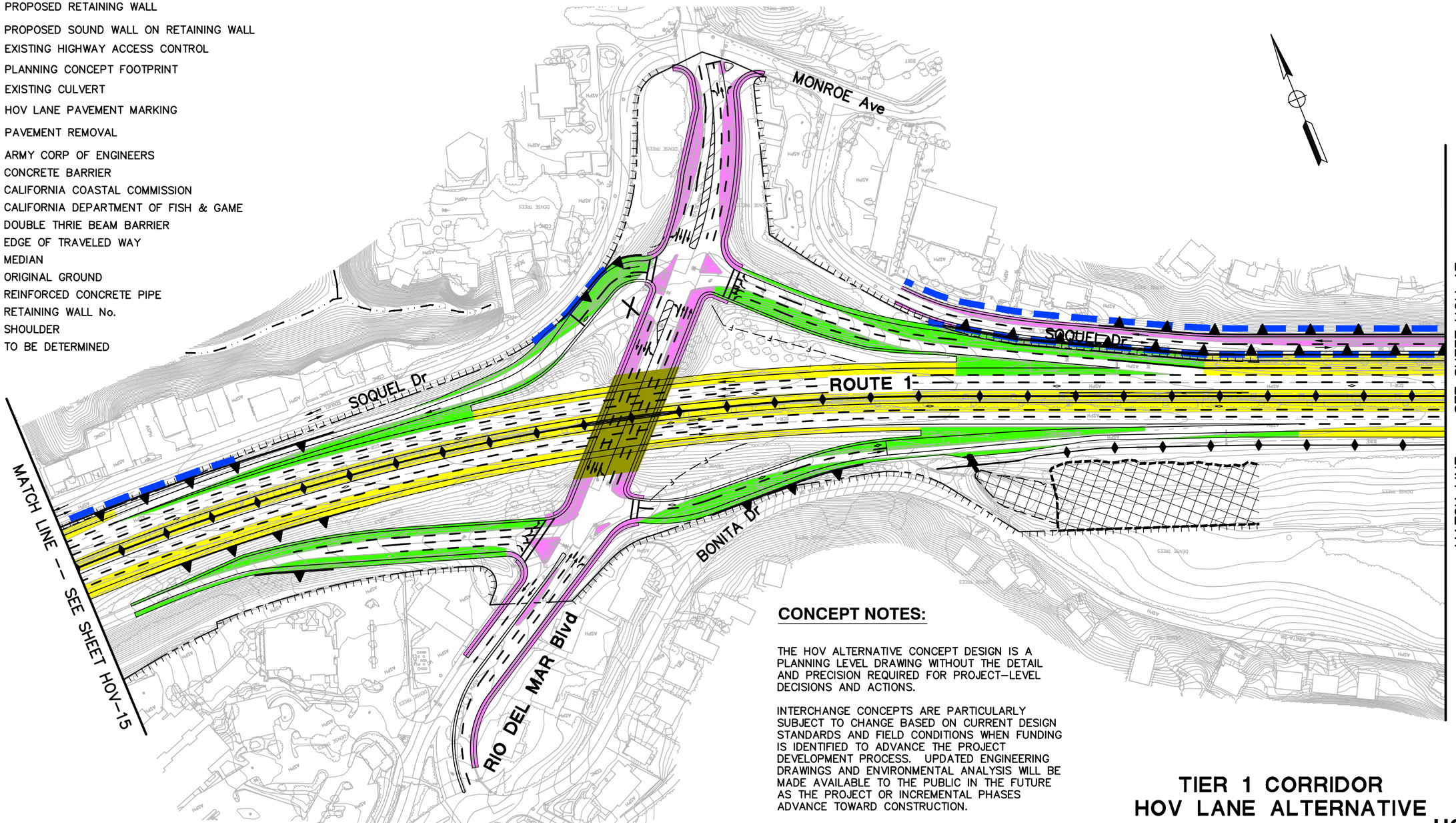
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED



TYPICAL SECTION – NO RAMPS SHOWN

NO SCALE



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TIER 1 CORRIDOR HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	17	20

CONCEPT NOTES:

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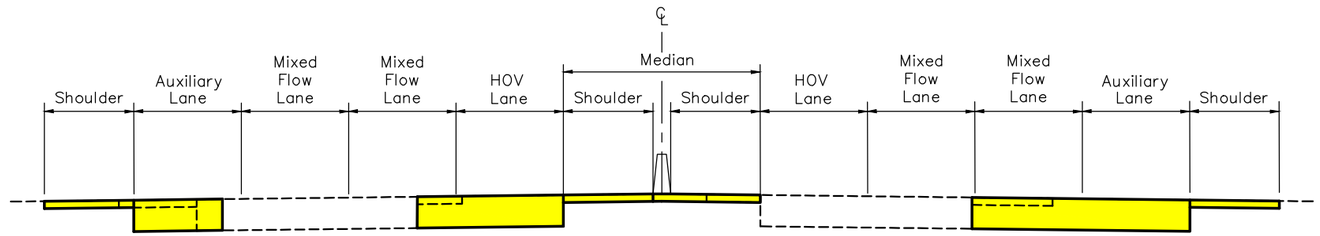
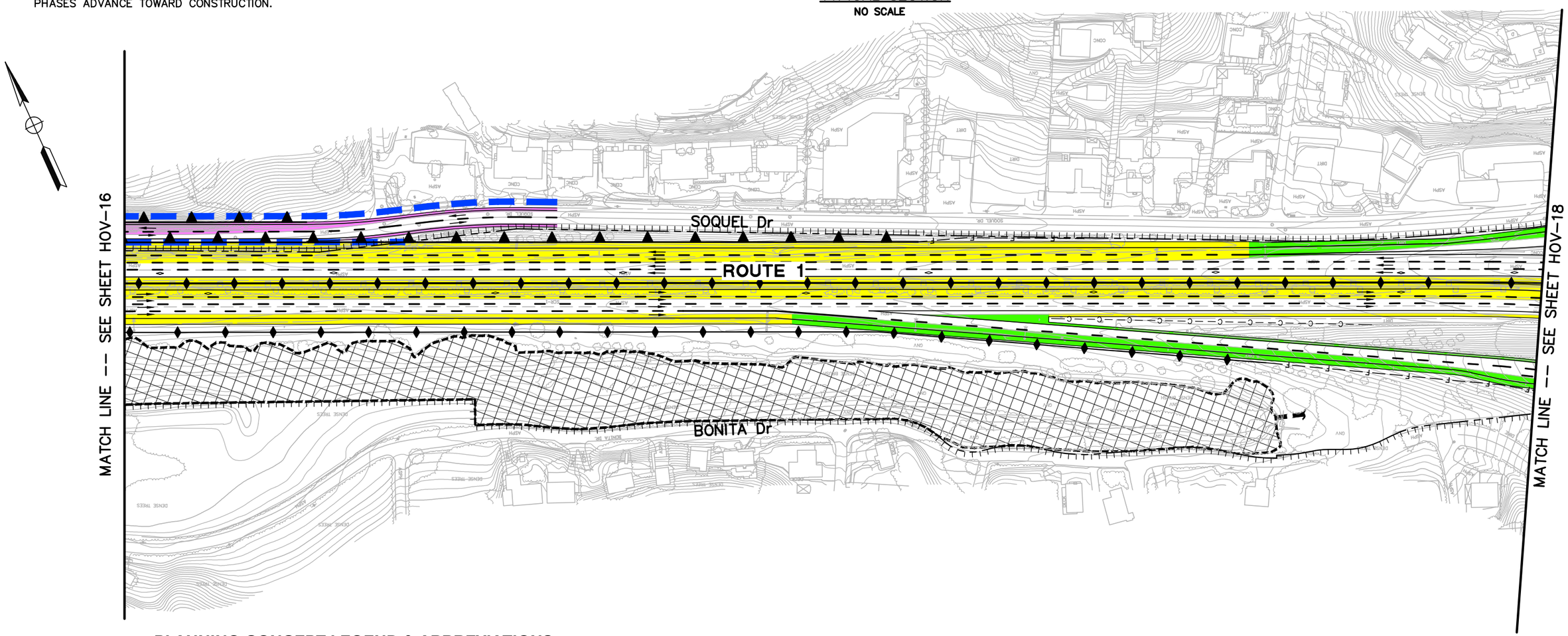


TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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- PROPOSED HIGHWAY PAVING
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- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
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- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

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RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR HOV LANE ALTERNATIVE

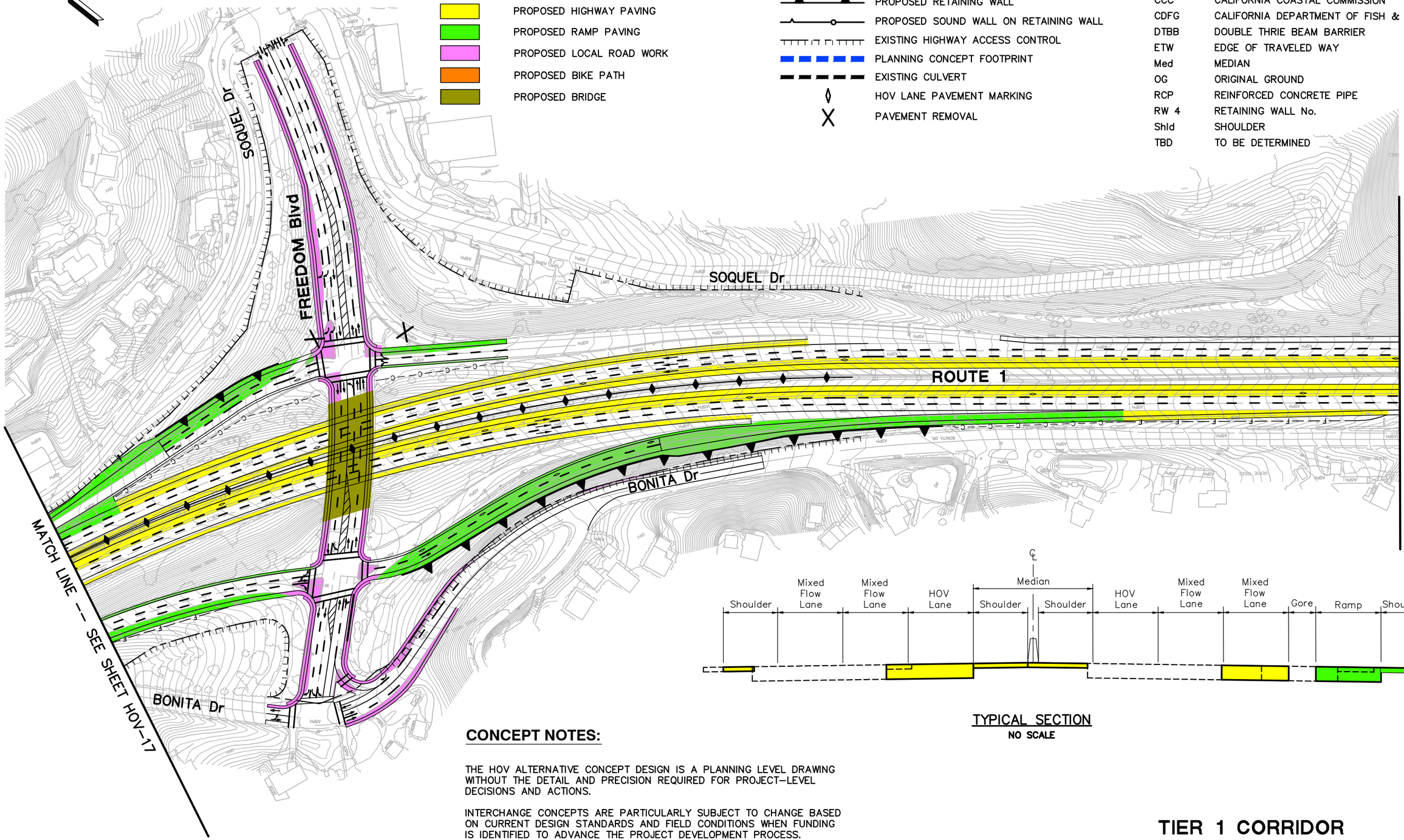
HOV-17

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	18	20

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED



TYPICAL SECTION
NO SCALE

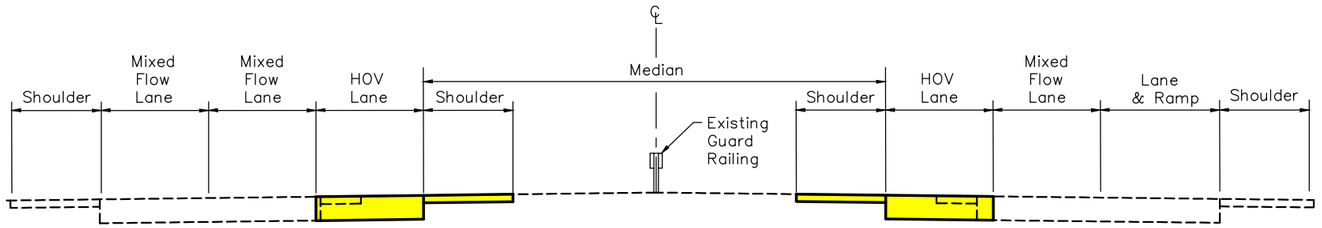
CONCEPT NOTES:

THE HOV ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT-LEVEL DECISIONS AND ACTIONS.

INTERCHANGE CONCEPTS ARE PARTICULARLY SUBJECT TO CHANGE BASED ON CURRENT DESIGN STANDARDS AND FIELD CONDITIONS WHEN FUNDING IS IDENTIFIED TO ADVANCE THE PROJECT DEVELOPMENT PROCESS. UPDATED ENGINEERING DRAWINGS AND ENVIRONMENTAL ANALYSIS WILL BE MADE AVAILABLE TO THE PUBLIC IN THE FUTURE AS THE PROJECT OR INCREMENTAL PHASES ADVANCE TOWARD CONSTRUCTION.

TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	19	20



TYPICAL SECTION
NO SCALE

CONCEPT NOTES:

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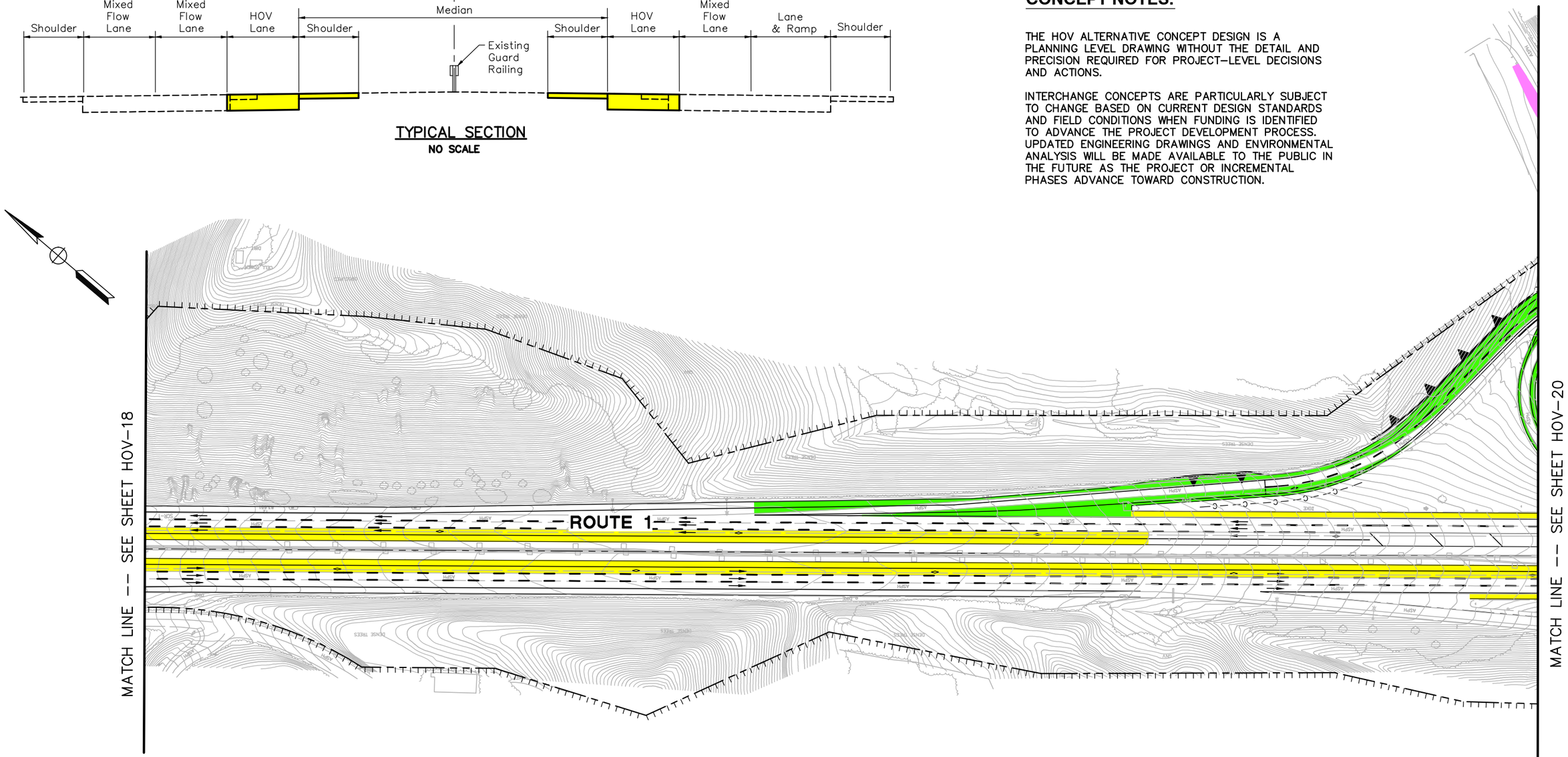

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
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Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	20	20

CONCEPT NOTES:

THE HOV ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT–LEVEL DECISIONS AND ACTIONS.

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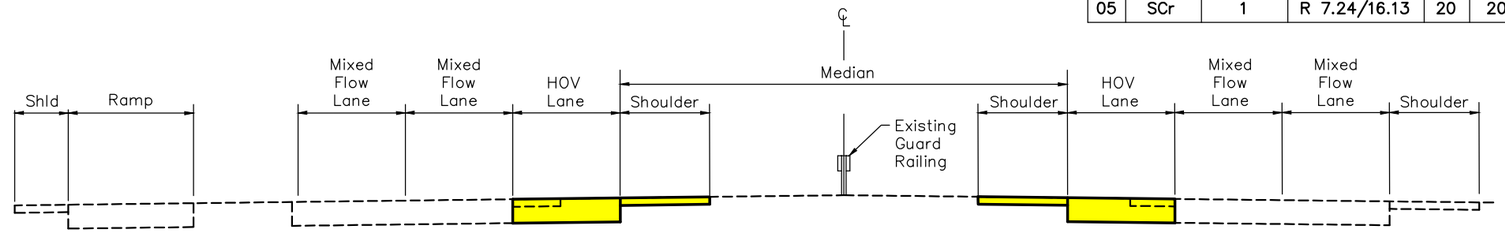
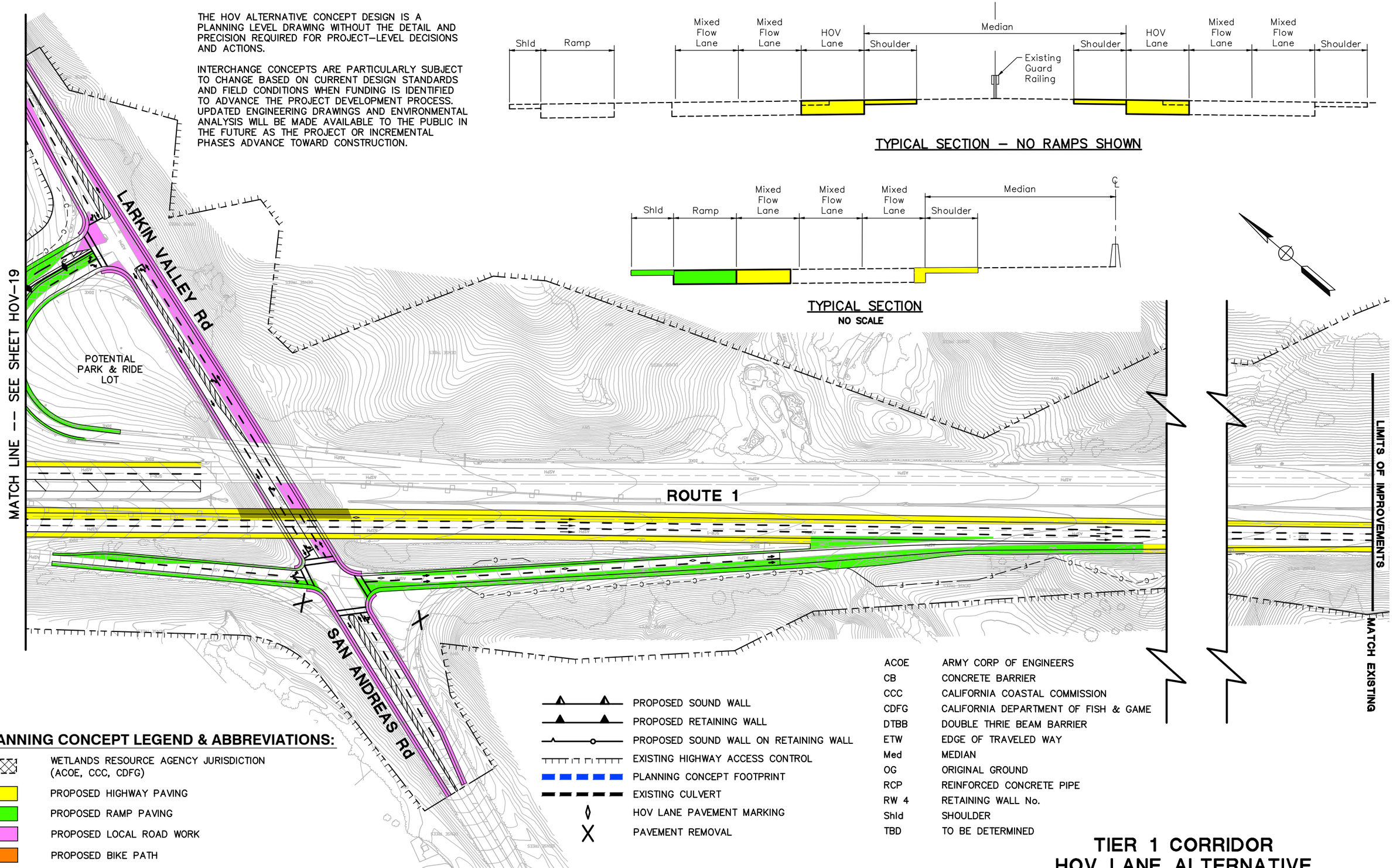


TYPICAL SECTION – NO RAMPS SHOWN

TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
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DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR
HOV LANE ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	1	20

CONCEPT NOTES:

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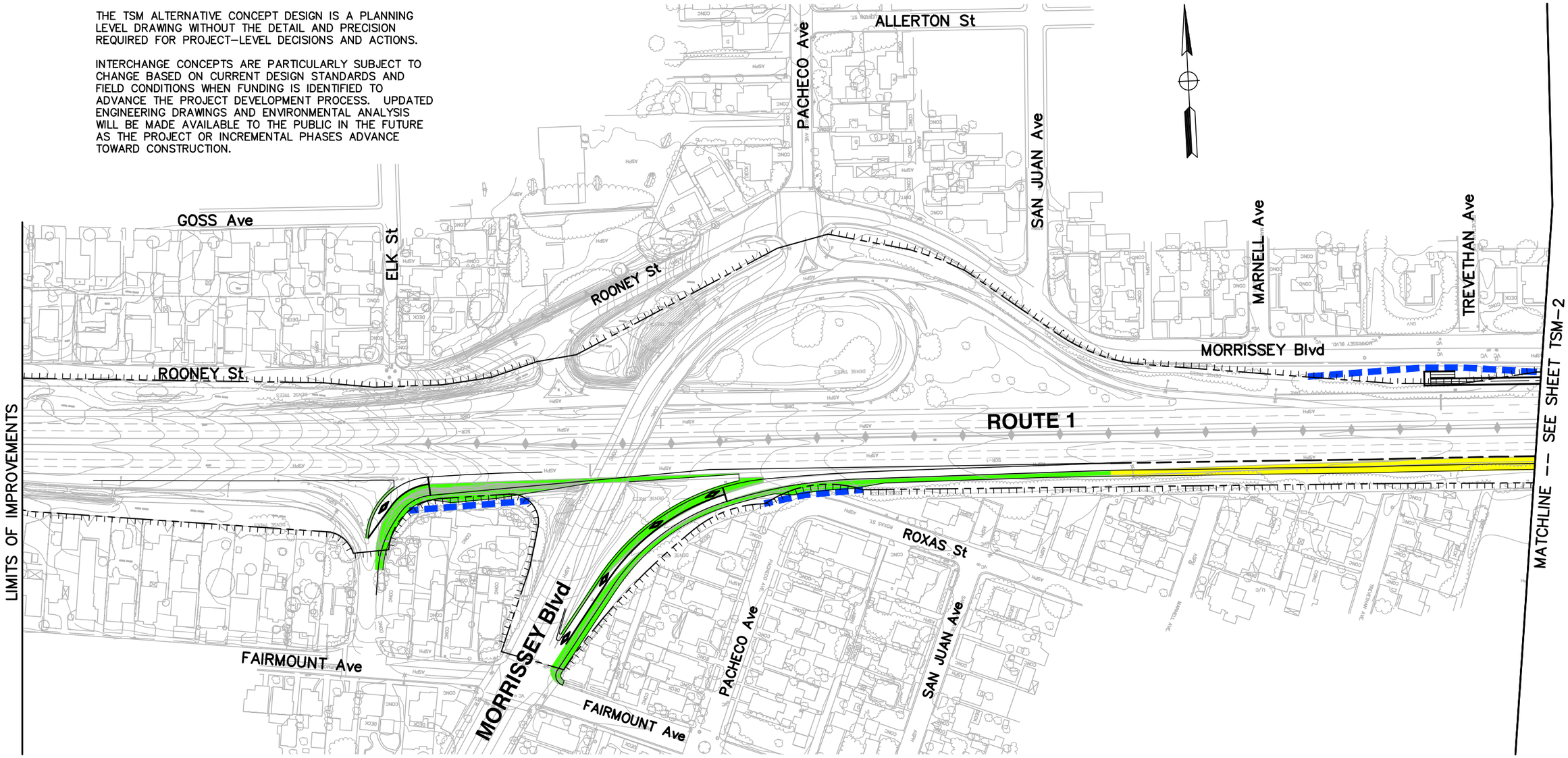

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
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- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
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- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
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- PLANNING CONCEPT FOOTPRINT
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DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-1

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	2	20

CONCEPT NOTES:

THE TSM ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT–LEVEL DECISIONS AND ACTIONS.

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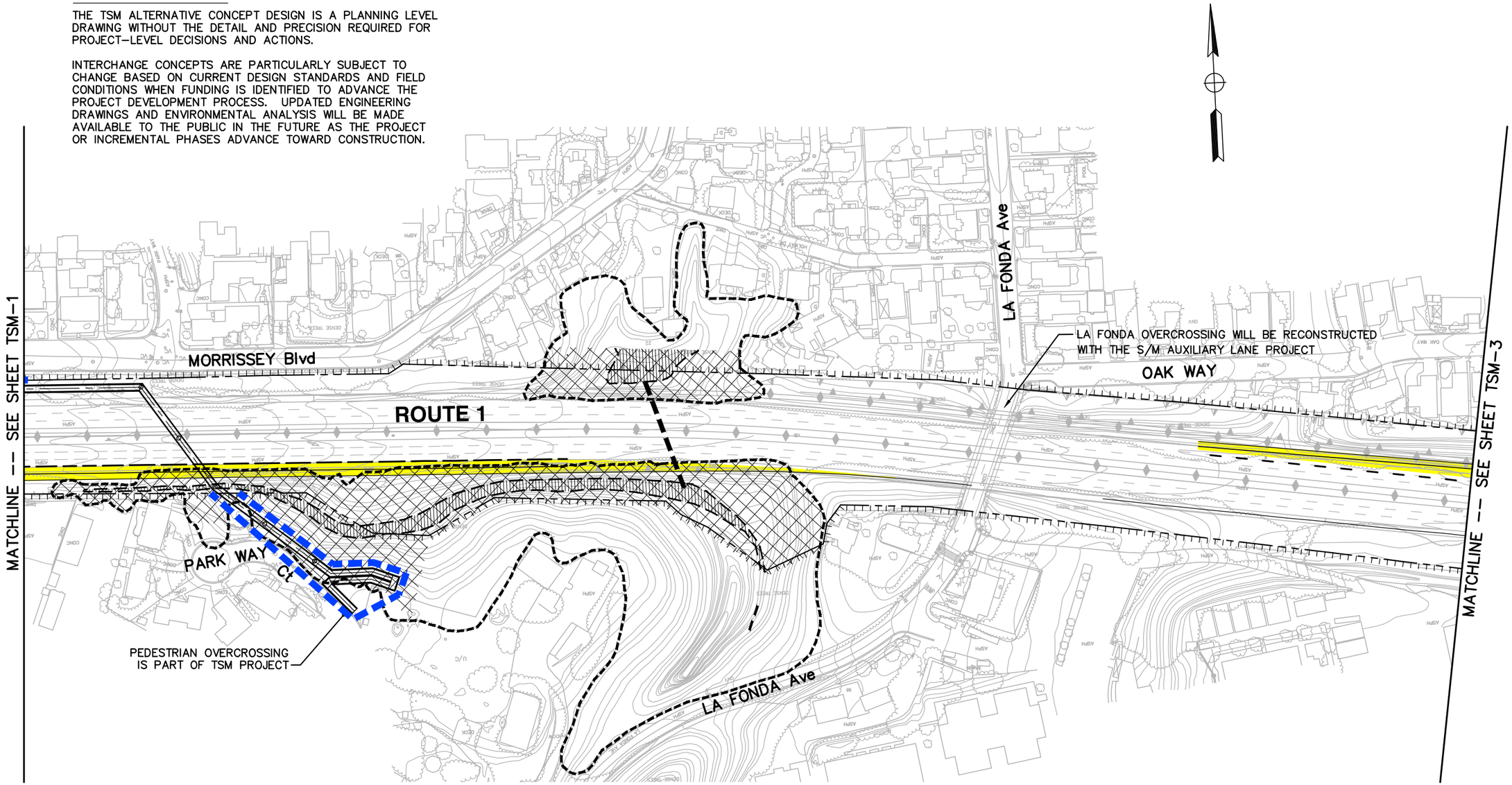

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
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- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
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ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-2

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	3	20

CONCEPT NOTES:

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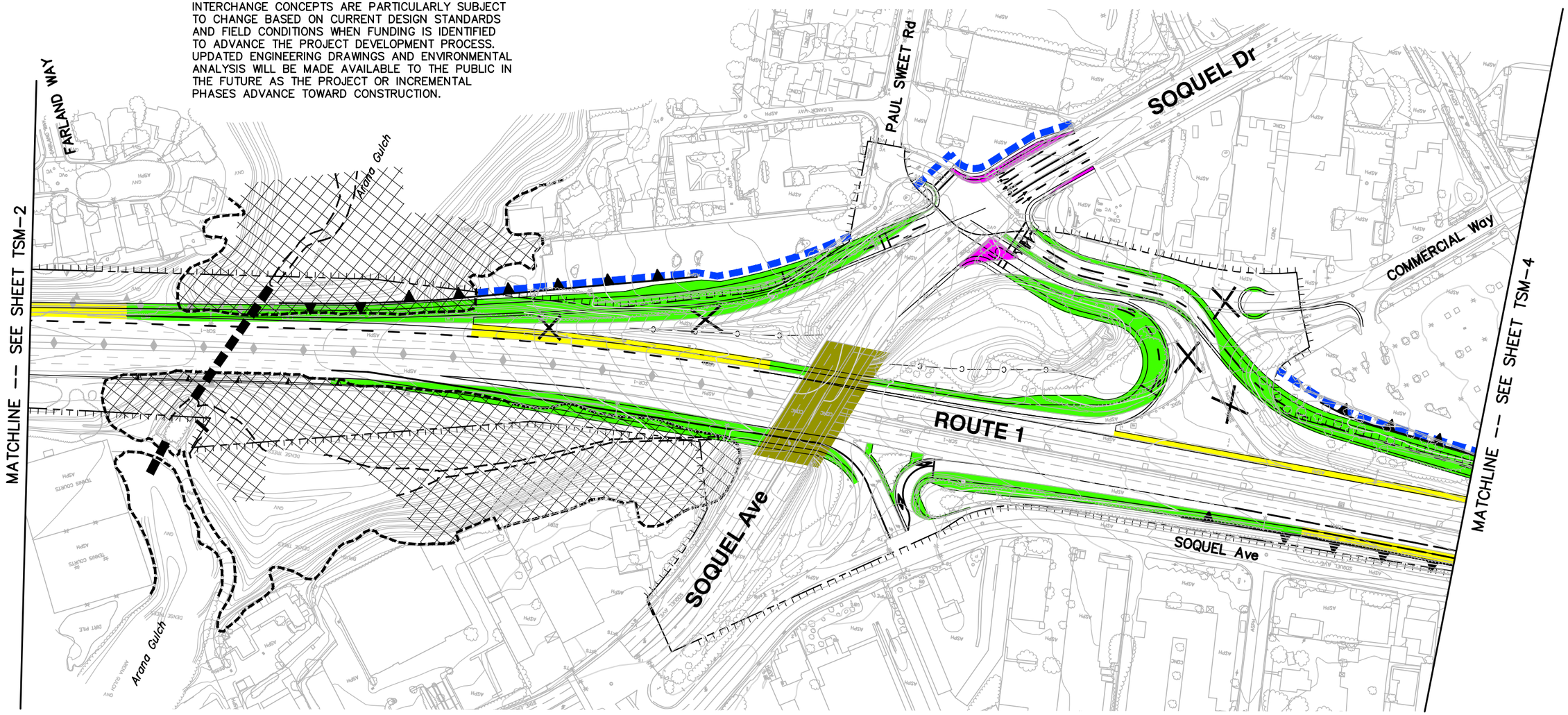

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
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- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
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DTBB	DOUBLE THRIE BEAM BARRIER
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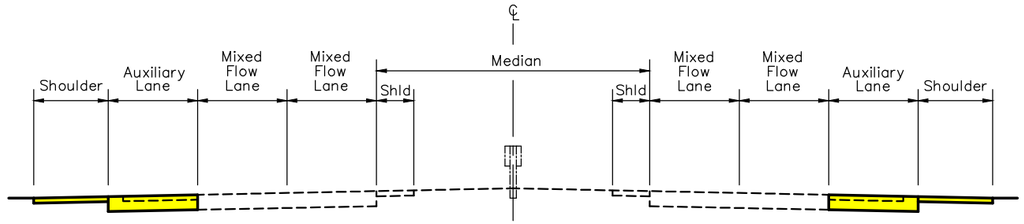
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-3

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	4	20



TYPICAL SECTION
NO SCALE

CONCEPT NOTES:

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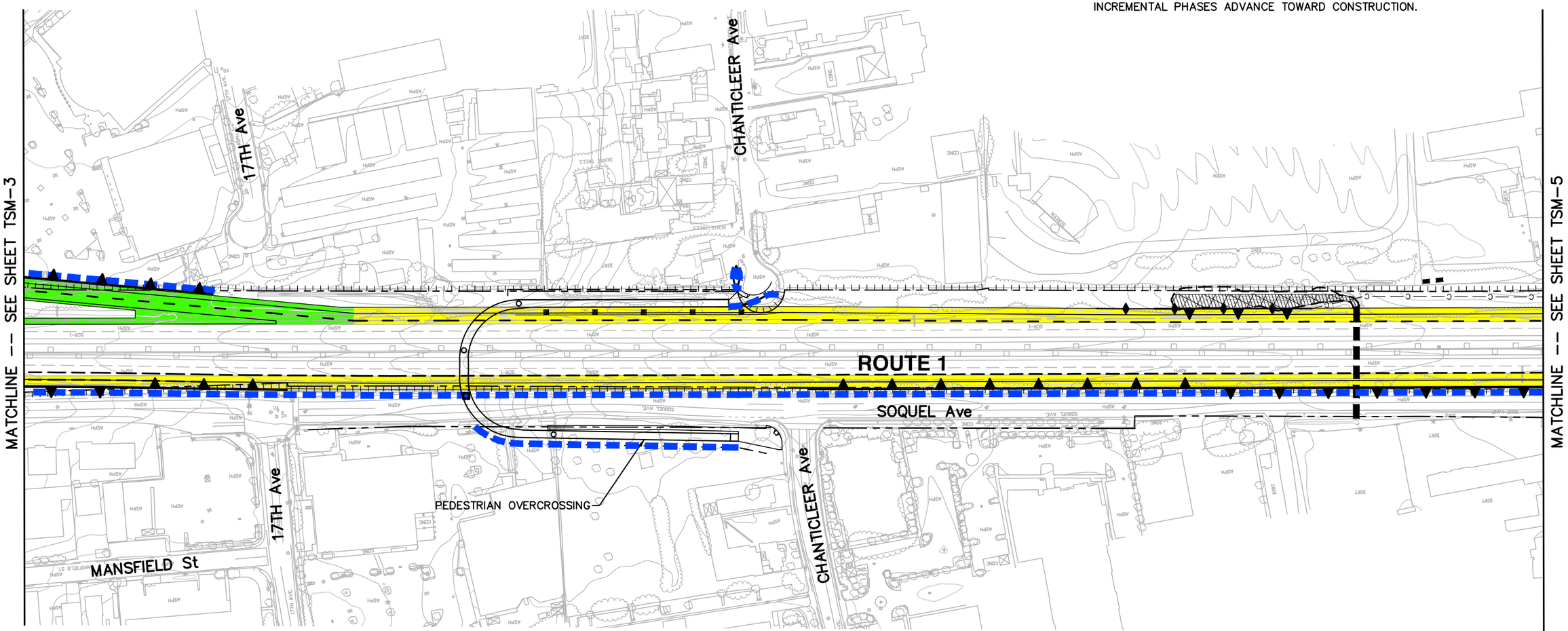

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
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Med	MEDIAN
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RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-4

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	5	20

CONCEPT NOTES:

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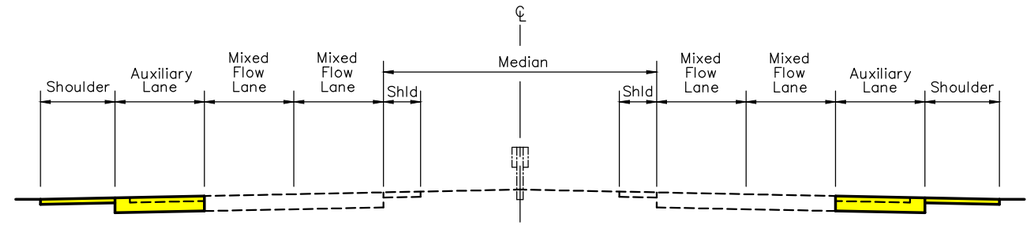
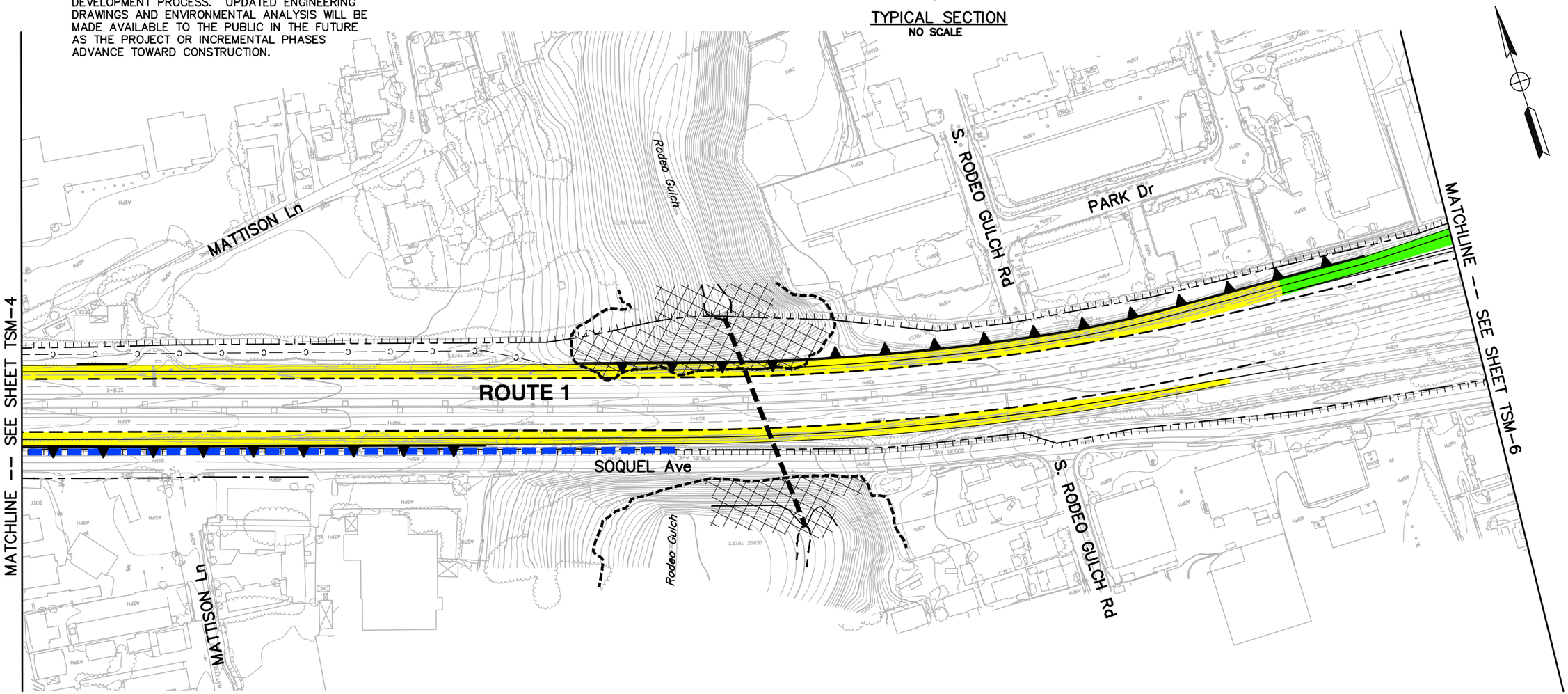


TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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- PROPOSED HIGHWAY PAVING
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- PROPOSED SOUND WALL
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- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
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CCC	CALIFORNIA COASTAL COMMISSION
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DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-5

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	6	20

CONCEPT NOTES:

THE TSM ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT-LEVEL DECISIONS AND ACTIONS.

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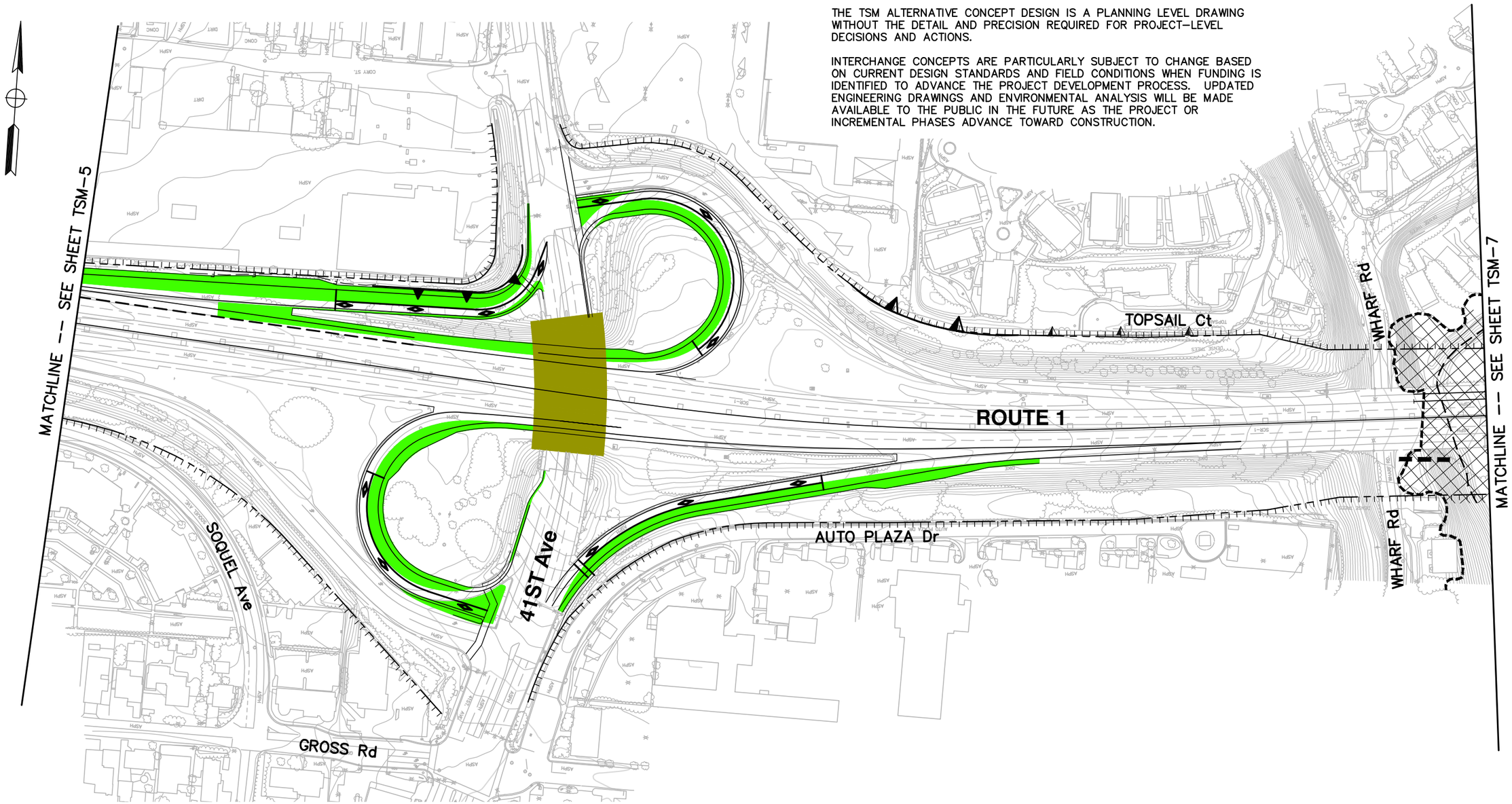

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
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- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
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ACOE	ARMY CORP OF ENGINEERS
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CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-6

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	7	20

CONCEPT NOTES:

THE TSM ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT–LEVEL DECISIONS AND ACTIONS.

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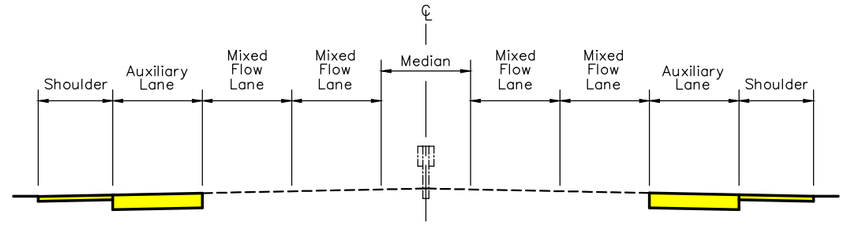
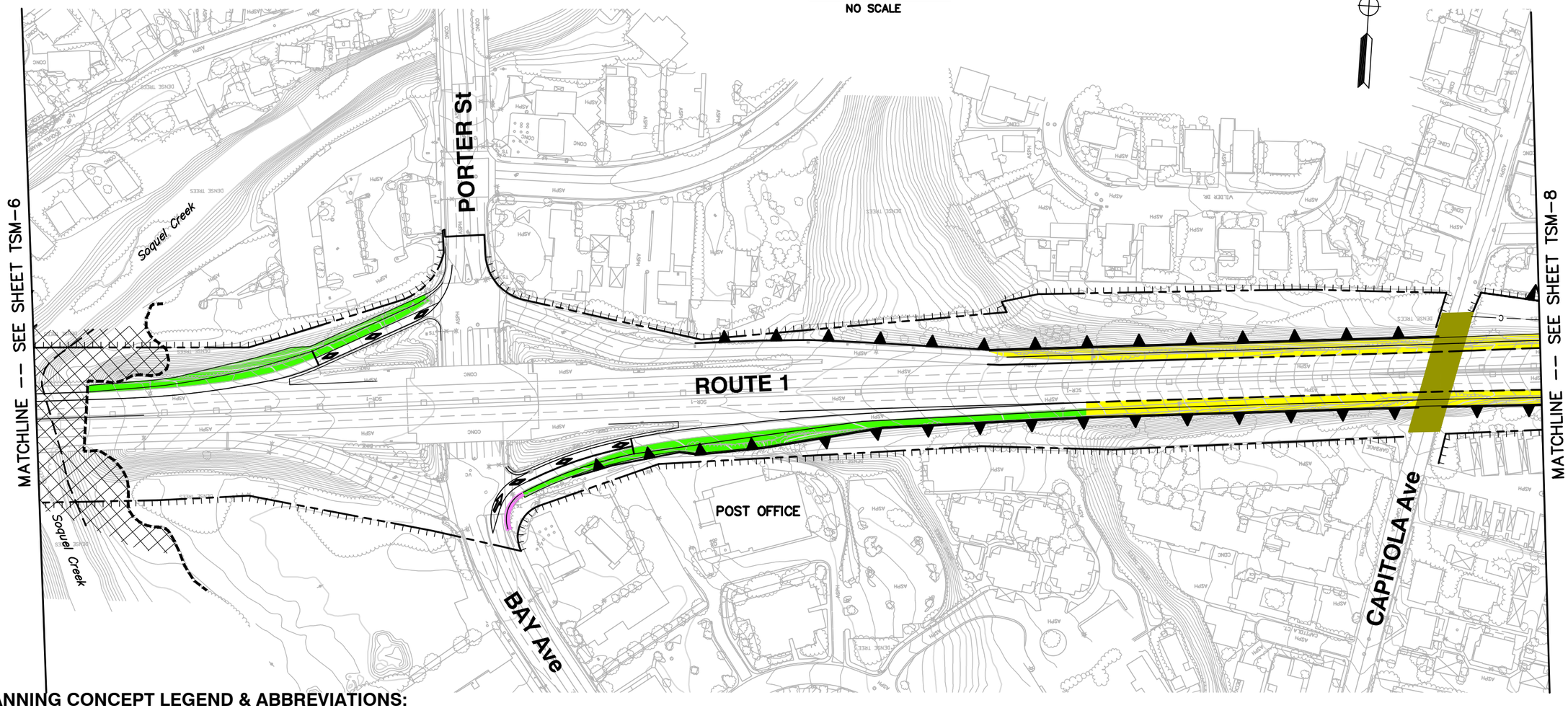


TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
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- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-7

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	8	20

CONCEPT NOTES:

THE TSM ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT-LEVEL DECISIONS AND ACTIONS.

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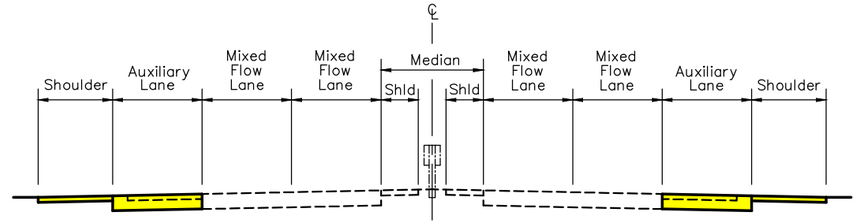
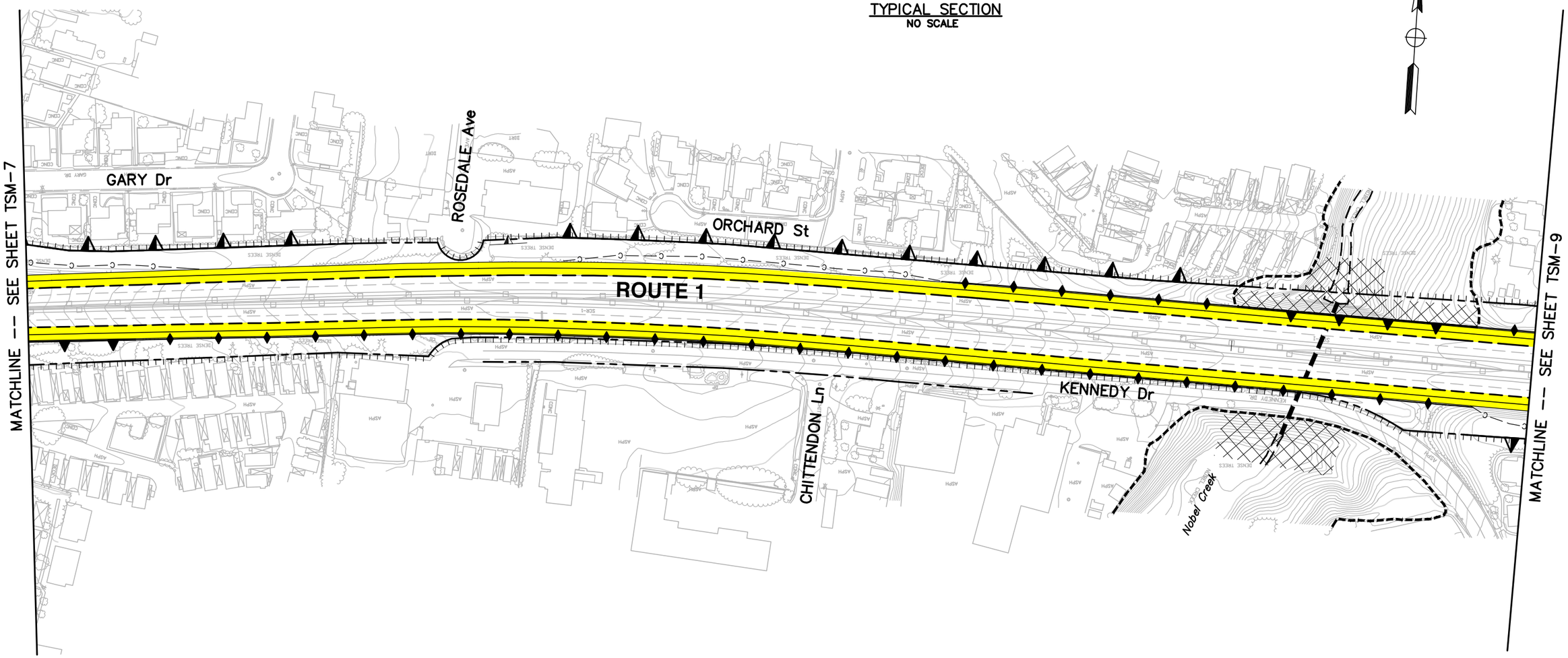


TYPICAL SECTION
NO SCALE



TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

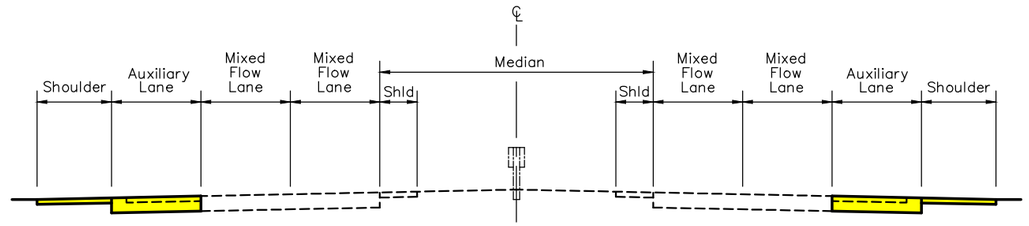
TSM-8

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	9	20

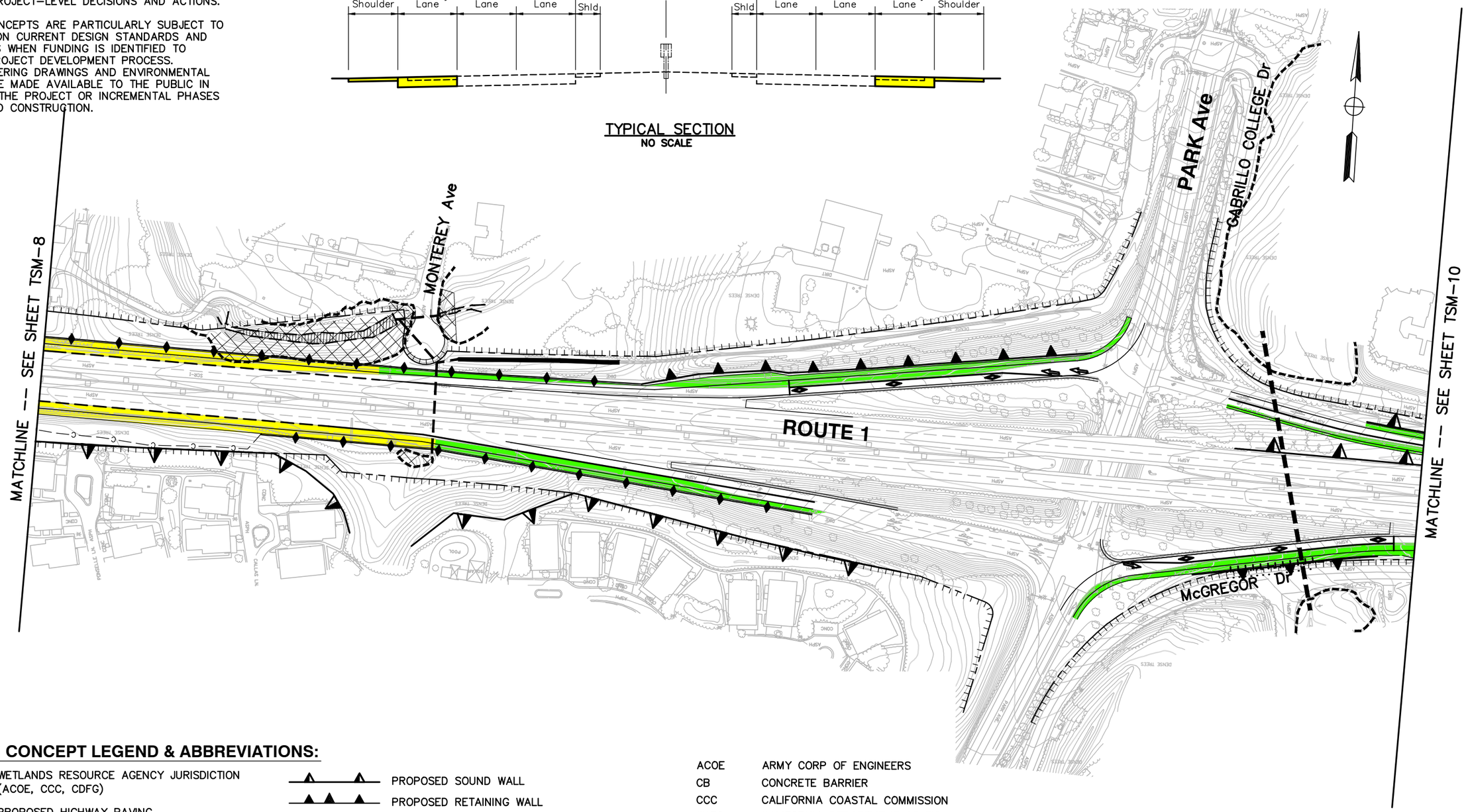
CONCEPT NOTES:

THE TSM ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT–LEVEL DECISIONS AND ACTIONS.

INTERCHANGE CONCEPTS ARE PARTICULARLY SUBJECT TO CHANGE BASED ON CURRENT DESIGN STANDARDS AND FIELD CONDITIONS WHEN FUNDING IS IDENTIFIED TO ADVANCE THE PROJECT DEVELOPMENT PROCESS. UPDATED ENGINEERING DRAWINGS AND ENVIRONMENTAL ANALYSIS WILL BE MADE AVAILABLE TO THE PUBLIC IN THE FUTURE AS THE PROJECT OR INCREMENTAL PHASES ADVANCE TOWARD CONSTRUCTION.



TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-9

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	10	20

CONCEPT NOTES:

THE TSM ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT–LEVEL DECISIONS AND ACTIONS.

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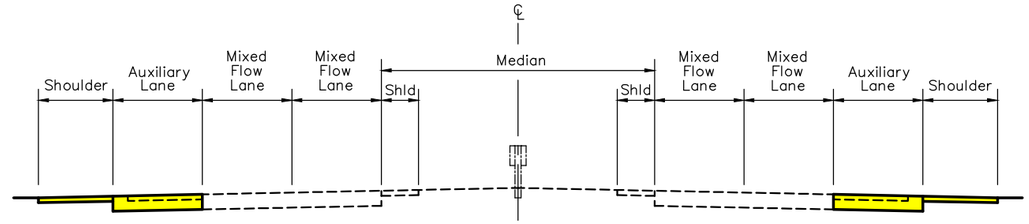
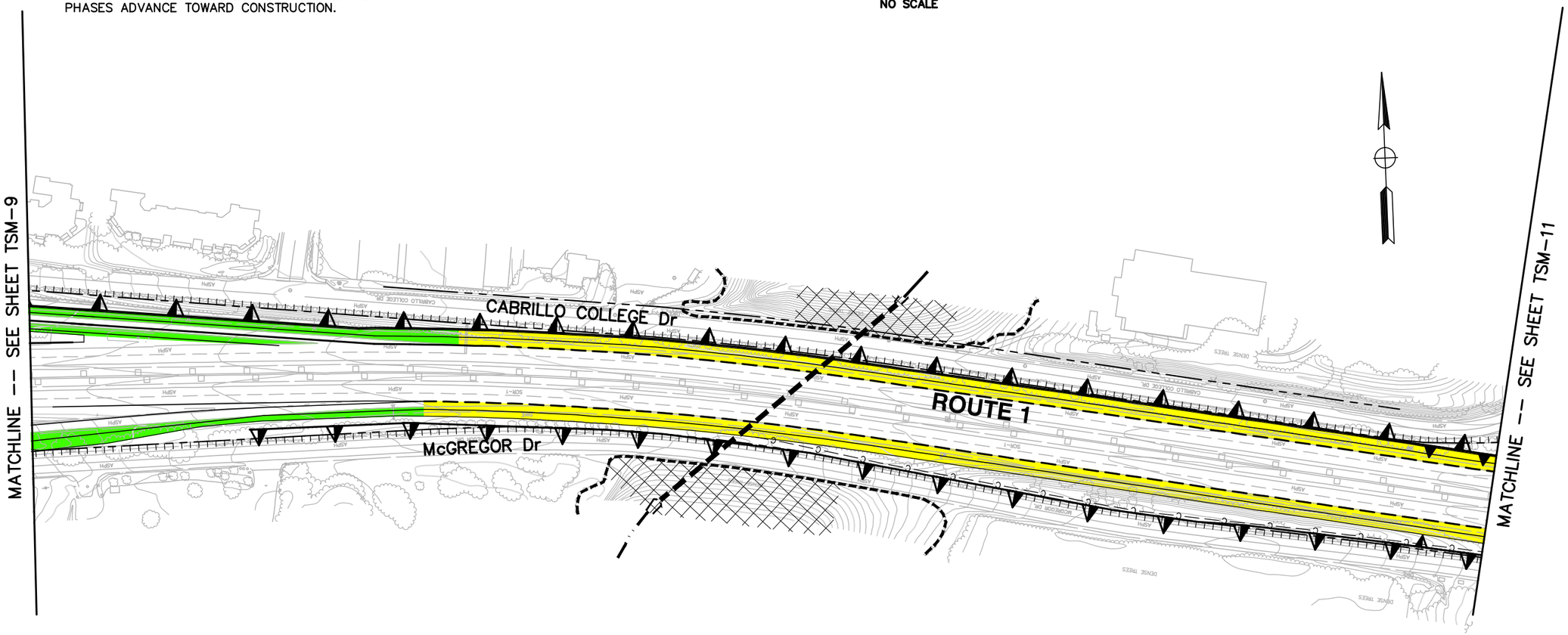


TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-10

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	11	20

CONCEPT NOTES:

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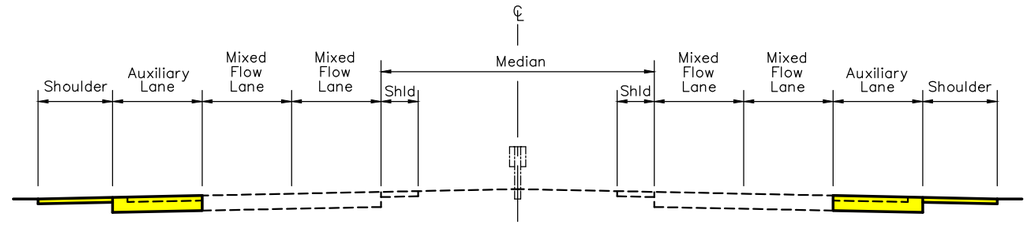
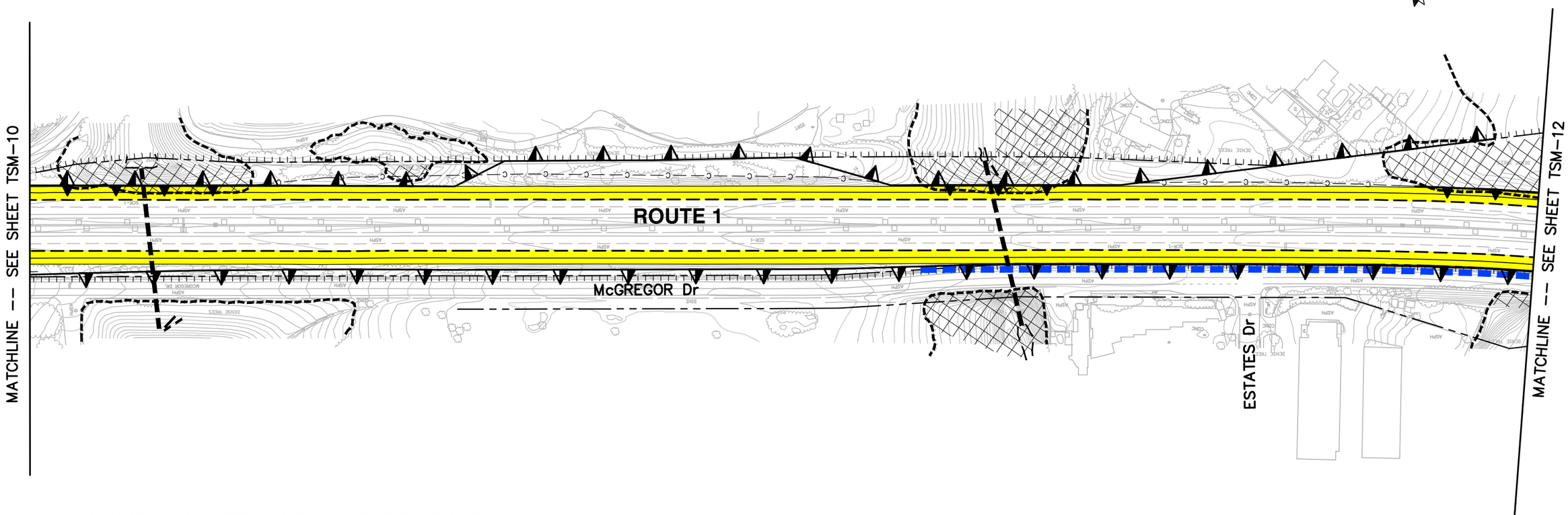


TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
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Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	12	20

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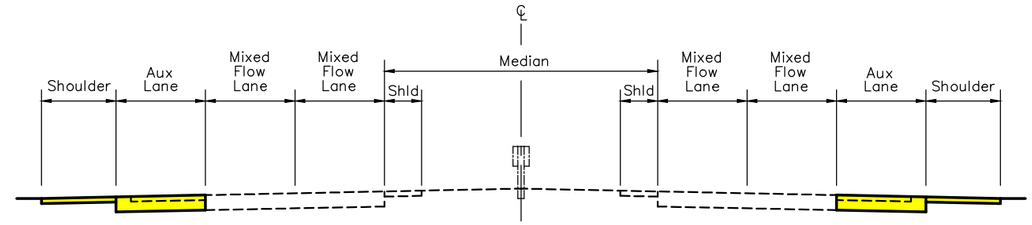

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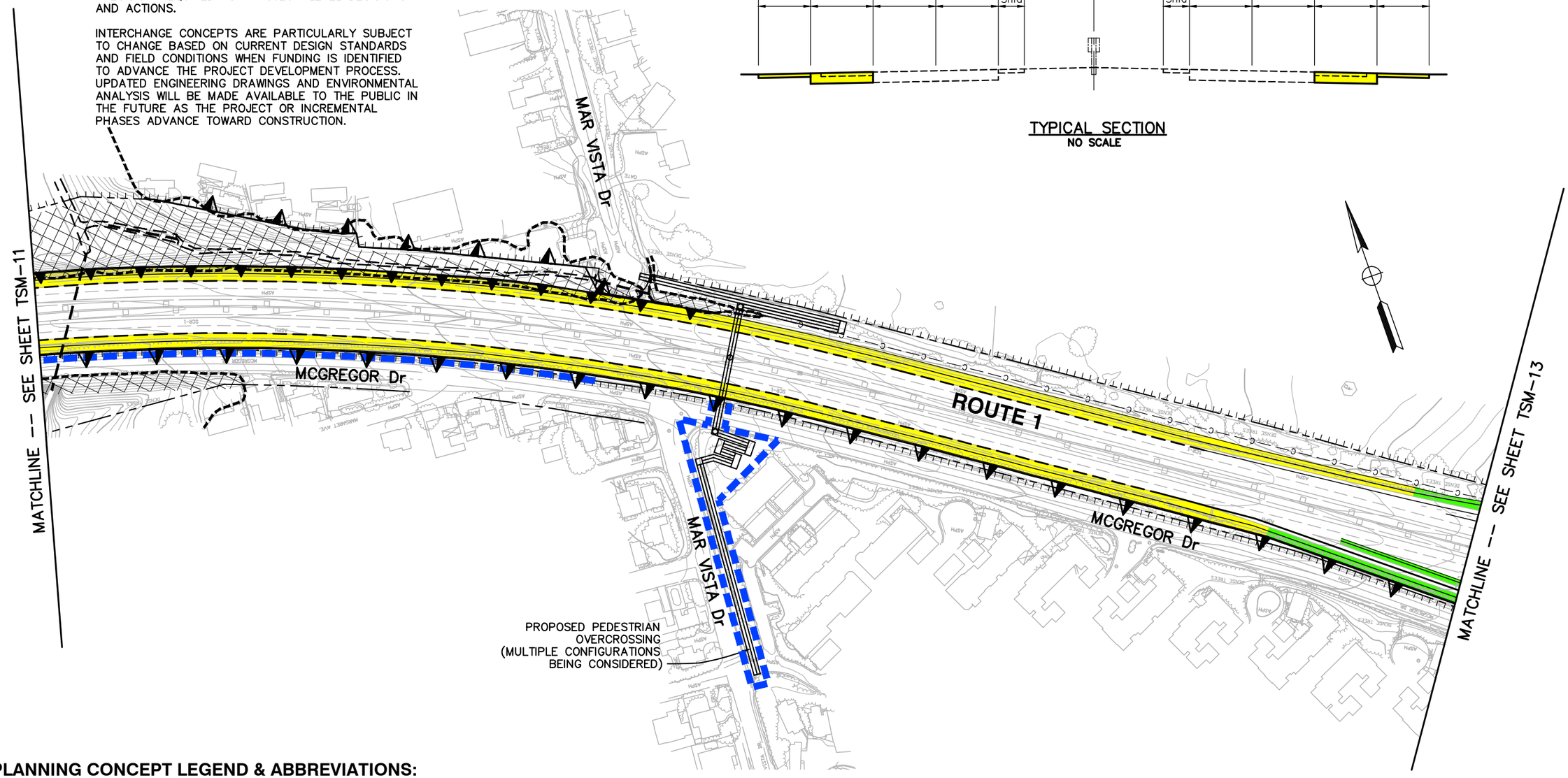

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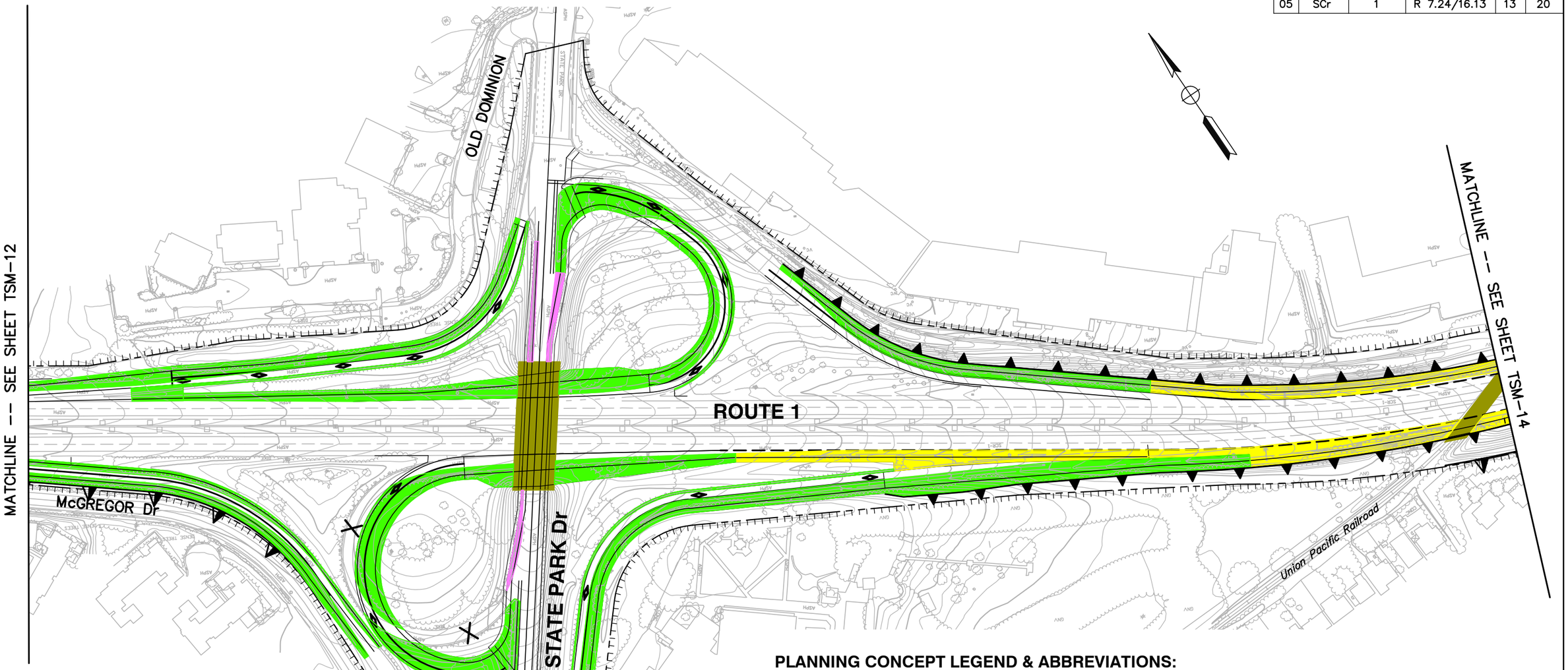
TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	13	20



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TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	14	20

CONCEPT NOTES:

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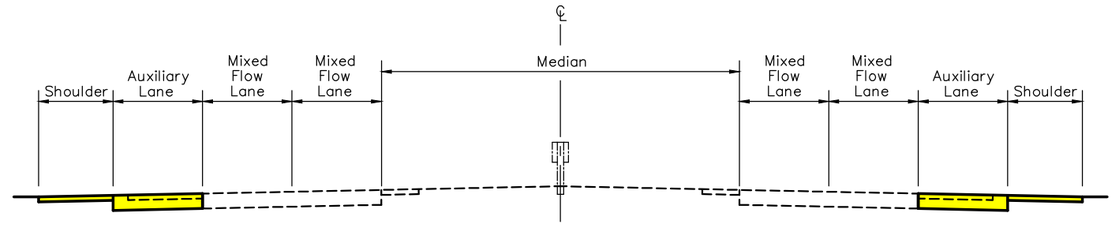
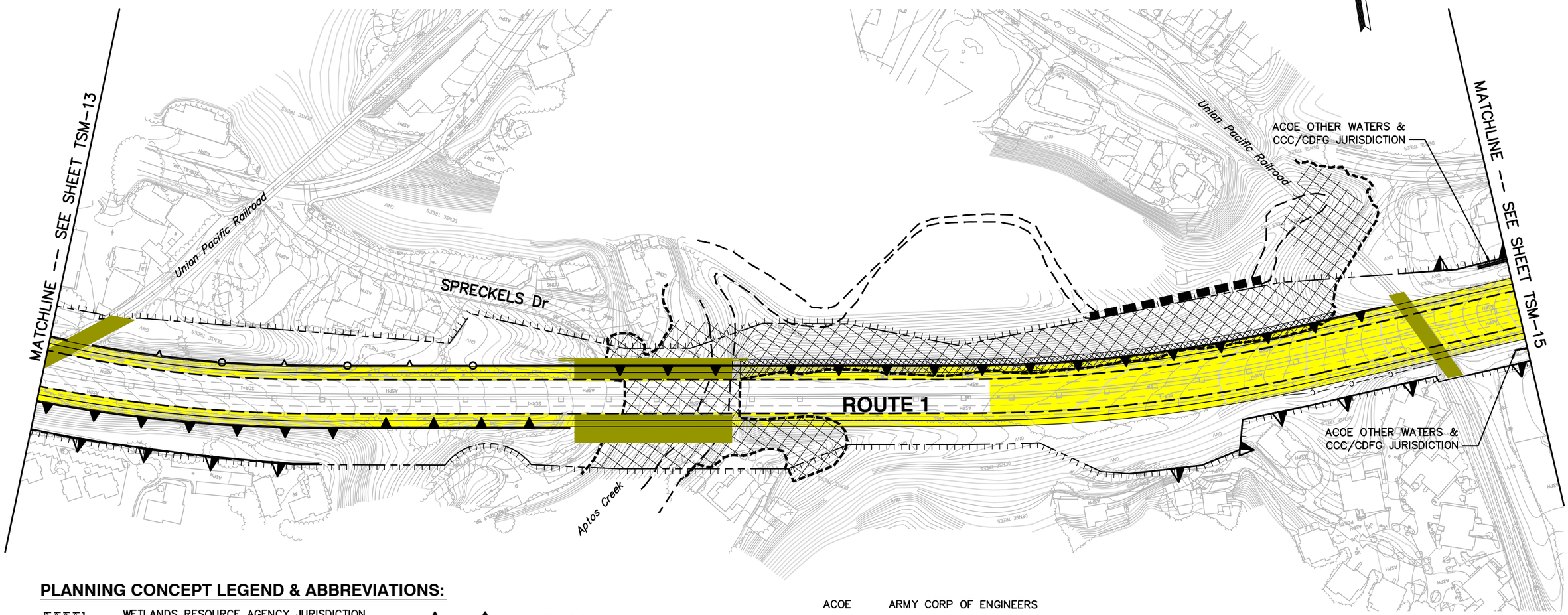


TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

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Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-14

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	15	20

CONCEPT NOTES:

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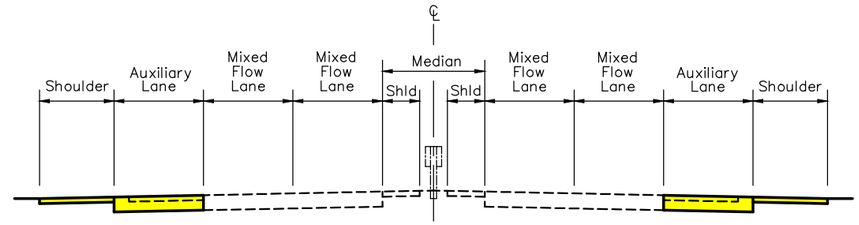
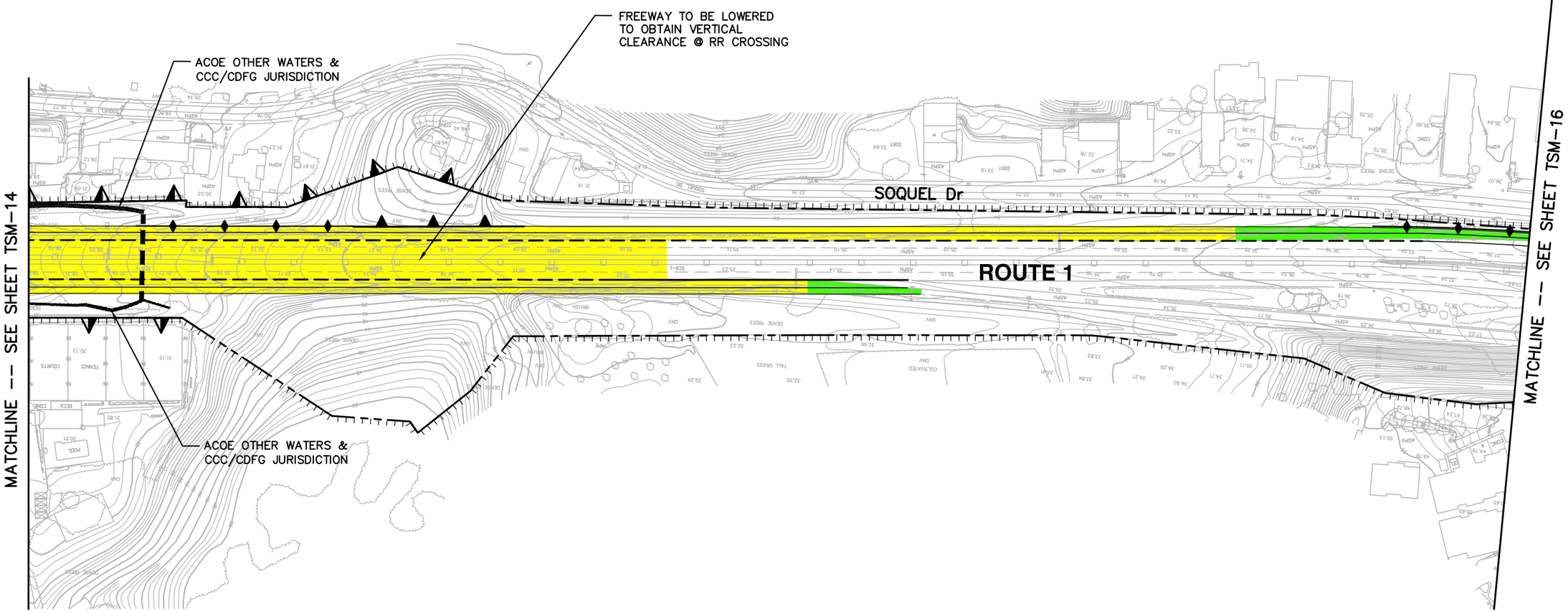


TYPICAL SECTION
NO SCALE



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
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RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-15

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	16	20

PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
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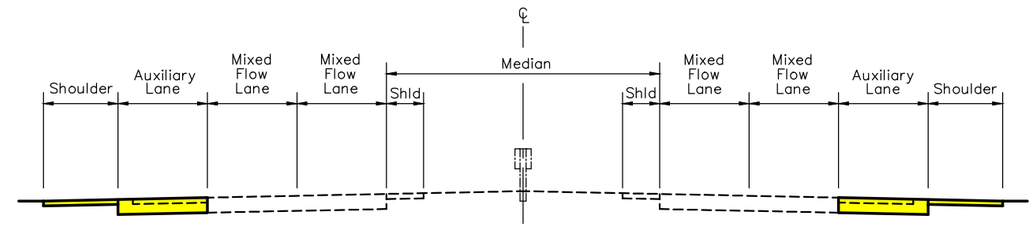
TBD	TO BE DETERMINED



TYPICAL SECTION
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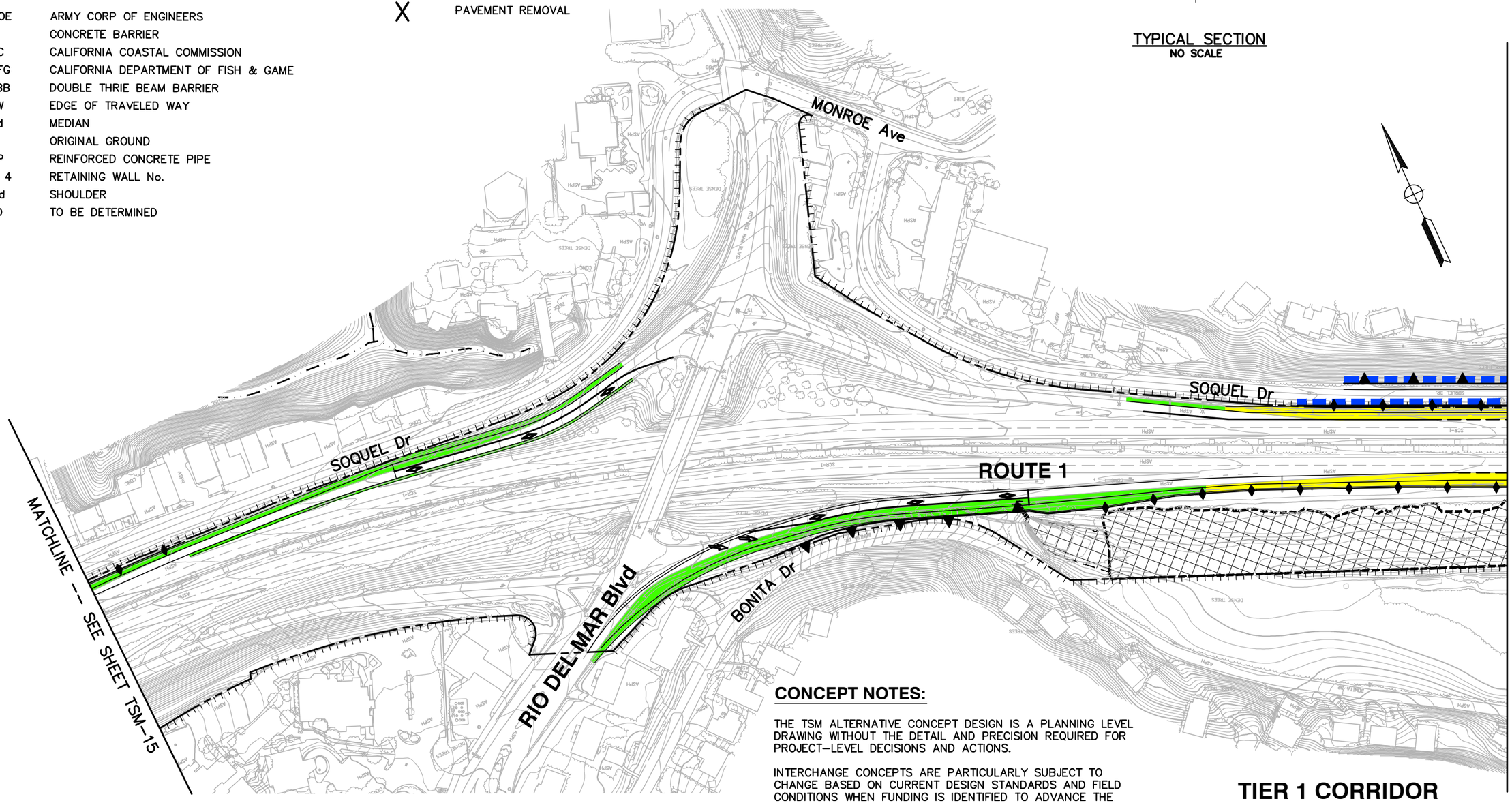

CONCEPT NOTES:

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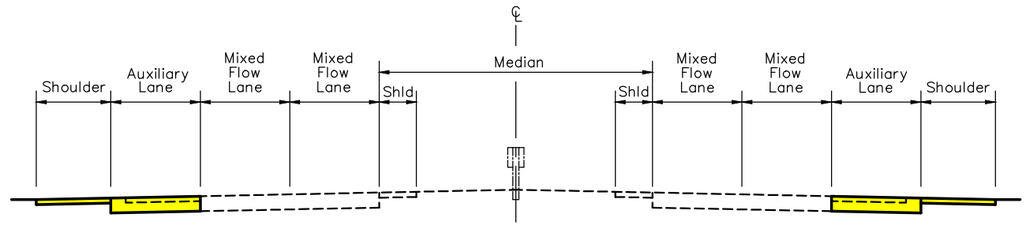
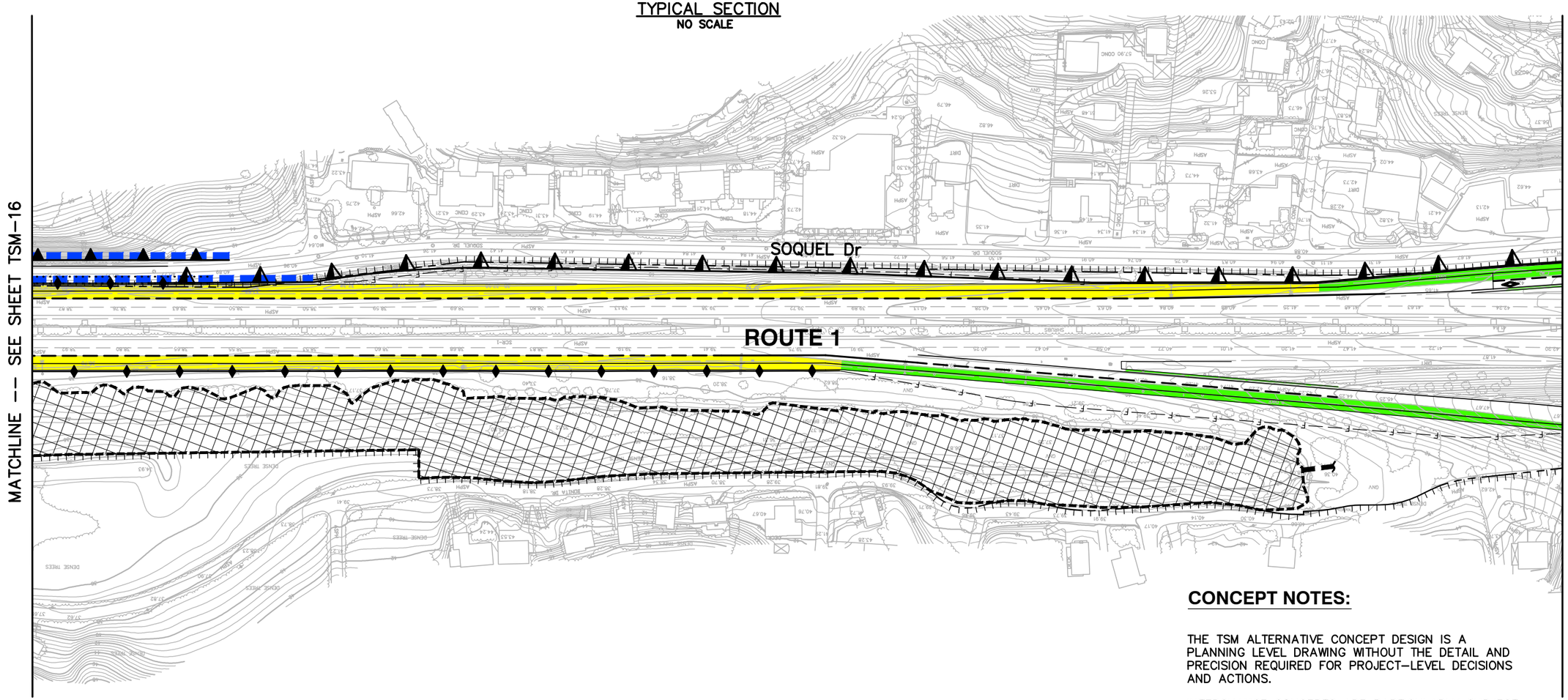
TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	17	20



TYPICAL SECTION
NO SCALE



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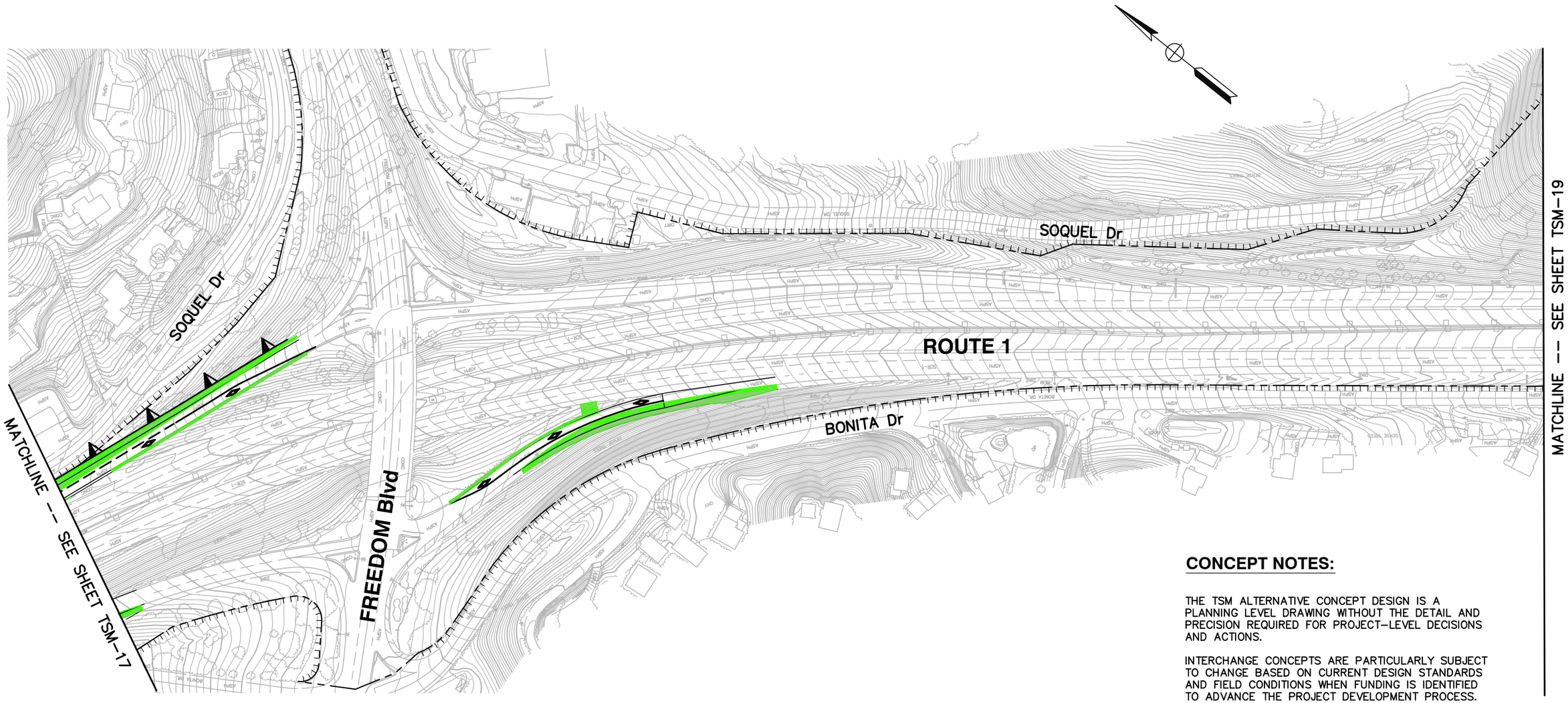
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	18	20



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CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

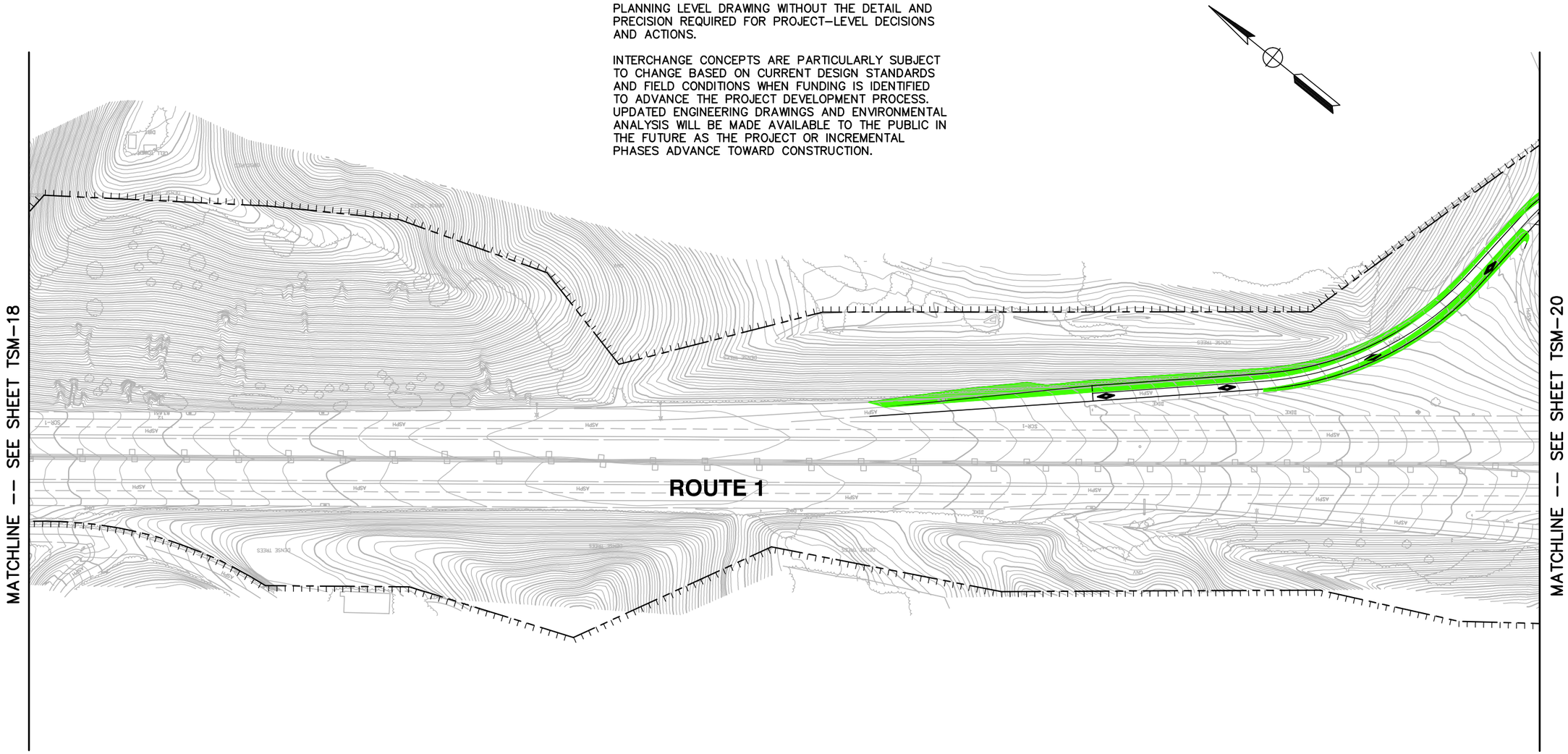
TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	19	20

CONCEPT NOTES:

THE TSM ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT–LEVEL DECISIONS AND ACTIONS.

INTERCHANGE CONCEPTS ARE PARTICULARLY SUBJECT TO CHANGE BASED ON CURRENT DESIGN STANDARDS AND FIELD CONDITIONS WHEN FUNDING IS IDENTIFIED TO ADVANCE THE PROJECT DEVELOPMENT PROCESS. UPDATED ENGINEERING DRAWINGS AND ENVIRONMENTAL ANALYSIS WILL BE MADE AVAILABLE TO THE PUBLIC IN THE FUTURE AS THE PROJECT OR INCREMENTAL PHASES ADVANCE TOWARD CONSTRUCTION.



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

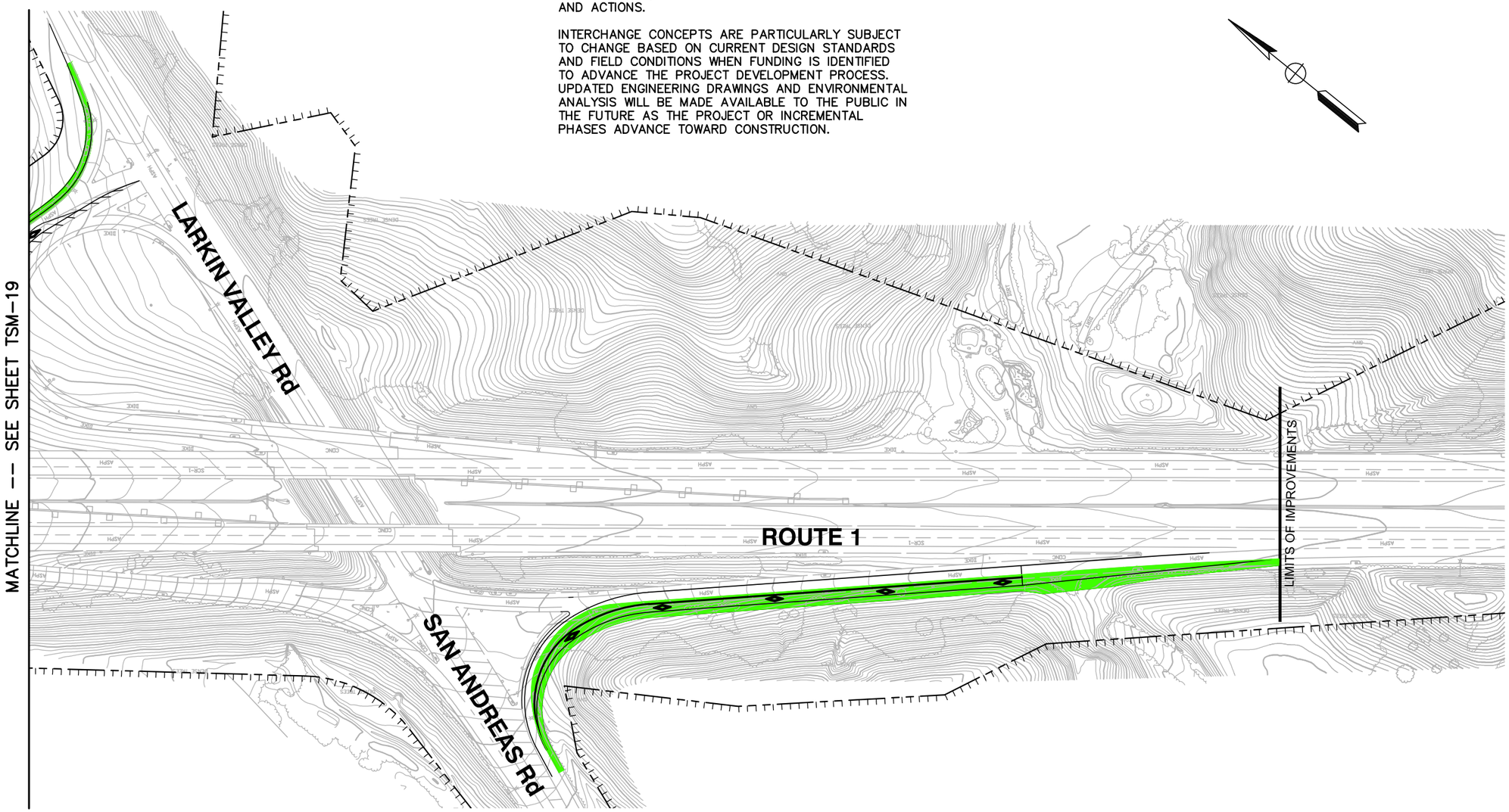
TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

DIST	COUNTY	ROUTE	MILE POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
05	SCr	1	R 7.24/16.13	20	20

CONCEPT NOTES:

THE TSM ALTERNATIVE CONCEPT DESIGN IS A PLANNING LEVEL DRAWING WITHOUT THE DETAIL AND PRECISION REQUIRED FOR PROJECT–LEVEL DECISIONS AND ACTIONS.

INTERCHANGE CONCEPTS ARE PARTICULARLY SUBJECT TO CHANGE BASED ON CURRENT DESIGN STANDARDS AND FIELD CONDITIONS WHEN FUNDING IS IDENTIFIED TO ADVANCE THE PROJECT DEVELOPMENT PROCESS. UPDATED ENGINEERING DRAWINGS AND ENVIRONMENTAL ANALYSIS WILL BE MADE AVAILABLE TO THE PUBLIC IN THE FUTURE AS THE PROJECT OR INCREMENTAL PHASES ADVANCE TOWARD CONSTRUCTION.



PLANNING CONCEPT LEGEND & ABBREVIATIONS:

- WETLANDS RESOURCE AGENCY JURISDICTION (ACOE, CCC, CDFG)
- PROPOSED HIGHWAY PAVING
- PROPOSED RAMP PAVING
- PROPOSED LOCAL ROAD WORK
- PROPOSED BIKE PATH
- PROPOSED BRIDGE
- PROPOSED SOUND WALL
- PROPOSED RETAINING WALL
- PROPOSED SOUND WALL ON RETAINING WALL
- EXISTING HIGHWAY ACCESS CONTROL
- PLANNING CONCEPT FOOTPRINT
- EXISTING CULVERT
- HOV LANE PAVEMENT MARKING
- PAVEMENT REMOVAL

ACOE	ARMY CORP OF ENGINEERS
CB	CONCRETE BARRIER
CCC	CALIFORNIA COASTAL COMMISSION
CDFG	CALIFORNIA DEPARTMENT OF FISH & GAME
DTBB	DOUBLE THRIE BEAM BARRIER
ETW	EDGE OF TRAVELED WAY
Med	MEDIAN
OG	ORIGINAL GROUND
RCP	REINFORCED CONCRETE PIPE
RW 4	RETAINING WALL No.
Shld	SHOULDER
TBD	TO BE DETERMINED

TIER 1 CORRIDOR TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

TSM-20

Appendix B. Tier II Project Plans

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCr	1			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER PARAG MEHTA No. C 66638 Exp. 6/30/12 CIVIL STATE OF CALIFORNIA

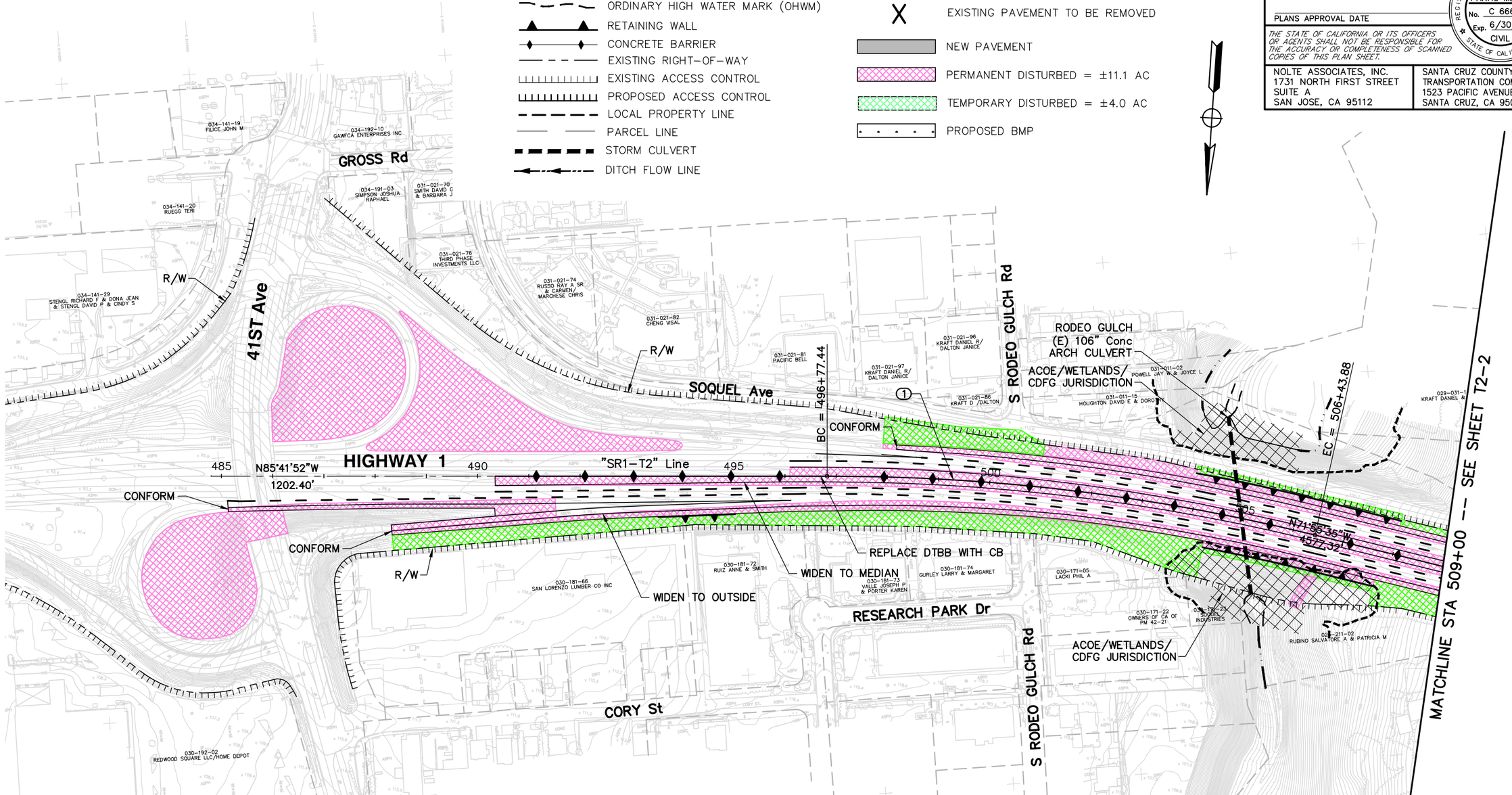
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

NOLTE ASSOCIATES, INC.
1731 NORTH FIRST STREET
SUITE A
SAN JOSE, CA 95112

SANTA CRUZ COUNTY REGIONAL TRANSPORTATION COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060

LEGEND

- WETLANDS JURISDICTION
- APPROXIMATE LOCATION OF WETLANDS JURISDICTION OUTSIDE PROJECT APE
- PERIMETER OF WETLANDS JURISDICTION
- ORDINARY HIGH WATER MARK (OHWM)
- RETAINING WALL
- CONCRETE BARRIER
- EXISTING RIGHT-OF-WAY
- EXISTING ACCESS CONTROL
- PROPOSED ACCESS CONTROL
- LOCAL PROPERTY LINE
- PARCEL LINE
- STORM CULVERT
- DITCH FLOW LINE
- —c— CUT LINE
- —F— FILL LINE
- S(No.) SOUND WALL NUMBER
- X EXISTING PAVEMENT TO BE REMOVED
- NEW PAVEMENT
- PERMANENT DISTURBED = ±11.1 AC
- TEMPORARY DISTURBED = ±4.0 AC
- PROPOSED BMP



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No.	R	Δ	T	L
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ROUTE 1
HOV - TIER 2 PROJECT
DISTURBED SOIL AREA
SEPTEMBER 2012

SCALE 1:100

T2-1

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION CONSULTANT FUNCTIONAL SUPERVISOR

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCr	1			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
PARAG MEHTA
No. C 66638
Exp. 6/30/12
CIVIL
STATE OF CALIFORNIA

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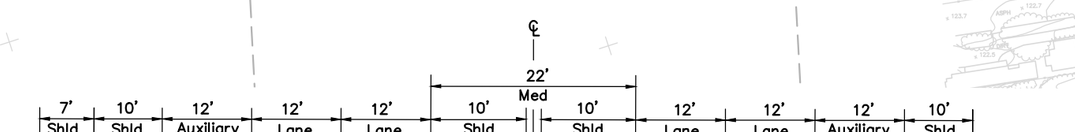
SUITE A
SAN JOSE, CA 95112

SANTA CRUZ COUNTY REGIONAL
TRANSPORTATION COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060



SECTION A–A
NO SCALE

ROUTE 1
HOV - TIER 2 PROJECT
DISTURBED SOIL AREA
SEPTEMBER 2012

SCALE 1:100

T2-2

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY
CHECKED BY

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION CONSULTANT FUNCTIONAL SUPERVISOR

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UNIT xxx

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCr	1			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
PARAG MEHTA
No. C 66638
Exp. 6/30/12
CIVIL
STATE OF CALIFORNIA

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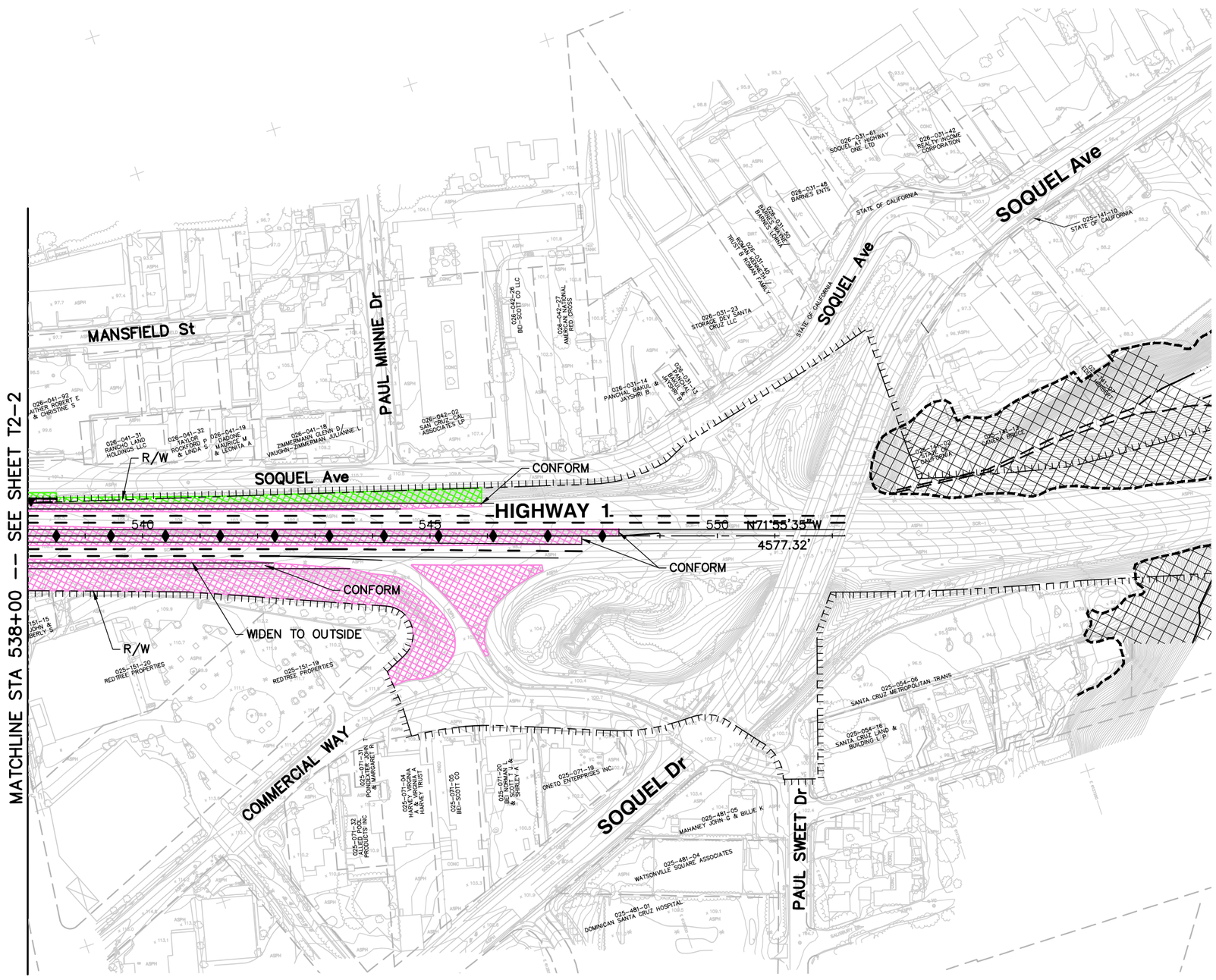
SUITE A
SAN JOSE, CA 95112

SANTA CRUZ COUNTY REGIONAL
TRANSPORTATION COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060



ROUTE 1
HOV - TIER 2 PROJECT
DISTURBED SOIL AREA
SEPTEMBER 2012

SCALE 1:100

T2-3

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY
CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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UNIT xxx

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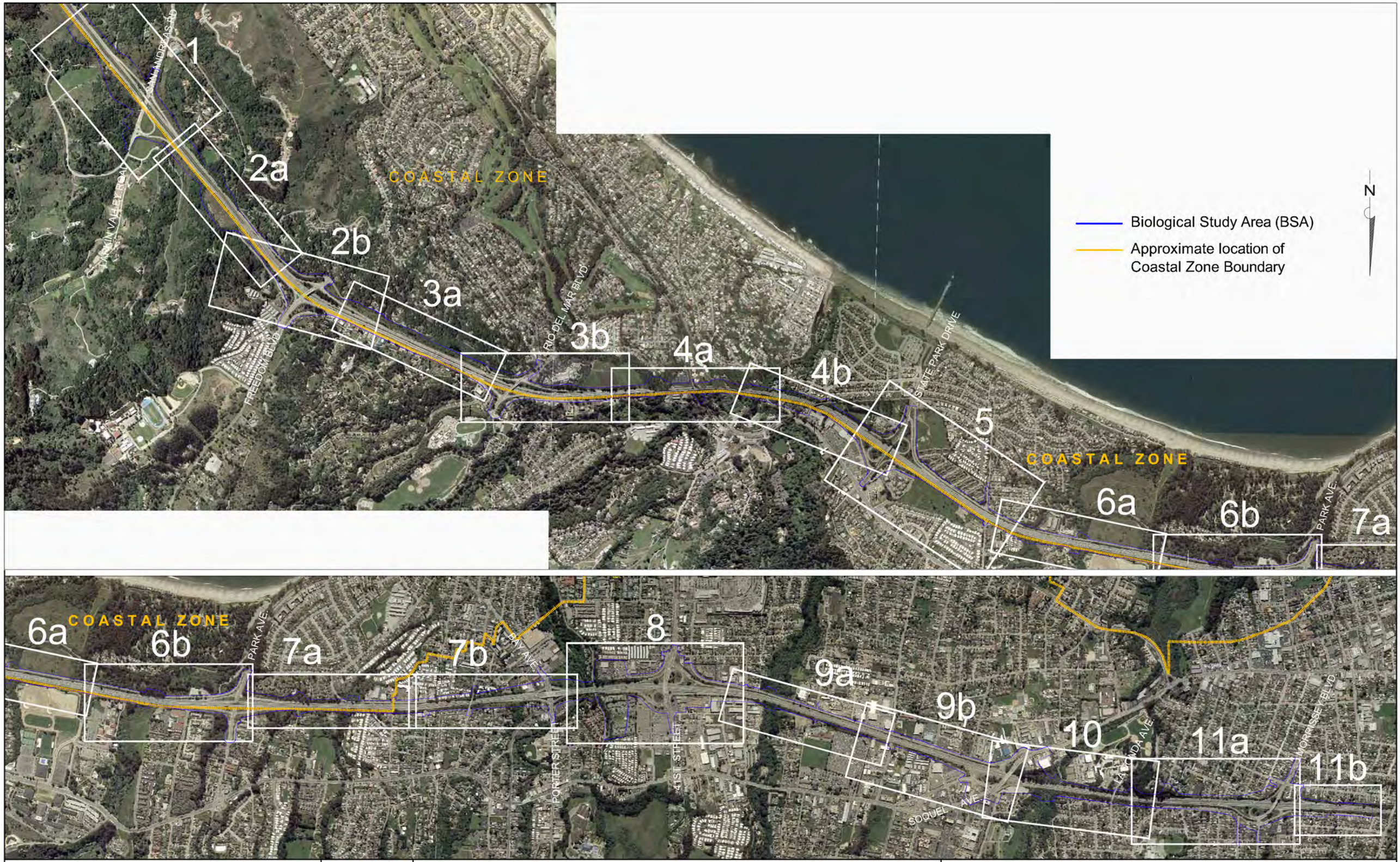
Appendix C. Plant Communities/Habitat Maps



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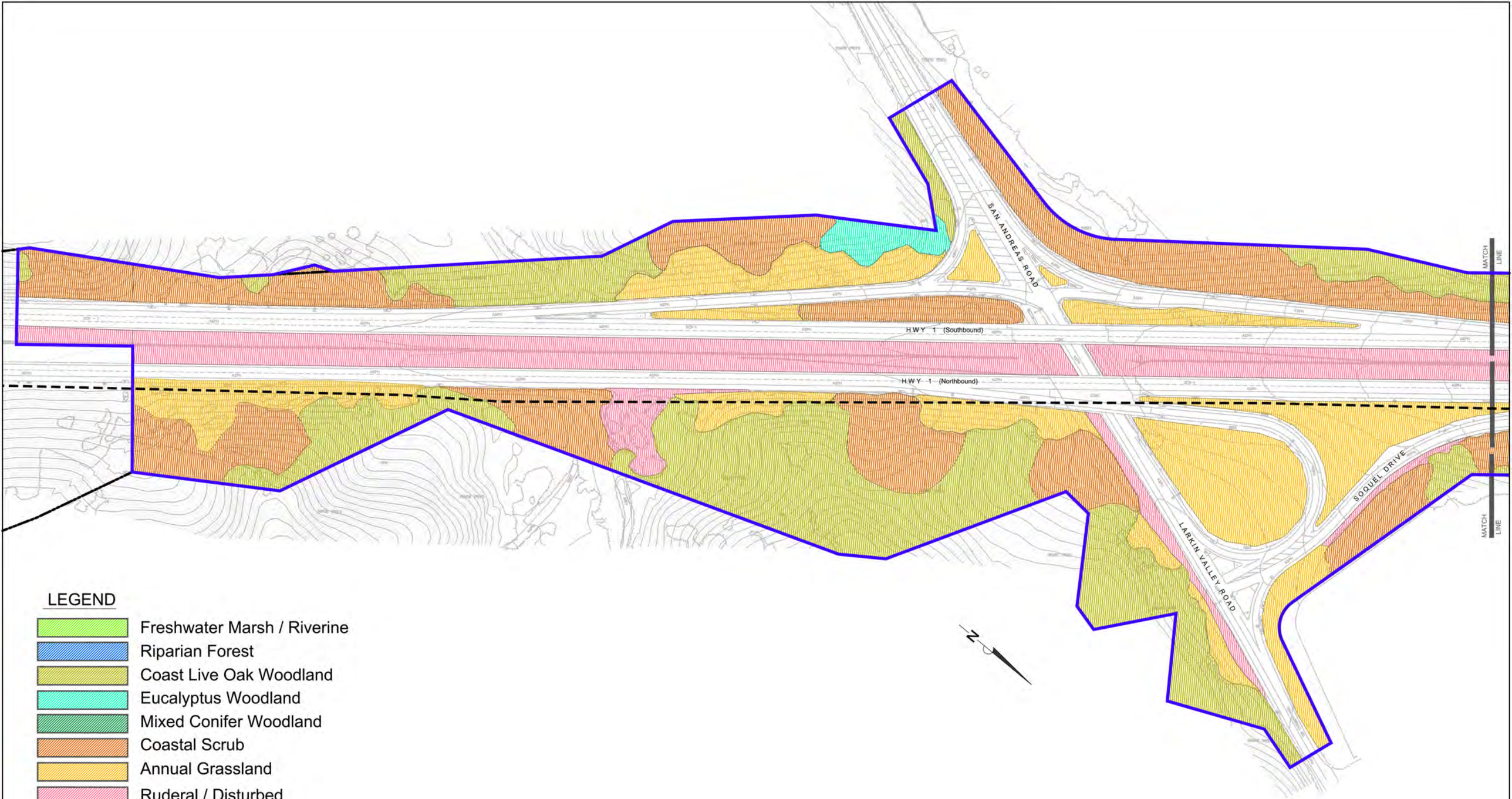
SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

KEY TO PLANT COMMUNITIES/HABITAT MAPS



LEGEND

- Freshwater Marsh / Riverine
- Riparian Forest
- Coast Live Oak Woodland
- Eucalyptus Woodland
- Mixed Conifer Woodland
- Coastal Scrub
- Annual Grassland
- Ruderal / Disturbed
- Developed / Landscaped
- approximate creek flowline
- Biological Study Area (BSA)
- approximate northerly limits of Coastal Zone

1

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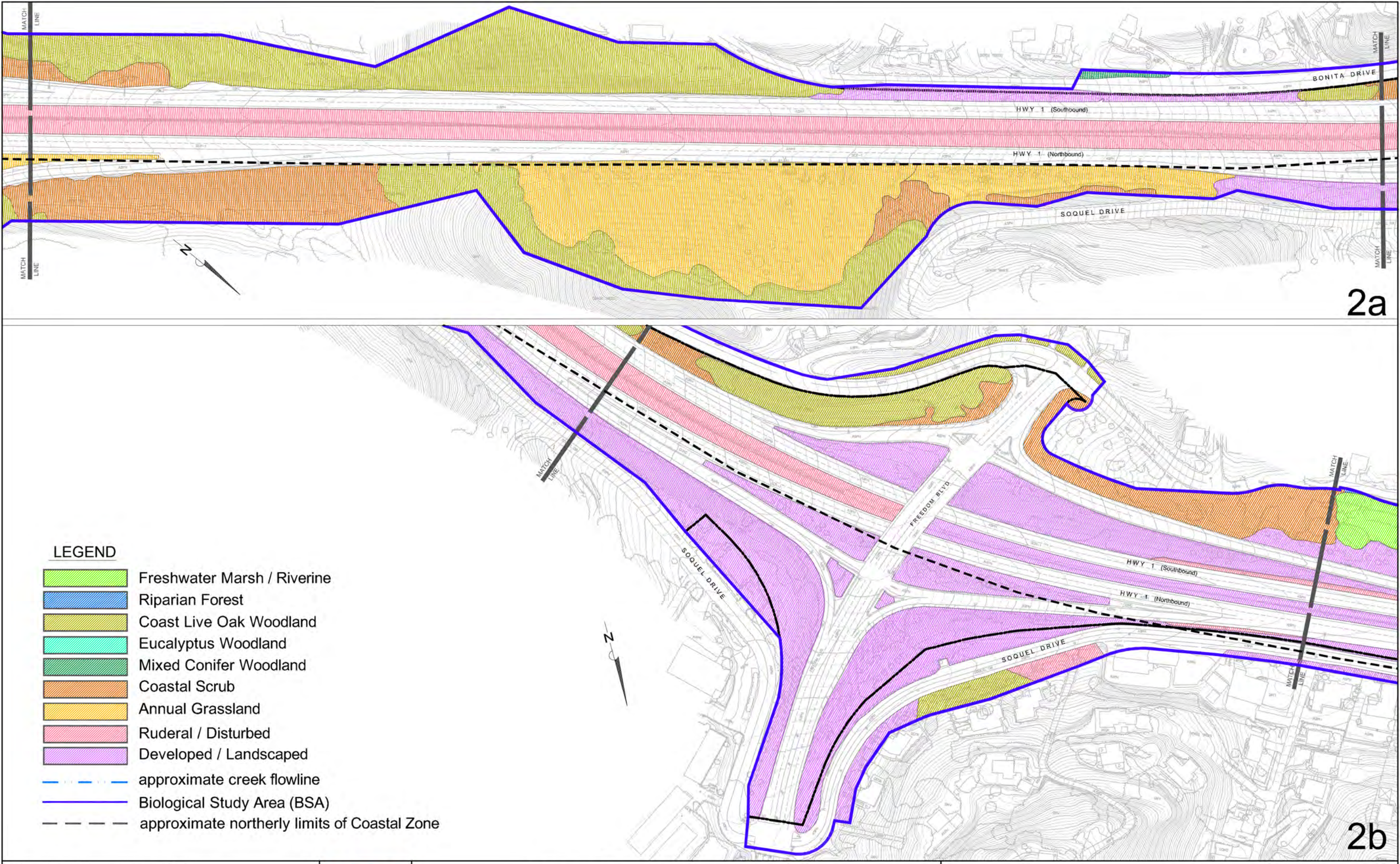
SHEET 1
Plant Communities / Habitats Map



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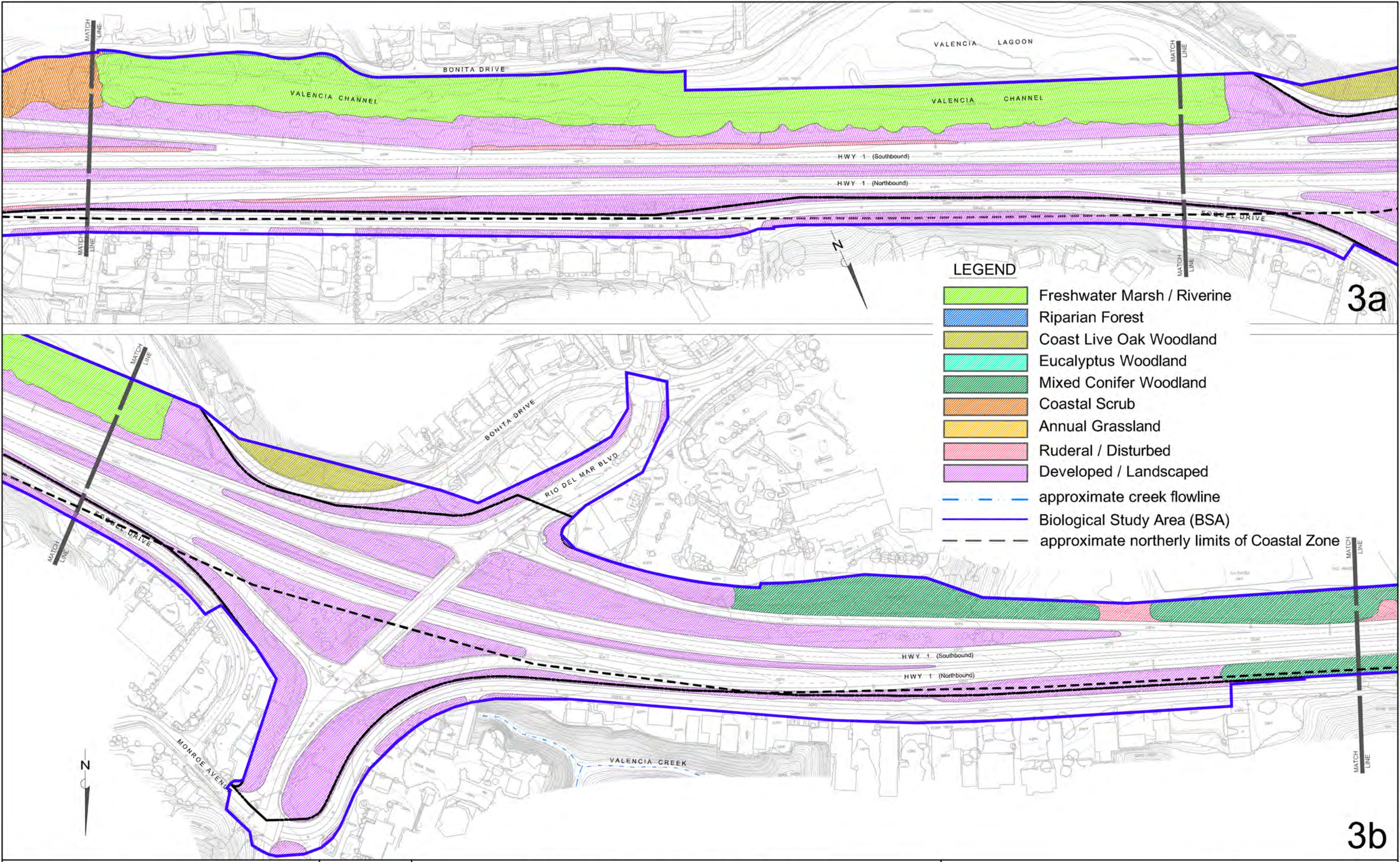
SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 2
Plant Communities / Habitats Map



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SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 3
Plant Communities / Habitats Map

SHEET: 5 OF 12 SCALE: 1:2400
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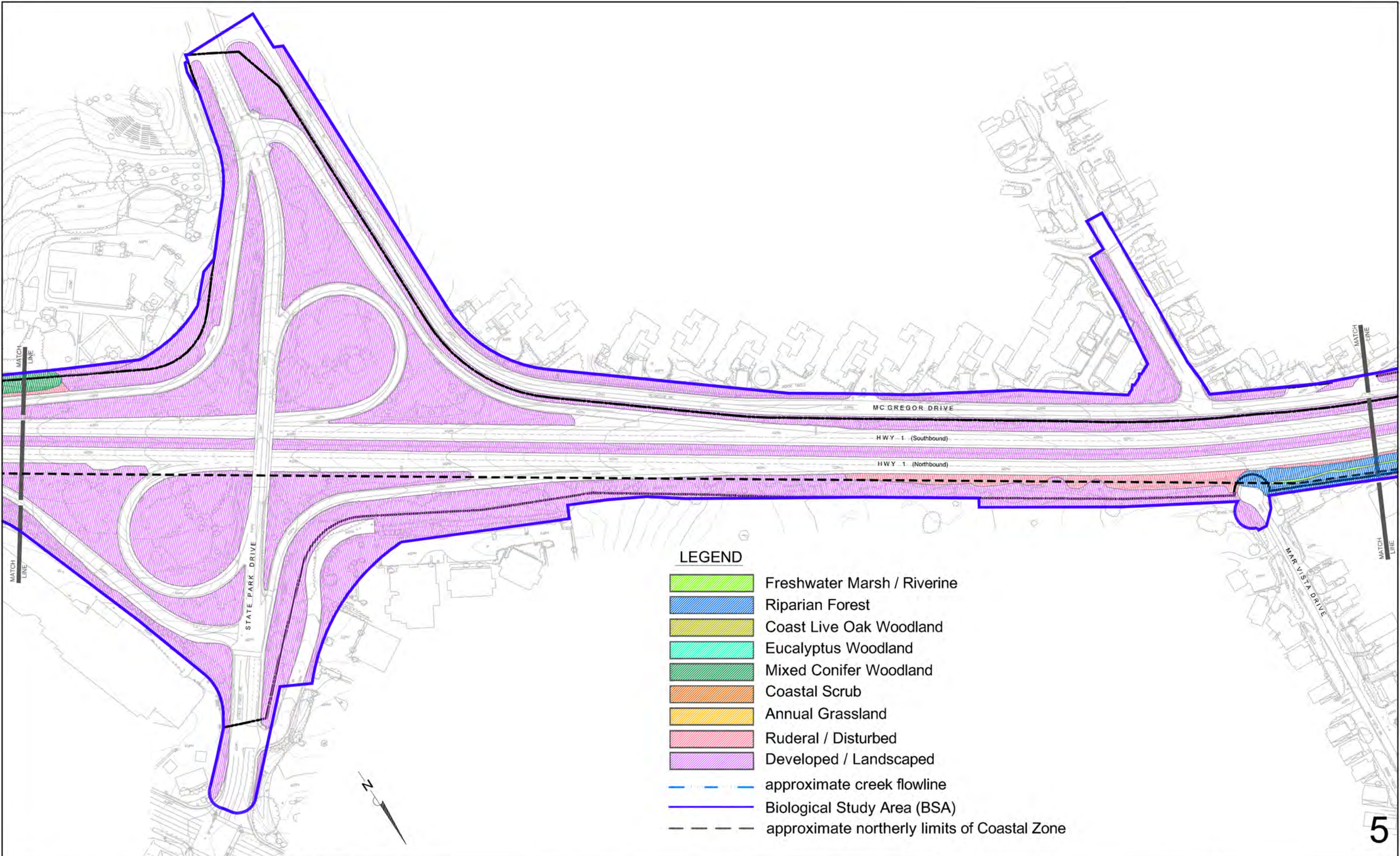
DATE: 6.25.07; 3.8.10 BY: dh,va REV.

SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 4
Plant Communities / Habitats Map



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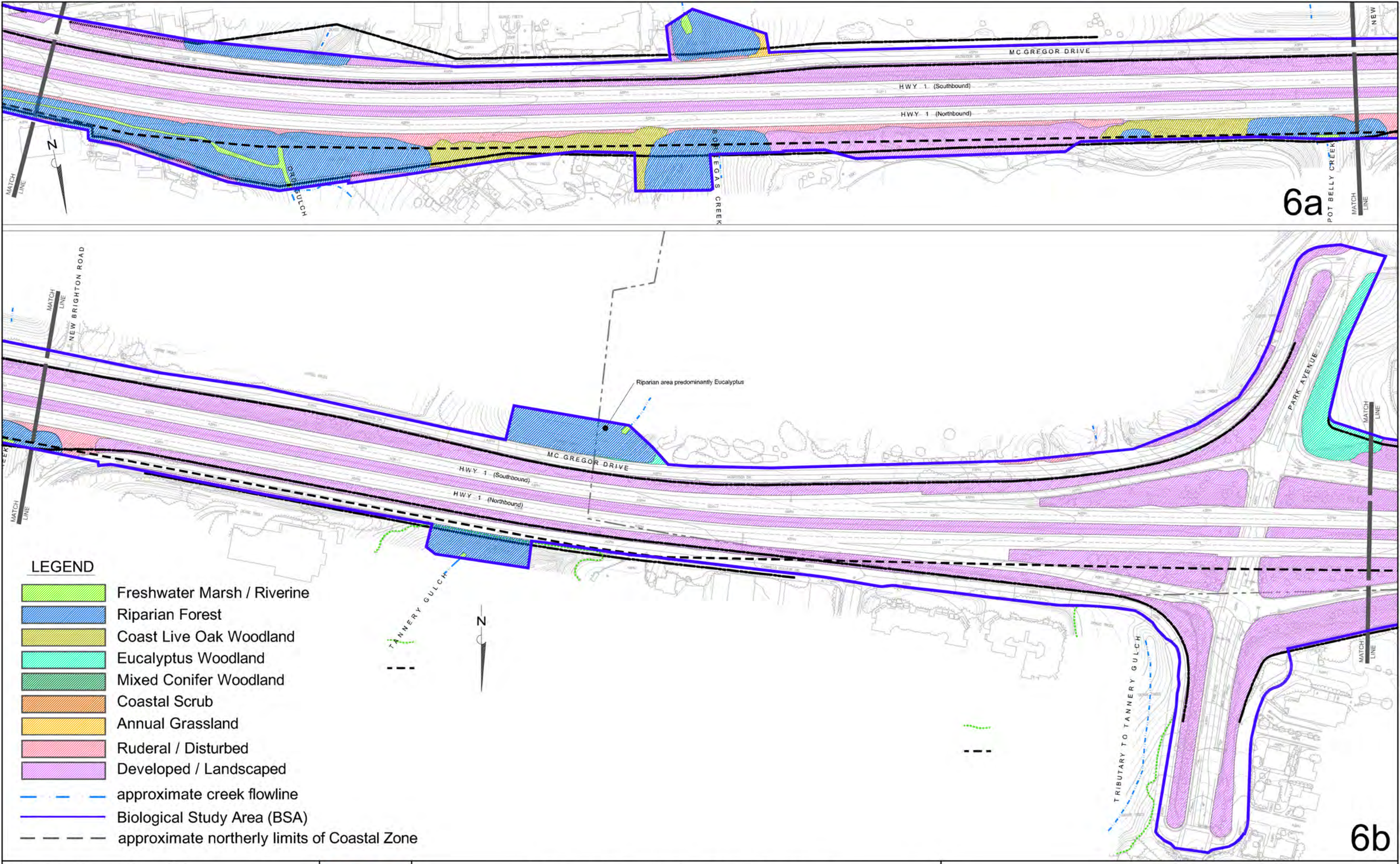
SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 5
Plant Communities / Habitats Map



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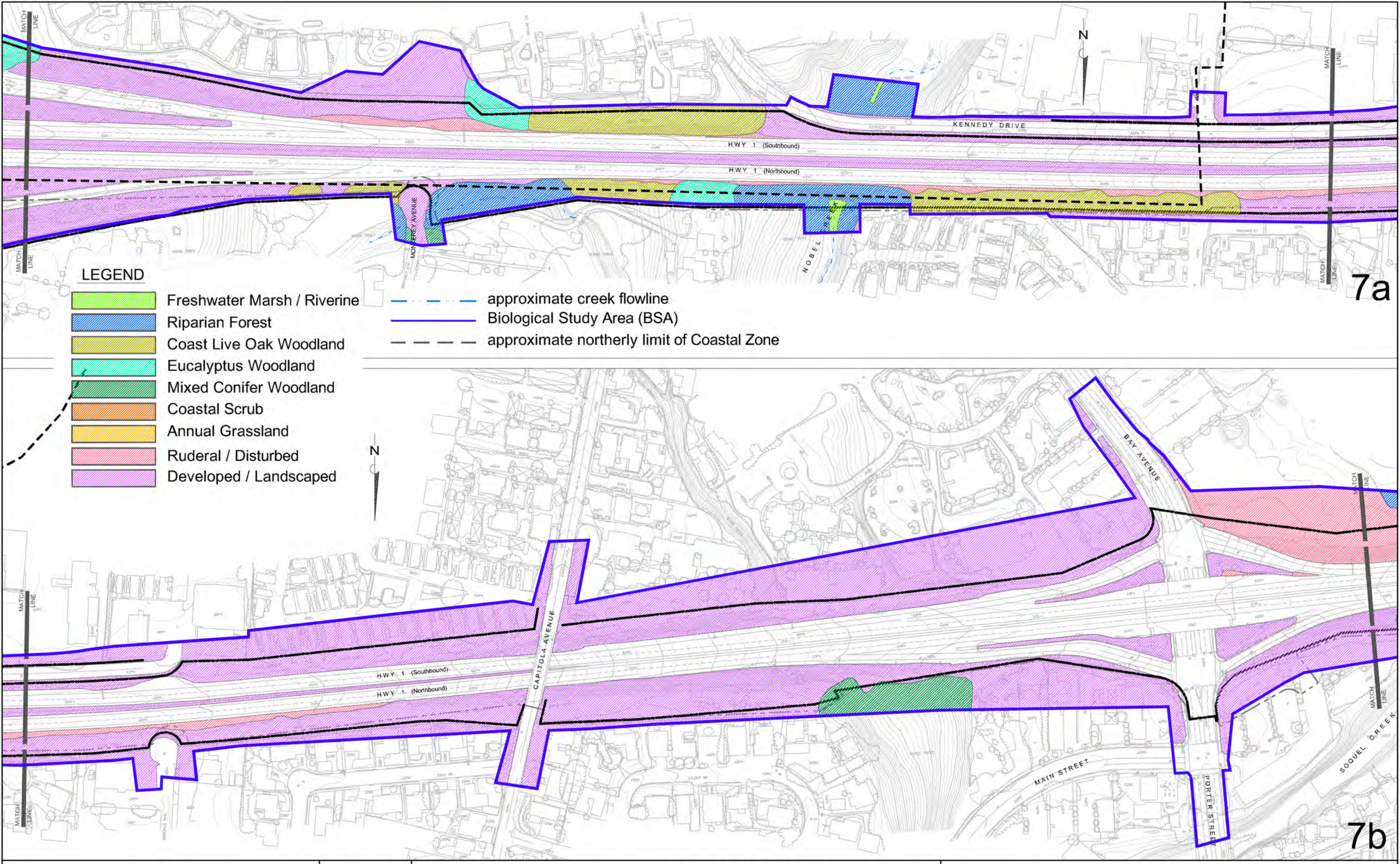
SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 6
Plant Communities / Habitats Map



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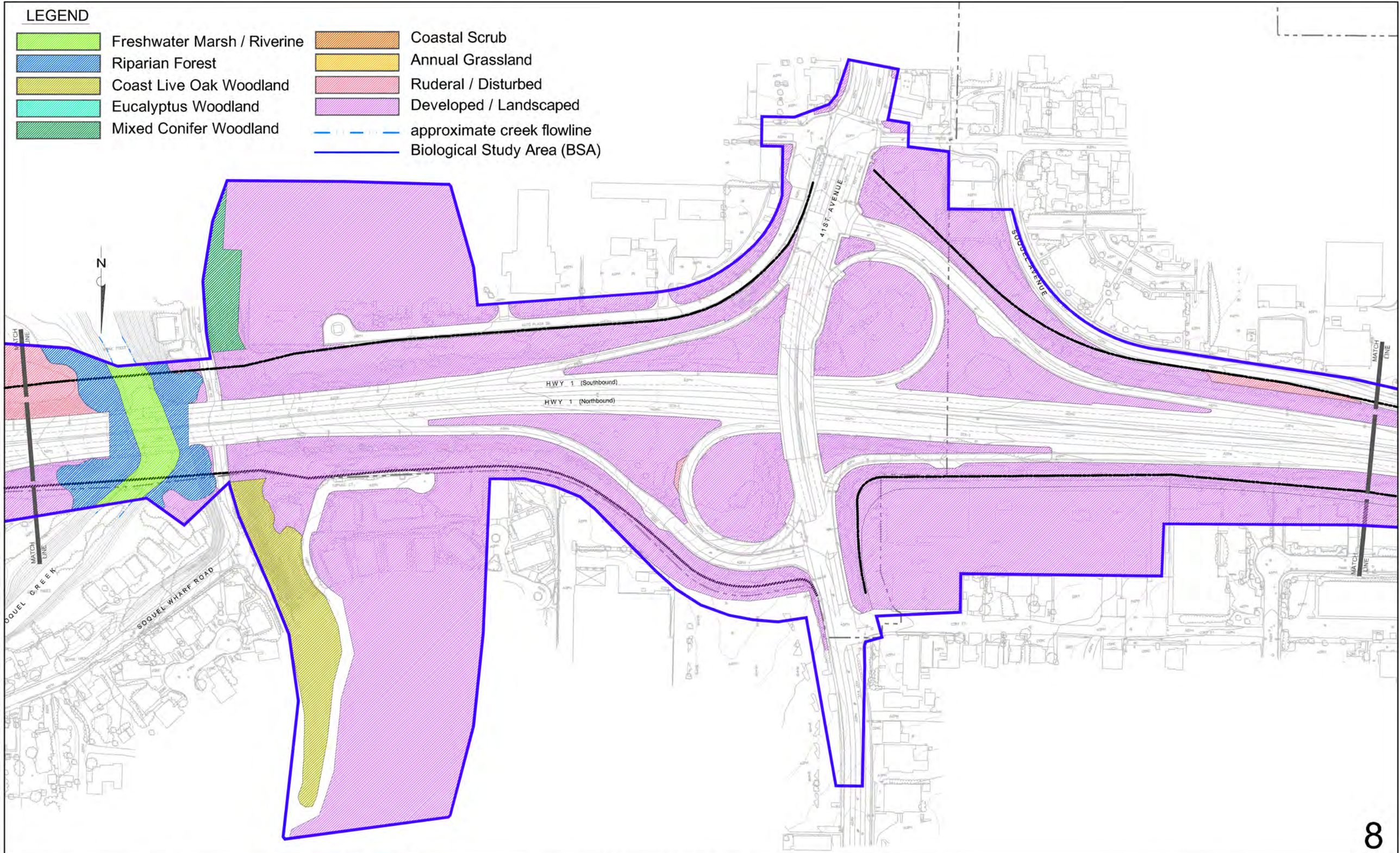
SHEET 7
Plant Communities / Habitats Map



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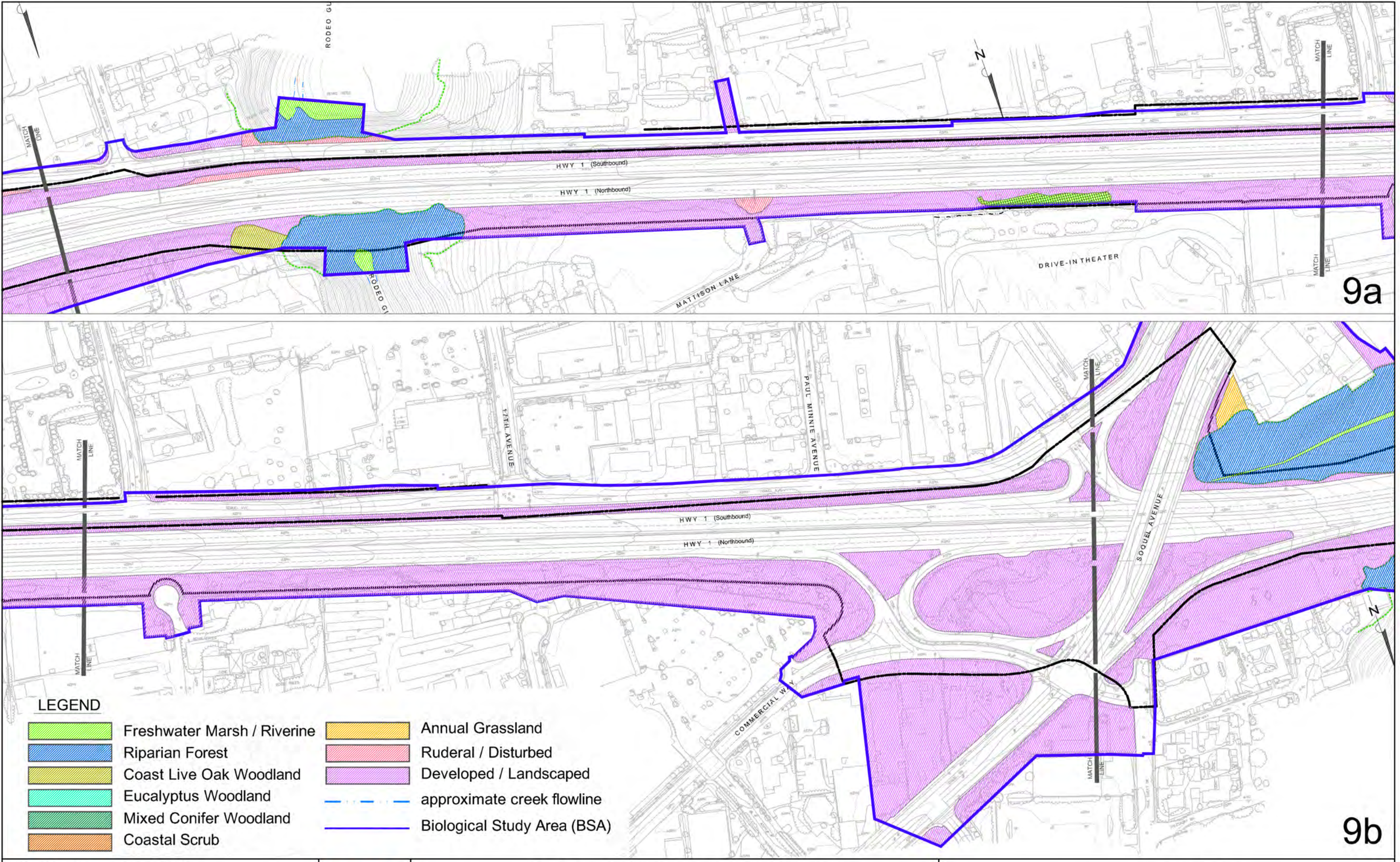
SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 8
Plant Communities / Habitats Map



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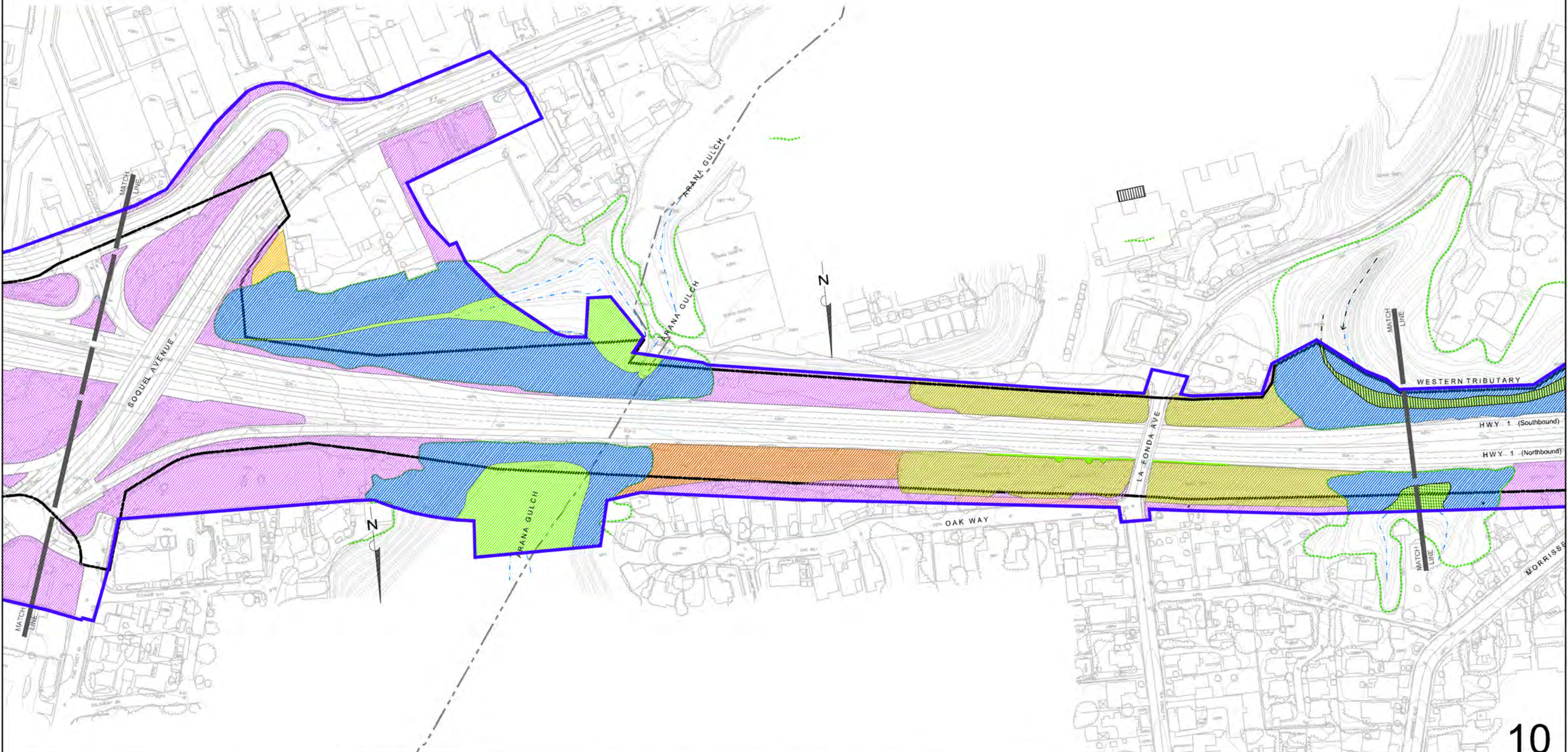
SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 9
Plant Communities / Habitats Map

LEGEND

- Freshwater Marsh / Riverine
- Riparian Forest
- Coast Live Oak Woodland
- Eucalyptus Woodland
- Mixed Conifer Woodland
- Coastal Scrub
- Annual Grassland
- Ruderal / Disturbed
- Developed / Landscaped
- approximate creek flowline
- Biological Study Area (BSA)



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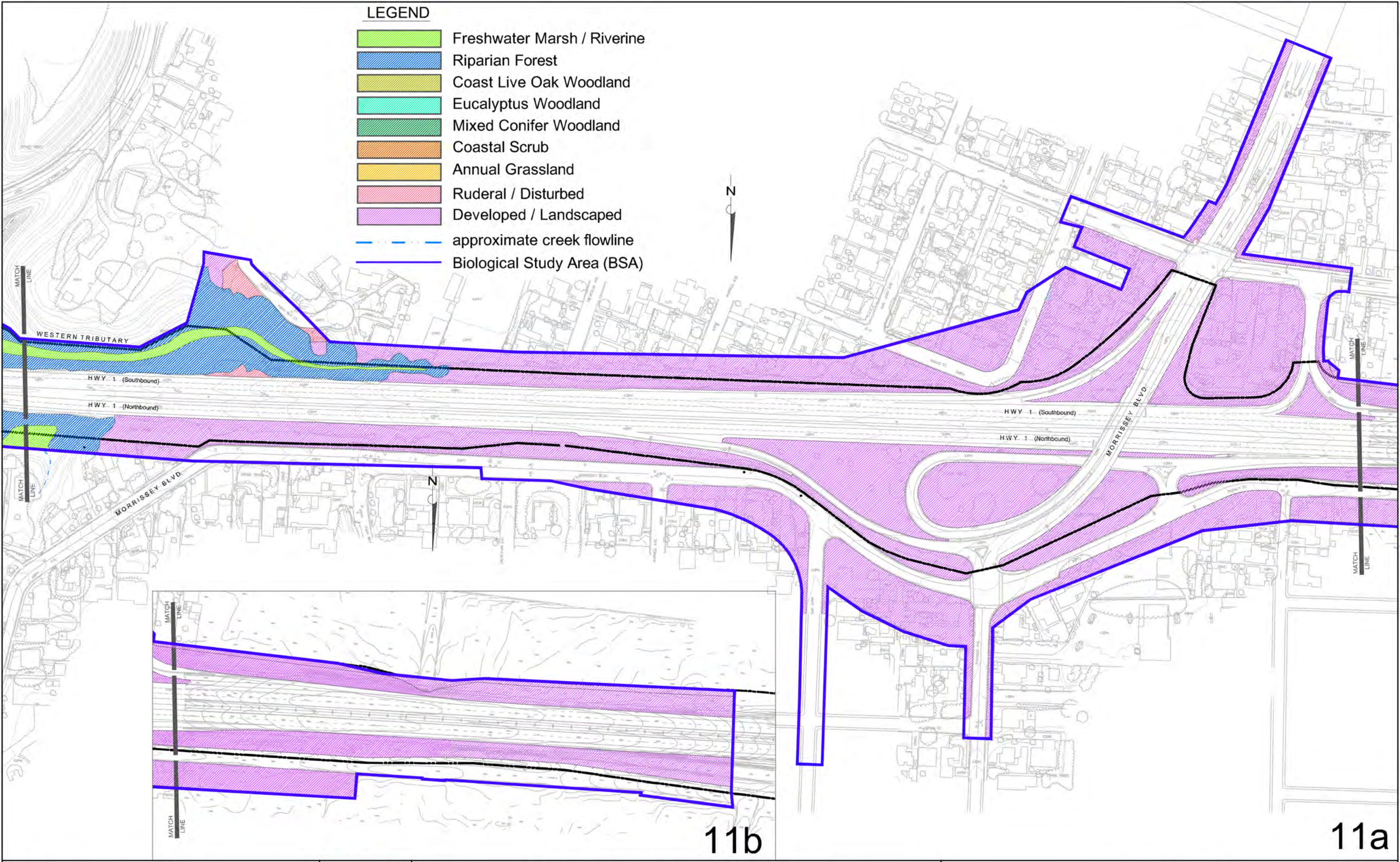
SHEET 10
Plant Communities / Habitats Map



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SHEET 11
Plant Communities / Habitats Map

Appendix D. Wetland Assessment

Wetland Assessment for the Highway 1 HOV Lane Project, Santa Cruz County, California

Prepared for:

Santa Cruz County
Regional Transportation Commission

Prepared by:

SWCA Environmental Consultants

Revised July 2010

WETLAND ASSESSMENT
FOR
HIGHWAY 1 HOV LANE PROJECT

Prepared for:

SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION COMMISSION
1523 Pacific Avenue
Santa Cruz, CA 95060

Prepared by:

SWCA Environmental Consultants
1422 Monterey Street
San Luis Obispo, CA 93401
Contact: Bob Sloan

Revised July 2010

SWCA Project Number: 13875

TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

1. INTRODUCTION

1.1 SCOPE

The following report summarizes existing soil, hydrology and vegetative conditions found near Santa Cruz, California (refer to Figures 1 and 2), within the Highway 1 High Occupancy Vehicle (HOV) Lane Project revised Biological Survey Area (BSA). SWCA Environmental Consultants (SWCA), formerly Morro Group, Inc., has prepared this revised report at the request of the Parsons Transportation Group, Inc., and it is intended for use by Parsons Transportation Group and other project consultants, and regulatory agencies. This report identifies potential waters of the United States, as defined by the U.S. Army Corps of Engineers (USACE), and wetlands as defined by the California Coastal Commission (CCC), found within the revised 2010 project area. This report is intended to assist in the identification of potential project impacts or constraints that could affect project construction. Findings reported herein are based on information gathered in the field at the time of investigation, and on SWCA's understanding of the USACE *1987 Wetlands Delineation Manual* (Environmental Laboratory 1987), the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2006), the *Definition and Delineation of Wetlands in the Coastal Zone* (CCC 2006), the most recent *Procedural Guidance for the Review of Wetland Projects in California's Coastal Zone* (CCC 2007), and other federal, state, and local guidelines for delineation of jurisdictional areas. This report is subject to jurisdictional review by the USACE and CCC, and should be submitted to the USACE and CCC for confirmation during the permitting phase of the project.

1.2 PROJECT BACKGROUND

The California Department of Transportation (Caltrans) and the Federal Highway Administration, in cooperation with the Santa Cruz County Regional Transportation Commission, propose to widen Highway 1 (State Route 1) for a distance of approximately 8.5 miles (13.7 kilometers), from 0.4 miles (0.6 kilometers) south of the San Andreas-Larkin Valley Road Interchange to 0.3 mile (0.4 kilometers) north of the Morrissey Boulevard Interchange. The project as revised in 2010 is designed to reduce congestion, encourage carpooling and use of alternative transportation modes as the means to increase transportation system capacity, and improve safety. Meeting these project purposes would address the following needs:

- Recurrent congestion, extending up to eight hours on weekdays,
- Travel time delays for commuters, commerce, and emergency vehicles,
- Disincentives to increase transit service because congestion threatens reliability and cost-effective transit service delivery,
- Disincentives to carpool from lack of supporting facilities and poor level of service,
- Accident rates exceeding statewide averages, and
- Increasing use of local streets by "cut-through" traffic seeking to avoid freeway congestion.

Three alternatives are currently under consideration: a High Occupancy Vehicle Lane Alternative, a Transportation System Management Alternative, and a No-Build Alternative.

1.2.1 High Occupancy Vehicle Lane Alternative

The HOV Lane Alternative would expand the existing four-lane highway to a six-lane facility by adding an HOV lane next to the median in both the northbound and southbound directions. Along the southern portion of the project, the existing median generally is wide enough to add the new HOV lanes within the existing right-of-way. A mandatory standard median width 21.7 ft. would be used through most of the corridor, north of Freedom Boulevard. Where existing frontage roads would be impacted, non-standard inside shoulder widths of 5 ft are proposed to reduce right-of-way requirements and impacts. In some locations as identified herein, widening would extend outside the existing State right-of-way.

The HOV Lane Alternative would modify or reconstruct all nine interchanges within the project limits to improve merging operations and ramp geometrics, lengthen acceleration and deceleration lanes, and improve sight distances. The Bay Avenue/Porter Street and 41st Avenue interchanges would be modified to operate as one interchange. Where feasible, design deficiencies on existing ramps would be corrected. Ramp metering and HOV lanes would be provided on all Highway 1 on-ramps. The HOV Lane Alternative would include auxiliary lanes between interchange ramps and Transportation Operations System electronic equipment, such as changeable message signs, highway advisory radio, closed-circuit television, microwave detection systems and vehicle detection systems as described also under the Transportation Systems Management Alternative—with the exception that an auxiliary lane would not be constructed northbound between State Park Drive and Park Avenue (see Section 1.3.1.3, Common Design Features of the Build Alternatives).

Bridge structures and the Capitola Avenue Overcrossing would be modified or replaced to accommodate the new HOV lanes. New and widened highway crossing structures would include shoulder and sidewalk facilities to accommodate pedestrians and bicycles. The HOV Lane Alternative would include three new pedestrian/bicycle overcrossings of Highway 1, as described also under the Transportation Systems Management Alternative and detailed in Section 1.3.1.3. The existing UPPR structures would be replaced to minimize environmental impacts. The Highway 1 bridge over Aptos Creek would be widened on the outsides to accommodate the new HOV lanes.

The High Occupancy Vehicle Lane Alternative would construct park and ride lots and bus pads with pedestrian access to local streets at some highway ramps to facilitate faster and easier highway access for buses. Intersections of freeway ramps with local roads would be modified to improve visibility and safety for pedestrians and bicycles. Three new pedestrian/bicycle overcrossings would be constructed, at Mar Vista Drive, Chanticleer Avenue, and Trevethan Avenue. These pedestrian/bicycle overcrossings also are proposed under the Transportation System Management Alternative.

1.2.2 Transportation System Management (TSM) Alternative

The Transportation Systems Management Alternative proposes to add ramp metering and construct HOV bypass lanes on existing interchange on-ramps, improve existing nonstandard geometric elements at various ramps, and add auxiliary lanes along the mainline between major interchange pairs within the project limits, as summarized under Common Design Features of the Build Alternatives. Auxiliary lanes are designed to reduce conflicts between traffic entering and exiting the highway by connecting from the on-ramp of one interchange to the off-ramp of the next; they are not designed to serve through traffic.

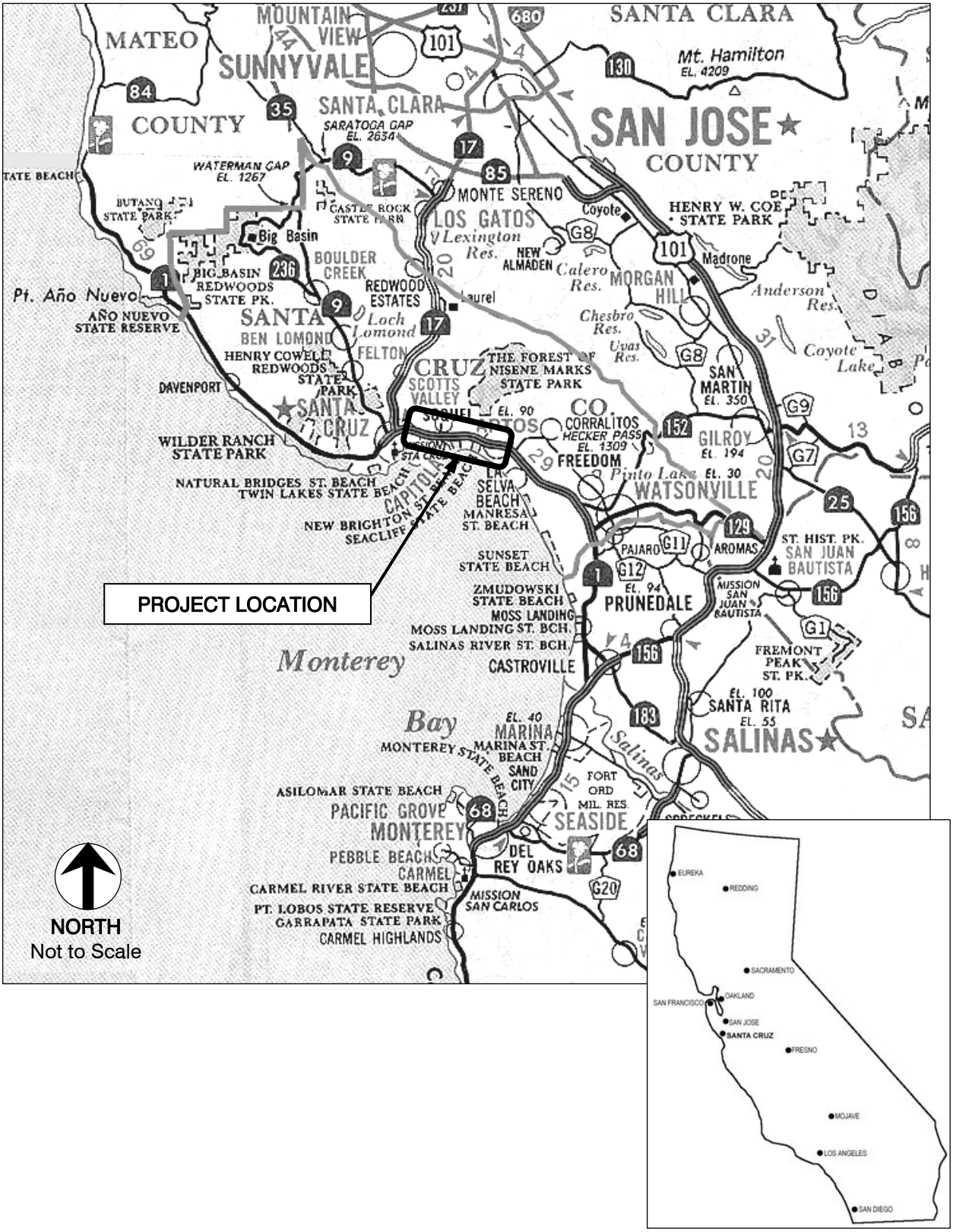
The Transportation Systems Management Alternative also would include Transportation Operations System electronic equipment as described for the HOV Lane Alternative. It would include HOV bypass lanes on interchange on-ramps, but would not construct HOV lanes or any additional through lanes on the mainline.

The Transportation Systems Management alternative would reconstruct the north and south Aptos railroad underpasses and the State Park Drive, Capitola Avenue, and 41st Avenue overcrossings, widen the Aptos Creek and Soquel Creek bridges, and construct new pedestrian/bicycle overcrossings over Highway 1, features it shares with the HOV Lane Alternative, as described below under Common Design Features of the Build Alternatives.

1.2.3 No-Build Alternative

The No-Build Alternative offers a basis of comparison with the Transportation Systems Management and HOV Lane Alternatives in the future analysis year of 2035. It would not address the project purpose and need. It assumes no major construction on Highway 1 through the project limits other than currently planned and programmed improvements and continued routine maintenance. Also included in the No-Build Alternative are a number of locally-sponsored projects for improving the local arterial network and constructing or improving bicycle lanes.

Figure 1. Regional Location Map



Source: Compass Maps

Figure 2. Project Vicinity Map

Source: Compass maps

NORTH
Not to Scale

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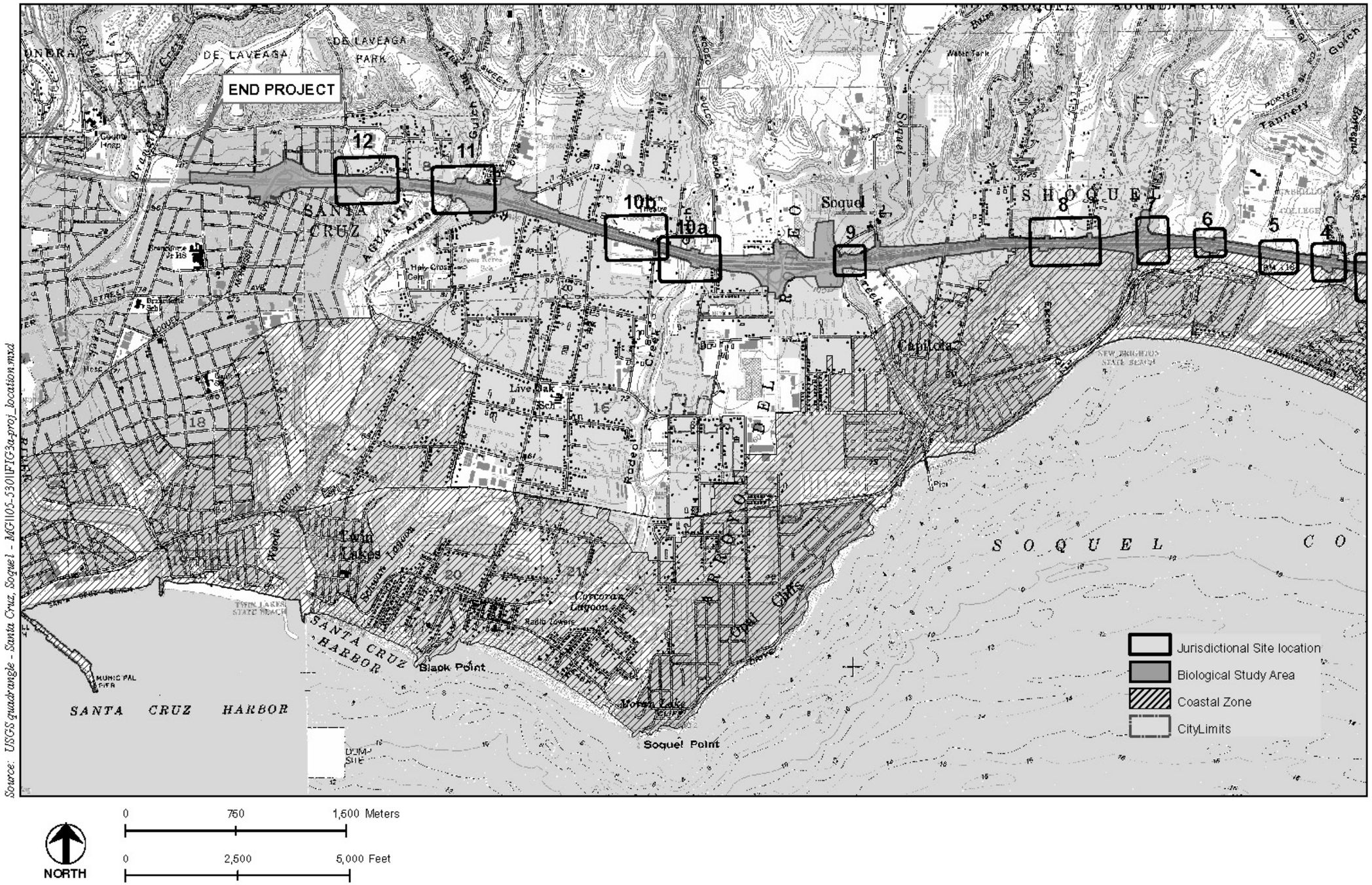
Figure 3a. Project Location / USGS Map



Source: USGS quadrangle - Santa Cruz, Soquel - MG\105-530\FIG3a-proj_location.mxd

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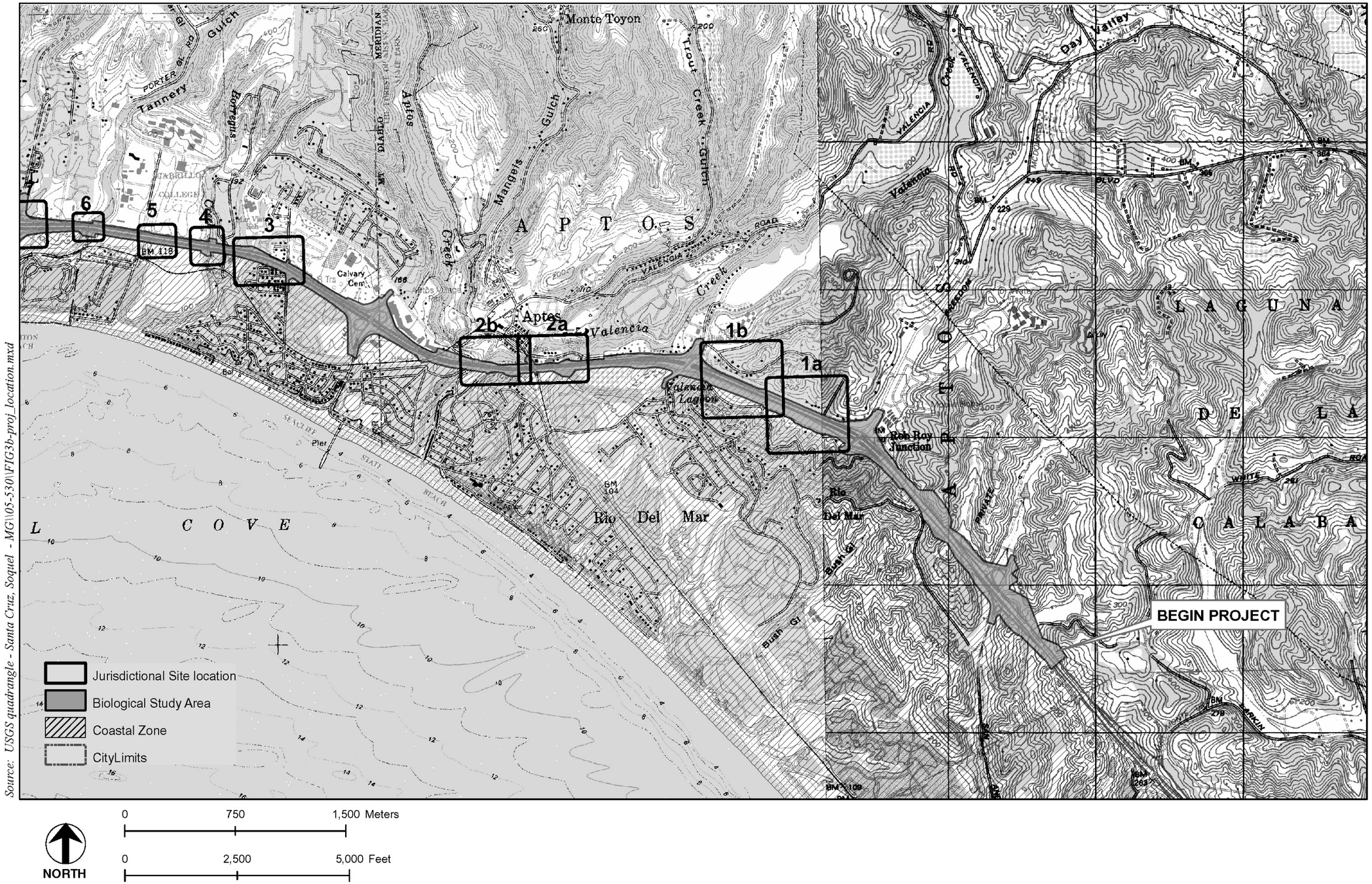
Figure 3b. Project Location / USGS Map



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1.3 SITE DESCRIPTION

The approximately nine-mile long linear project area is located within or immediately adjacent to the existing Highway 1 Right-of-Way (ROW) between San Andreas Road and Morrissey Boulevard, and crosses County of Santa Cruz, City of Santa Cruz, and City of Capitola jurisdictions. The project route is dominated by typical freeway landscaping and ruderal habitats, with residential and commercial buildings and landscapes within or immediately adjacent to the BSA in many locations. The southern portion of the project area lies within the Coastal Zone. Scattered areas of disturbed annual grassland habitat, oak woodland habitat, eucalyptus groves, and urban tree plantings are present along the route, interspersed with residential and urban development and associated ornamental plantings. The project BSA crosses nine named creek channels, two small, unnamed tributary drainages, and runs parallel to Valencia Creek, Valencia Lagoon, the Valencia Channel, and an unnamed tributary to Nobel Creek (refer to Figures 2, 3a, and 3b). In addition, several concrete lined and dirt bank roadside ditches are present along portions of the BSA, and direct stormwater into the storm drain system. Creeks and drainages along the route contain wetland and riparian habitats, and pass under the freeway by means of existing bridges and culverts. All potentially jurisdictional areas that cross or parallel the project BSA are described in detail below, proceeding from south to north. Photographs of representative areas are included in Attachment A, and detailed maps of each jurisdictional site are included as Attachment B.

1.3.1 Site 1a/1b. Valencia Lagoon and Valencia Channel

The Valencia Lagoon and Valencia Channel are located on the southern side of Highway 1, between Del Mar Boulevard and Freedom Boulevard (refer to Attachment A, Photo 1, and Attachment B, Jurisdictional Sites 1a and 1b). The Lagoon consists of a man-made pond located outside and to the south of the ROW, out of the BSA. The Valencia Channel is an approximately 2,500-foot long drainage channel within the BSA, and is maintained by Caltrans as a flood control measure. Valencia Channel ranges from 20 to 40 feet in width, and the channel and surrounding low-lying areas are densely vegetated with arroyo willow (*Salix lasiolepis*), cattail (*Typha latifolia*), bulrush (*Scirpus californicus*), California blackberry (*Rubus ursinus*), and poison oak (*Toxicodendron diversilobum*). The channel begins at a 48-inch by 72-inch concrete culvert outlet near the southbound offramp for Freedom Boulevard, and continues west along the southbound lanes to a concrete basin and culvert near the southbound onramp from Del Mar Boulevard. Valencia Channel is hydrologically connected to the Valencia Lagoon, and both areas are known to provide habitat for the federal- and state-listed endangered salamander (*Ambystoma macrodactylum croceum*). Valencia Lagoon was constructed by Caltrans in 1978 as mitigation for previous impacts to Santa Cruz long-toed salamander habitat in the area.

1.3.2 Site 2a/2b. Valencia Creek / Aptos Creek

Valencia Creek

The portion of Valencia Creek assessed in this report consists of a broad, deeply to slightly incised channel, dominated by California bay (*Umbellularia californica*), big leaf maple (*Acer macrophyllum*), California redwood (*Sequoia sempervirens*), California blackberry, poison oak, stinging nettle (*Urtica dioica*), English ivy (*Hedera helix*), and arroyo willow, in a residential setting (refer to Attachment A, Photo 3, and Attachment B, Jurisdictional Site 2b). Valencia Creek is a USGS-designated blue-line stream that receives runoff from a large urban watershed area. The Valencia Creek corridor and associated riparian vegetation meander in and out of the north side of the project BSA, and join Aptos Creek approximately 100 feet north of Highway 1. The channel contained shallow pools and flowing

water during the assessment. The channel exhibited a clay and sand bottom averaging 20 to 50 feet wide at the Ordinary High Water Mark (OHWM), which was approximately 4.5 feet above the thalweg. The creek passes through two long, curving concrete culverts and several sections of riprap on the banks intended to protect Highway 1 from erosion. A large adjacent high flow terrace area dominated by willow and blackberry is present along the BSA, between Highway 1 and the large northerly bend in the creek channel. Dense riparian canopy cover is present on the north side of Highway 1, within and adjacent to the BSA.

Roadside Ditches leading to Valencia Creek

Unlined roadside ditches are present along both sides of Highway 1 approximately 105 feet (32 meters) east of the UPRR tracks crossing Valencia Creek (refer to Attachment A, Photo 4, and Attachment B, Jurisdictional Site 2a). The ditch on the south side of Highway 1 is 1-3 feet wide and 0.5 to 2 feet deep, and receives runoff from the adjacent tennis courts & roadside areas. This area has no riparian or wetland vegetation present, and is dominated by English ivy, annual grasses and cypress trees. The ditch on the north side is 4 feet wide and 1-2 feet deep, and receives runoff from commercial and residential areas adjacent to the ROW. This area is dominated by Himalayan blackberry (*Rubus discolor*) and coast redwood trees. Stormwater from both ditches enters drop inlets, and flows through storm drains before entering Valencia Creek.

Aptos Creek

The portion of Aptos Creek assessed in this report consists of a broad, slightly incised channel, dominated by California bay, big leaf maple, sycamore (*Platanus racemosa*), California blackberry, poison oak, stinging nettle, horsetail (*Equisetum arvense*), and arroyo willow, in a residential setting (refer to Attachment A, Photo 2, and Attachment B, Jurisdictional Site 2b). Aptos Creek is a USGS-designated blue-line stream that receives runoff from a large urban watershed area that includes the Valencia Creek watershed. Aptos Creek flows under Highway 1 through a large concrete bridge. The channel contained deep pools and flowing water during the assessment. The channel exhibited a clay, sand, and cobble bottom averaging 40 to 50 feet wide at the OHWM, which was approximately five feet above the thalweg. Several sections of the creek bank consist of riprap or poured concrete intended to prevent erosion of adjacent residential properties within the floodplain. No adjacent wetland areas were observed within or near the project area. Dense riparian canopy cover is present on both sides of Highway 1, within the BSA.

1.3.3 Site 3. Ord Gulch and Tributary

The portion of Ord Gulch assessed in this report consists of a small, narrow incised channel dominated by coast live oak (*Quercus agrifolia*), poison oak, English ivy, vinca (*Vinca major*), and a few arroyo willows, in a residential/commercial setting (refer to Attachment A, Photo 6, and Attachment B, Jurisdictional Site 3). Ord Gulch is not a USGS-designated blue-line stream and is a tributary to Borregas Creek. The channel exhibited a clay and sand bottom averaging 8 to 12 feet wide at the OHWM, which was approximately 1.5 feet above the thalweg. Riprap bank protection is present on both banks south of Highway 1. The creek flows under Highway 1 through a 48-inch concrete culvert. Low flow conditions were observed during the assessment. No pools were observed within the channel, and no adjacent wetland areas were observed within or near the project area. Some willow canopy is present on the north side of Highway 1, along the fill slope within the BSA.

A small earthen bank roadside drainage channel parallels the north side of Highway 1 within the BSA, and crosses under the Mar Vista Drive cul-de-sac before entering Ord Gulch approximately 25 feet north of the culvert inlet. This channel was two to three feet wide at the OHWM. The portion west of Mar Vista Drive contained areas of standing water, and a dense cover of California blackberry and coast live oak. East of Mar Vista Drive the channel was dry and unvegetated.

1.3.4 Site 4. Borregas Creek

The portion of Borregas Creek assessed in this report consists of a narrow, deeply incised channel, dominated by coast live oak, poison oak, acacia (*Acacia* sp.), arroyo willow, and kikuyu grass (*Pennisetum clandestinum*), in a residential setting (refer to Attachment A, Photo 5, and Attachment B, Jurisdictional Site 4). This creek is a USGS-designated blue-line stream that receives residential and highway runoff from a small watershed area. The creek flows under Highway 1 through a 48-inch concrete culvert. Low flow conditions were observed during the assessment. Natural channel areas exhibited a gravel bottom channel averaging three to five feet wide at the OHWM, which was approximately 16 inches above the thalweg. No pools were observed within the channel, and no adjacent wetland areas were observed within or near the project area. Willow canopy is present on the south side of Highway 1, within the BSA.

1.3.5 Site 5. Potbelly Creek

The portion of Potbelly Creek assessed in this report consists of a small drainage that originates along Cabrillo College Drive north of Highway 1 and continues south of the Highway along New Brighton Road to Potbelly Beach (refer to Attachment B, Jurisdictional Site 5). Although not designated as a USGS-designated blue-line stream, Potbelly Creek receives residential and highway runoff from a small watershed area that includes Cabrillo College. The creek flows under Highway 1 through a 30-inch concrete culvert. Low flow conditions were observed during the assessment. The channel is narrow, and moderately incised, and is dominated by coast live oak, Monterey pine (*Pinus radiata*), arroyo willow, poison oak, California blackberry, coffeeberry (*Rhamnus californica*), bracken fern (*Pteridium aquilinum*), and canary grass (*Phalaris californica*), in a rural residential setting. No pools were observed within the channel, and no adjacent wetland areas were observed within or near the project area. Willow canopy is present on the north side of Highway 1, within the BSA. A small roadside swale/depressional area parallels the north side of Highway 1 within the BSA, and is connected to Potbelly Creek by a 24 inch culvert under Highway 1. This swale was three to six feet wide, but did not contain defined bed or bank structure. The swale contained arroyo willow, canary grass, poison oak, Pampas grass (*Cortederia jubata*), vinca, and coast live oak.

1.3.6 Site 6. Tannery Gulch

The portion of Tannery Gulch assessed in this report consists of a narrow, moderately incised channel, dominated by blue gum eucalyptus (*Eucalyptus globulus*), poison oak, dogwood (*Cornus sericea*), and arroyo willow, in a rural residential setting (refer to Attachment A, Photo 7, and Attachment B, Jurisdictional Site 6). This creek is a USGS-designated blue-line stream that receives runoff from a medium sized urban watershed area. The creek flows under Highway 1 and adjacent frontage roads through a 72-inch square concrete culvert. Channel areas up- and downstream of the culvert contained several small pools with ponded water during the assessment. Natural channel areas exhibited a sand or clay bottom averaging three feet wide at the OHWM, which was approximately 18 inches above the thalweg. One small depressional adjacent wetland area was observed outside the project area boundary,

south of the ROW and west of the creek channel. Willow canopy is present on both sides of Highway 1, within or adjacent to the BSA.

1.3.7 Site 7. Tributary to Tannery Gulch

A small, moderately incised tributary to Tannery Gulch crosses under Highway 1 through a 48-inch corrugated metal culvert east of Park Avenue and drains into Tannery Gulch south of the project BSA (refer to Attachment B, Jurisdictional Site 7). This tributary is fed by urban runoff and is not marked as a USGS-designated blue-line stream. The channel north of Highway 1 was dry during the assessment and was vegetated with eucalyptus, poison oak, California blackberry, and coast live oak. Channel width below the OHWM ranged from approximately two feet to four feet wide, with the OHWM approximately 12 inches above the thalweg. No potential pool areas were observed within the channel, and no adjacent wetland areas were observed within or near the project area. The channel north of Highway 1 parallels Park Avenue and the project BSA for approximately 400 feet.

1.3.8 Site 8. Monterey Avenue / Nobel Creek

Monterey Avenue Drainage Channel

Monterey Avenue ends at the north side of Highway 1, approximately 0.25 mile east of Nobel Creek (refer to Attachment A, Photo 8, and Attachment B, Jurisdictional Site 8). An unnamed drainage channel crosses under Monterey Avenue and parallels the Highway 1 ROW within the BSA for approximately 348 feet (106 meters) before turning to the north, away from the project area and merging with Nobel Creek. A concrete v-ditch is also present along the highway edge east of Monterey Avenue. The unnamed drainage channel averages 6 feet deep and ten-15 feet wide, and is dominated by acacia, coast live oak, poison oak, English ivy, Himalayan blackberry, and annual grasses. The ordinary high water mark in this channel was visible at approximately 1.5 feet above the thalweg. Slowly flowing and ponded water less than 12 inches deep was present in the channel during the survey of this area. No adjacent wetlands were observed within or near the project area.

The concrete v-ditch is surrounded by coast live oak, English ivy, and annual grasses. Numerous culverts enter the unnamed drainage, including one that originates on the south side of the highway. Examination of this area found a depressional area dominated by California blackberry near a drop inlet (refer to Attachment B, Jurisdictional Site 8). No channel or evidence of ponding was observed in this area.

Nobel Creek

The portion of Nobel Creek assessed in this report consists of a narrow, moderately incised channel, dominated by eucalyptus, coast live oak, poison oak, horsetail, and arroyo willow, in an urban setting (refer to Attachment A, Photo 9, and Attachment B, Jurisdictional Site 8). This creek is a USGS-designated blue-line stream that receives runoff from a medium sized urban watershed area. The creek flows under Highway 1 and an adjacent frontage road through a 72-inch square concrete culvert. Channel areas up- and downstream of the culvert contained several small pools and slowly flowing water during the assessment. Natural channel areas exhibited a clay bottom averaging two to three feet wide at the OHWM, which was approximately 24 inches above the thalweg. No adjacent wetland areas were observed within or near the project area, although a broad, high flow terrace dominated by eucalyptus is present along the right creek bank north of Highway 1. Dense willow canopy is present on the south side of Highway 1, within and adjacent to the BSA.

1.3.9 Site 9. Soquel Creek

The portion of Soquel Creek assessed in this report consists of a broad, moderately incised channel, dominated by alder (*Alnus* sp.), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), redwood, coast live oak, poison oak, California blackberry, bulrush, and arroyo willow, in an urban setting (refer to Attachment A, Photo 10, and Attachment B, Jurisdictional Site 9). This large creek is a USGS-designated blue-line stream that receives runoff from a large urban watershed area. The creek flows under Highway 1 through a large open span concrete bridge. The creek channel within the project area contained deep pools and flowing water during the assessment. Natural channel areas exhibited clay, sand, and cobble bottom averaging 60 to 75 feet wide at the OHWM, which was approximately 5.5 feet above the thalweg. No adjacent wetland areas were observed within or near the project area. Dense riparian canopy cover is present on both sides of Highway 1, within the BSA.

1.3.10 Site 10a. Rodeo Gulch

The portion of Rodeo Gulch assessed in this report consists of a broad, slightly incised channel, dominated by California bay, coast live oak, California blackberry, poison oak, stinging nettle, and arroyo willow, in an urban setting (refer to Attachment A, Photo 11, and Attachment B, Jurisdictional Site 10a). This creek is a USGS-designated blue-line stream that receives runoff from a medium sized urban watershed area. The creek flows under Highway 1and Soquel Avenue through a nine-foot arch culvert partially obstructed by sediment. Channel areas upstream and downstream of the culvert were dry during the assessment, with the exception of a small stagnant pool at the southern end of the culvert. The broad, flat natural channel area south of Highway 1 exhibited a central flat, sandy low flow channel, surrounded by low-lying, regularly inundated flood plain areas consisting of sand or loamy soils that were densely covered with riparian vegetation. A detailed examination of this area found wetland boundaries extending across the floodplain to a width of between 100 to 200 feet within the creek corridor. Creek banks above the wetland floodplain area were dominated by annual grassland, coast live oak, and poison oak. Dense willow canopy is present on both sides of Highway 1, within and adjacent to the BSA.

1.3.11 Site 10b. Soquel Drive-In Roadside Ditch

The Soquel Drive-In roadside ditch is located on the north side of the ROW immediately adjacent to the Drive-In (refer to Attachment A, Photo 12, and Attachment B, Jurisdictional Site 10b). The ditch consists of a linear depression approximately 308 feet (94 meters) long, 5 to 25 feet wide, and approximately three feet deep. The area is dominated by curly dock (*Rumex crispus*), alders, acacia, English ivy, Himalayan blackberry, annual grasses, and ice plant. A two-foot wide earthen channel extends to the east just north of the BSA boundary, and is vegetated with annual grasses and English ivy. The ditch receives runoff from the paved Drive-In and from Highway 1, and directs flows into two culverts leading south under the Highway. Water from this area likely reaches Rodeo Gulch by way of the storm drain system.

1.3.12 Site 11. Arana Gulch and Eastern Tributary

The portion of Arana Gulch assessed in this report consists of a broad, slightly incised channel, dominated by arroyo willow, knotweed (*Polygonum punctatum*) blue gum eucalyptus, California bay, redwood, coast live oak, blackberry (*Rubus ulmifolius* var. *inermis*), and poison oak (refer to Attachment A, Photo 13, and Attachment B, Jurisdictional Site 11). This creek is a USGS-designated blue-line stream that receives runoff from a large urban watershed area, including several tributary channels within or immediately adjacent to the project BSA. Arana Gulch flows under Highway 1 through a 72-inch concrete culvert. Channel areas upstream and downstream of the culvert contained flowing water during

the delineation, with the exception of a small stagnant pool in the detention basin at the southern end of the culvert. Natural channel areas exhibited a clay or sand bottom averaging 10 to 20 feet (three to six meters) wide at the OHWM (Ordinary High Water Mark), which was approximately 2.5 feet (0.8 m) above the thalweg. A broad, forested floodplain terrace is present along the left creek bank north of Highway 1, where storm flows regularly back up behind the culvert inlet. An examination of this area found wetland boundaries extending to a width of approximately 200 feet (61 m) within the creek corridor. Creek banks above the wetland area were dominated by annual grasses, coast live oak, California bay, and poison oak. The culvert outlet on the south side of Highway 1 flows into a concrete detention basin, and then through a short culvert under a paved school access road, and then along a concrete V-ditch along the east side of the Harbor High School tennis courts.

A small, eucalyptus lined tributary channel (eastern tributary), fed by road runoff, parallels the south side of Highway 1 and drains into a large depressional wetland area dominated by arroyo willow and knotweed (refer to Attachment B, Jurisdictional Site 11). The channel contained numerous small pools, with stagnant or slowly moving water one to two feet (0.3 to 0.6 m) deep. Channel width below the OHWM ranged from approximately two feet wide at the upper end to over 10 feet (three meters) wide at the lower western portion before entering the depressional area. The OHWM was approximately two feet (0.6 m) above the thalweg. The eastern tributary channel and portions of the depressional area are within the BSA, and drain into Arana Gulch at the concrete detention basin south of Highway 1 through a 12-inch (30.5 cm) plastic corrugated culvert.

1.3.13 Site 12. La Fonda Overcrossing Road Shoulder

Areas of saturated soils and wetland plants were found in 2008 along the northbound Route 1 road shoulder area on the east and west sides of the La Fonda overcrossing bridge abutments. This area consists of a narrow dirt road shoulder that extends approximately five feet from the edge of pavement to the toe of the steep banks of the adjacent road cut.

The banks of the road cut east of the overcrossing contained several seep areas containing saturated soils and wetland vegetation consisting of tall flatsedge (*Cyperus eragrostis*) and watercress (*Rorippa nasturtium-aquatica*) (refer to Attachment A, Photos 14 and 15). The hillside seeps appear to be the source of hydrology for wetland vegetation on the cut slope and the saturated soil areas along the road shoulder east of the overcrossing. No channel or evidence of flow along the road shoulder was observed, however, a tire rut at the base of the bank contained ponded water in this area. A storm drain inlet (DI) is present in the road shoulder 126 meters (413 feet) east of the overcrossing.

The road shoulder west of the overcrossing contained an area of saturated soils and shallow ponding at the base of the cut bank approximately 46 meters (150 feet) long, dominated by cattail (*Typha latifolia*) and watercress. The saturated area was approximately 3 feet wide and ponded areas were less than 6 inches deep. The saturated areas and cattail growth fade into dry road shoulder conditions approximately 46 meters (150 feet) west of the overcrossing. No erosion or evidence of flow along the road shoulder were observed, and the wet area does not connect with the Arana Gulch tributary channel located approximately 165 meters (561 feet) west of the overcrossing. A seep area approximately 10 feet up on the cut bank near the overcrossing was dominated by watercress. This seep appears to be the source of hydrology for the saturated road shoulder area.

1.3.14 Site 13. Western Tributary to Arana Gulch

A small, moderately incised tributary to Arana Gulch crosses under Highway 1 just west of La Fonda Avenue through a 36-inch concrete culvert (refer to Attachment A, Photo 16, and Attachment B,

Jurisdictional Site 13). This tributary passes under the highway through a four-foot box culvert, and joins with a second channel that parallels the southern side of Highway 1 for approximately 900 feet (274 m). These western tributary channels are fed by urban runoff and highway drop inlets, and drain into Arana Gulch south of the project area. The channel corridors are vegetated with arroyo willow, blue gum eucalyptus, poison oak, blackberry, English ivy, acacia, greater periwinkle, and coast live oak.

The western tributary channel on the north side of Highway 1 was found to be two to four feet (0.6 to 1.2 m) wide at the OHWM, and contained two to four inches (five to 10 cm) of standing water in the channel during the wetland delineation. The secondary channel along the south side of the Highway 1 contains several in-stream concrete detention structures designed to detain storm flows, separated by natural channel sections. No water was observed in the channel during the wetland delineation. Channel width below the OHWM ranged from approximately five to twenty feet (1.5 to 6 m) wide along the southern portion of the Highway 1 right-of-way. The OHWM averaged 2.5 feet (0.8 m) above the thalweg.

2. METHODOLOGY

The primary literature reviewed and referenced as part of this wetland determination included Hoover (1970), Cowardin et al. (1979), SCS (1984, 1992); Holland (1986), Environmental Laboratory (1987), Reed (1988, 1996), Hickman (1993), USACE (2006), and CCC (2006, 2007). Specific references not listed above are cited in text.

2.1 DELINEATION PROCEDURE

Initial determination and delineation of jurisdictional areas along the approximately eight-mile (12.9-km) long BSA were based on review of pertinent literature and a thorough on-site investigation conducted by Bob Sloan and Jeremy Wiggins of Morro Group on September 30 through October 3, 2003. A supplemental wetland examination was conducted over portions of the route on February 21 and 22, 2007, to include new areas resulting from changes in the proposed BSA. The supplemental examination was conducted by Bob Sloan and Geoff Hoetker of SWCA. Mr. Sloan is a U.C. Berkeley Extension-trained wetland delineator, and Mr. Hoetker is a Wetland Training Institute certified wetland delineator. Both have performed numerous wetland delineations in the Central California region. The routine wetland determination methodology, as described in the 1987 Corps Wetlands Delineation Manual (Environmental Laboratory 1987), was used throughout the delineation process. Potential wetland areas within the Coastal Zone were also evaluated using the Coastal Commission one-parameter wetland definition in addition to USACE three-parameter methodology. Coastal Commission wetland areas include USACE wetland and other waters areas, and typically coincide with California Department of Fish and Game (CDFG) jurisdictional boundaries. Where wetland resources were bisected by the Coastal Zone boundary line, this analysis considered the entire resource within the project area subject to CCC wetland regulations.

On September 12, 2007, Bob Sloan and Barrett Holland of SWCA conducted a wetland delineation for the Highway 1 Soquel to Morrissey Auxiliary Lanes Project to address that specific project area which is located within the BSA for the HOV project. This supplemental delineation was conducted according to the methods described in the USACE Arid West Supplement (USACE 2006) and the 1987 Corps Wetlands Delineation Manual (Environmental Laboratory 1987). Data from the Wetland Assessment Report for the Auxiliary Lanes Project has been incorporated into this Wetland Assessment in both the description and mapping for Site 11 – Arana Gulch, Site 12 – La Fonda Overcrossing, and Site 13 – Western Tributary to Arana Gulch.

Representative sample plots with soil pits were evaluated to investigate the presence of hydric soils, hydrophytic vegetation, and wetland hydrology as needed. Examined soils were moistened and characterized using Munsell Soil Color Charts standards (Munsell Color, 2000). Jurisdictional features and habitats were mapped throughout the BSA, using a Trimble Pathfinder GPS unit capable of accuracy to ten centimeters. USACE jurisdictional boundaries in incised stream channels with no adjacent floodplain areas were determined by mapping the OHWM location. In most cases, no soil pits were dug in these incised channels due to the presence of clear OHW marks. Soil pits were used to determine jurisdictional boundaries in broad channels with adjacent floodplain areas, and in areas without clearly visible OHW marks such as the Valencia Channel. No soil pits were dug during the supplemental wetland examination, as all new areas identified consisted of extensions of previously mapped sites, or new channel features including regularly maintained manmade roadside ditches that exhibited clear OHW marks.

Wetlands are defined in the USACE Wetlands Delineation Manual as:

> "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Corps-defined wetlands are determined to be present if evidence of each of the following three criteria is observed:

- dominance by hydrophytic vegetation,
- presence of hydric soils, and,
- evidence of wetland hydrology.

Corps-defined "other waters" are jurisdictional areas that do not meet USACE three-parameter requirement for wetland status. "Other waters" often consist of lakes, streams, channels, and ditches containing flowing or ponded water, but typically lacking the hydric vegetation or hydric soils component.

The California Coastal Commission has jurisdiction over activities within the coastal zone under the California Coastal Act of 1976. The CCC defines wetlands as:

> "Wetlands are lands where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent or drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salt or other substance in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to vegetated wetlands or deepwater habitats."

The CCC definition requires observance of only one of the three Corps wetland criteria to establish wetland presence. As a result, CCC wetland areas typically include USACE jurisdictional "other waters" areas, and often extend to adjacent riparian canopy or top of bank areas that are not within USACE jurisdiction. In addition, if the Coastal Zone boundary line bisects a wetland resource, the CCC will

typically consider the entire resource within the project area subject to CCC wetland regulations, since impacts to another portion of the resource could negatively affect the CCC area.

2.2 FUNCTION AND VALUE ASSESSMENT

Wetland functions are typically complex, interrelated, and difficult to assess and quantify. Wetland functions are defined as a process or series of processes that take place within a wetland. Wetlands have value for the wetland itself, for surrounding ecosystems, and for people. Functions can be grouped broadly as habitat, hydrologic, or water quality, and may include water quality improvement, floodwater storage, fish and wildlife habitat, aesthetics, and biological productivity. Functions of wetlands and other waters are assessed independently of any value such functions might provide to people, while values assess those benefits that do accrue to people. The value of a wetland is an estimate of the importance or worth of one or more of its functions to society. This can include values associated with commerce, recreation, tourism, or public support for conservation. The functional values of the potentially jurisdictional wetland areas identified during this assessment were evaluated according to Corps protocol (Adamus et al. 1987). Table 1 is a synthesis of methodologies used to evaluate the functions and values of wetland habitats. Rating criteria were derived from Adamus et al. (1987), Adamus and Stockwell (1983), and Reppert et al. (1979).

Table 1. Wetland Function and Value Rating Criteria

Function / Value	Rating		
	Low	Moderate	High
Water Quality Improvement	<5 acres in size; <50% vegetation density; no proximity to pollutants.	5-10 acres in size; 50-80% vegetation density; adjacent to non-point pollutants.	>10 acres in size; >80% vegetation density; downstream from point discharges.
Storm- and Floodwater Storage	<5 acres in size; <10% woody cover; permanently flooded; unconstrained outlet.	5-10 acres in size; 10-30% woody cover.	>10 acres in size; urban and developable areas; >30% woody cover; seasonal hydroperiod; constrained outlet.
Groundwater Discharge	Isolated depression; temporarily saturated or inundated.	Open drainage system; seasonally flooded.	Open tidal systems; permanent saturation or inundation.
Groundwater Recharge	<5 acres in size; isolated depression; temporarily saturated or inundated; impermeable substrate.	5-10 acres in size; seasonally flooded.	>10 acres in size; permanent inundation; several feet deep; permeable substrate.
Natural Biological Support	Small size; low species diversity; one vegetation layer; no sensitive or water-dependent species.	Medium size; moderate species diversity; several vegetation layers; water-dependent species; no sensitive species.	Large size; high species diversity; water-dependent and sensitive species; many vegetation layers.

3. RESULTS

3.1 SOIL CONDITIONS

The Soil Conservation Service (1976) mapped seven soil series containing nine soil map units within the identified potentially jurisdictional areas of the BSA. These nine soils are described below. Soil maps for each jurisdictional area are located in Attachment D. Of the nine soil types described below, only Watsonville loam, 2-15 percent slopes, is listed as a hydric soil.

Lompico-Felton complex, 30 to 50 percent slopes. This complex consists of soils on foot slopes and wide ridges. Elevation ranges from 400 to 3,000 feet. This complex is about 35 percent Lompico loam and 30 percent Felton sandy loam.

The Lompico soil is moderately deep and well drained. It formed in residuum derived from sandstone, shale, siltstone, or mudstone. Typically, the surface layer is dark brown (7.5YR 3/2 moist), slightly acid loam about 5 inches thick. The subsoil is brown, strong brown, and yellowish brown, strongly acid and medium acid clay loam and sandy clay loam. Highly weathered sandstone is at a depth of 37 inches. Permeability of the Lompico soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is 3 to 7 inches. Runoff is rapid, and the erosion hazard is high.

The Felton soil is deep and well drained. It formed in residuum derived from sandstone, shale, siltstone, or schist. Typically, the surface layer is very dark brown (10YR 2/2 moist), slightly acid sandy loam about 11 inches thick. The subsoil is brown and yellowish red, slightly acid and strongly acid sandy clay loam and clay loam about 32 inches thick. The substratum is variegated light brownish gray and light olive brown, strongly acid loam and sandy loam about 20 inches thick. Weathered sandstone is at a depth of 63 inches. Permeability of the Felton soil is moderately slow. Effective rooting depth is 40 to 72 inches. Available water capacity is 5.5 to 10.0 inches. Runoff is rapid, and the erosion hazard is high.

Lompico-Felton complex, 50 to 75 percent slopes. This complex consists of soils that are dominantly on footslopes but are also in areas near ridgetops. Elevation ranges from 400 to 3,000 feet. This complex is about 35 percent Lompico loam and 30 percent Felton sandy loam.

The Lompico soil is moderately deep and well drained. It formed in residuum derived from sandstone, shale, siltstone, or mudstone. Typically, the surface layer is dark brown (7.5YR 3/2 moist), slightly acid loam about 5 inches thick. The subsoil is brown, strong brown, and yellowish brown, strongly acid and medium acid clay loam and sandy clay loam. Highly weathered sandstone is at a depth of 37 inches. Permeability of the Lompico soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is 3 to 7 inches. Runoff is rapid, and the erosion hazard is high.

The Felton soil is deep and well drained. It formed in residuum derived from sandstone, shale, siltstone, or schist. Typically, the surface layer is very dark brown (10YR 2/2 moist), slightly acid sandy loam about 11 inches thick. The subsoil is brown and yellowish red, slightly acid and strongly acid sandy clay loam and clay loam about 32 inches thick. The substratum is variegated light brownish gray and light olive brown, strongly acid loam and sandy loam about 20 inches thick. Weathered sandstone is at a depth of 63 inches. Permeability of the Felton soil is moderately slow. Effective rooting depth is 40 to 72 inches. Available water capacity is 5.5 to 10.0 inches. Runoff is rapid, and the erosion hazard is high.

Elkhorn-Pfeiffer complex, 30 to 50 percent slopes. This complex is on dissected marine terraces and hills. Elevation ranges from about 100 to 800 feet. This complex is about 45 percent Elkhorn sandy loam

and 25 percent Pfeiffer gravelly sandy loam. Elkhorn soils are on marine terraces. Pfeiffer soils are in deep cuts on marine terraces and hills.

The Elkhorn soil is very deep and well-drained. It formed in alluvium derived mainly from sedimentary rock. Typically, the surface layer is very dark brown (10YR 2/2 moist), slightly acid and medium acid sandy loam about 21 inches thick. The subsoil, to a depth of 61 inches, is pale brown and variegated light gray and very pale brown, neutral sandy clay loam. Permeability of the Elkhorn soil is moderately slow. The effective rooting depth is 60 inches or more. Available water capacity ranges from 8.5 to 10.0 inches. Runoff is rapid, and the erosion hazard is high.

The Pfeiffer soil is deep and well-drained. It formed in residuum derived from sandstone or marine sediment. Typically, the surface layer is very dark brown (10YR 2/2 moist), to dark brown (7.5YR 3/2 moist), slightly acid gravelly sandy loam about 24 inches thick. The subsoil is brown, slightly acid gravelly sandy loam and cobbly sandy loam about 29 inches thick. The substratum is brown, slightly acid gravelly sandy loam about 13 inches thick. Weathered granodiorite bedrock is at a depth of 66 inches. Permeability of this Pfeiffer soil is moderately rapid. Effective rooting depth is 40 to 66 inches. Available water capacity is 3 to 6 inches. Surface runoff is rapid, and the erosion hazard is high.

Elkhorn sandy loam, 2 to 9 percent slopes. This very deep, well-drained soil is on old alluvial fans and marine terraces. Elevation ranges from about 20 to 800 feet. Typically, the surface layer is very dark brown (10YR 2/2 moist), slightly acid and medium acid sandy loam about 21 inches thick. The subsoil, to a depth of 61 inches, is pale brown and variegated light gray and very pale brown, neutral sandy clay loam. Permeability of this Elkhorn soil is moderately slow. Effective rooting depth is more than 60 inches. Available water capacity ranges from 8.5 to 10 inches. Runoff is slow to medium, and the erosion hazard is slight to moderate.

Watsonville loam, thick surface, 2 to 15 percent slopes. This deep, somewhat poorly drained soil is on coastal terraces. It formed in alluvium. Elevation ranges from 20 to 1,200 feet. Typically, the surface layer is very dark brown (10YR 2/2 moist), slightly acid loam about 20 inches thick. The subsurface layer is light gray, slightly acid sandy loam about 6 inches thick. The subsoil is pale brown and mixed light gray and very pale brown, slightly acid clay about 21 inches thick. The substratum to a depth of 63 inches is mixed light gray, very pale brown, and yellow, slightly acid and medium acid sandy clay loam. Permeability of this soil is very slow. Available water capacity is 4.5 to 6.0 inches. Water is perched above the clay in places. The effective rooting depth is as much as 60 inches, but roots are restricted to cracks in the clay below a depth of 20 to 40 inches. Runoff is slow to medium, and the erosion hazard is slight to moderate. Watsonville loam, 2-15 percent slopes, is listed as a hydric soil.

Tierra-Watsonville complex, 15 to 30 percent slopes. This complex consists of soils on alluvial and marine terraces. Elevation ranges from about 20 to 1,200 feet. This complex is about 55 percent Tierra sandy loam and 30 percent Watsonville loam.

The Tierra soil is very deep and moderately well drained. It formed in alluvium derived from sedimentary rock. Typically, the surface layer is very dark grayish brown (10YR 3/2 moist), and dark gray to black, slightly acid sandy loam about 14 inches thick. The upper part of the subsoil is brown, light brownish gray, pale brown, and light gray, slightly acid sandy clay and sandy clay loam about 23 inches thick. The lower part to a depth of 66 inches is light gray and yellow, slightly acid and strongly acid clay and silty clay. Permeability of the Tierra soil is very slow. Available water capacity is 2.0 to 3.5 inches. Water is perched above the clay at times. The effective rooting depth of this soil is as much as 60 inches, but roots are restricted to cracks in the clay below a depth of 12 to 20 inches. Runoff is rapid, and the erosion hazard is high.

The Watsonville soil is very deep and somewhat poorly drained. It formed in alluvium derived from sedimentary rock. Typically, the surface layer is very dark brown (10YR 2/2 moist), slightly acid loam about 12 inches thick. The subsurface layer is light gray, slightly acid sandy loam about 6 inches thick. The subsoil is pale brown and mixed light gray and very pale brown, slightly acid clay about 21 inches thick. The substratum to a depth of 63 inches is mixed light gray, very pale brown, and yellow, slightly acid and medium acid sandy clay loam. Permeability of the Watsonville soil is very slow. Available water capacity is 4.0 to 5.0 inches. Water is perched above the clay at times. The effective rooting depth is as much as 60 inches, but roots are restricted to cracks in the clay below a depth of 10 to 20 inches. Runoff is rapid, and the erosion hazard is high.

Soquel loam, 2 to 9 percent slopes. This very deep, moderately well-drained soil is on plains. It formed in alluvium. Elevation ranges from 20 to 1,000 feet. Typically, the surface layer is very dark gray (10YR 3/1 moist), medium acid and slightly acid loam about 21 inches thick. The upper part of the underlying material is brown, neutral silt loam about 16 inches thick over a buried surface layer of brown, neutral silty clay loam about 14 inches thick. The lower part, to a depth of 62 inches, is yellowish brown, neutral loam. Permeability of this Soquel soil is moderately slow. Available water capacity is 8.5 to 10.5 inches. Effective rooting depth is 60 inches. Surface runoff is slow to medium, and the erosion hazard is slight to moderate.

Elkhorn sandy loam, 15 to 30 percent slopes. This very deep, well drained soil is on old alluvial fans and marine terraces. Elevation ranges from about 20 to 800 feet. Typically, the surface layer is very dark brown (10YR 2/2 moist), slightly acid and medium acid sandy loam about 21 inches thick. The subsoil to a depth of 61 inches is pale brown and variegated light gray and very pale brown, neutral sandy clay loam. In cultivated areas, much of the surface layer has been removed by sheet and rill erosion. Permeability of the Elkhorn soil is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity ranges from 8.5 to 10.0 inches. Runoff is rapid, and the erosion hazard is high.

Elder sandy loam, 2 to 9 percent slopes. This very deep, well-drained soil is on alluvial fans and plains and in narrow valleys. It formed in mixed alluvium. Elevation ranges from 20 to 600 feet. Typically, the surface layer is very dark gray (10YR 3/1 moist), medium acid and slightly acid sandy loam about 31 inches thick. The underlying material, to a depth of 60 inches, is brown and dark grayish brown, slightly acid sandy loam and loamy sand. Permeability of this Elder soil is moderate. Available water capacity is 6.0 to 9.0 inches. Effective rooting depth is 60 inches. Runoff is slow, and the erosion hazard is slight to moderate.

Soil Test Pits

Eight soil tests pits were excavated within the banks of several creeks and drainages located in the project area during the October 2003 wetland assessment (refer to Attachment B, Jurisdictional Sites 1-12 for pit locations). No soil pits were dug during the supplemental wetland examination, as all new areas identified consisted of extensions of previously mapped sites or new channel features exhibiting clear OHW marks. Soil pits 1 through 4 were located within and adjacent to the Valencia Channel, soil pits 5 through 7 were located on the southern side of Rodeo Gulch, and soil pit 8 was located on the northeast bank of Arana Gulch. Pits were dug in areas that did not exhibit a defined OHWM, or in broad, low-lying areas above an existing OHWM that appeared to receive and hold floodwaters during normal flow events. Pits were not dug in incised channels containing hydric vegetation and no adjacent floodplain areas. USACE jurisdictional boundaries under these conditions were determined by mapping the OHWM.

The soils investigation found low chroma, dry to moist silt, sandy loam, and clay soils in wetland areas, with redox features, organic materials, and sediment deposition common. Soils within wetland areas typically did not match the mapped soil type. Adjacent upland areas contained dry sandy loam and clay soils with low chromas and some redox features.

3.2 HYDROLOGIC CONDITIONS

Hydrology along the route is controlled by existing creeks and drainages, with extensive runoff occurring from urban and residential development, roadways, and parking areas. Several large watersheds are crossed by the route, and most of the creeks and drainages crossed enter the Pacific Ocean downstream of the BSA. No tidally influenced or brackish areas are present within the BSA. The creeks and drainages examined in this report contained well-defined bed and bank structure and in many cases consisted of deeply incised channels.

Manmade and maintained roadside drainage ditches consisting of dirt or concrete v-ditches, and associated culvert structures were mapped along the route. These ditches were typically less than two feet deep and four feet wide, and showed evidence of regular maintenance. In some cases storm flow from the ditches could be traced to nearby natural creek channels through culvert inlet and outlet structures. Other roadside ditches had no evidence of direct connection to identified jurisdictional areas, but did connect with the municipal storm drain system. Water entering the storm drain system is assumed to eventually reach jurisdictional waters.

The 2003 assessment was conducted at the end of the dry season, and water levels were at their lowest point. Flowing or ponded water ranging from less than a foot (0.3 meter) to over five feet (1.5 m) deep in the majority of the creeks along the route. Ord, Potbelly, Rodeo, and Borregos Creeks, and the small tributary to Tannery Creek were dry during the October 2003 assessment. The February 2007 supplemental examination was conducted during and immediately following a rainfall event, and found ponded or flowing water in all examined areas. Flows within drainages in the project area are expected to be substantially higher during the wet season due to channelization and runoff from surrounding developed areas.

Indicators of wetland hydrology were observed in each of the creeks and drainages assessed in this report. Hydrologic indicators included established channel morphology, OHW marks consisting of shelving, vegetation lines, water marks, and debris, presence of terraced floodplain areas, and presence of flowing or ponded water.

3.3 VEGETATIVE CONDITIONS

The creeks and drainages examined in this report contained a diverse mixture of riparian and wetland plant species, including native and non-native plants, and escaped ornamental species. Dominant riparian canopy, riparian understory, and wetland species observed during the examination are listed below.

Dominant tree species encountered as riparian canopy included coast live oak, sycamore, arroyo willow, blue gum, redwood, big-leaf maple, box elder, acacia, and California bay. Most of the riparian corridor areas exhibited dense canopy cover within and extending past the top of the defined creek banks, while smaller roadside ditches were generally unvegetated or dominated by annual grasses or ornamental species.

Dominant riparian understory species observed within jurisdictional areas included California blackberry, poison oak, dogwood, coyote brush (*Baccharis pilularis*), stinging nettle, Scotch broom (*Cytisus*

scoparius), English ivy, vinca, Kikuyu grass, hedge nettle (*Stachys bullata*), milk thistle (*Silybum marianum*), sowthistle (*Sonchus oleraceaus*), canarygrass, Italian ryegrass (*Lolium multiflorum*), Cape ivy (*Delairea odorata*), prickly lettuce (*Lactuca serriola*), garden nasturtium (*Tropaeolum majus*), and bristly ox-tongue (*Picris echioides*).

Dominant wetland plant species observed within the creek corridors included California bulrush, cattail, tule (*Scirpus acutus*), water parsley (*Oenanthe sarmentosa*), common horsetail, curly dock, common rush (*Juncus patens*), tall flatsedge (*Cyperus eragrostis*), small-fruited bulrush (*Scirpus microcarpus*), scarlet monkeyflower (*Mimulus cardinalis*), watercress (*Rorippa nasturtium-aquaticum*), rabbitsfoot grass (*Polypogon monspeliensis*), curly dock (*Rumex crispus*), speedwell (*Veronica anagalis-aquatica*), and spiny cocklebur (*Xanthium spinosum*).

3.4 JURISDICTIONAL DETERMINATION

Potentially jurisdictional wetland and other waters habitats were found to be associated with each of the areas examined in this report (refer to Attachment B, Jurisdictional Sites 1-13). Table 2 summarizes the results of sample plot assessments conducted within selected areas of the BSA (refer to Attachment B for soil pit locations).

The jurisdictional areas within the project BSA (refer to Attachment B, Jurisdictional Sites 1-13) were mapped through the proposed project area, using a Trimble Pathfinder GPS unit capable of accuracy to ten centimeters. USACE Waters of the U.S., consisting of wetlands and "other waters," were identified and mapped within the Ordinary High Water Mark (OHWM) and in adjacent areas of the creeks, drainages, and roadside ditches within the BSA. CCC wetland areas and CDFG jurisdictional areas were identified and mapped within the banks or riparian canopy of each creek and drainage within Coastal Zone areas of the BSA. CDFG jurisdictional areas were identified and mapped within the banks or riparian canopy of each creek and drainage not located within Coastal Zone areas of the BSA. Roadside ditches lacking hydric vegetation were considered to be jurisdictional USACE other waters and CCC wetlands due to connectivity with creeks and drainages by means of culvert and storm drain systems.

Table 2. Sample Plot Jurisdictional Determination Summary

Sample Plot / Soil Pit	Hydrophytic Vegetation	Hydric Soils	Wetland Hydrology	Potential Jurisdiction	
				USACE	CCC/CDFG
1	**Yes**	**Yes**	**Yes**	**Wetland**	**CCC/CDFG Wetland**
2	No	**Yes**	No	Non-Wetland	**CCC/CDFG Wetland**
3	**Yes**	**Yes**	**Yes**	**Wetland**	**CCC/CDFG Wetland**
4	No	**Yes**	No	Non-Wetland	**CCC/CDFG Wetland**
5	**Yes**	**Yes**	**Yes**	**Wetland**	**CDFG Wetland**
6	**Yes**	**Yes**	**Yes**	**Wetland**	**CDFG Wetland**
7	**Yes**	No	No	Non-Wetland	**CDFG Wetland**
8	**Yes**	**Yes**	**Yes**	**Wetland**	**CDFG Wetland**

3.5 JURISDICTIONAL AREAS WITHIN THE BSA

Potentially jurisdictional Waters of the U.S., including wetlands as defined by the USACE, the CCC, and the CDFG are present within the project BSA. The extent of potentially jurisdictional areas within the BSA is quantified in Table 3 below. As listed in Table 3, approximately 9.86 acres of USACE jurisdictional areas, and approximately 28.19 acres of CDFG jurisdictional areas are present within the project BSA. Of those jurisdictional areas, 15.48 acres are within the Coastal Zone and are also regulated by the CCC.

Table 3. Jurisdictional Areas within the BSA

Site No.	Jurisdictional Area (within Coastal Zone)	USACE Jurisdiction				CCC/CDFG Jurisdiction[1]	
		Wetlands		Other Waters			
		Sq. Meter	Acre	Sq. Meter	Acre	Sq. Meter	Acre
1a, 1b	Valencia Channel and Lagoon	24,783	**6.12**	0	**0**	24,783	**6.12**
2a	Valencia Creek roadside ditches	0	**0**	128	**0.03**	128	**0.03**
2b	Valencia Creek/ Aptos Creek	1,343	**0.33**	0	**0**	14,242	**3.52**
3	Ord Gulch	543	**0.13**	255	**0.06**	10,005	**2.47**
4	Borregas Creek	80	**0.02**	0	**0**	3,906	**0.97**
5	Potbelly Creek	46	**0.01**	0	**0**	1,467	**0.36**
6	Tannery Gulch	25	**0.01**	0	**0**	2,346	**0.58**
7	Tannery Gulch Tributary	0	**0**	0	**0**	7	**0.00**
8	Monterey Avenue /Nobel Creek	218	**0.05**	0	**0**	5,769	**1.43**
SUBTOTAL		***27,039***	***6.68***	*383*	***0.09***	*62,653*	***15.48***
Site No.	**Jurisdictional Area (outside Coastal Zone)**	**USACE Jurisdiction**				**CDFG Jurisdiction[2]**	
		Wetlands		**Other Waters**			
		Sq. Meter	**Acre**	**Sq. Meter**	**Acre**	**Sq. Meter**	**Acre**
6	Tannery Gulch	13	**0.00**	0	**0**	**1,304**	0.32
8	Monterey Avenue /Nobel Creek	0	0	345	0.09	**187**	**0.05**
9	Soquel Creek	**2,557**	0.63	**0**	0	**7,770**	1.92
10a	Rodeo Gulch	**838**	0.21	**0**	0	**5,358**	1.32
10b	Soquel Drive-In roadside ditch	**0**	0	**541**	0.13	**541**	0.13
11	Arana Gulch & E. Tributary	**5,862**	1.45	**0**	0	**22,602**	5.59
12	La Fonda Road Shoulder	**163**	0.04	**0**	0	**0**	0
13	Arana Gulch W. Tributary	**0**	0.00	**2,184**	0.54	**13,649**	3.37
SUBTOTAL		***9,433***	*2.33*	***3,070***	0.76	***51,411***	*12.70*
USACE Jurisdiction Totals		36,471	9.01	3,453	0.85		
CDFG Jurisdiction Total						114,064	28.19
CCC Jurisdiction Total						62,653	15.48

[1] CDFG/CCC jurisdiction includes USACE areas.

[2] CDFG jurisdiction includes USACE areas.

3.6 FUNCTIONS AND VALUES OF IDENTIFIED JURISDICTIONAL AREAS

Using the rating criteria from Table 1 (refer to Section 2.2), the identified jurisdictional areas rank moderate to high in function and value, due to presence of standing water and saturated soils during summer months, dense riparian and emergent vegetation, and discharge, recharge and water quality benefits (refer to following Table 4).

Table 4. Function and Value Ratings of Identified Jurisdictional Areas

Resource	Size (within BSA)	Water Quality	Storage	Discharge	Recharge	Biological Support
USACE/CDFG/ CCC Jurisdiction	39,924sq. meters / 9.86 acres	High	Moderate	High	Moderate	High
CCC Wetlands	62,653 sq. meters / 15.48 acres	High	Moderate	High	Moderate	High
CDFG Wetlands	114,064 sq. meters / 28.19 acres	High	Moderate	High	Moderate	High

4. DISCUSSION

The jurisdictional areas identified in this report consist of seasonal and perennial freshwater marsh wetlands, shrub-scrub wetlands, roadside ditches, and riparian forest habitats associated with creeks and drainage channels that cross or are adjacent to the project BSA. Most of the areas assessed in this report contained USACE jurisdictional areas only within the OHWM, however, adjacent wetland areas on low-lying floodplains were identified in association with Arana Gulch, Rodeo Gulch, Valencia Creek, and Valencia Channel. USACE wetlands and jurisdictional other waters areas were found associated with roadside ditches and smaller tributary channels along the project route. CCC wetlands were present in all Coastal Zone areas assessed in this report, and generally followed the top of bank or outside edge of the riparian canopy line. CDFG jurisdictional areas coincide with CCC boundaries, and were present within the banks or riparian canopy of each creek and drainage not located within the Coastal Zone. As shown in Table 4 above, the jurisdictional areas within and adjacent to the BSA provide moderate to high functions and values.

USACE jurisdictional areas have greater potential to contain aquatic special-status species, contain a greater diversity of wetland plant and animal species, and have greater potential for direct water quality impacts than non-USACE areas that meet CCC/CDFG jurisdictional requirements. Non-USACE jurisdictional areas serve as vital buffer between upland and stream habitats, and provide habitat for a hugely diverse assemblage of plant and animal species dependent on riparian habitats.

The proposed project has the potential to cause both permanent and temporary impacts to USACE and CDFG/CCC jurisdictional areas associated with the creeks, drainages, and roadside features that cross or are adjacent to the project BSA. Permanent impacts to jurisdictional areas could result from grading changes to bank configuration, and loss of riparian and wetland habitat associated with road improvements, retaining walls, sound walls, bridge replacement and culvert installation or extension. Temporary impacts could result from stream diversion installation and removal, streambed disturbance

during culvert installation, removal and reconstruction of roadside ditches (including bioswale construction), and vegetation pruning or removal for construction activities and access.

5. REGULATORY IMPLICATIONS

5.1 U.S. ARMY CORPS OF ENGINEERS

Section 404 of the Clean Water Act (CWA) regulates activities that result in the discharge of dredge or fill materials into Waters of the United States, including wetlands. USACE is charged with administering and regulating various sections of the CWA. Waters of the U.S. (considered jurisdictional waters) includes special aquatic sites (e.g., marine waters, tidal areas, stream channels, and wetlands). Constraints to federally protected biological resources are also assessed as part of the 404 permitting process through consultation with the USFWS. Policies relating to the loss of aquatic habitats generally stress the need for no net loss of wetland resources. Under section 404, actions in waters of the U.S. may be subject to an individual permit, nationwide permit, a general permit, or may be exempt from regulatory requirements. Development activities within or immediately adjacent to the jurisdictional areas mapped in Attachment B, Jurisdictional Sites 1-13 will be subject to regulation by USACE and will likely require the submittal of a permit application to USACE for: 1) verification of this wetland assessment, and 2) determination of permitting/mitigation requirements.

5.2 CALIFORNIA DEPARTMENT OF FISH AND GAME

Section 1600 of the State of California Fish and Game Code requires any person, state or local government agency, or public utility proposing a project that may affect a river, stream, or lake to notify the CDFG before beginning the project. If activities will result in the diversion or obstruction of the natural flow of a stream, or substantially alter its bed, channel, or bank, or adversely affect existing fish and wildlife resources, a Streambed Alteration Agreement is required. A Streambed Alteration Agreement lists the CDFG conditions of approval relative to the proposed project, and serves as an agreement between an applicant and the CDFG for a term of not more than five years for the performance of activities subject to this section. Any activities affecting the mapped bed, bank, or outside riparian canopy edge of the jurisdictional areas mapped in Attachment B, Jurisdictional Sites 1-13 will likely require a 1600 Streambed Alteration Agreement.

5.3 REGIONAL WATER QUALITY CONTROL BOARD

Section 401 of the CWA ensures that federally permitted activities comply with the federal CWA and state water quality laws. Section 401 is implemented by California's RWQCB, triggered by the Section 404 permitting process. The RWQCB issues a Water Quality Certification via the 401 process that a proposed project complies with water quality standards and other conditions of California law. Evaluating the effects of the proposed project on both water quality and quantity (runoff) falls under the jurisdiction of the RWQCB. Any activities within the project area that have the potential to result in a need for a permit from the USACE would require a RWQCB Section 401 Water Quality Certification.

Section 401 of the CWA regulates activities that have the potential to cause water quality impacts to Waters of the United States, including wetlands, as defined by the USACE. This certification typically precedes USACE permit issuance. Any activities that would require an USACE Section 404 permit would also require a Section 401 Water Quality Certification from the RWQCB.

5.4 CALIFORNIA COASTAL COMMISSION

The California Coastal Act was enacted in 1976 to provide long-term protection of California's coastal resources. The Act's coastal resources management policies are based on recommendations contained in the California Coastal Plan. One such policy includes:

> "Protection, enhancement and restoration of environmentally sensitive habitats, including intertidal and nearshore waters, wetlands, bays and estuaries, riparian habitat, certain wood and grasslands, streams, lakes, and habitat for rare or endangered plants or animals."

The CCC considers wetlands to be lands that contain any of the three indicators for wetlands (hydrophytic vegetation hydric soils, or wetland hydrology) used by USACE. CCC wetland definitions and boundaries are typically the same as CDFG definitions and boundaries. A Coastal Development Permit may be required to obtain authorization to disturb any areas with one or more of these three indicators within the portions of the BSA which occur within the California coastal zone.

In addition, if the Coastal Zone boundary line bisects a wetland resource, the CCC will typically consider the entire resource within the project area subject to CCC wetland regulations. Coastal wetland setbacks and buffer zones as established in the California Coastal Act and any applicable Local Coastal Plans must be addressed in the proposed project design. Any activities affecting the mapped bed, bank, or outside riparian canopy edge of the CCC jurisdictional areas mapped in Attachment B, Jurisdictional Sites 1-13 will likely require a coastal development permit, and coordination with applicable Local Coastal Plans.

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United States Geological Service. 1987. 7.5 minute series quadrangle for Soquel, California.

United States Geological Service. 1995. 7.5 minute series quadrangle for Watsonville West, California.

Attachment A:
Photo Documentation

PHOTO 1:

View of Valencia Channel along Highway 1, looking west. Note wide, flat channel lined with dense cover of riparian vegetation.

Picture taken September 30, 2003.

(Jurisdictional Site 1a/1b)

PHOTO 2:

View of Aptos Creek looking downstream from under the Highway 1 bridge. Note cobble stream bed and well-developed riparian canopy.

Picture taken September 30, 2003.

(Jurisdictional Site 2b)

PHOTO DOCUMENTATION

PHOTO 3:

View of Valencia Creek looking downstream toward the box culvert at Highway 1. Note the deeply incised channel and sandy stream bed.

Picture taken February 21, 2007.

(Jurisdictional Site 2b)

PHOTO 4:

View of the southern Valencia roadside ditch, looking east along the southbound lanes of Highway 1. Note cover of ivy and annual grasses along the ditch.

Picture taken February 22, 2007.

(Jurisdictional Site 2a)

PHOTO DOCUMENTATION

PHOTO 5:

View of Borregas Gulch looking downstream from the frontage road along the south side of Highway 1. Note the incised channel, and adjacent oak woodland habitat.

Picture taken September 30, 2003.

(Jurisdictional Site 4)

PHOTO 6:

View of roadside drainage channel tributary to Ord Gulch, viewing upstream along Highway 1. Note blackberry and tree canopy along channel.

Picture taken September 8, 2004.

(Jurisdictional Site 3)

PHOTO DOCUMENTATION

PHOTO 7:

View of Tannery Gulch, looking downstream from the box culvert under Highway 1. Note dense cover of eucalyptus in the channel.

Picture taken February 21, 2007.

(Jurisdictional Site 6)

PHOTO 8:

View of the Monterey Avenue tributary to Nobel Creek, looking west along Highway 1. Note dense cover of blackberry and annual grasses on banks.

Picture taken February 21, 2007.

(Jurisdictional Site 8)

PHOTO DOCUMENTATION

PHOTO 9:

View of Nobel Creek, looking upstream from the culvert inlet under Highway 1. Note steep banks and standing water in channel.

Picture taken October 1, 2003.

(Jurisdictional Site 8)

PHOTO 10:

View of Soquel Creek, looking upstream toward the Highway 1 bridge.

Picture taken October 1, 2003.

(Jurisdictional Site 9)

PHOTO DOCUMENTATION

PHOTO 11:

View of the Rodeo Creek main channel, looking downstream from the culvert outlet under Highway 1. Note the broad, flat channel and wide floodplain area.

Picture taken October 1, 2003.

(Jurisdictional Site 10a)

PHOTO 12:

View of the Soquel Drive-Inn roadside ditch area, looking north along the Highway edge. Note ponded water after rainfall that occurred earlier that day.

Picture taken February 22, 2007.

(Jurisdictional Site 10b)

PHOTO DOCUMENTATION

PHOTO 13:

View of broad floodplain of Arana Gulch, looking downstream toward Highway 1 along the left side of the creek.

Picture taken October 1, 2003.

(Jurisdictional Site 11)

PHOTO 14:

View of cattails in roadside swale just north of the La Fonda overcrossing. Area is fed by seeps along the cut bank.

Picture taken on October 14, 2008.

(Jurisdictional Site 12)

PHOTO DOCUMENTATION

PHOTO 15:

View of wetland vegetation and seep areas on roadside bank just south of the La Fonda overcrossing.

Picture taken on October 14, 2008.

(Jurisdictional Site 12)

PHOTO 16:

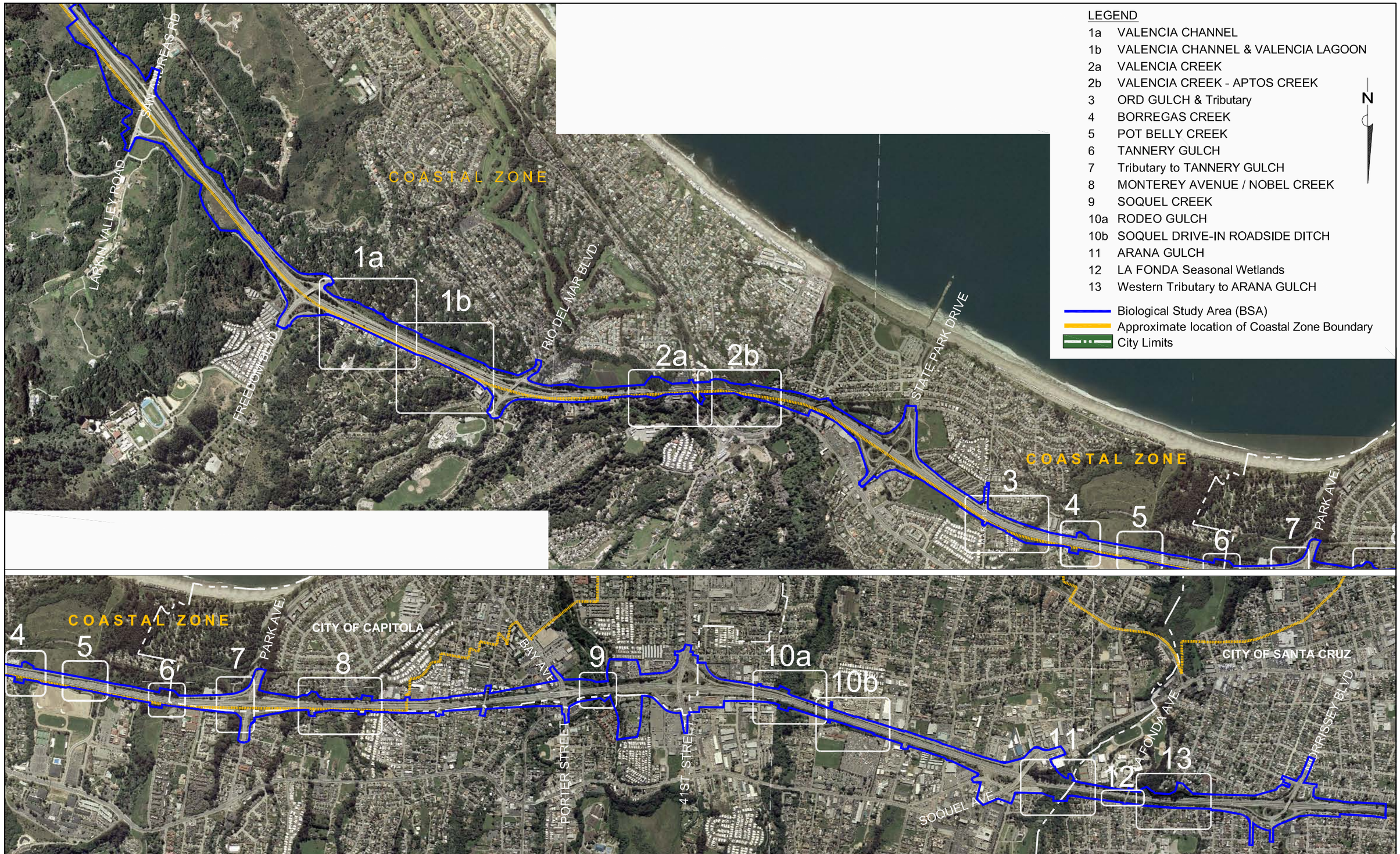
View of western tributary on south side of Highway 1 to Arana Gulch, looking upstream. Note dense cover, and Highway ROW fence posts at left of picture.

Picture taken October 1, 2003.

(Jurisdictional Site 13)

PHOTO DOCUMENTATION

Attachment B:
Jurisdictional Site Maps 1-12

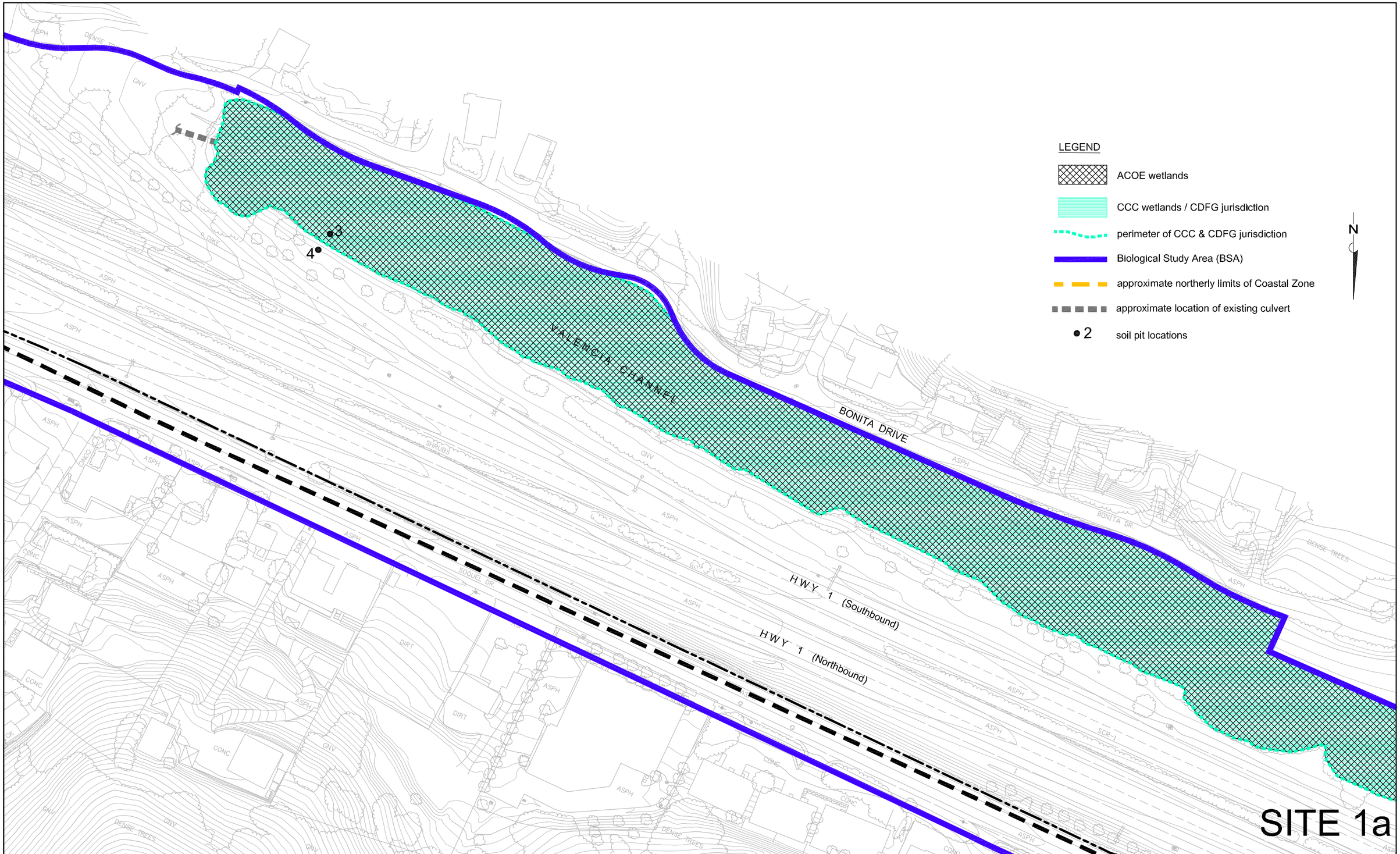


SHEET: 1 OF 14 SCALE: 1:20,000
CADD FILE: 13875\\ nesr 3.10.dwg\KEY
DATE: 3.8.10 BY: dh REV. 1–CZB

SWCA ENVIRONMENTAL CONSULTANTS

WETLAND ASSESSMENT
Highway 1 HOV Lane Project - Santa Cruz, California

KEY TO JURISDICTIONAL SITES



SHEET: 2 OF 14 SCALE: 1:1200 CADD FILE: 13875\\nesr 3.10.dwg\1a DATE: 3.8.10 BY: dh REV. 1–CZB	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California	JURISDICTIONAL SITE 1a Valencia Channel

LEGEND

- ACOE wetlands
- CCC wetlands / CDFG jurisdiction
- perimeter of CCC & CDFG jurisdiction
- Biological Study Area (BSA)
- approximate northerly limits of Coastal Zone
- approximate location of existing culvert
- ● 2 soil pit locations

N

BONITA DRIVE

VALENCIA LAGOON

VALENCIA CHANNEL

HWY 1 (Southbound)

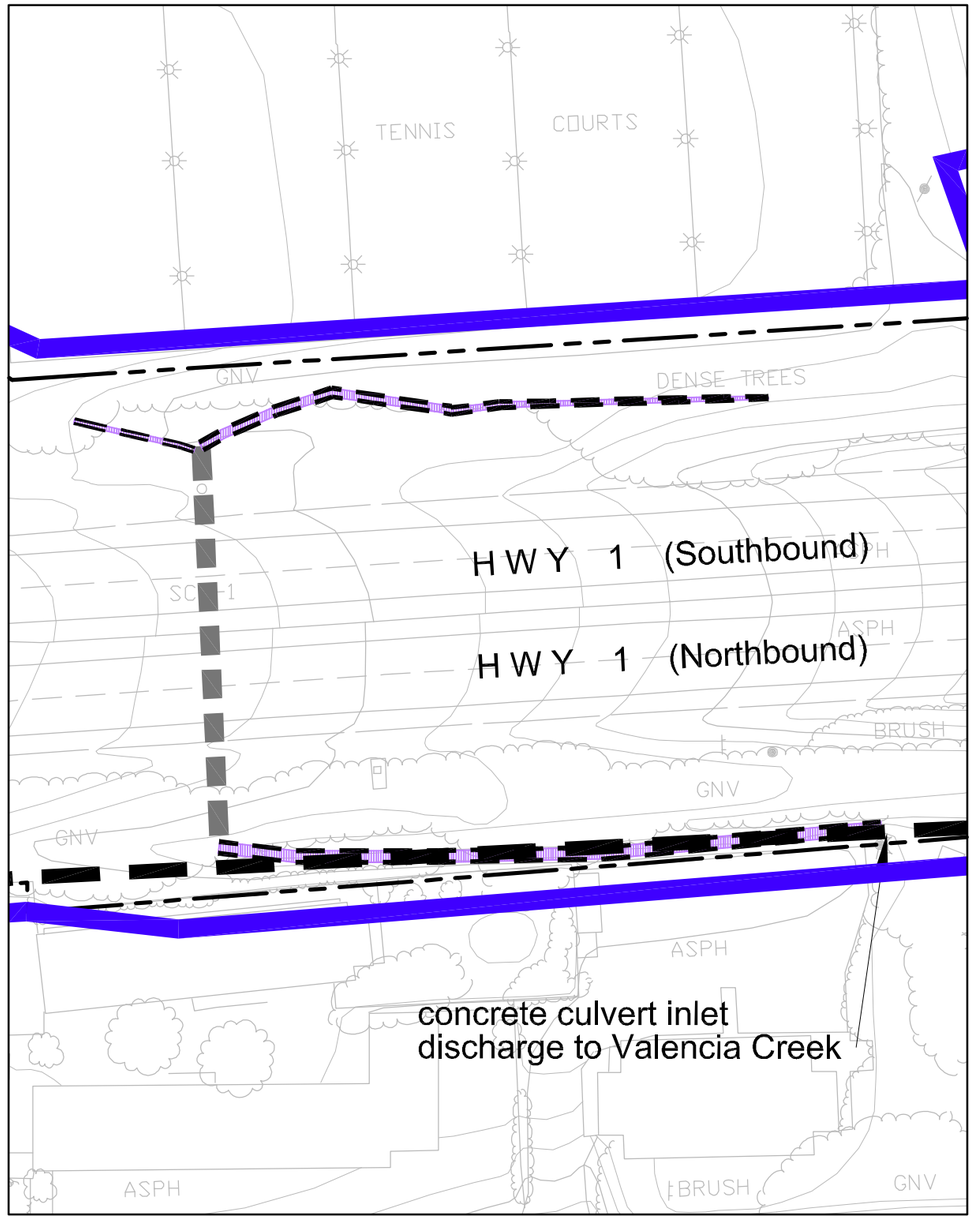
HWY 1 (Northbound)

SOQUEL DR.

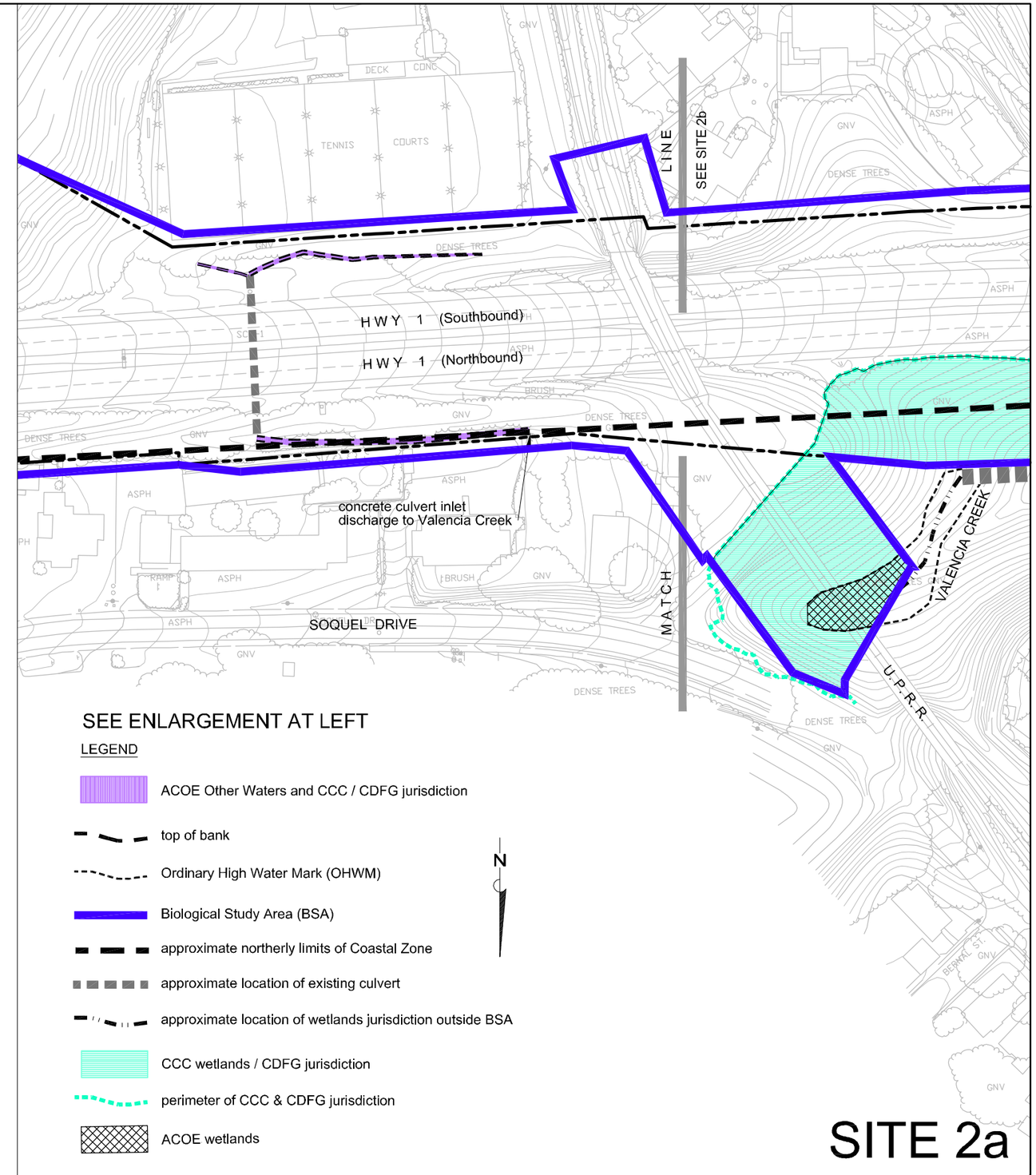
concrete basin at outlet

SITE 1b

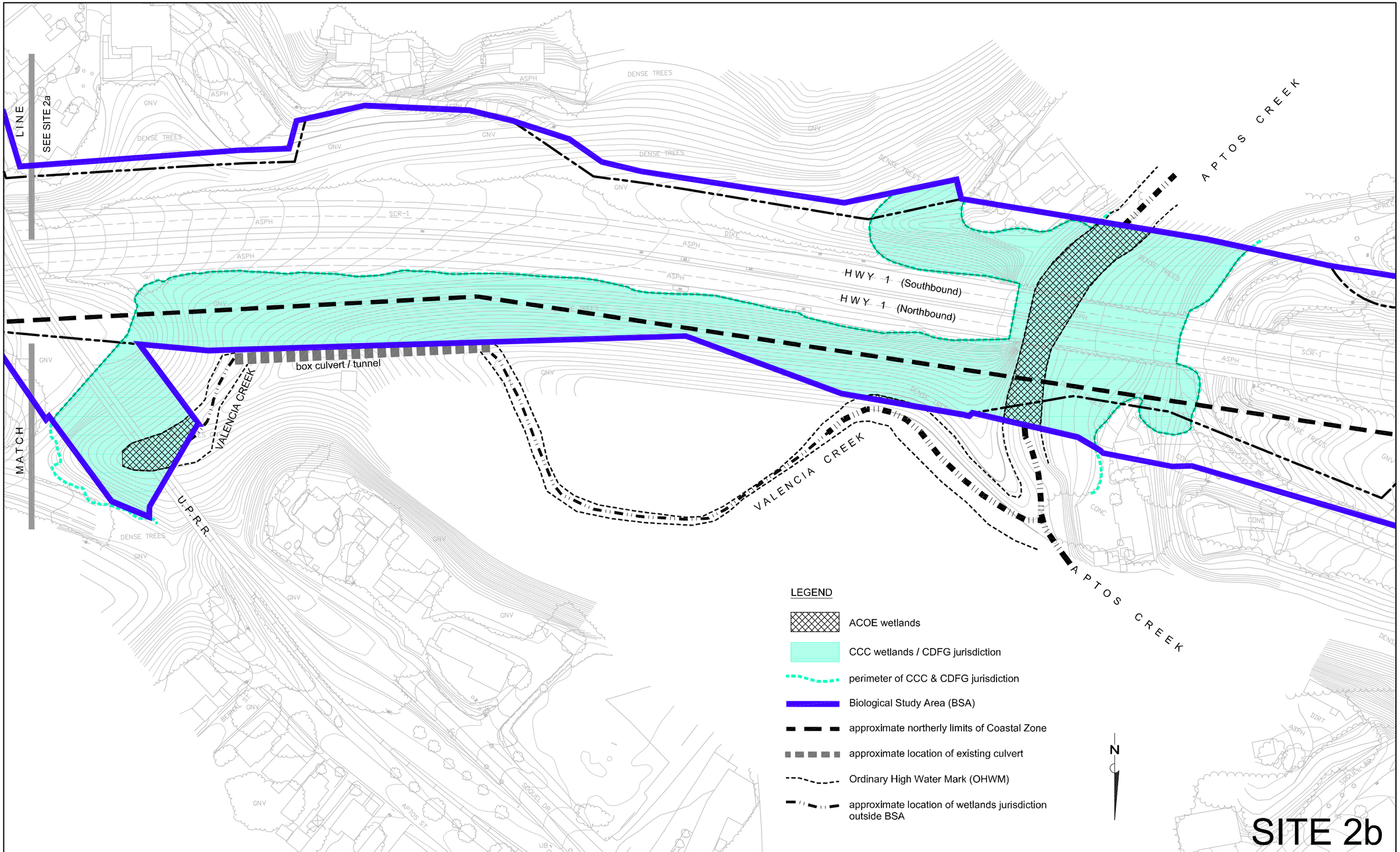
SHEET: 3 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\1b DATE: 3.8.10 BY: dh REV. 1–CZB	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California
		JURISDICTIONAL SITE 1b Valencia Channel & Valencia Lagoon



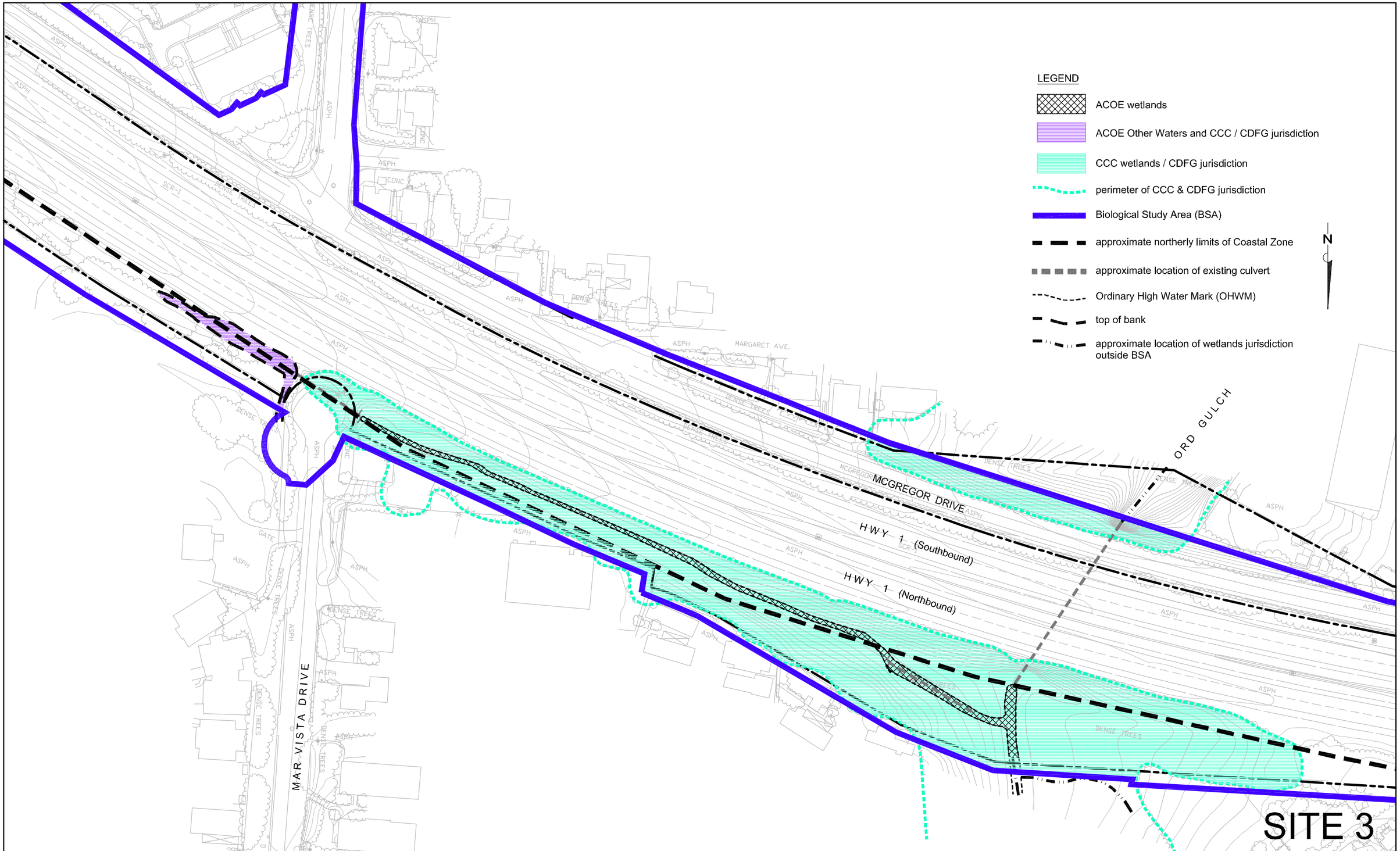
JURISDICTIONAL AREA 2a
Enlargement - 1: 600



SHEET: 4 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\ nesr 3.10.dwg\2a DATE: 3.8.10 BY: dh REV. 1–CZB	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California	JURISDICTIONAL AREA 2a Valencia Creek

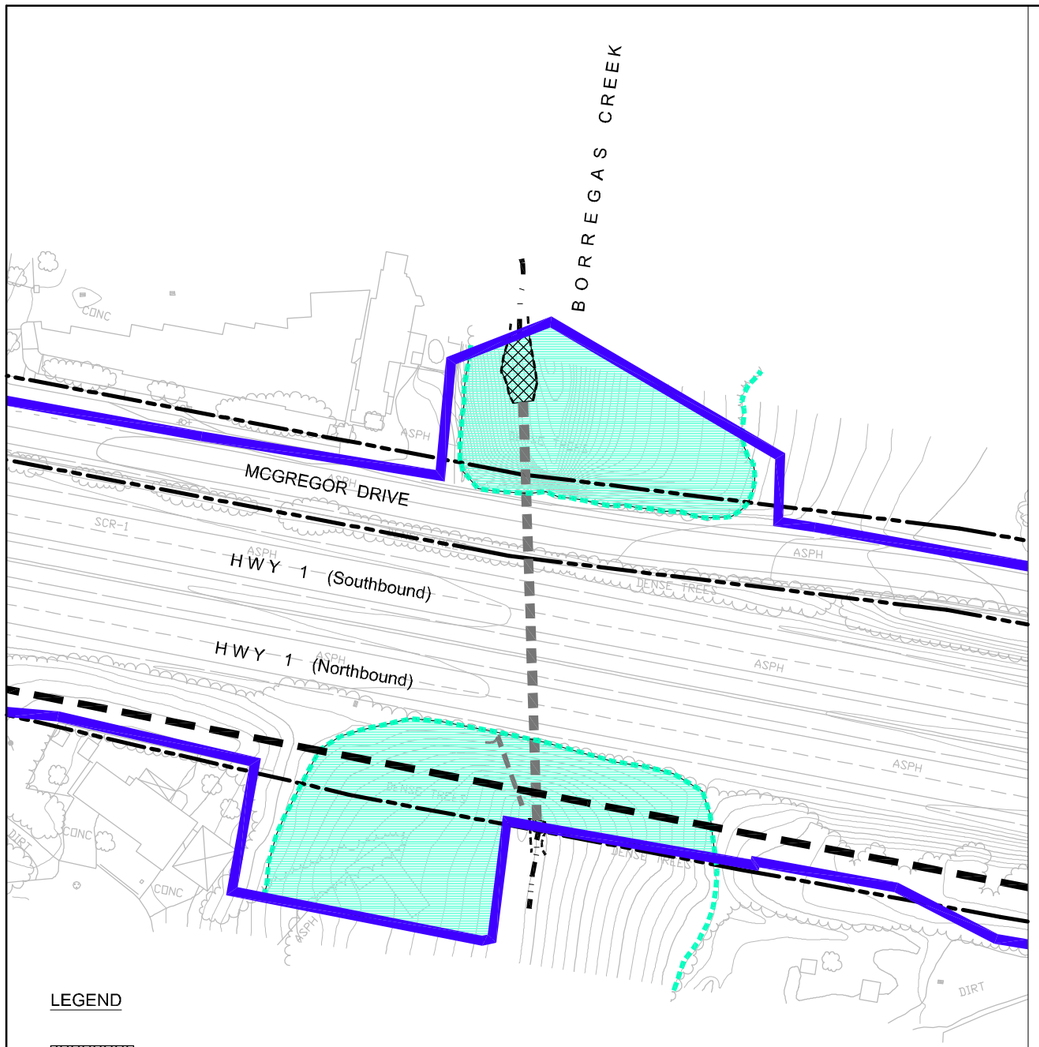


SHEET: 5 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\2b DATE: 3.8.10 BY: dh REV. 1–CZB	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California
		JURISDICTIONAL AREA 2b Valencia Creek - Aptos Creek



SHEET: 6 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\3 DATE: 3.8.10 BY: dh REV. 1–CZB	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California

JURISDICTIONAL AREA 3
Ord Gulch & Tributaries

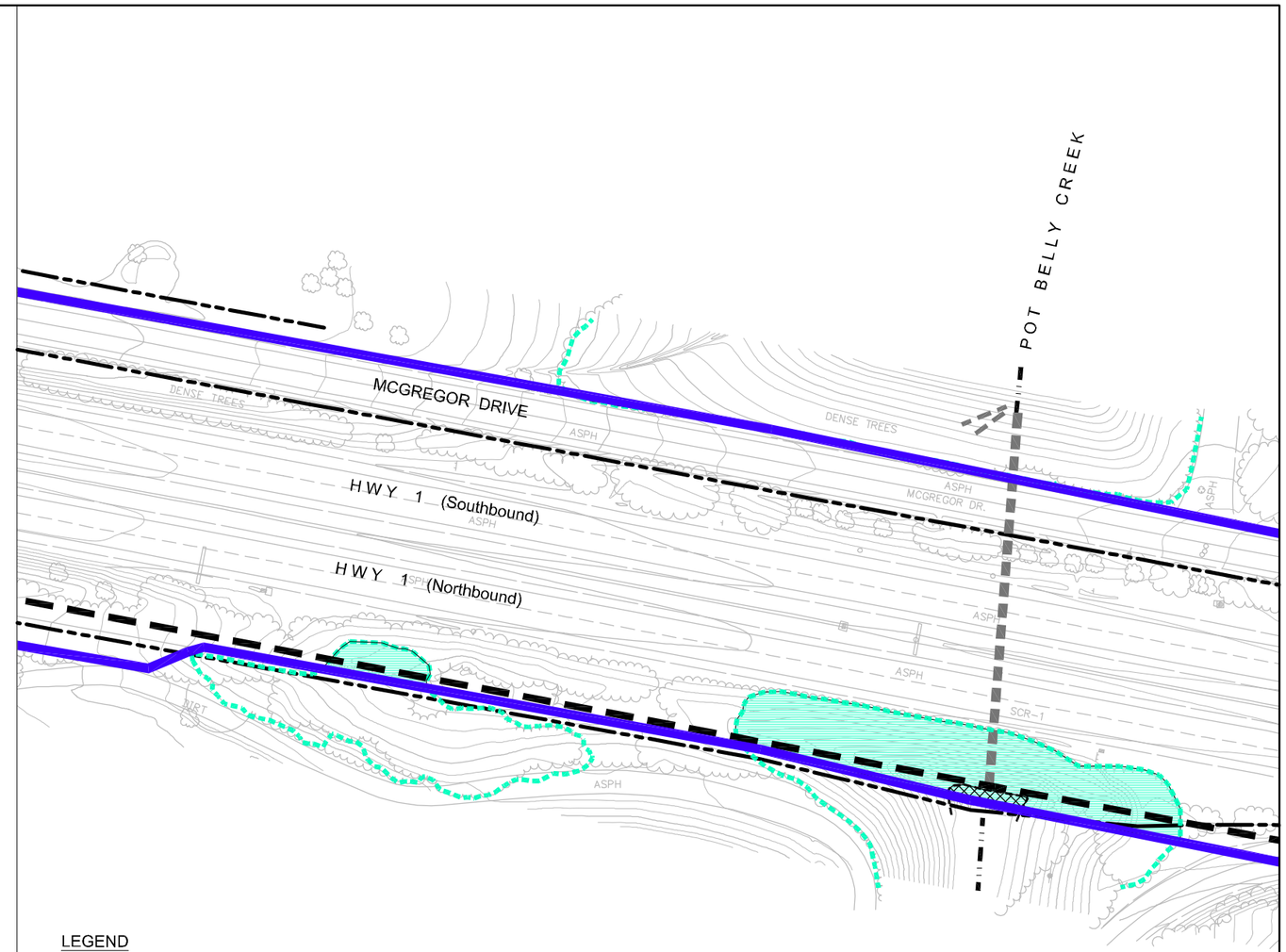


LEGEND

- ACOE wetlands
- CCC wetlands / CDFG jurisdiction
- perimeter of CCC & CDFG jurisdiction
- Biological Study Area (BSA)
- approximate northerly limits of Coastal Zone
- approximate location of existing culvert
- Ordinary High Water Mark (OHWM)
- approximate location of wetlands jurisdiction outside BSA

N

SITE 4



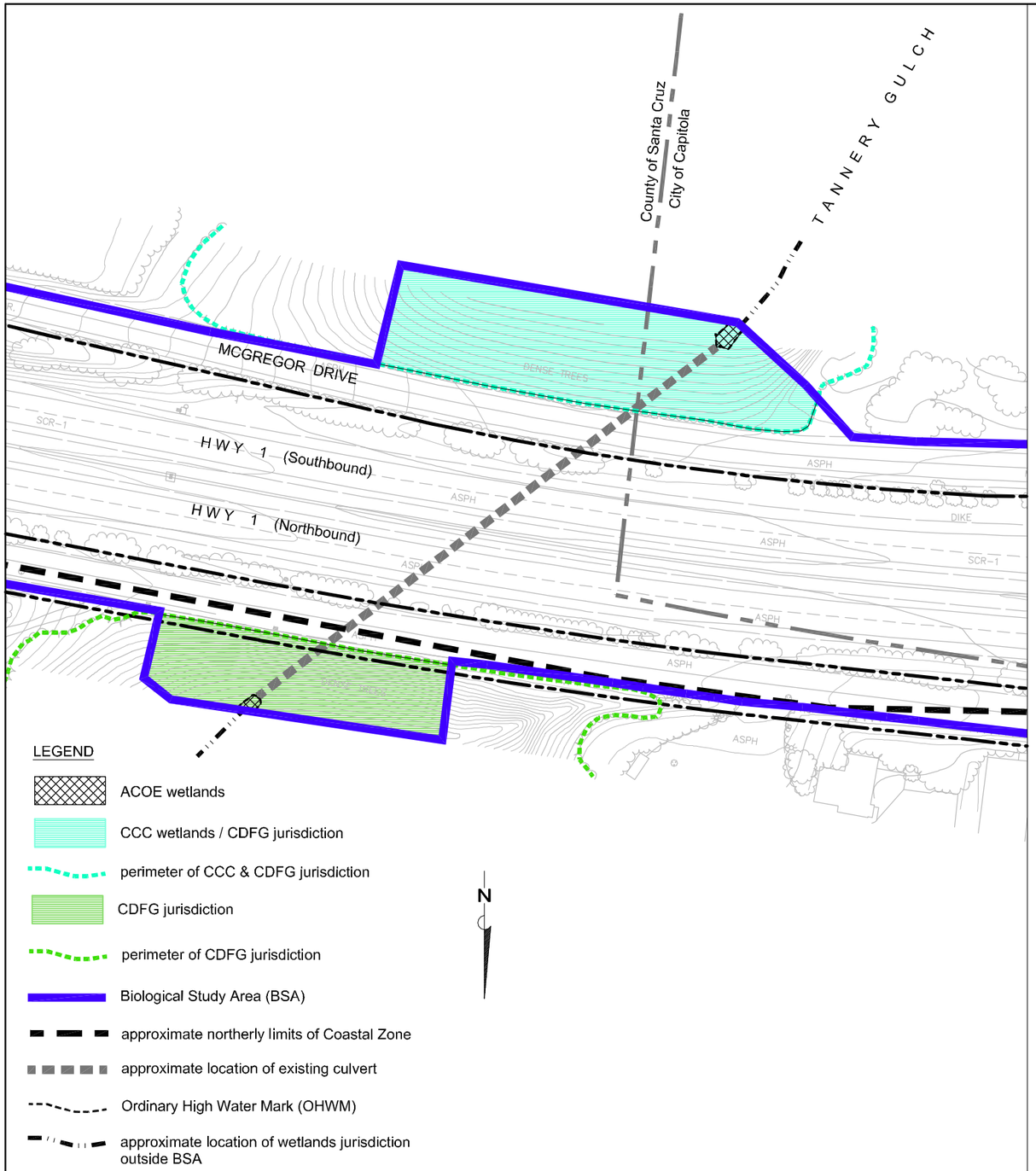
LEGEND

- ACOE wetlands
- CCC wetlands / CDFG jurisdiction
- perimeter of CCC & CDFG jurisdiction
- Biological Study Area (BSA)
- approximate northerly limits of Coastal Zone
- approximate location of existing culvert
- Ordinary High Water Mark (OHWM)
- approximate location of wetlands jurisdiction outside BSA

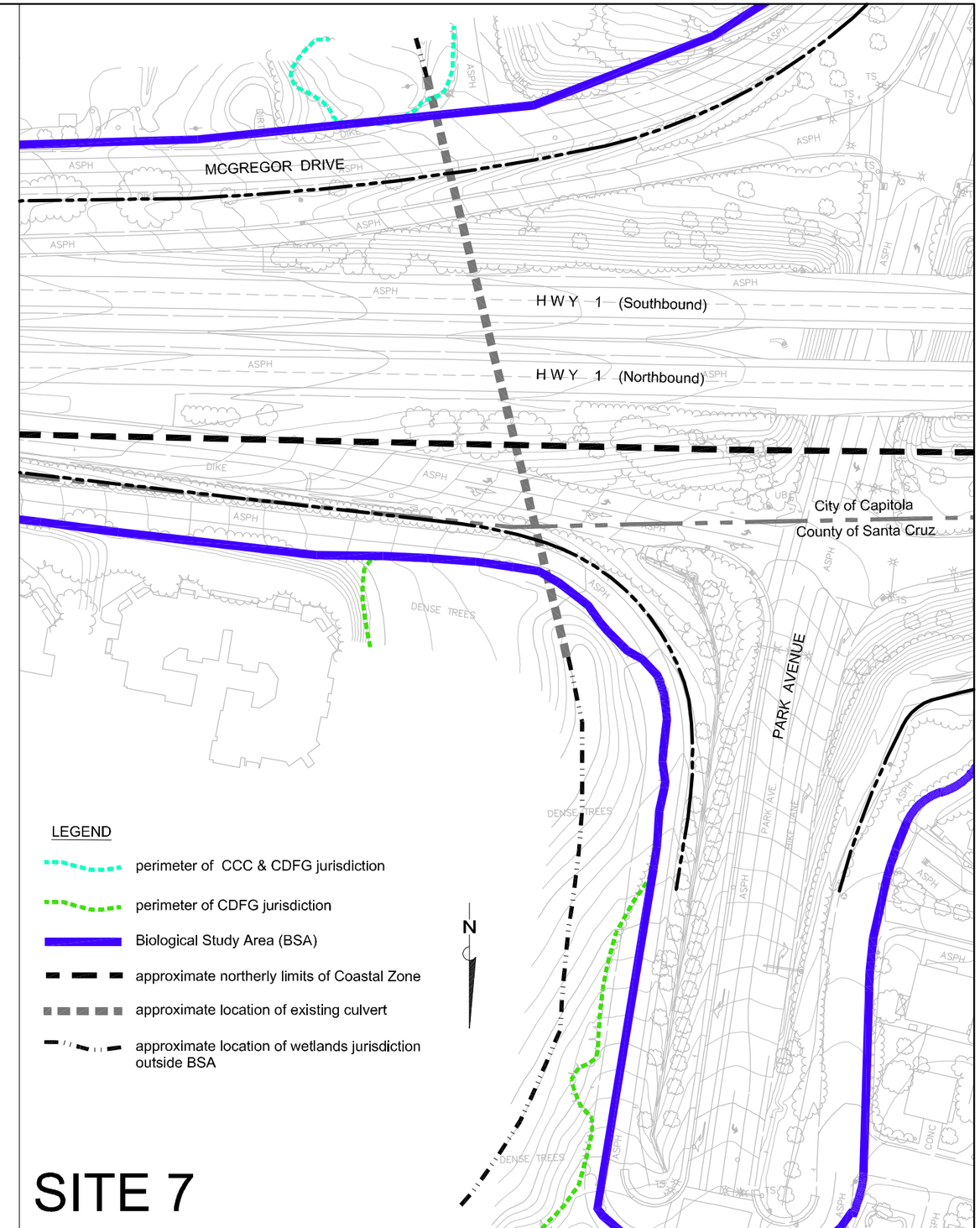
N

SITE 5

SHEET: 7 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\4-5 DATE: 3.8.10 BY: dh REV. 1-CZB	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California	JURISDICTIONAL SITE 4 - Borregas Creek JURISDICTIONAL SITE 5 - Pot Belly Creek

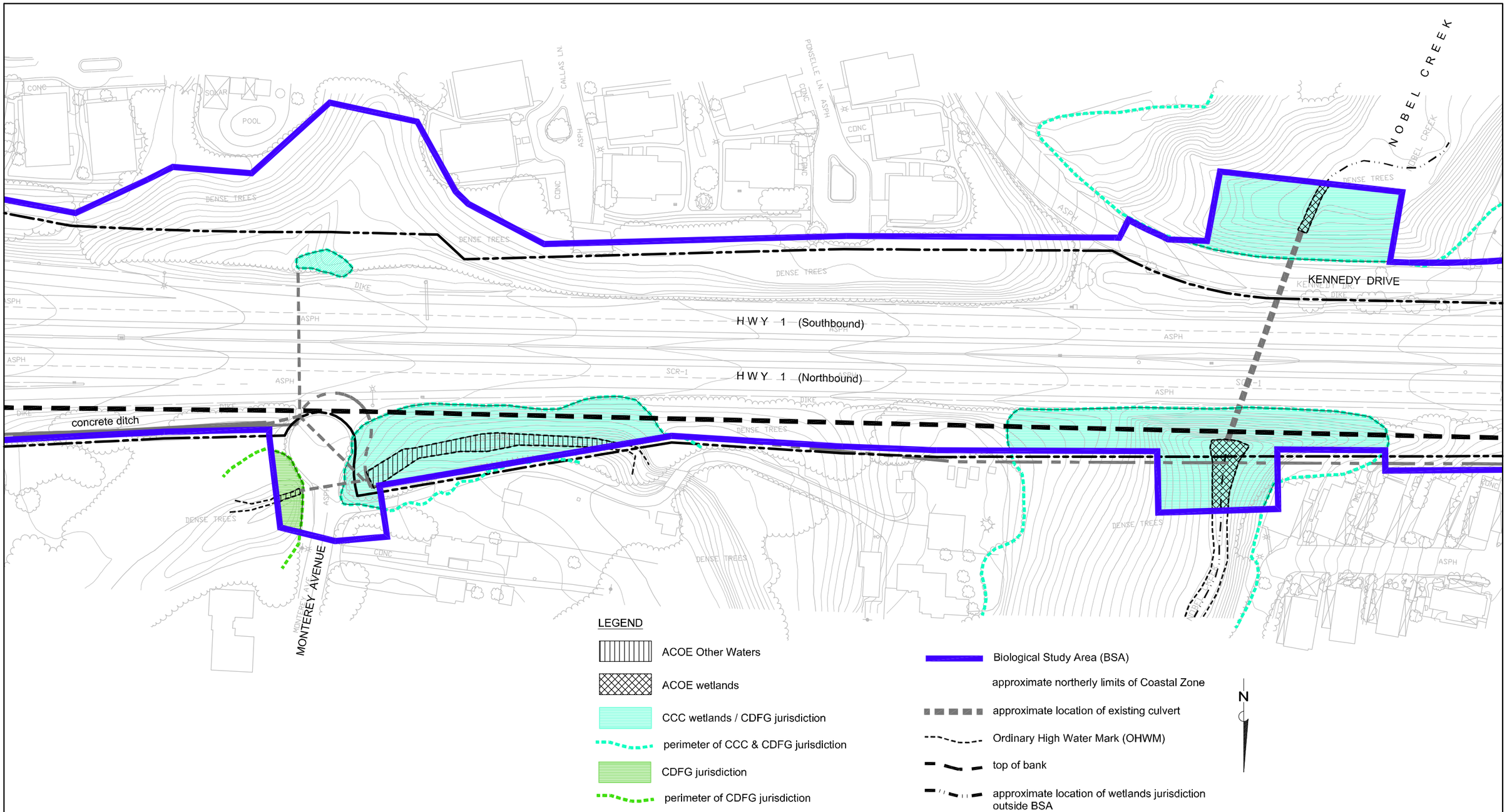


SITE 6



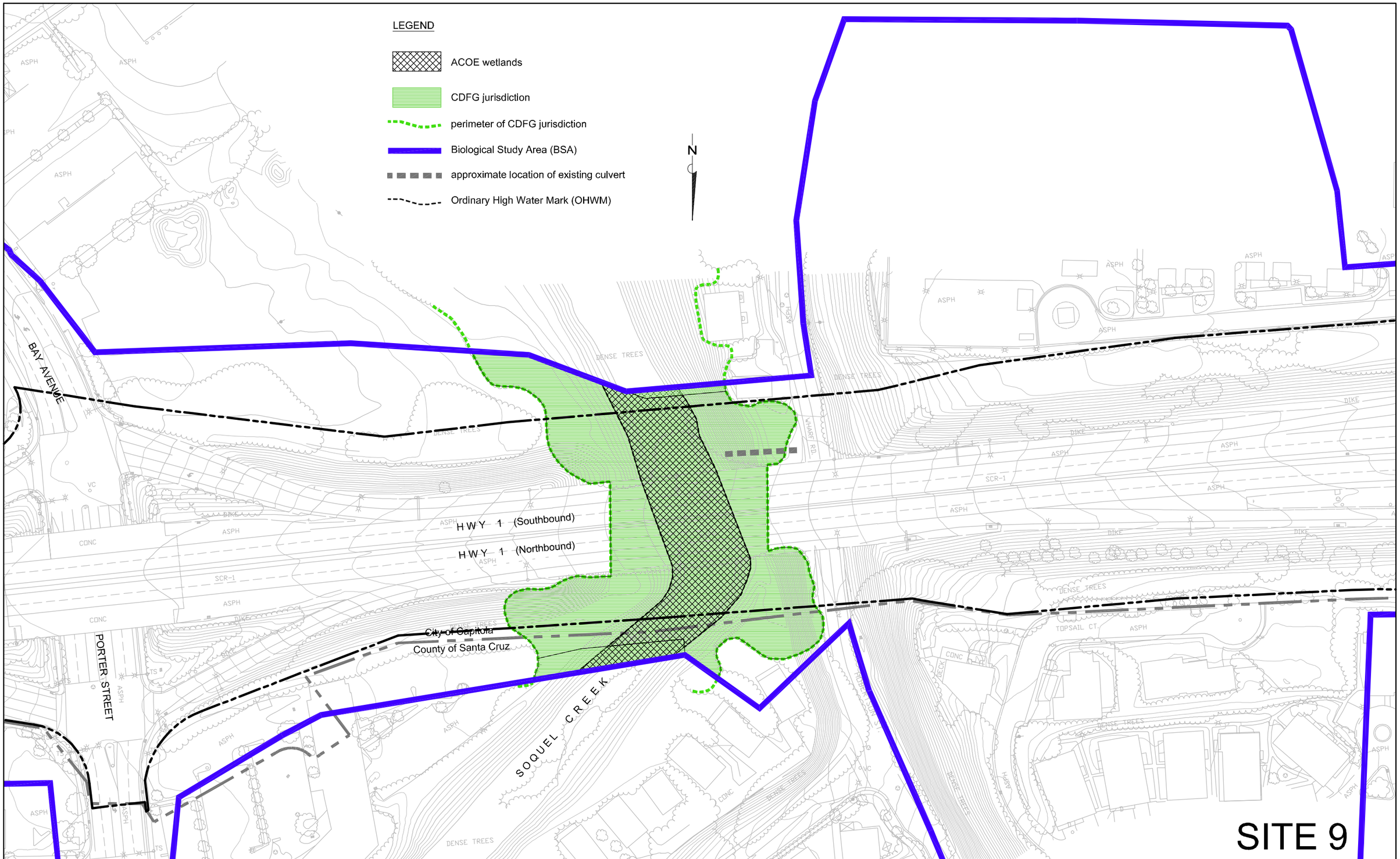
SITE 7

SHEET: 8 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\6-7 DATE: 3.8.10 BY: dh REV. 1-CZB	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California	JURISDICTIONAL SITE 6 - Tannery Gulch JURISDICTIONAL SITE 7 - Tributary to Tannery Gulch



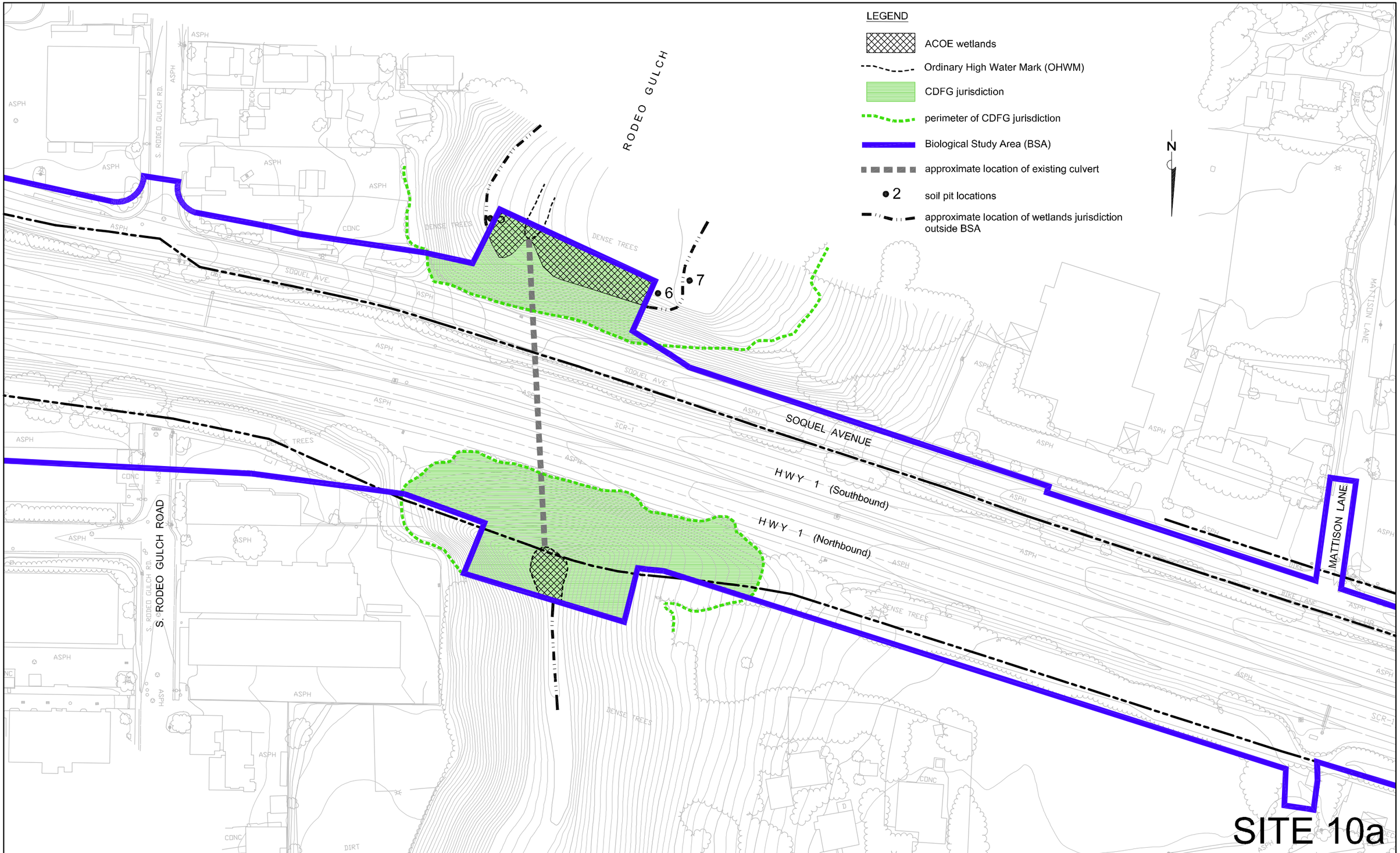
SITE 8

SHEET: 9 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\8 DATE: 3.8.10 BY: dh REV. 1-CZB	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California	JURISDICTIONAL SITE 8 - Monterey Avenue JURISDICTIONAL SITE 8 - Nobel Creek



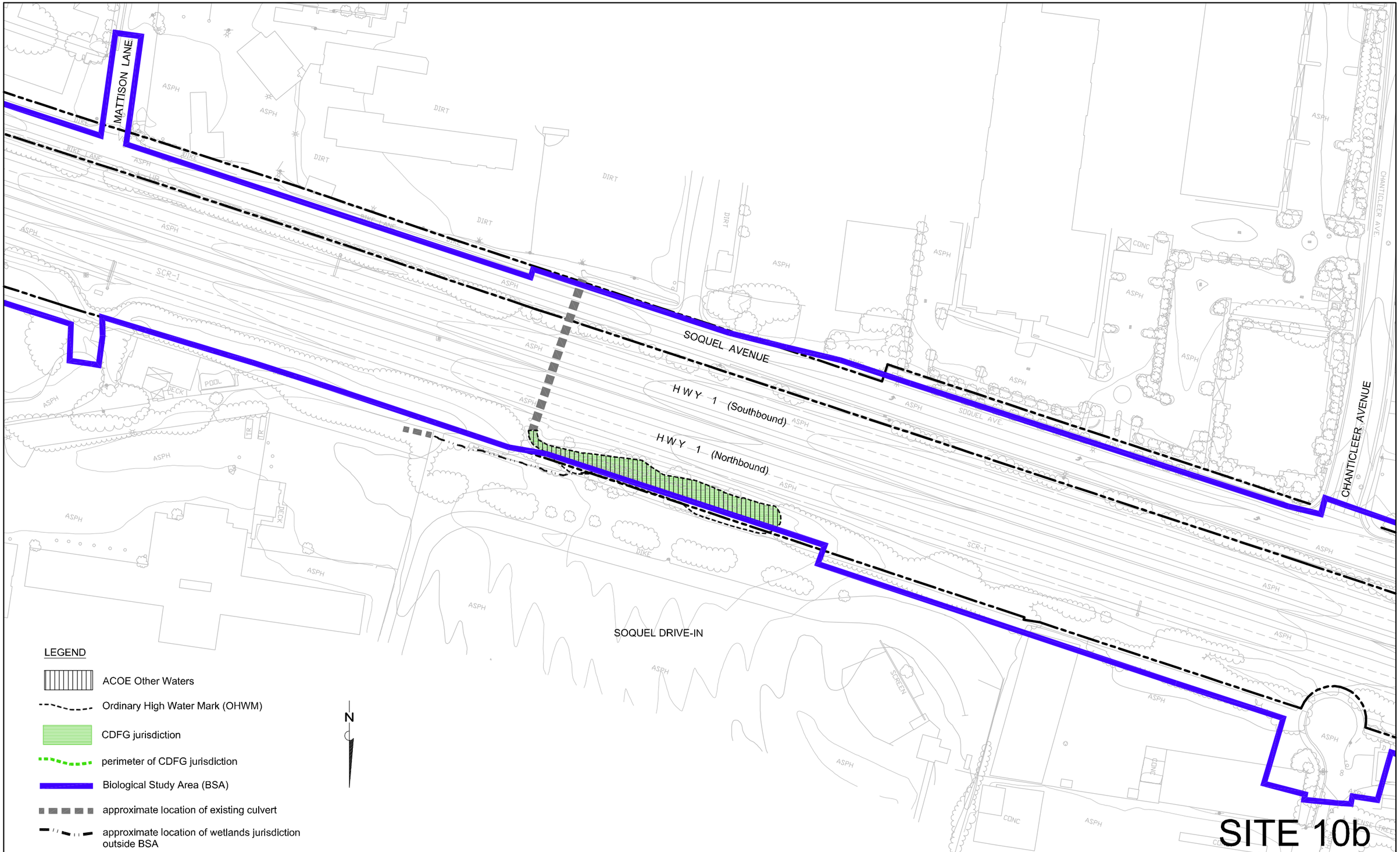
SHEET: 10 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\9 DATE: 3.8.10 BY: dh REV.	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California

JURISDICTIONAL SITE 9 - Soquel Creek

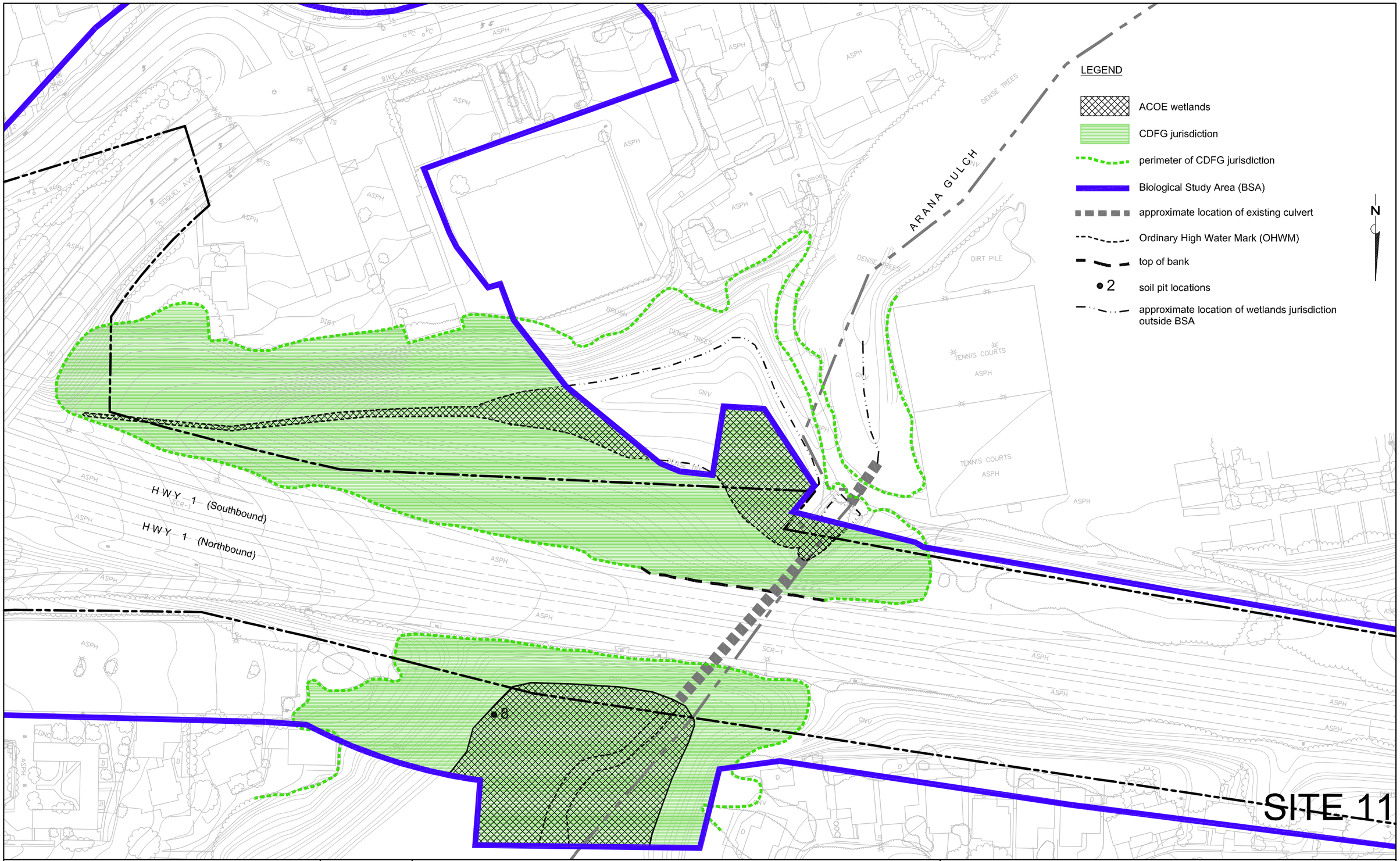


SHEET: 11 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\10a DATE: 3.8.10 BY: dh REV.	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California

JURISDICTIONAL SITE 10a
Rodeo Gulch

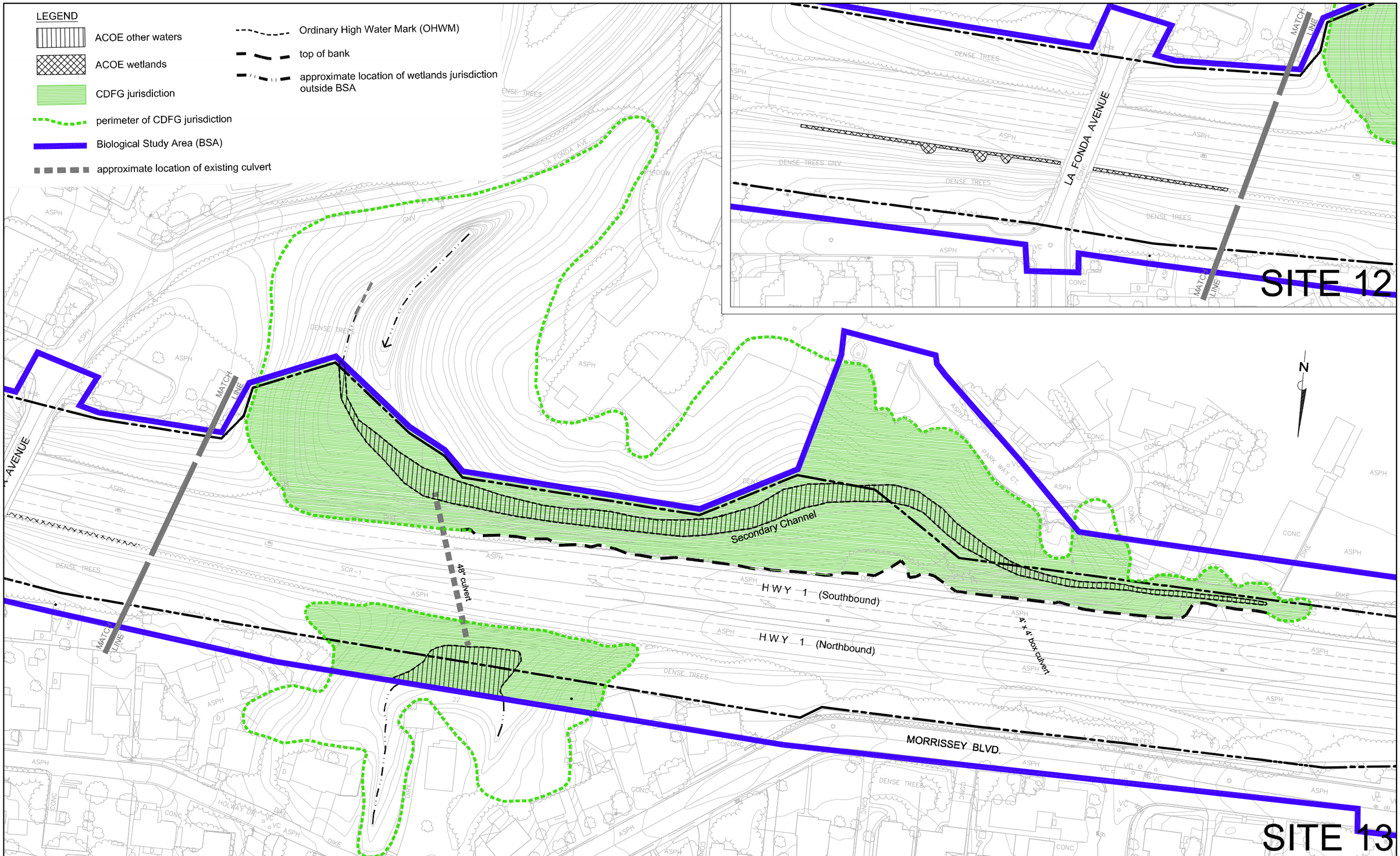


SHEET: 12 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\10b DATE: 3.8.10 BY: dh REV.	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California
		JURISDICTIONAL SITE 10b Soquel Drive-In Roadside Ditch



SHEET: 13 OF 14 SCALE: 1:1200 CADD FILE: 13875.\\nesr 3.10.dwg\11 DATE: 3.8.10 BY: dh REV. 1-aux delineation	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT Highway 1 HOV Lane Project - Santa Cruz, California

JURISDICTIONAL SITE 11
Arana Gulch



SHEET: 14 OF 14 SCALE: 1:1200	SWCA ENVIRONMENTAL CONSULTANTS	WETLAND ASSESSMENT	JURISDICTIONAL SITE 12 - La Fonda Seasonal Wetlands
CADD FILE: 13875.\\nesr 3.10.dwg\12		Highway 1 HOV Lane Project - Santa Cruz, California	JURISDICTIONAL SITE 13 - Tributary to Arana Gulch
DATE: 3.8.10 BY: dh REV. 1–aux delineation			

Attachment C:
Field Data Sheets

Routine Wetland Determination Form

Applicant: Parsons Transportation Group
Project: Santa Cruz HWY 1 HOV
Date: 9/30/03
State: CA
County: Santa Cruz
Transect/Pit No.: 1
Investigators: Sloan, Wiggins
Transect/Pit Area: Left bank of Valencia Channel at HWY 1
Vegetation Community (Cowardin Classification): Freshwater marsh

VEGETATION

Dominant Plant Species	Habit	Indicator	Percent Cover	Dominant Plant Species	Habit	Indicator	Percent Cover
Salix lasiolepis	tree	FACW	80				
Rubus ursinus	shrub	FACW	75				
Quercus agrifolia	tree	none	5				

Percent of Dominant Species that are OBL, FACW, or FAC: 66% **Taxonomic Reference:** Hickman, Reed

SOIL

Map Unit: Elkhorn sandy loam, 15-30 percent slopes

Hydric Soil List? ☐ Yes ☒ No
Mottles? ☒ Yes ☐ No
Gleyed? ☐ Yes ☒ No
NRCS Match? ☐ Yes ☒ No
Other Indicators: none

Profile Description:

0-6 dry sandy loam 10YR 2/2 w/ few mottles 7.5YR 5/8
6-16 dry clay 10YR 2/1 w/ mottles 10YR 5/6

HYDROLOGY

Inundated? ☐ Yes ☒ No
Sediment Deposits? ☐ Yes ☒ No
Depth of Surface Water: none
Depth of Free Water in Pit: none
Other Indicators: Pit on upper bank of drainage channel

Saturated Soil? ☐ Yes ☒ No **Depth:**
Drift Lines? ☒ Yes ☐ No
Water Marks? ☒ Yes ☐ No
Oxidized Rhizospheres? ☐ Yes ☒ No **Color:**

WETLAND DETERMINATION

Vegetation Criterion Met? ☒ Yes ☐ No
Hydric Soil Criterion Met? ☒ Yes ☐ No
Hydrology Criterion Met? ☒ Yes ☐ No

Normal Circumstances? ☒ Yes ☐ No
Is this Plot within a Wetland? ☒ Yes ☐ No

Comments: Maintained roadside drainage channel connected to Valencia Lagoon

Morro Group Determination by: _____
Signature

Rev: 12/1/00

Routine Wetland Determination Form

Applicant: Parsons Transportation Group **Project:** Santa Cruz HWY 1 HOV **Date:** 9/30/03
State: CA **County:** Santa Cruz **Transect/Pit No.:** 2
Investigators: Sloan, Wiggins **Transect/Pit Area:** Left bank of Valencia Channel at HWY 1
Vegetation Community (Cowardin Classification): Landscaped/ruderal

VEGETATION

Dominant Plant Species	Habit	Indicator	Percent Cover	Dominant Plant Species	Habit	Indicator	Percent Cover
Sequoia sempervirens	tree	none	25				
Liquidambar styraciflua	tree	none	10				
Picris echioides	forb	FAC	5				
Medicago polymorpha	forb	none	5				
Matricaria matricarioides	forb	FACU	10				

Percent of Dominant Species that are OBL, FACW, or FAC: 20% **Taxonomic Reference:** Hickman, Reed

SOIL

Map Unit: Elkhorn sandy loam, 15-30 percent slopes

Profile Description:
0-4 dry sandy loam 10YR2/2
2-18 dry clay 10YR2/1 w/ mottles 5YR 4/6

Hydric Soil List? ☐ Yes ☒ No
Mottles? ☒ Yes ☐ No
Gleyed? ☐ Yes ☒ No
NRCS Match? ☐ Yes ☒ No
Other Indicators: none

HYDROLOGY

Inundated? ☐ Yes ☒ No **Saturated Soil?** ☐ Yes ☒ No **Depth:**
Sediment Deposits? ☐ Yes ☒ No **Drift Lines?** ☐ Yes ☒ No
Depth of Surface Water: none **Water Marks?** ☐ Yes ☒ No
Depth of Free Water in Pit: none **Oxidized Rhizospheres?** ☐ Yes ☒ No **Color:**
Other Indicators: None-pit above upper bank of drainage channel

WETLAND DETERMINATION

Vegetation Criterion Met? ☐ Yes ☒ No **Normal Circumstances?** ☒ Yes ☐ No
Hydric Soil Criterion Met? ☒ Yes ☐ No
Hydrology Criterion Met? ☐ Yes ☒ No **Is this Plot within a Wetland?** ☐ Yes ☒ No
Comments: Maintained roadside landscape area above drainage channel connected to Valencia Lagoon

Morro Group Determination by: _____
Signature

Rev: 12/1/00

Routine Wetland Determination Form

Applicant: Parsons Transportation Group **Project:** Santa Cruz HWY 1 HOV **Date:** 9/30/03
State: CA **County:** Santa Cruz **Transect/Pit No.:** 3
Investigators: Sloan, Wiggins **Transect/Pit Area:** Left bank of Valencia Channel at HWY 1
Vegetation Community (Cowardin Classification): Freshwater marsh

VEGETATION

Dominant Plant Species	Habit	Indicator	Percent Cover	Dominant Plant Species	Habit	Indicator	Percent Cover
Salix lasiolepis	tree	FACW	5				
Typha latifolia	shrub	OBL	40				
Juncus acutus	shrub	FACW	10				
Rumex crispis	shrub	FACW	5				
Veronica anagallis-aquatica	forb	OBL	10				

Percent of Dominant Species that are OBL, FACW, or FAC: 100% **Taxonomic Reference:** Hickman, Reed

SOIL

Map Unit: Elkhorn sandy loam, 15-30 percent slopes

Hydric Soil List? ☐ Yes ☒ No
Mottles? ☒ Yes ☐ No
Gleyed? ☐ Yes ☒ No
NRCS Match? ☐ Yes ☒ No
Other Indicators: none

Profile Description:

0-16 moist loam 10YR 3/1 w/ many large mottles 5YR 4/6

HYDROLOGY

Inundated? ☐ Yes ☒ No **Saturated Soil?** ☐ Yes ☒ No **Depth:**
Sediment Deposits? ☐ Yes ☒ No **Drift Lines?** ☒ Yes ☐ No
Depth of Surface Water: none **Water Marks?** ☒ Yes ☐ No
Depth of Free Water in Pit: none **Oxidized Rhizospheres?** ☐ Yes ☒ No **Color:**
Other Indicators: Pit on lower bank at south end of drainage channel

WETLAND DETERMINATION

Vegetation Criterion Met? ☒ Yes ☐ No **Normal Circumstances?** ☒ Yes ☐ No
Hydric Soil Criterion Met? ☒ Yes ☐ No
Hydrology Criterion Met? ☒ Yes ☐ No **Is this Plot within a Wetland?** ☒ Yes ☐ No
Comments: Maintained roadside drainage channel connected to Valencia Lagoon

Morro Group Determination by: _____
Signature

Rev: 12/1/00

Routine Wetland Determination Form

Applicant: Parsons Transportation Group **Project:** Santa Cruz HWY 1 HOV **Date:** 9/30/03
State: CA **County:** Santa Cruz **Transect/Pit No.:** 4
Investigators: Sloan, Wiggins **Transect/Pit Area:** Left bank of Valencia Channel at HWY 1
Vegetation Community (Cowardin Classification): Ruderal

VEGETATION

Dominant Plant Species	Habit	Indicator	Percent Cover	Dominant Plant Species	Habit	Indicator	Percent Cover
Aveena fatua	grass	none	50				
Raphanus sativus	forb	none	10				
Lactuca serriola	forb	FAC	10				
Medicago polymorpha	forb	none	5				
Eschscholzia californica	forb	none	10				

Percent of Dominant Species that are OBL, FACW, or FAC: 20% **Taxonomic Reference:** Hickman, Reed

SOIL

Map Unit: Elkhorn sandy loam, 15-30 percent slopes

Hydric Soil List? ☐ Yes ☒ No
Mottles? ☒ Yes ☐ No
Gleyed? ☐ Yes ☒ No
NRCS Match? ☐ Yes ☒ No
Other Indicators: none

Profile Description:

0-4 dry sandy loam 10YR3/2
4-16 dry sandy loam 10YR 3/2 w/ few fine mottles 7.5YR 5/8

HYDROLOGY

Inundated? ☐ Yes ☒ No **Saturated Soil?** ☐ Yes ☒ No **Depth:**
Sediment Deposits? ☐ Yes ☒ No **Drift Lines?** ☐ Yes ☒ No
Depth of Surface Water: none **Water Marks?** ☐ Yes ☒ No
Depth of Free Water in Pit: none **Oxidized Rhizospheres?** ☐ Yes ☒ No **Color:**
Other Indicators: None-pit on upper bank of drainage channel

WETLAND DETERMINATION

Vegetation Criterion Met? ☐ Yes ☒ No **Normal Circumstances?** ☒ Yes ☐ No
Hydric Soil Criterion Met? ☒ Yes ☐ No
Hydrology Criterion Met? ☐ Yes ☒ No **Is this Plot within a Wetland?** ☐ Yes ☒ No
Comments: Maintained roadside area above drainage channel connected to Valencia Lagoon

Morro Group Determination by: _____
Signature

Rev: 12/1/00

Routine Wetland Determination Form

Applicant: Parsons Transportation Group **Project:** Santa Cruz HWY 1 HOV **Date:** 9/30/03
State: CA **County:** Santa Cruz **Transect/Pit No.:** 5
Investigators: Sloan, Wiggins **Transect/Pit Area:** Left bank of Rodeo Gulch south of HWY 1
Vegetation Community (Cowardin Classification): Scrub-shrub wetland

VEGETATION

Dominant Plant Species	Habit	Indicator	Percent Cover	Dominant Plant Species	Habit	Indicator	Percent Cover
Salix lasiolepis	tree	FACW	30				
Rubus ursinus	shrub	FACW	80				
Umbellularia californica	tree	FAC	40				

Percent of Dominant Species that are OBL, FACW, or FAC: 100% **Taxonomic Reference:** Hickman, Reed

SOIL

Map Unit: Lompico-Felton complex, 30-50 percent slopes

Hydric Soil List? ☐ Yes ☒ No
Mottles? ☒ Yes ☐ No
Gleyed? ☐ Yes ☒ No
NRCS Match? ☐ Yes ☒ No
Other Indicators: none

Profile Description:

0-3 dry silt 10YR 3/2 w/ common mottles 10YR 5/8
3-16 dry clay 10YR 3/1 w/ common mottles 5YR 4/6

HYDROLOGY

Inundated? ☐ Yes ☒ No **Saturated Soil?** ☐ Yes ☒ No **Depth:**
Sediment Deposits? ☒ Yes ☐ No **Drift Lines?** ☒ Yes ☐ No
Depth of Surface Water: none **Water Marks?** ☒ Yes ☐ No
Depth of Free Water in Pit: none **Oxidized Rhizospheres?** ☐ Yes ☒ No **Color:**
Other Indicators: polygonal cracking, floodplain area

WETLAND DETERMINATION

Vegetation Criterion Met? ☒ Yes ☐ No **Normal Circumstances?** ☒ Yes ☐ No
Hydric Soil Criterion Met? ☒ Yes ☐ No
Hydrology Criterion Met? ☒ Yes ☐ No **Is this Plot within a Wetland?** ☒ Yes ☐ No
Comments: depressional floodplain area in low gradient, broad seasonal stream channel

Morro Group Determination by: _____
Signature

Rev: 12/1/00

Routine Wetland Determination Form

Applicant: Parsons Transportation Group **Project:** Santa Cruz HWY 1 HOV **Date:** 9/30/03

State: CA **County:** Santa Cruz **Transect/Pit No.:** 6

Investigators: Sloan, Wiggins **Transect/Pit Area:** Right bank of Rodeo Gulch south of HWY 1

Vegetation Community (Cowardin Classification): Scrub-shrub wetland

VEGETATION

Dominant Plant Species	Habit	Indicator	Percent Cover	Dominant Plant Species	Habit	Indicator	Percent Cover
Salix lasiolepis	tree	FACW	90				
Polygonum persicaria	forb	FACW	20				

Percent of Dominant Species that are OBL, FACW, or FAC: 100% **Taxonomic Reference:** Hickman, Reed

SOIL

Map Unit: Lompico-Felton complex, 30-50 percent slopes

Hydric Soil List? ☐ Yes ☒ No

Mottles? ☒ Yes ☐ No

Gleyed? ☐ Yes ☒ No

NRCS Match? ☐ Yes ☒ No

Other Indicators: none

Profile Description:

0-8 damp sandy loam 10YR 3/1 w/ fine common mottles 7.5YR 5/8
8-16 moist clay 10YR 3/1 w/ fine common mottles 7.5YR 5/8

HYDROLOGY

Inundated? ☐ Yes ☒ No **Saturated Soil?** ☐ Yes ☒ No **Depth:**

Sediment Deposits? ☒ Yes ☐ No **Drift Lines?** ☒ Yes ☐ No

Depth of Surface Water: none **Water Marks?** ☒ Yes ☐ No

Depth of Free Water in Pit: none **Oxidized Rhizospheres?** ☐ Yes ☒ No **Color:**

Other Indicators: polygonal cracking, floodplain area

WETLAND DETERMINATION

Vegetation Criterion Met? ☒ Yes ☐ No **Normal Circumstances?** ☒ Yes ☐ No

Hydric Soil Criterion Met? ☒ Yes ☐ No

Hydrology Criterion Met? ☒ Yes ☐ No **Is this Plot within a Wetland?** ☒ Yes ☐ No

Comments: depressional floodplain area in low gradient, broad seasonal stream channel

Morro Group Determination by: _____
Signature

Rev: 12/1/00

Routine Wetland Determination Form

Applicant: Parsons Transportation Group **Project:** Santa Cruz HWY 1 HOV **Date:** 9/30/03
State: CA **County:** Santa Cruz **Transect/Pit No.:** 7
Investigators: Sloan, Wiggins **Transect/Pit Area:** Right bank of Rodeo Gulch south of HWY 1
Vegetation Community (Cowardin Classification): Scrub-shrub wetland

VEGETATION

Dominant Plant Species	Habit	Indicator	Percent Cover	Dominant Plant Species	Habit	Indicator	Percent Cover
Salix lasiolepis	tree	FACW	60				
Rubus ursinus	shrub	FACW	80				
Juncus patens	shrub	FAC	5				

Percent of Dominant Species that are OBL, FACW, or FAC: 100% **Taxonomic Reference:** Hickman, Reed

SOIL

Map Unit: Lompico-Felton complex, 30-50 percent slopes

Hydric Soil List? ☐ Yes ☒ No
Mottles? ☐ Yes ☒ No
Gleyed? ☐ Yes ☒ No
NRCS Match? ☒ Yes ☐ No
Other Indicators: none

Profile Description:

0-10 dry sandy loam 10YR 3/2
10-16 dry sandy loam w/ sandstone 10YR 3/2

HYDROLOGY

Inundated? ☐ Yes ☒ No **Saturated Soil?** ☐ Yes ☒ No **Depth:**
Sediment Deposits? ☐ Yes ☒ No **Drift Lines?** ☐ Yes ☒ No
Depth of Surface Water: none **Water Marks?** ☐ Yes ☒ No
Depth of Free Water in Pit: none **Oxidized Rhizospheres?** ☐ Yes ☒ No **Color:**
Other Indicators: upper edge of floodplain area

WETLAND DETERMINATION

Vegetation Criterion Met? ☒ Yes ☐ No **Normal Circumstances?** ☒ Yes ☐ No
Hydric Soil Criterion Met? ☐ Yes ☒ No
Hydrology Criterion Met? ☐ Yes ☒ No **Is this Plot within a Wetland?** ☐ Yes ☒ No
Comments: area likely to qualify as CCC wetland

Morro Group Determination by: _____
Signature

Rev: 12/1/00

Routine Wetland Determination Form

Applicant: Parsons Transportation Group **Project:** Santa Cruz HWY 1 HOV **Date:** 9/30/03

State: CA **County:** Santa Cruz **Transect/Pit No.:** 8

Investigators: Sloan, Wiggins **Transect/Pit Area:** Left bank of Arana Gulch north of HWY 1

Vegetation Community (Cowardin Classification): Scrub-shrub wetland

VEGETATION

Dominant Plant Species	Habit	Indicator	Percent Cover	Dominant Plant Species	Habit	Indicator	Percent Cover
Salix lasiolepis	tree	FACW	40				
Rubus ursinus	shrub	FACW	20				
Polygonum persicaria	forb	FACW	10				
Quercus agrifolia	tree	none	25				

Percent of Dominant Species that are OBL, FACW, or FAC: 75% **Taxonomic Reference:** Hickman, Reed

SOIL

Map Unit: Soquel loam, 2-9 percent slopes

Profile Description:

0-16 dry sandy loam 10YR 2/2 w/ common mottles 7.5YR 3/2

Hydric Soil List? ☐ Yes ☒ No

Mottles? ☐ Yes ☒ No

Gleyed? ☐ Yes ☒ No

NRCS Match? ☒ Yes ☐ No

Other Indicators: layered organics in upper 6 inches of soil

HYDROLOGY

Inundated? ☐ Yes ☒ No **Saturated Soil?** ☐ Yes ☒ No **Depth:**

Sediment Deposits? ☒ Yes ☐ No **Drift Lines?** ☒ Yes ☐ No

Depth of Surface Water: none **Water Marks?** ☒ Yes ☐ No

Depth of Free Water in Pit: none **Oxidized Rhizospheres?** ☐ Yes ☒ No **Color:**

Other Indicators: faint polygonal cracking in bare areas, pit at upper edge of floodplain area

WETLAND DETERMINATION

Vegetation Criterion Met? ☒ Yes ☐ No **Normal Circumstances?** ☒ Yes ☐ No

Hydric Soil Criterion Met? ☒ Yes ☐ No

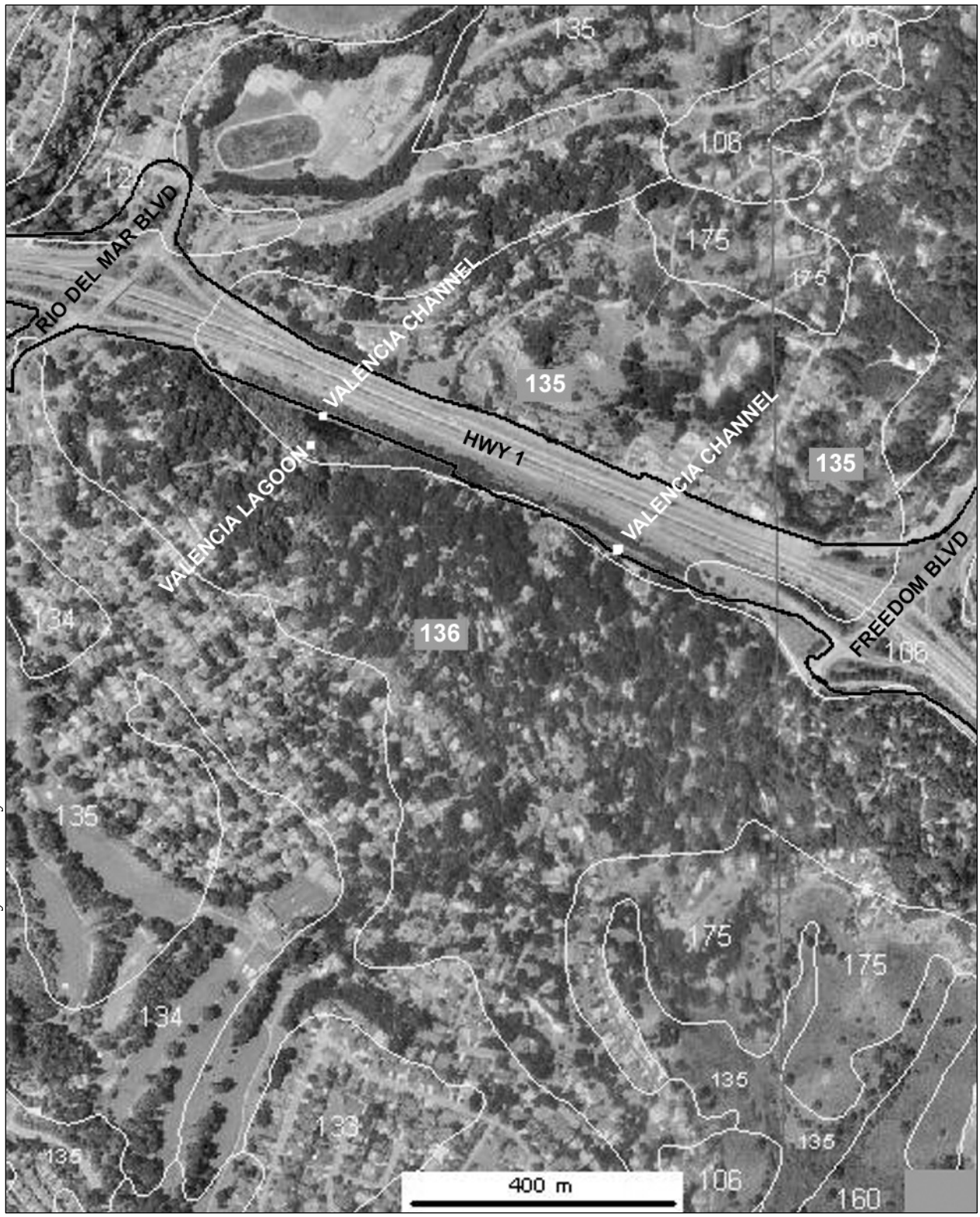
Hydrology Criterion Met? ☒ Yes ☐ No **Is this Plot within a Wetland?** ☒ Yes ☐ No

Comments: regularly inundated floodplain area adjacent to defined low flow channel

Morro Group Determination by: _____
Signature

Rev: 12/1/00

Attachment D:
Soil Survey Maps



Source: NRCS – Santa Cruz County Soil Survey

SOIL KEY

135 Elkhorn sandy loam, 15-30% slopes
136 Elkhorn-Pfeiffer complex, 30-50 % slopes

NORTH
1:24,000

SOIL SURVEY MAP
Valencia Channel – Valencia Lagoon
Jurisdictional Sites 1a/1b

Source: NRCS – Santa Cruz County Soil Survey

SOIL KEY

143 Lompico-Felton complex 30-50% slopes
144 Lompico-Felton complex, 50-75 % slopes
174 Tierra-Watsonville complex, 15-30% slopes

NORTH
1:24,000

SOIL SURVEY MAP
Valencia Creek / Aptos Creek
Jurisdictional Site 2a / 2b

Source: NRCS – Santa Cruz County Soil Survey

SOIL KEY

133 Elkhorn sandy loam, 2-9% slopes
174 Tierra-Watsonville complex, 15-30% slopes

NORTH
1:24,000

SOIL SURVEY MAP
Ord Gulch – Borregas Creek
Jurisdictional Sites 3 and 4

Source: NRCS – Santa Cruz County Soil Survey

SOIL KEY

136 Elkhorn sandy loam, 2-9% slopes
174 Elkhorn-Pfeiffer complex, 30-50% slopes

NORTH
1:24,000

SOIL SURVEY MAP
Pot Belly Creek - Tannery Gulch
– Tributary to Tannery Gulch
Jurisdictional Sites 5, 6, and 7

Source: NRCS – Santa Cruz County Soil Survey

SOIL KEY

135 Elkhorn sandy loam, 15-30% slopes

NORTH
1:24,000

SOIL SURVEY MAP
Nobel Creek
Jurisdictional Site 8

Source: NRCS – Santa Cruz County Soil Survey

SOIL KEY

130 Elder sandy loam, 2-9% slopes
185 Water

NORTH
1:24,000

SOIL SURVEY MAP
Soquel Creek
Jurisdictional Site 9

Source: NRCS – Santa Cruz County Soil Survey

SOIL KEY

143 Lompico-Felton complex, 30-50% slopes

NORTH
1:24,000

SOIL SURVEY MAP
Rodeo Gulch / Soquel Drive-Inn
Jurisdictional Sites 10a / 10b

Source: NRCS – Santa Cruz County Soil Survey

SOIL KEY

135 Elkhorn sandy loan, 15-30% slopes
171 Soquel loam, 2-9% slopes

NORTH
1:24,000

SOIL SURVEY MAP
Arana Gulch – Tributary to Arana Gulch
Jurisdictional Sites 11 and 12

Appendix E. Photo Documentation

Photo 1:
An example of riverine habitat and riparian forest in the overstory. This is a view of Aptos Creek looking downstream from under the Route 1 bridge.

Photo taken on September 30, 2003.

Photo 2:
An example of freshwater marsh habitat. This is a west-facing view of Valencia Lagoon just south of Route 1. Note cattails (recently cut back) in the marsh toward the middle of the lagoon and willows and oaks along the edges.

Photo taken on February 22, 2007.

Photo 3:

West-facing view along the south side of Route 1, roughly in-between Kennedy Drive and Park Avenue. Coast live oak woodland habitat is to the left, and a drainage ditch occurs at the base of the berm next to the road edge.

Photo taken on February 22, 2007.

Photo 4:

View of mixed conifer woodland habitat in the vicinity of Valencia Creek.

Photo taken on February 21, 2007.

Photo 5:
East-facing view of eucalyptus woodland habitat in the vicinity of Nobel Creek

Photo taken on February 21, 2007.

Photo 6:
Northwest-facing view of coastal scrub habitat on the north side of Route 1.

Photo taken on May 13, 2007.

Photo 7:

Annual grassland (in foreground), and coastal scrub and landscaped vegetation (in background) along a slope on the edge of Route 1.

Photo taken on May 13, 2007.

Photo 8:

An example of ruderal/disturbed habitat (in the foreground) and landscaped vegetation (in the background) along the edge of Route 1.

Photo taken on May 13, 2007.

Photo 9:

An example of landscaped vegetation along the edge of Route 1.

Photo taken on May 13, 2007.

Photo 10:

Another example of landscaped vegetation along the edge of Route 1, facing west.

Picture taken on May 13, 2007.

Photo 11:

An example of a potential anthropogenic habitat underneath the bridge over Soquel Creek. These eaves could support nesting swallows and/or roosting bats, although none were observed at the time of the survey.

Picture taken on May 21, 2007.

Photo 12:

Presumed bat "grease marks" observed under bridge over Soquel Creek. Bats have evidently roosted at this location at some time in the past.

Photo taken on May 21, 2007.

Photo 13:

Non-native acacia near the bridge over Soquel Creek.

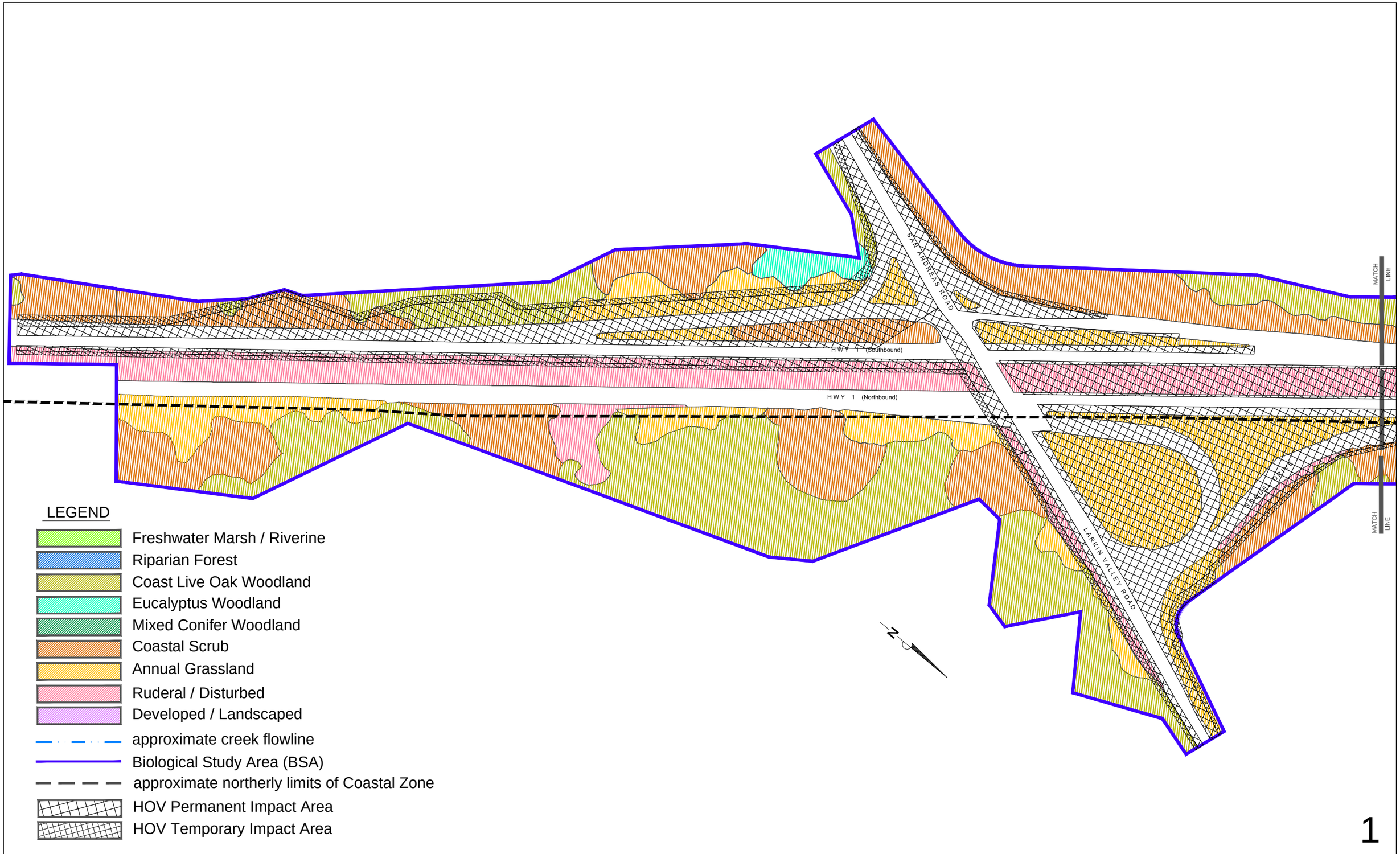
Picture taken on May 21, 2007.

Photo 14:

Downstream view of Soquel Creek from under the bridge.

Picture taken on May 21, 2007.

Appendix F. Habitat Impact Maps



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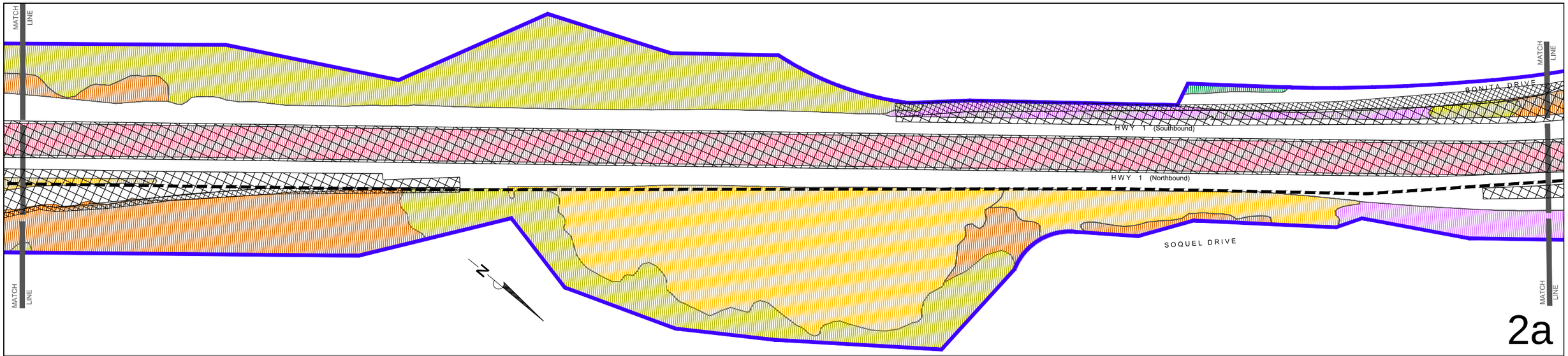
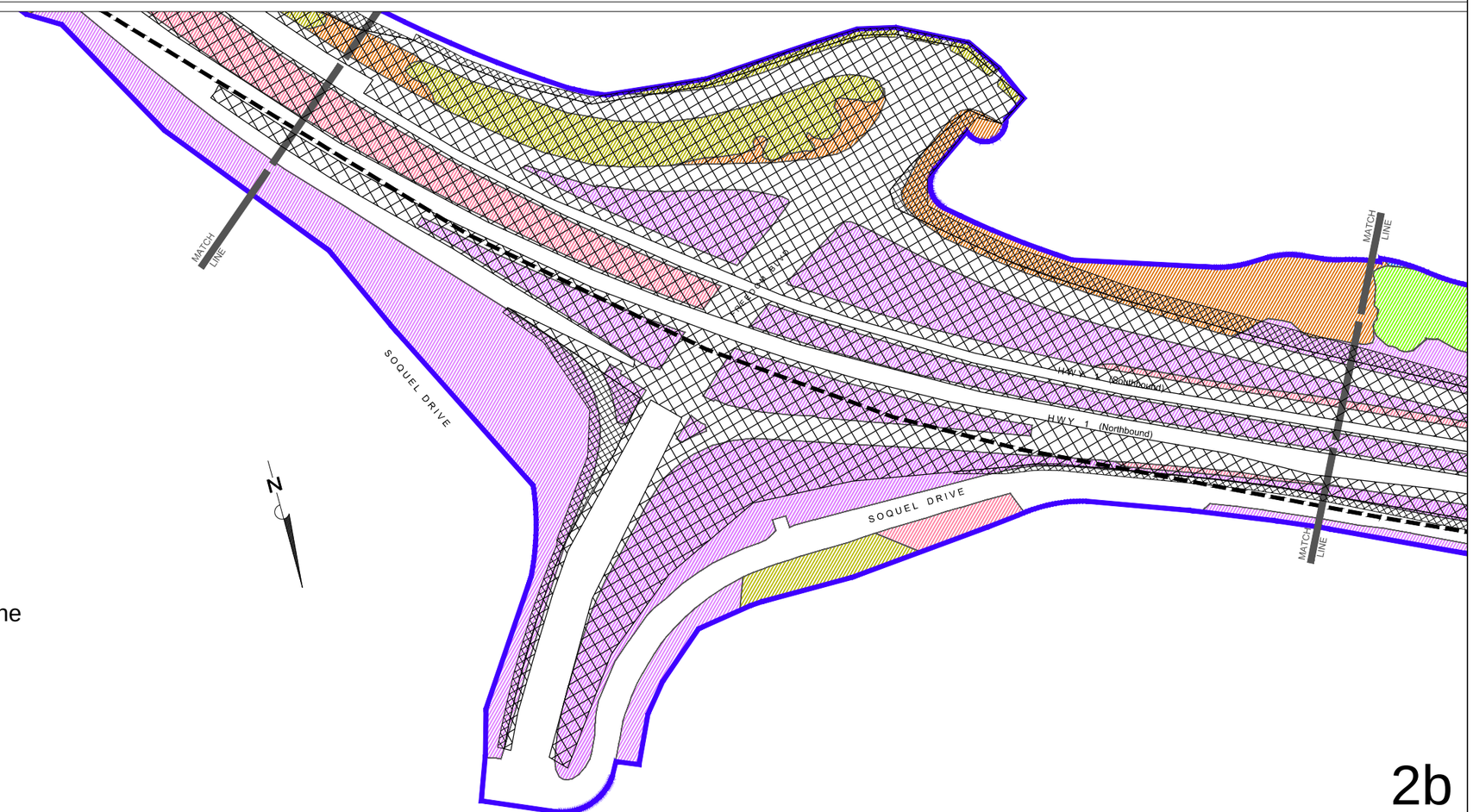
APPENDIX F - SHEET 1
HOV Impacts to Habitats





LEGEND

- Freshwater Marsh / Riverine
- Riparian Forest
- Coast Live Oak Woodland
- Eucalyptus Woodland
- Mixed Conifer Woodland
- Coastal Scrub
- Annual Grassland
- Ruderal / Disturbed
- Developed / Landscaped
- approximate creek flowline
- Biological Study Area (BSA)
- approximate northerly limits of Coastal Zone
- HOV Permanent Impact Area
- HOV Temporary Impact Area

SHEET: 3 OF 11 SCALE: 1:2400	SWCA ENVIRONMENTAL CONSULTANTS	NATURAL ENVIRONMENT STUDY REPORT Route 1 HOV Lane Project - Santa Cruz, California	SHEET 2 HOV Impacts to Habitats
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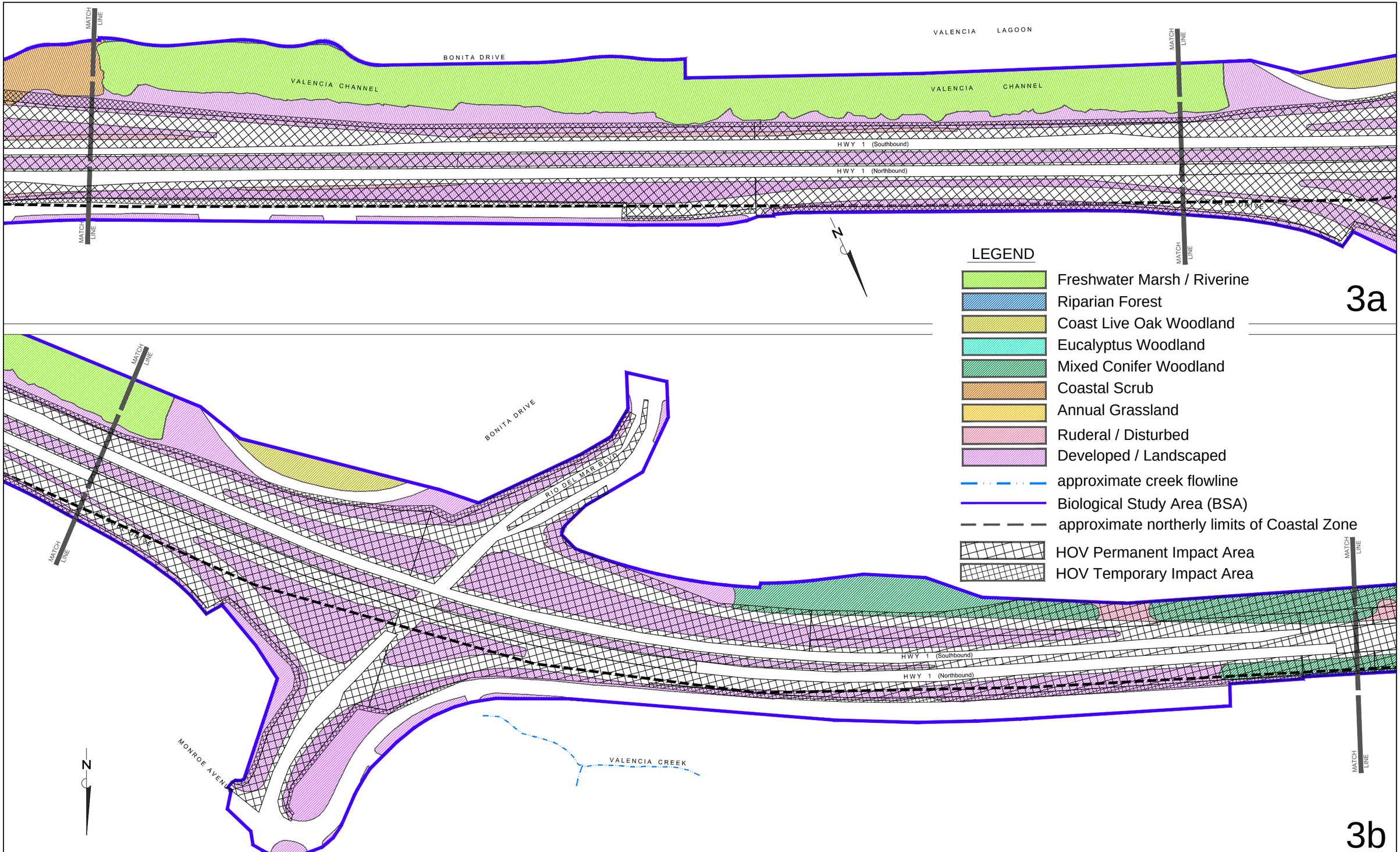
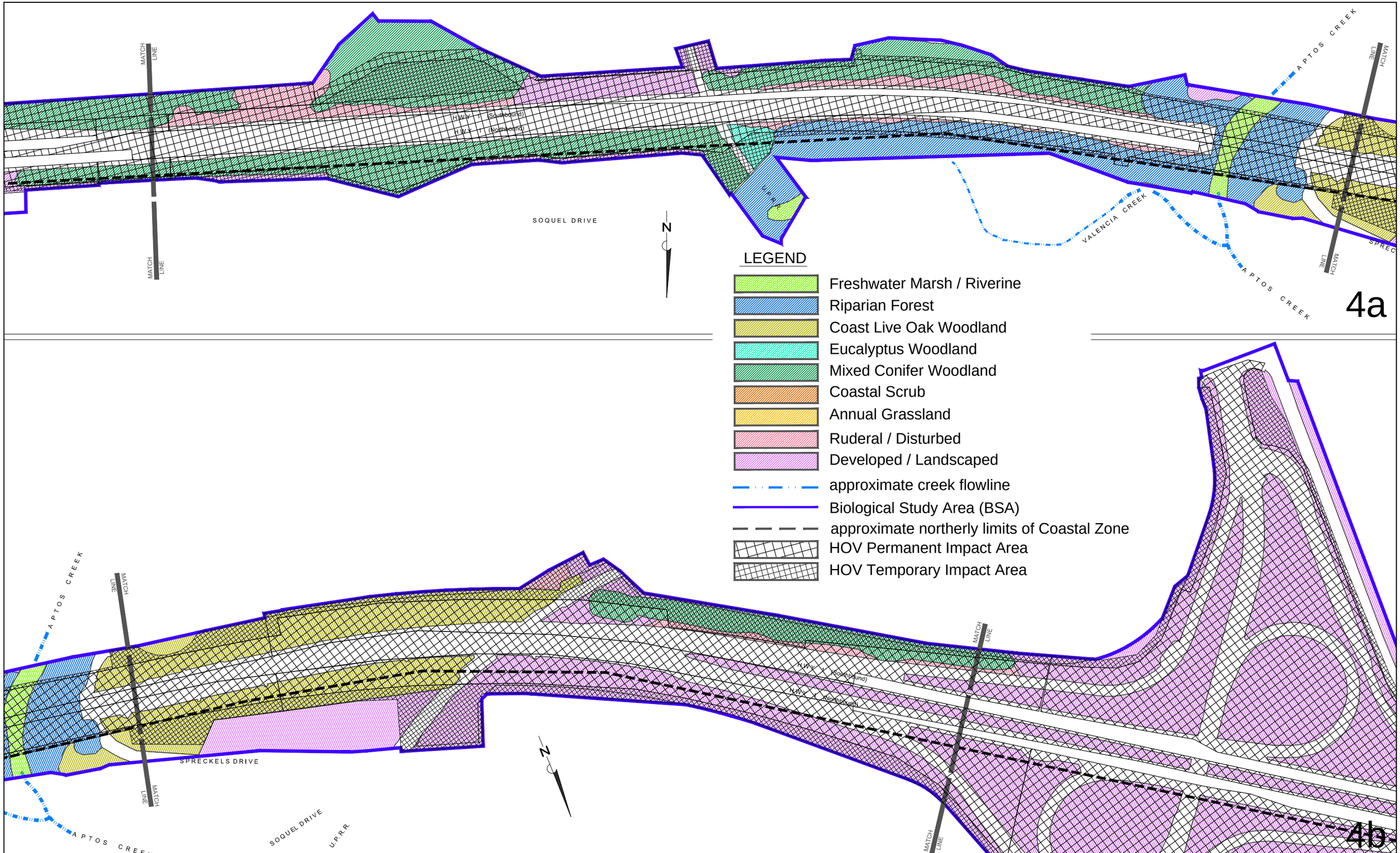
DATE: 311.10 BY: dh REV.			



SHEET: 4 OF 11 SCALE: 1:2400 CADD FILE: 13875\\nesr_HOVHabitatImpacts 3–10.dwg\hab3 DATE: 3.11.10 BY: dh REV.	SWCA ENVIRONMENTAL CONSULTANTS	NATURAL ENVIRONMENT STUDY REPORT Route 1 HOV Lane Project - Santa Cruz, California

SHEET 3
HOV Impacts to Habitats



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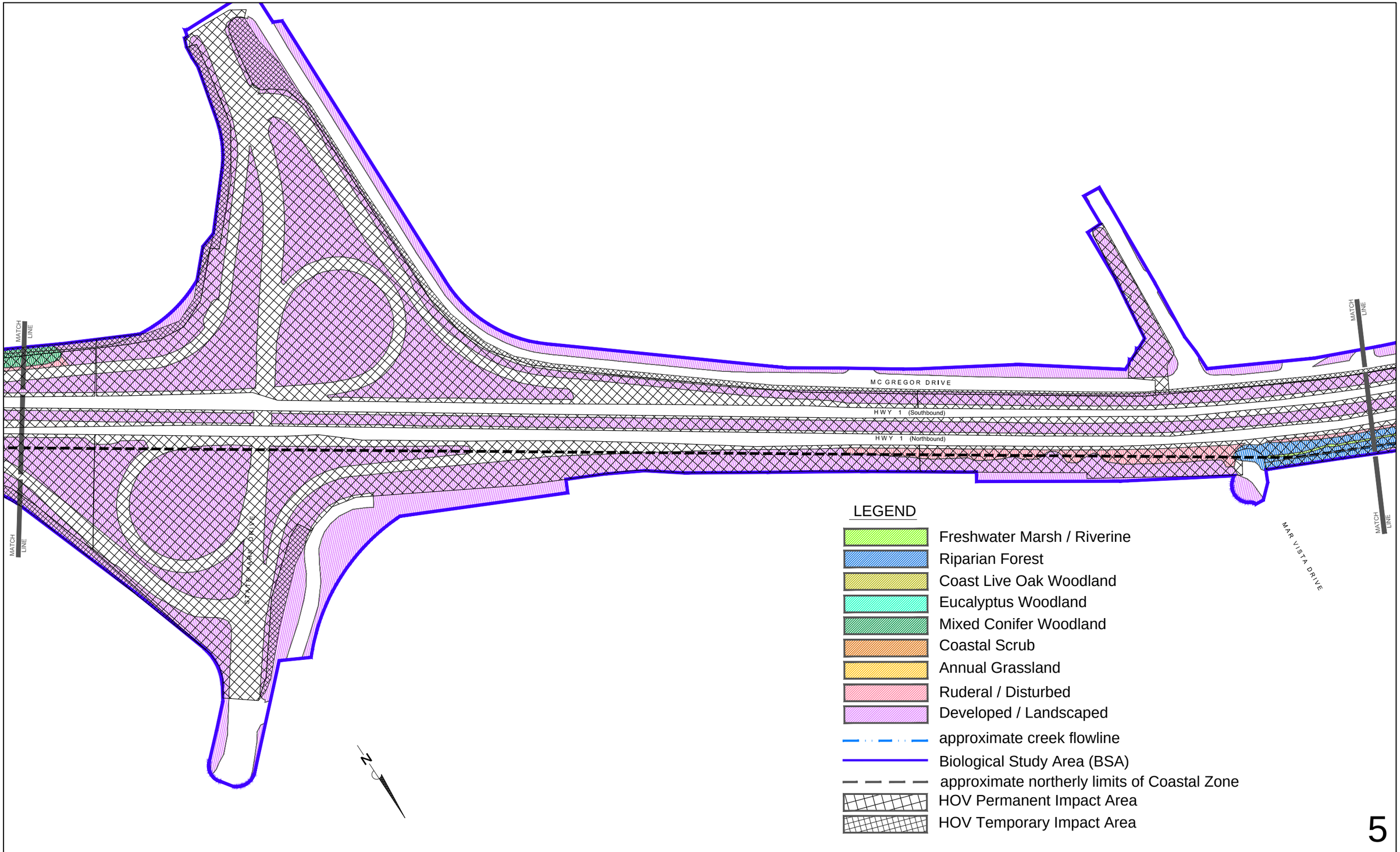
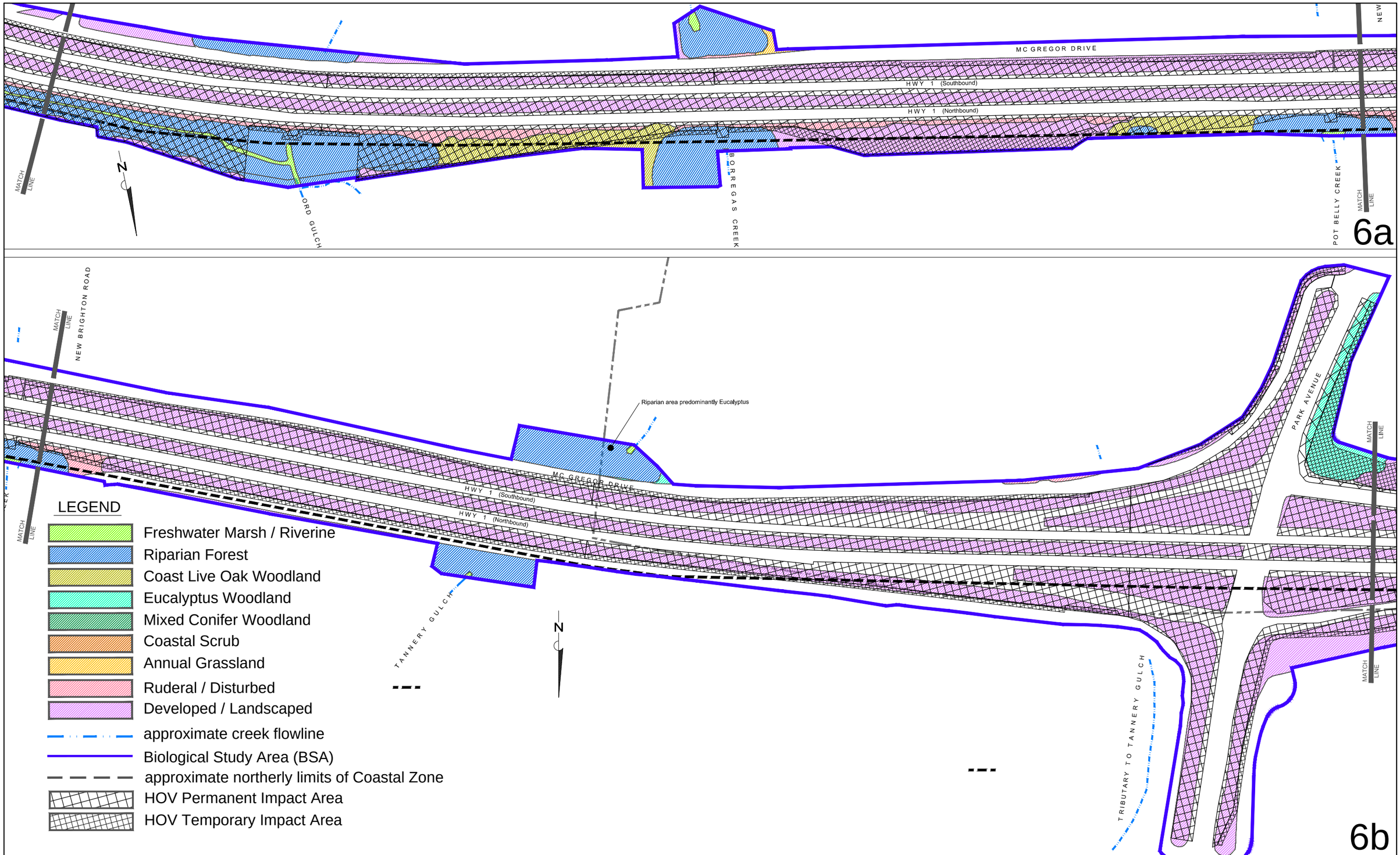
DATE: 3.11.10 BY: dh REV.		SHEET 4 HOV Impacts to Habitats



SHEET: 6 OF 11 SCALE: 1:2400 CADD FILE: 13875\\nesr_HOVHabitatImpacts 3–10.dwg\hab5 DATE: 3.11.10 BY: dh REV.	SWCA ENVIRONMENTAL CONSULTANTS	NATURAL ENVIRONMENT STUDY REPORT Route 1 HOV Lane Project - Santa Cruz, California

SHEET 5
HOV Impacts to Habiats



SHEET: 7 OF 11 SCALE: 1:2400
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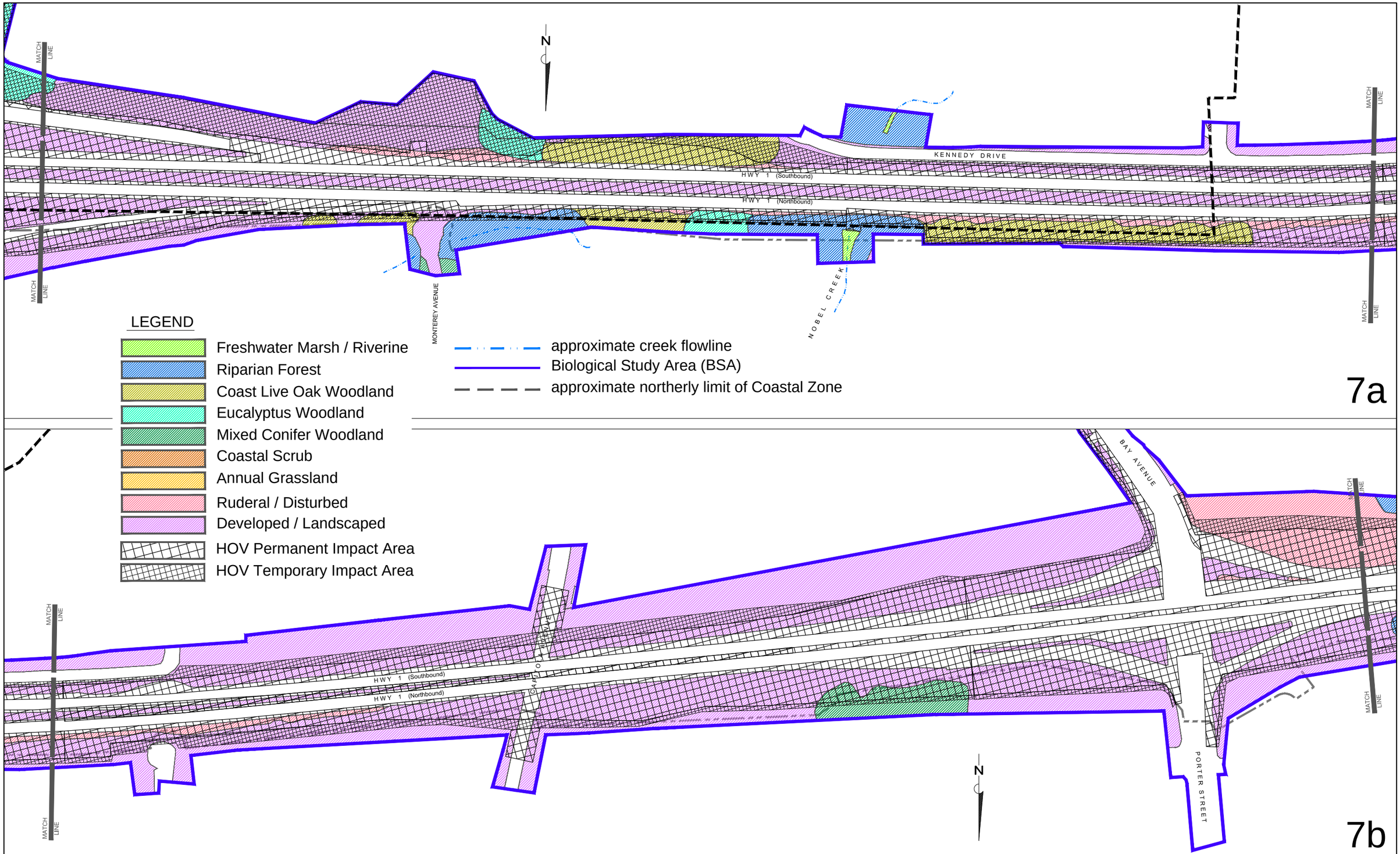
DATE: 3.11.10 BY: dh REV.

SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 6
HOV Impacts to Habiatats



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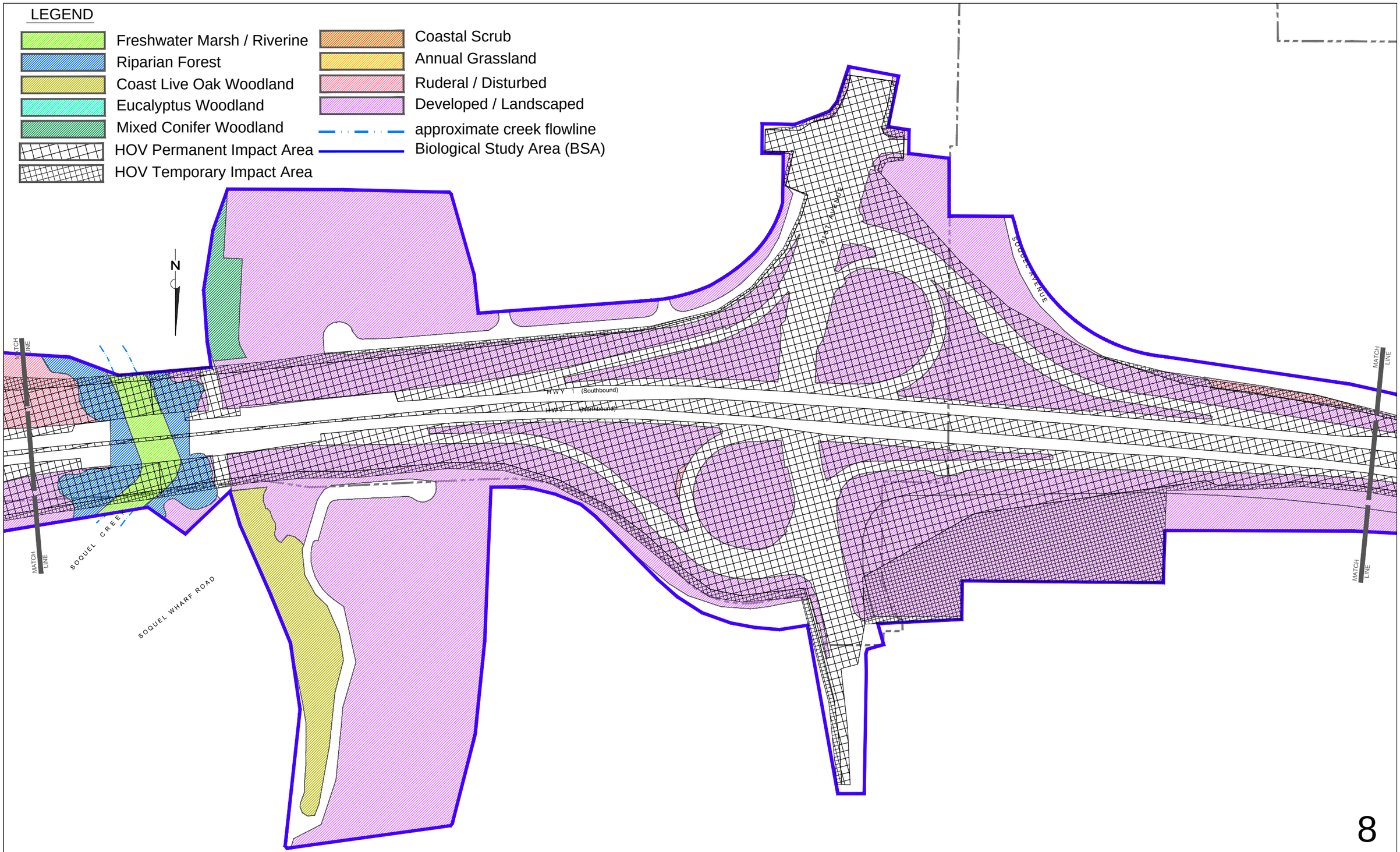
SHEET 7
HOV Impacts to Habitats



SHEET: 9 OF 11 SCALE: 1:2400	SWCA ENVIRONMENTAL CONSULTANTS	NATURAL ENVIRONMENT STUDY REPORT Route 1 HOV Lane Project - Santa Cruz, California
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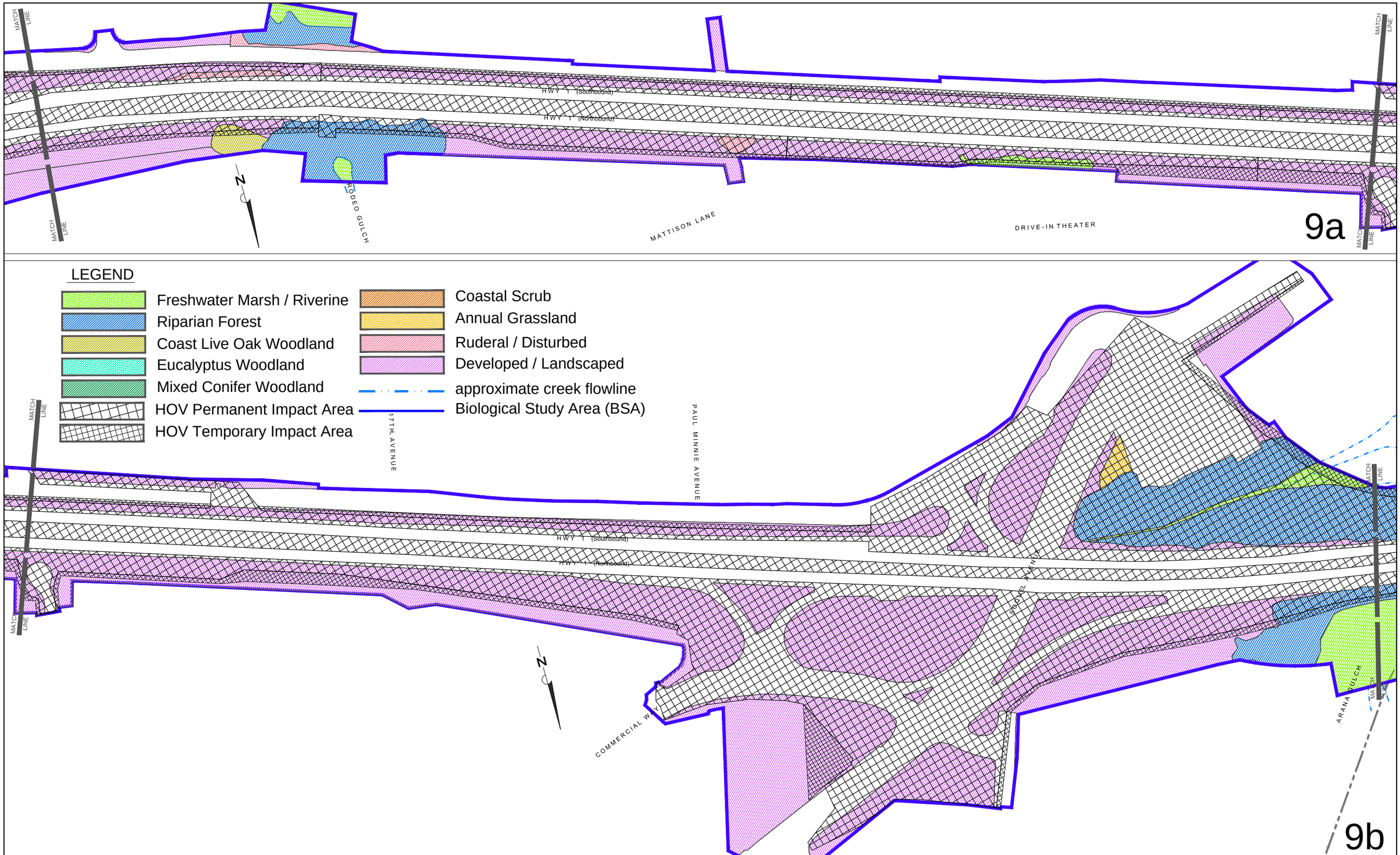

SHEET: 9 OF 11 SCALE: 1:2400
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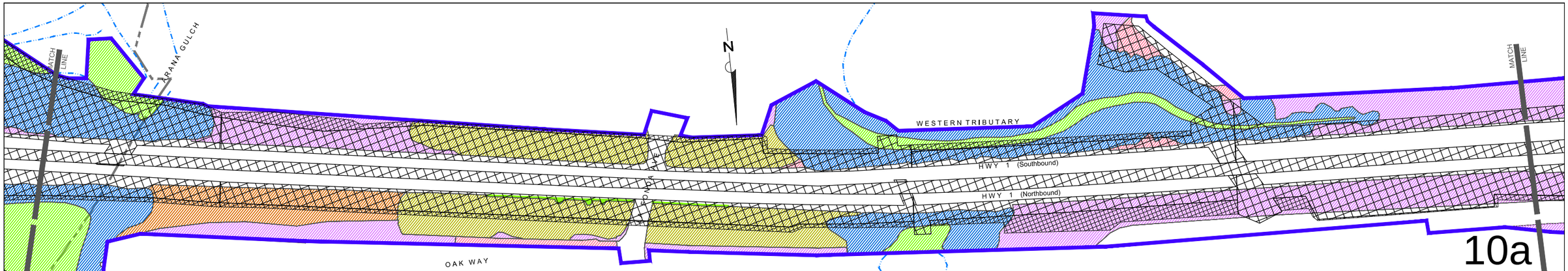
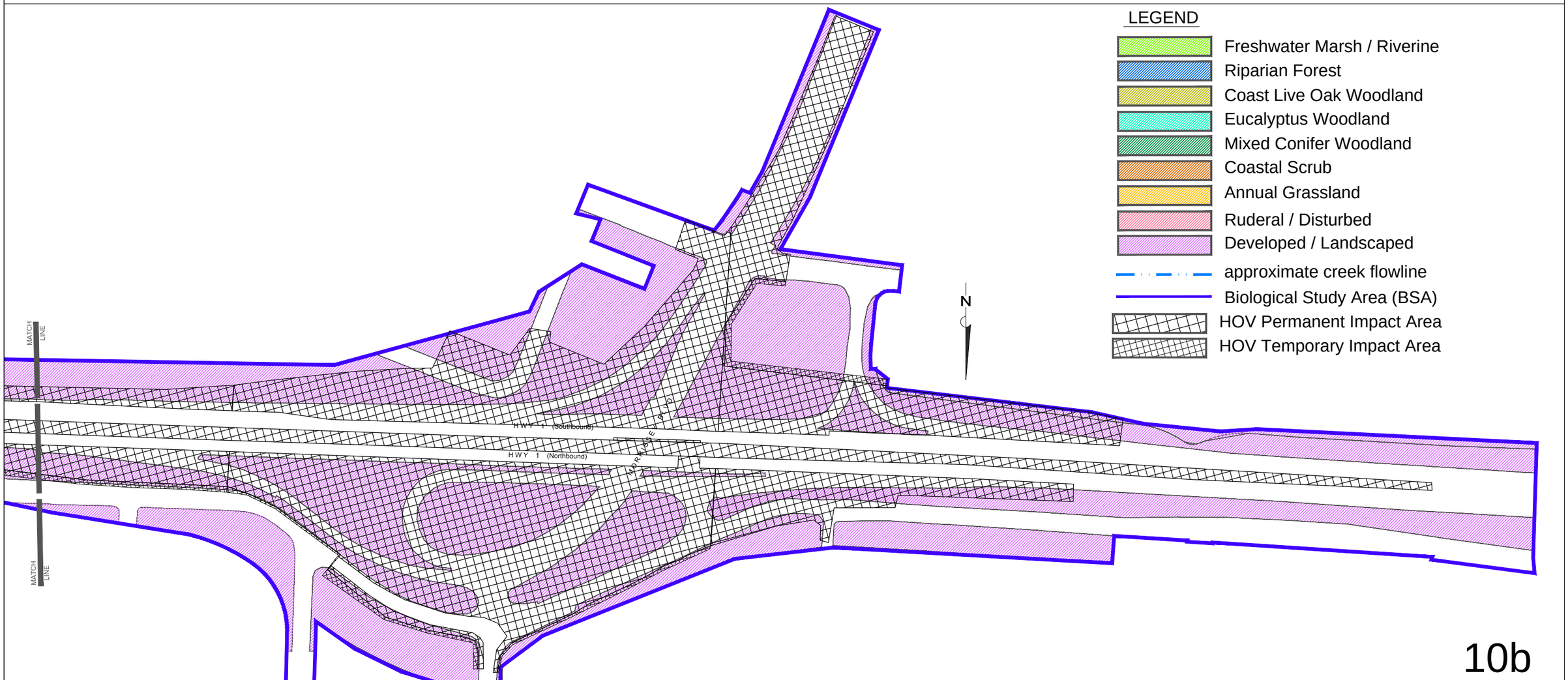
DATE: 3.11.10 BY: dh REV.

SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 9
HOV Impacts to Habitats





SHEET: 11 OF 11 SCALE: 1:2400	SWCA ENVIRONMENTAL CONSULTANTS	NATURAL ENVIRONMENT STUDY REPORT Route 1 HOV Lane Project - Santa Cruz, California	SHEET 10 HOV Impacts to Habitats
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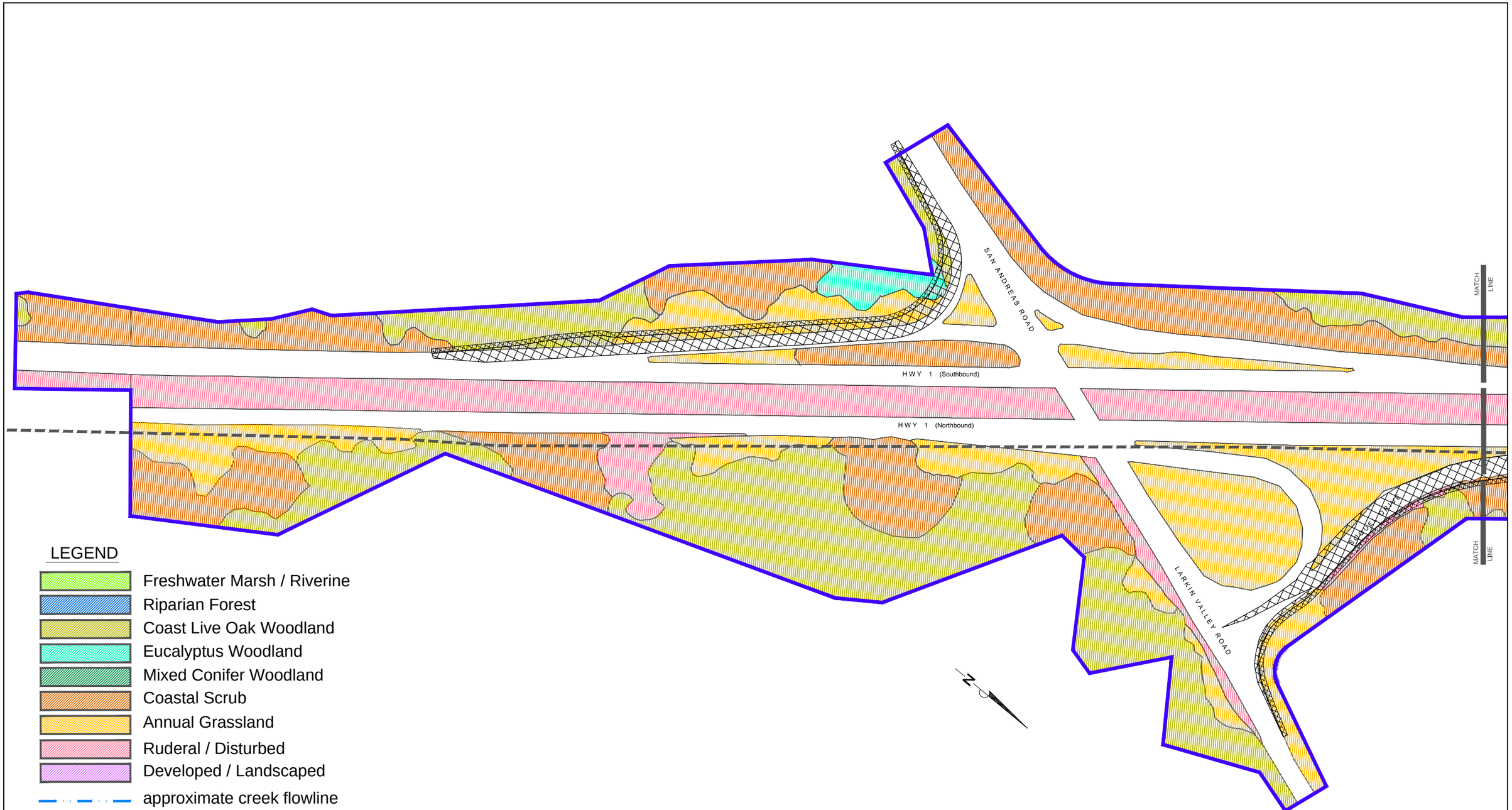


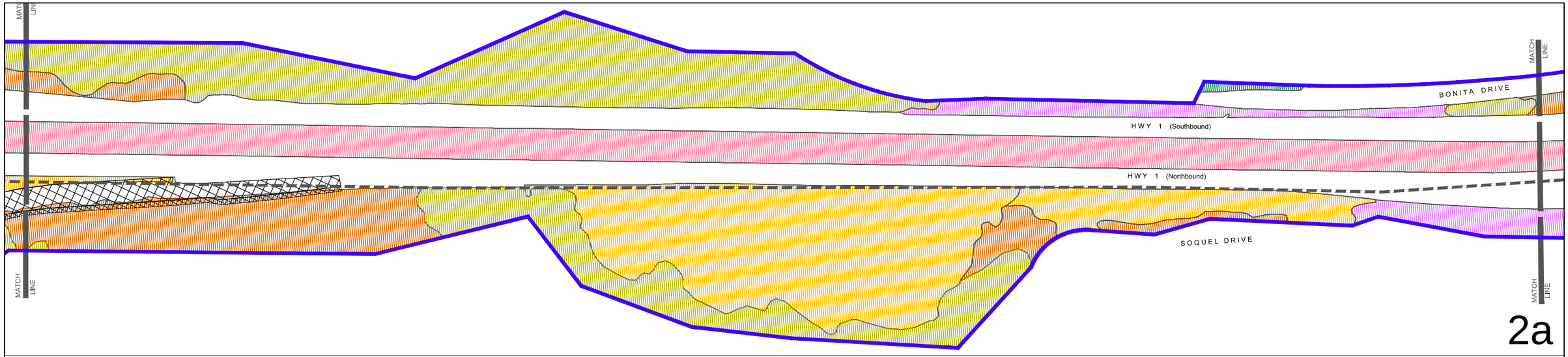
LEGEND

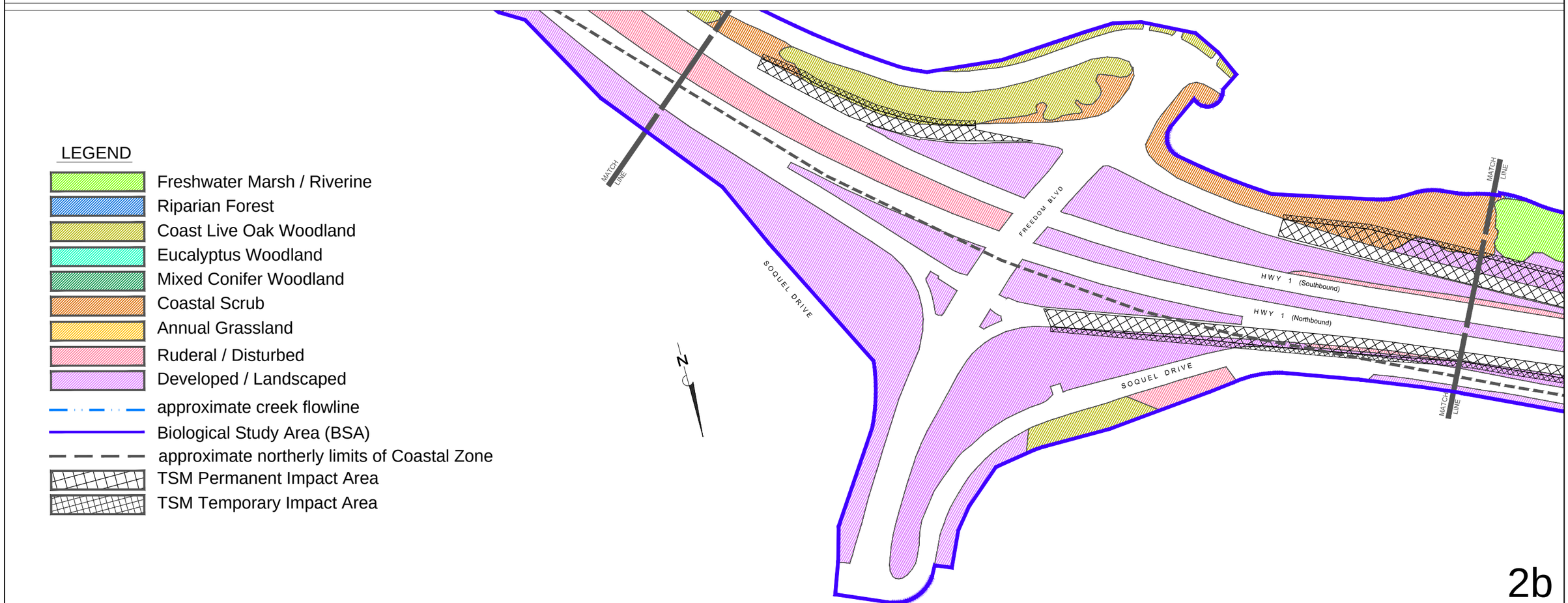
- Freshwater Marsh / Riverine
- Riparian Forest
- Coast Live Oak Woodland
- Eucalyptus Woodland
- Mixed Conifer Woodland
- Coastal Scrub
- Annual Grassland
- Ruderal / Disturbed
- Developed / Landscaped
- approximate creek flowline
- Biological Study Area (BSA)
- approximate northerly limits of Coastal Zone
- TSM Permanent Impact Area
- TSM Temporary Impact Area

1

SHEET: 2 OF 11 SCALE: 1:2400 CADD FILE: 13875\\nesr_TSMHabitatImpacts 3–10.dwg\hab1 DATE: 3.11.10 BY: dh REV.	SWCA ENVIRONMENTAL CONSULTANTS	NATURAL ENVIRONMENT STUDY REPORT Route 1 HOV Lane Project - Santa Cruz, California

APPENDIX F- SHEET 1
TSM Impacts to Habitats





LEGEND

- Freshwater Marsh / Riverine
- Riparian Forest
- Coast Live Oak Woodland
- Eucalyptus Woodland
- Mixed Conifer Woodland
- Coastal Scrub
- Annual Grassland
- Ruderal / Disturbed
- Developed / Landscaped
- approximate creek flowline
- Biological Study Area (BSA)
- approximate northerly limits of Coastal Zone
- TSM Permanent Impact Area
- TSM Temporary Impact Area

SHEET: 3 OF 11 SCALE: 1:2400	SWCA ENVIRONMENTAL CONSULTANTS	NATURAL ENVIRONMENT STUDY REPORT Route 1 HOV Lane Project - Santa Cruz, California	SHEET 2 TSM Impacts to Habitats
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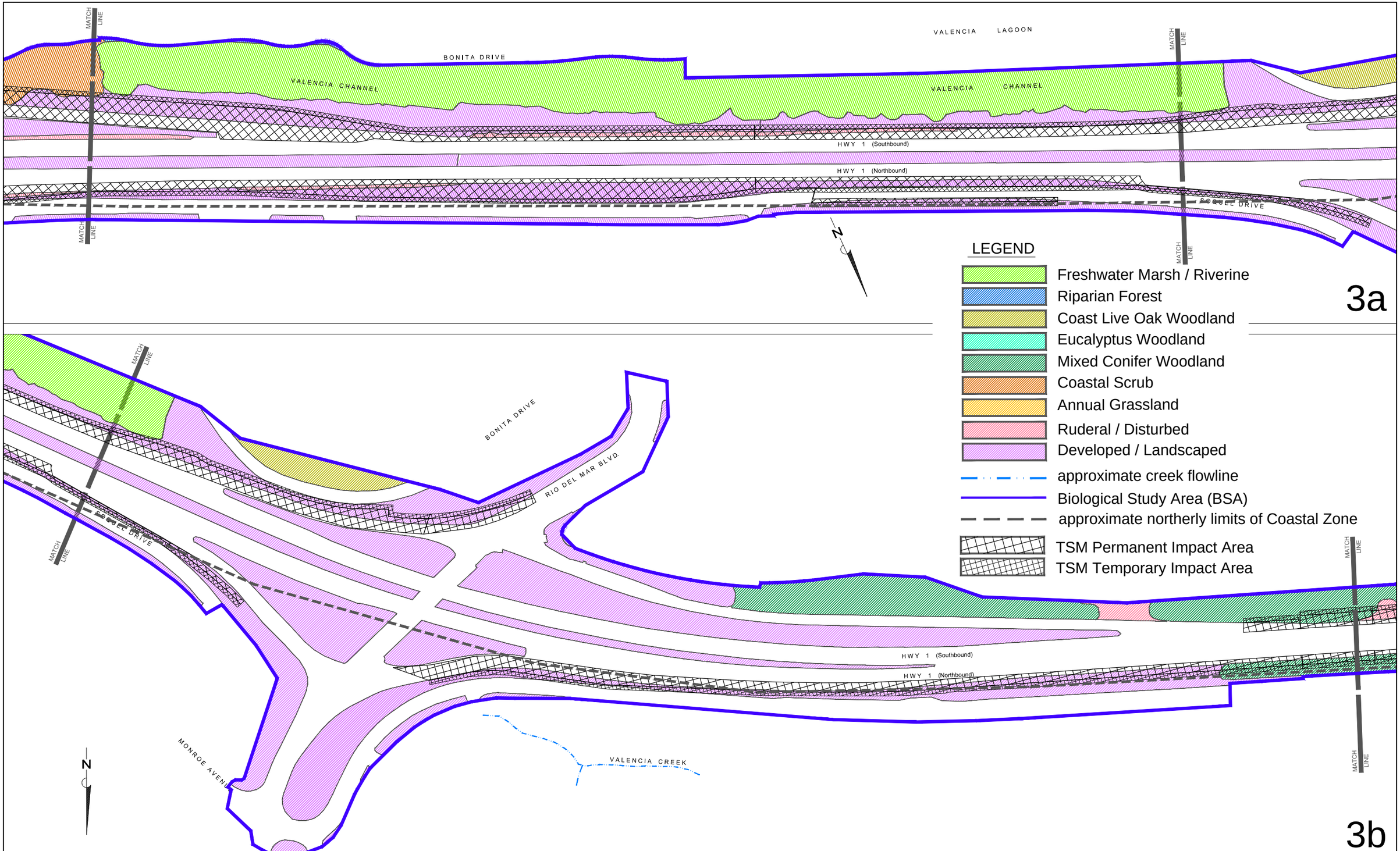
DATE: 3.11.10 BY: dh REV.			



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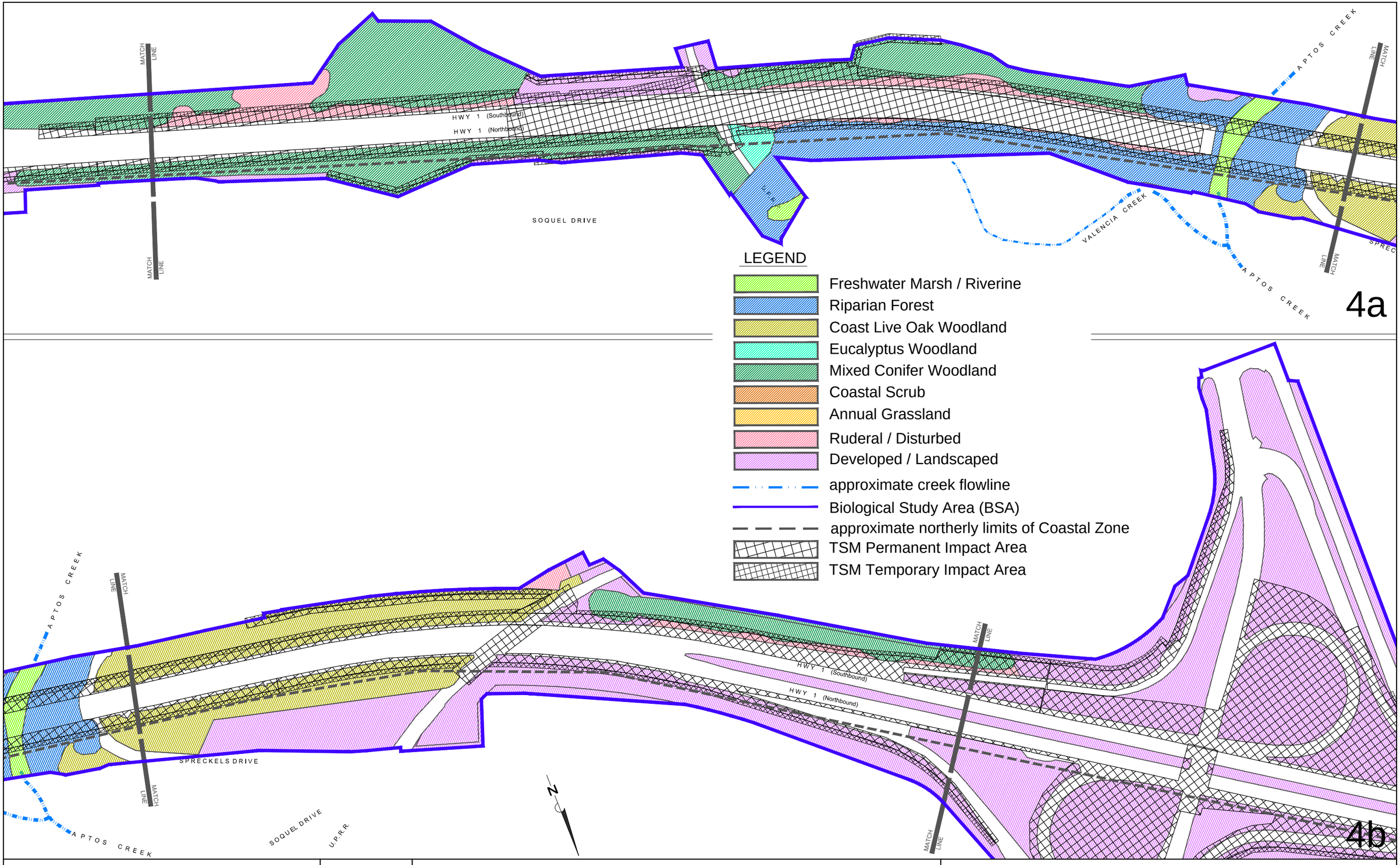
SHEET 3
TSM Impacts to Habitats



SHEET: 5 OF 11 SCALE: 1:2400
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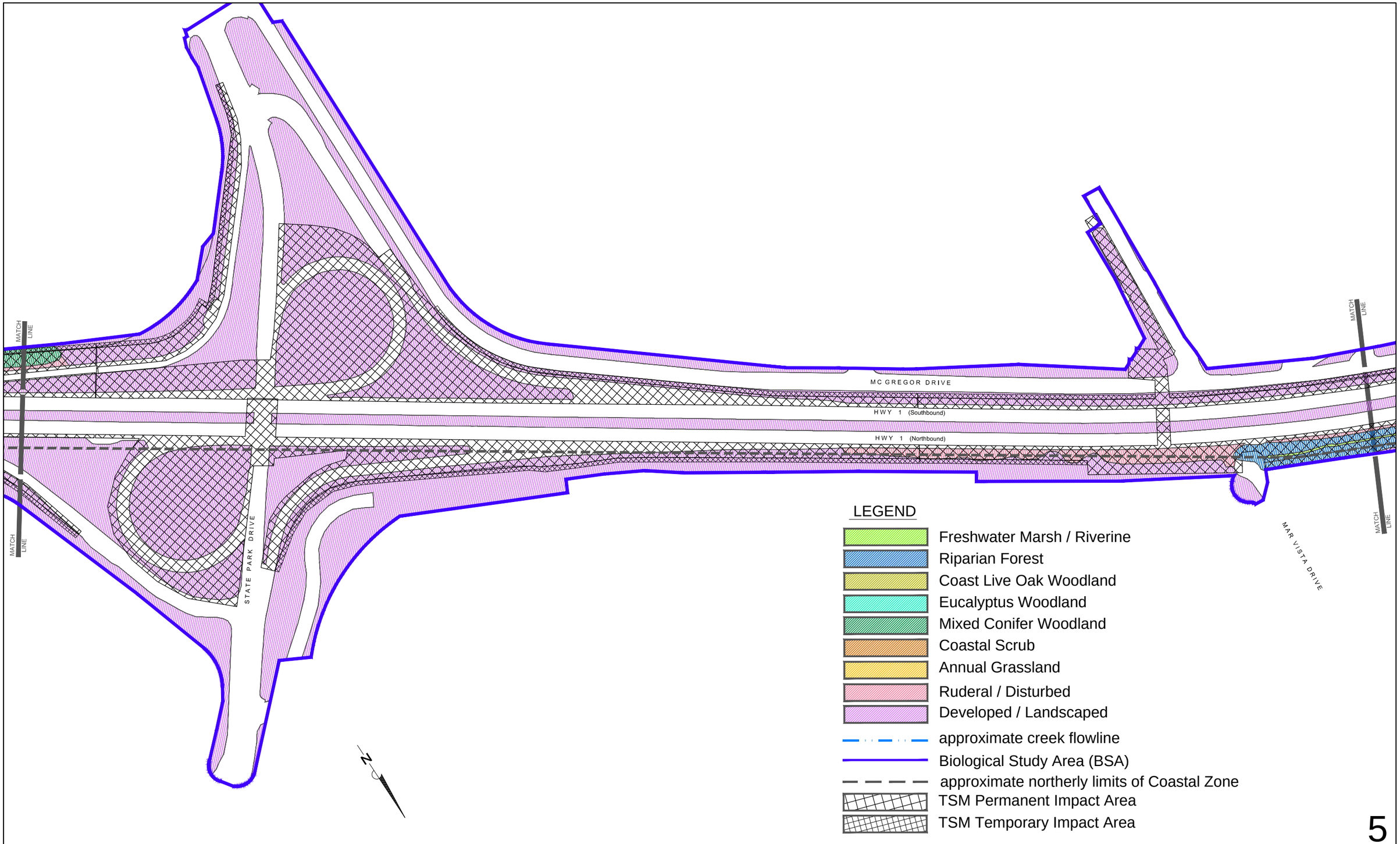
DATE: 3.11.10 BY: dh REV.

SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 4
TSM Impacts to Habitats



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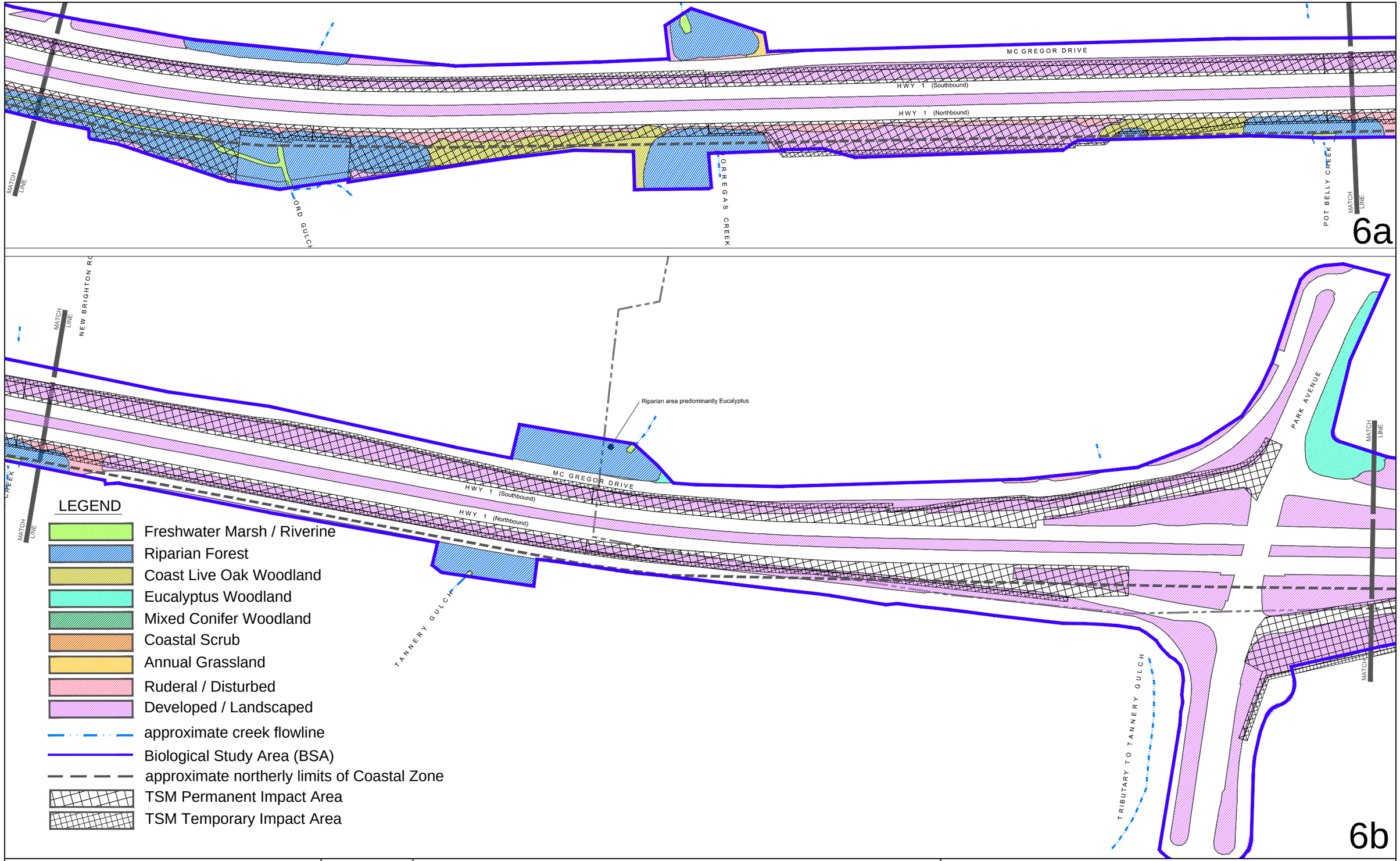
SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 5
TSM Impacts to Habiats



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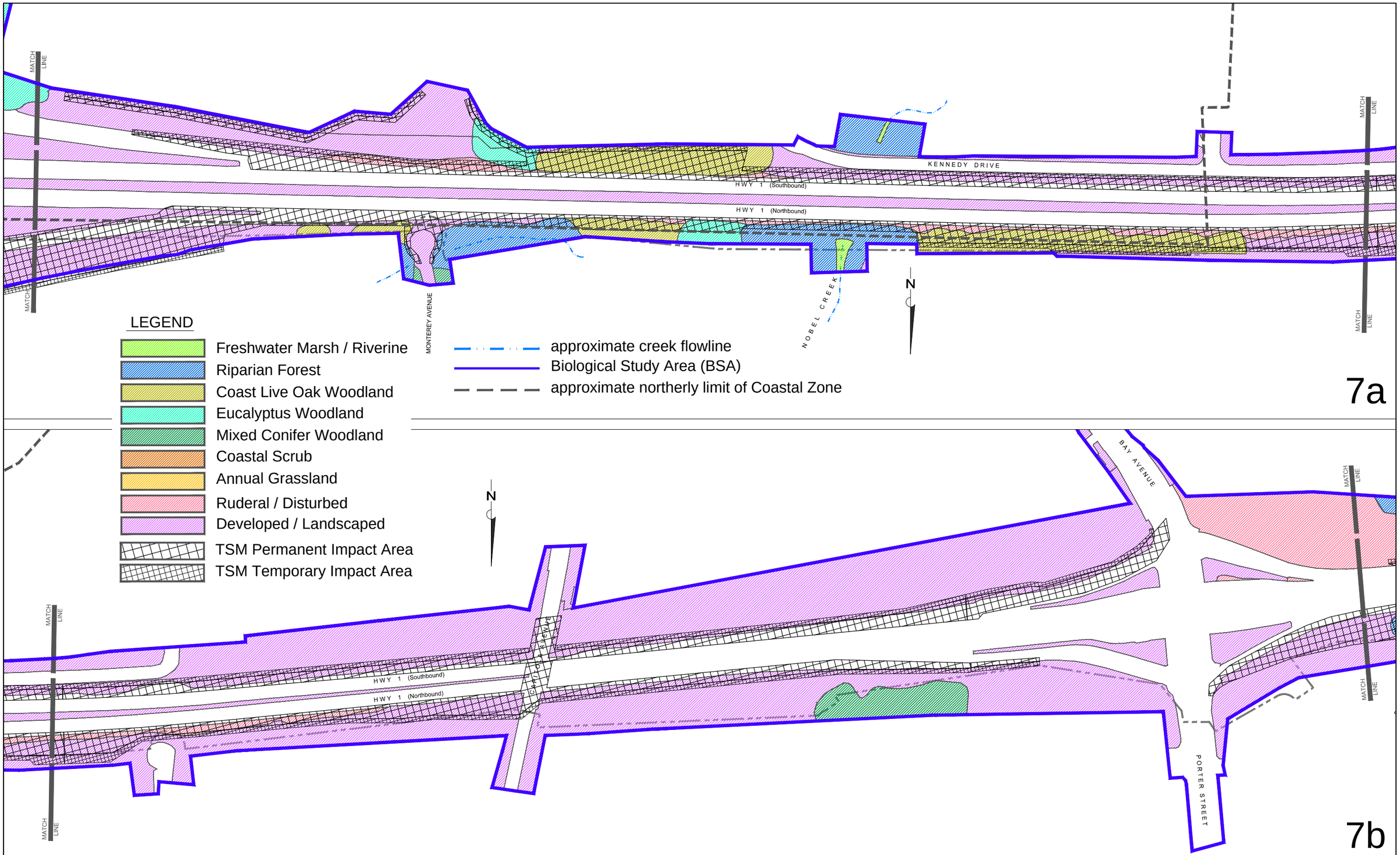

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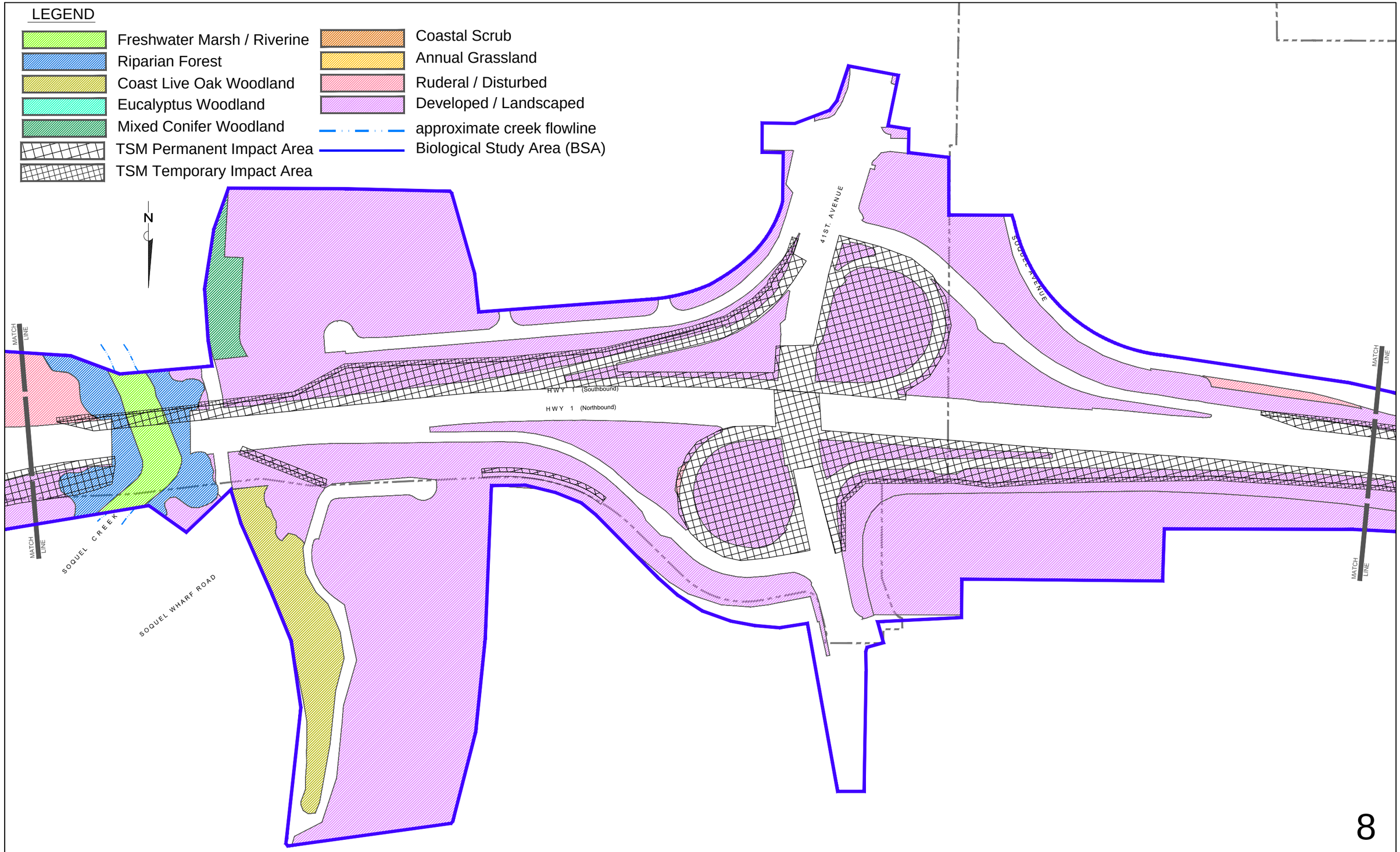

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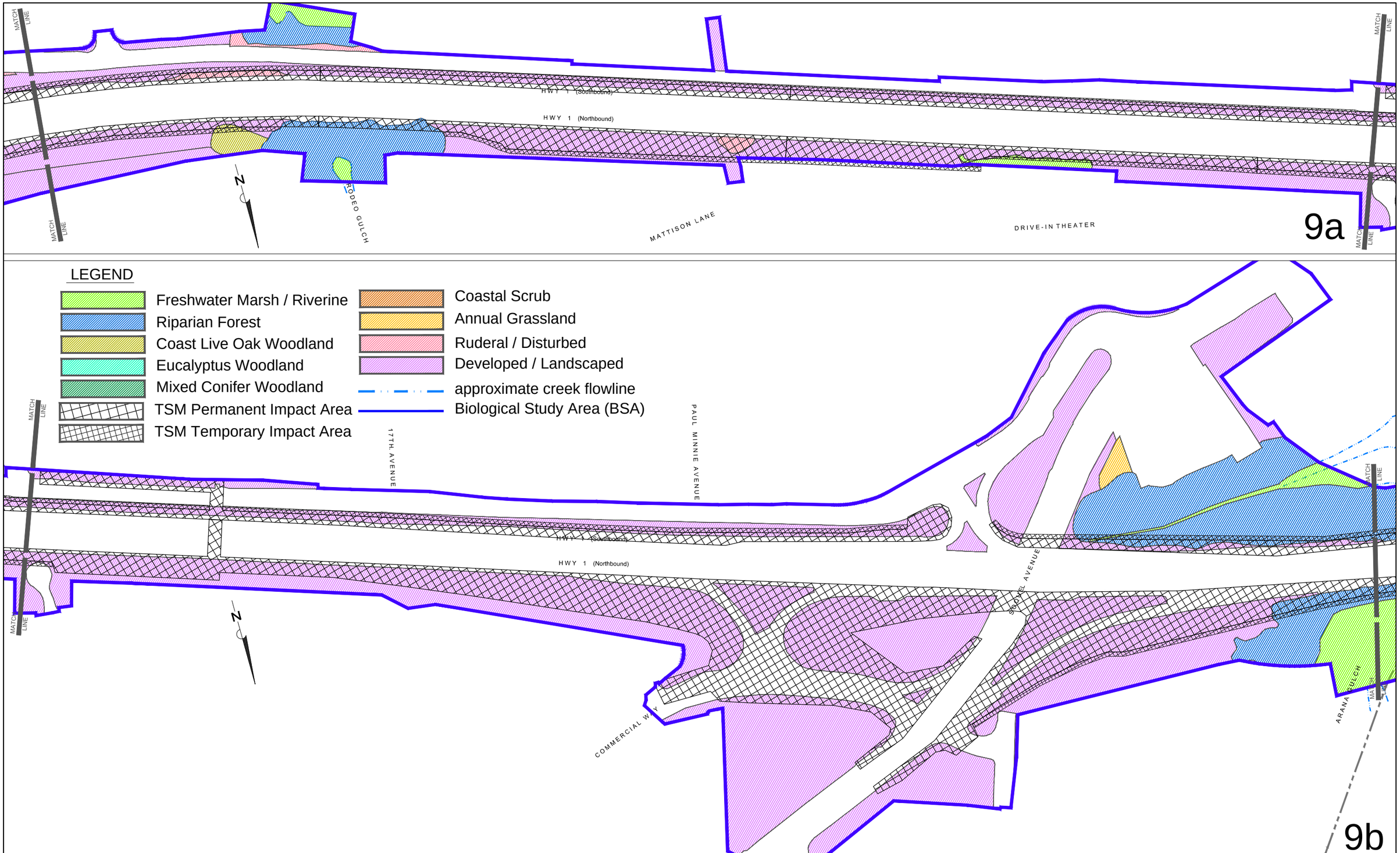
SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 8
TSM Impacts to Habitats



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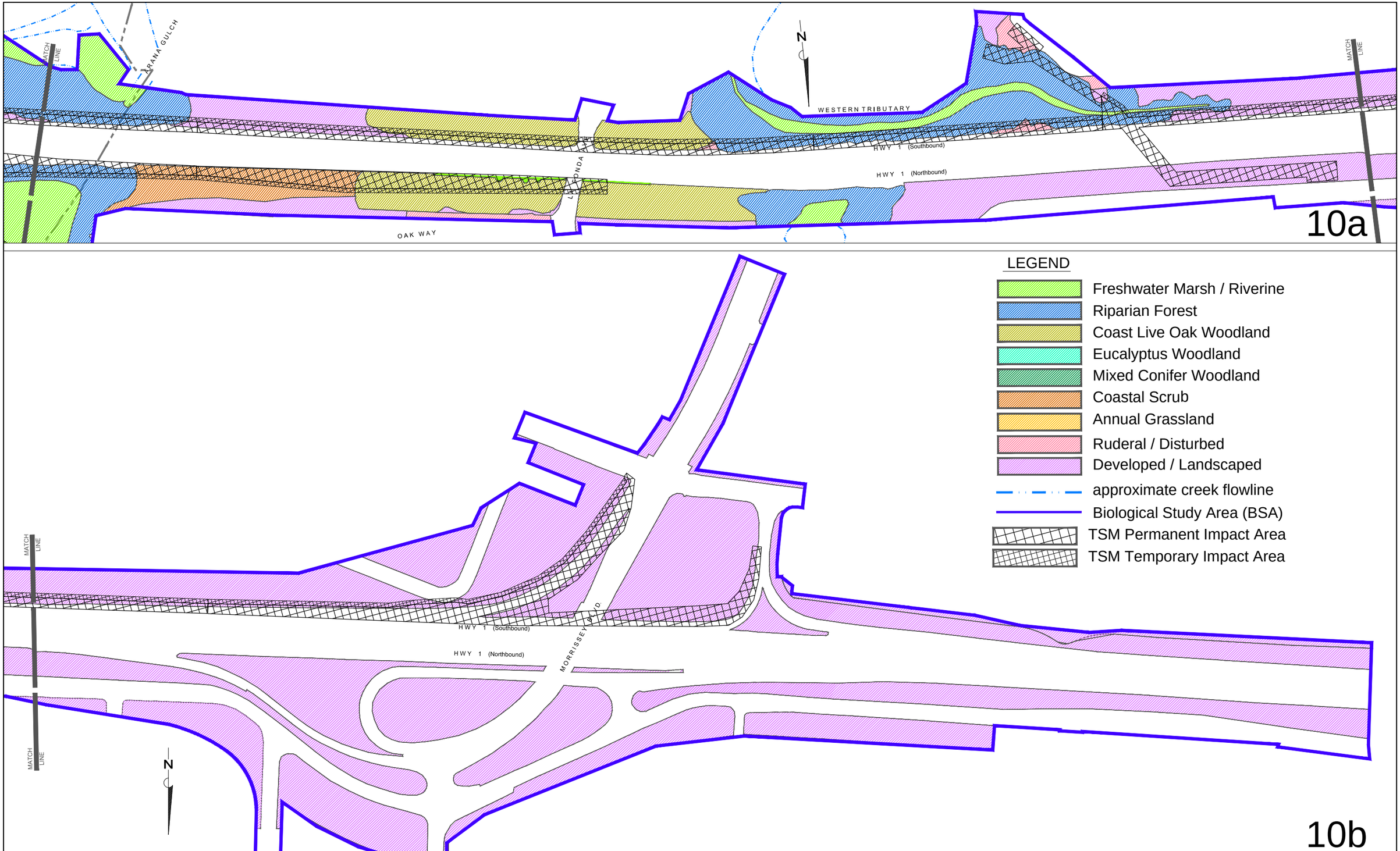
DATE: 3.11.10 BY: dh REV.

SWCA ENVIRONMENTAL CONSULTANTS

NATURAL ENVIRONMENT STUDY REPORT
Route 1 HOV Lane Project - Santa Cruz, California

SHEET 9
TSM Impacts to Habitats



SHEET: 11 OF 11 SCALE: 1:2400 CADD FILE: 13875\\nesr_TSMHabitatImpacts 3–10.dwg\hab10 DATE: 3.11.10 BY: dh REV.	SWCA ENVIRONMENTAL CONSULTANTS	NATURAL ENVIRONMENT STUDY REPORT Route 1 HOV Lane Project - Santa Cruz, California

SHEET 10
TSM Impacts to Habitats

Appendix G. Tree Survey Report

Tree Survey Report for the Highway 1 HOV Lane Project, Santa Cruz County, California

Prepared for:

Santa Cruz County
Regional Transportation Commission

Prepared by:

SWCA Environmental Consultants

August 2010

TREE SURVEY REPORT
FOR
HIGHWAY 1 HOV LANE PROJECT

Prepared for:

SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION COMMISSION
1523 Pacific Avenue
Santa Cruz, CA 95060

Prepared by:

SWCA Environmental Consultants
1422 Monterey Street
San Luis Obispo, CA 93401
Contact: Bob Sloan

August 2010

SWCA Project Number: 13875

TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENT

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1. INTRODUCTION

The California Department of Transportation (Caltrans), in cooperation with the Federal Highway Administration and the Santa Cruz County Regional Transportation Commission, proposes improvements to Highway 1 (designated State Route 1 or SR1) in Santa Cruz County along a distance of approximately 9.1 miles, from approximately 0.4 miles south of the San Andreas-Larkin Valley Road Interchange to 0.3 miles north of the Morrissey Boulevard Interchange. Three alternatives are under consideration including the HOV Lane Alternative, the Transportation Systems Management Alternative, and the No-Build Alternative.

The HOV Lane Alternative includes the following main project components: changes to the highway mainline to accommodate an HOV lane and auxiliary lanes, reconfiguration of highway interchanges, planning for transit supportive features, and the addition of two bicycle/pedestrian overcrossings. The HOV Lane Alternative would expand the existing four-lane highway to a six-lane facility by adding an HOV lane next to the median in both the northbound and southbound directions. Expanding the highway from four lanes to six lanes would be achieved by reducing the existing freeway median width, in addition to widening the freeway footprint and right-of-way. The Transportation Systems Management Alternative proposes to add ramp metering and construct HOV bypass lanes on existing interchange on-ramps, improve existing nonstandard geometric elements at various ramps, and add auxiliary lanes along the mainline between major interchange pairs within the project limits.

The HOV project may result in impacts to jurisdictionally significant trees that are located within the project Biological Study Area (BSA), the area that may be affected directly, indirectly, temporarily, or permanently by construction and construction–related activities. SWCA Environmental Consultants (SWCA), formerly Morro Group, Inc., was retained to evaluate the presence of jurisdictionally significant trees that may be impacted by project activities within the BSA. The following report summarizes the methods and results of a field reconnaissance survey that SWCA conducted on February 21 through 23, 2007, and May 11 through 13, 2007.

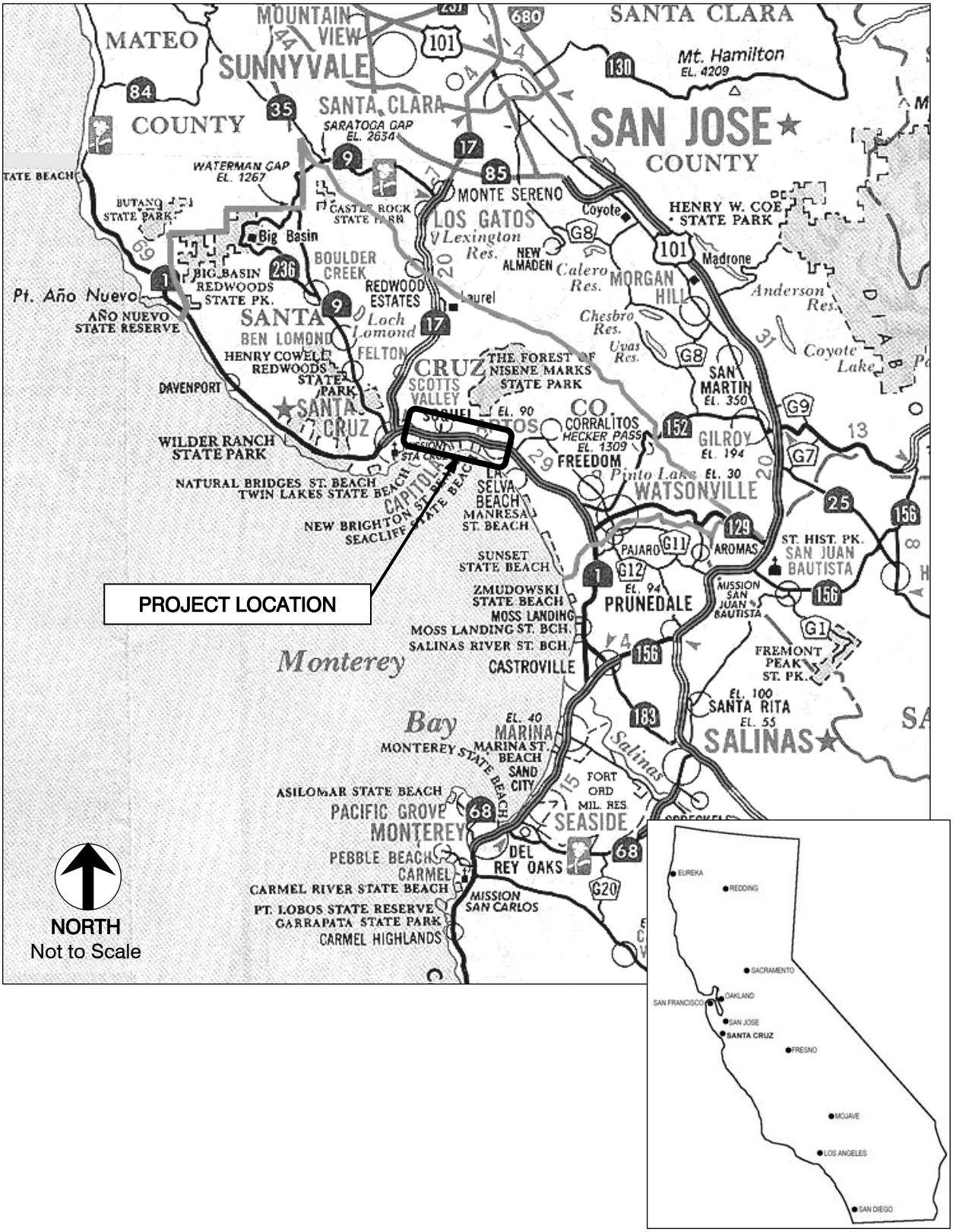
1.1 PROJECT BACKGROUND AND LOCATION

The Highway 1 High Occupancy Vehicle (HOV) Lane Project has been proposed to improve Highway 1 [designated State Route (SR-) 1] in Santa Cruz County for a distance of approximately 9.0 miles (14.5 kilometers), from approximately 0.4 miles (0.6 kilometers) south of the San Andreas-Larkin Valley Road Interchange to 0.3 miles (0.4 kilometers) north of the Morrissey Boulevard Interchange. The purpose of the proposed project is to reduce congestion, encourage carpooling and use of alternative transportation modes as a means to increase transportation system capacity, and improve safety. For a detailed discussion of the project description and alternatives, please refer to the Natural Environmental Survey Report (NESR) for the project.

1.2 STUDY DESCRIPTION

The following report summarizes existing significant trees that are located within the project Biological Study Area (BSA). SWCA has prepared this report at the request of Parsons Transportation Group, Inc., and it is intended for use by Parsons Transportation Group, project planners, and regulatory agencies. The following report provides an estimate of the number of significant trees in the project BSA, as defined by the County of Santa Cruz, City of Santa Cruz, and City of Capitola (refer to Table 1). Findings reported herein are based on information gathered in the field at the time of investigation. It is important to note that the following report does not attempt to quantify impacts to significant trees; however, this report provides a baseline estimate of the number of potentially significant trees that are located within the project BSA.

Figure 1. Regional Location Map



Source: Compass Maps

Figure 2. Project Location Map

Source: Compass maps

NORTH
Not to Scale

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1.3 REGULATORY CONDITIONS

Since the project spans across three jurisdictions and several special biotic resource areas, definitions of the term "Tree", "Significant Tree" and "Heritage Tree" were researched (refer to Table 1). A tree in the County of Santa Cruz, regardless of species, is deemed significant when it has a diameter-at-breast height (DBH) at or greater than twenty inches; or if it is a clumping tree with greater than four stems, where each stem is greater than or equal to twelve inches DBH. According to the Local Coastal Plan, the County of Santa Cruz defines trees in the Coastal Zone above twenty inches DBH as significant. Mitigation is required for County tree impacts within the coastal zone per individual permit requirements. The City of Capitola requires 2:1 replacement for removal of any tree species with a DBH of six inches or greater, and defines a Heritage Tree as being fourteen inches DBH or greater. The City of Santa Cruz identifies a Heritage Tree as being fourteen inches DBH or greater, regardless of species, and requires replacement at a 3:1 ratio (15 gallon trees) for all Heritage Trees. Every jurisdiction within the project BSA established that any tree regardless of size or species is significant if it lies within a sensitive habitat area or area of biotic concern. For the purpose of this survey, sensitive habitat areas were defined as identified on the *Local Coastal Program* Sensitive Habitats maps, the *General Plan* Resources and Constraints maps, and other biotic resources maps on file in the County of Santa Cruz Planning Department.

Table 1. Definition of Jurisdictionally Important Trees

Area	DBH	Keyword	Source
County of Santa Cruz and Local Coastal Plan	20"	Significant Tree	Santa Cruz County Code Title 16.34.030
County of Santa Cruz and Local Coastal Plan	(clump >4 stems) 12" each	Significant Tree	Santa Cruz County Code Title 16.34.030
County of Santa Cruz and Local Coastal Plan	All trees in Area of Biotic Concern*	Significant Tree	Santa Cruz County Code Title 16.32.040 and Title 16.34.030
City of Capitola	6"	Significant Tree	Chap. 12.12 of Muni. Code & per email from Ryan Bane of City of Capitola 7/7/10
City of Santa Cruz	14"	Heritage Tree	Santa Cruz Muni. Code Section 9.56

Notes:

- All terms used in this chapter shall be as defined in the *General Plan* and *Local Coastal Program Land Use Plan* (16.34.030 Definitions SC County).
- Area of Biotic Concern. Any area in which development may affect a sensitive habitat, as identified on the *Local Coastal Program* Sensitive Habitats maps, the *General Plan* Resources and Constraints maps, and other biotic resources maps on file in the Planning Department.

1.4 ENVIRONMENTAL SETTING

In general terms, the BSA contains dense tree coverage of a mix of sizes and species. Throughout the BSA, trees often grow on slopes and road cuts, promoting a more dense character of the landscape. Many areas contain smaller, younger trees in the foreground, as viewed from the highway, with mature trees present in the background. The smaller trees do not qualify for significant or heritage status or require mitigation under existing statutes; however, their influence on the character of the landscape is notable.

2. SURVEY METHODOLOGY

On February 21 through February 23, 2007, and again from May 11 through 13, 2007, SWCA conducted a reconnaissance survey to obtain an estimate of the number of significant trees that are located within the project BSA. The survey provided baseline data to be use in the planning process of the HOV project. The surveys included field preparations and field work.

2.1 FIELD PREPARATION

Using the project BSA boundary, and city and county jurisdictional boundaries, SWCA developed areas called Tree Survey Units (TSUs) to ensure correct identification of trees and their status. The TSU boundaries are shown on Figures 3a and 3b, with the different jurisdictions coded by color / significant tree criteria. The TSU boundaries included all unpaved areas within the BSA, including biotic resource areas as designated by the County. The TSUs were the units utilized for surveying significant trees and calculating trees per acre in a given jurisdiction (refer to Table 2). After the TSUs were established along the study area, the geographic data was downloaded into a global positioning unit (GPS unit) for field reference to insure that the field work correlated correctly with the maps.

2.2 FIELD WORK

A survey team utilized aerial images and GPS units to locate and survey all the TSUs that were within the BSA. The biologists walked and drove through the BSA and collected data on the number of significant trees within each TSU, assessed the general character of each TSU, and obtained representative photographs of select TSUs. The surveyors walked through all the TSUs and tallied the observed significant trees. The species of each significant tree was recorded; however, multiple species of non-native landscape trees were present in the BSA. These species were counted at the genus level.

The surveyors employed a qualitative method to assess the general characteristics of each TSU. This method focused on applying a general descriptor (sparse, dense, and very dense) of the observed canopy cover density. For the purpose of this study, the following definitions were used to assess the general characteristics of the TSUs:

- Sparse is defined as an area of land that when viewed from the highway appears to have less than 25% canopy cover;
- Dense is defined as an area of land that when viewed from the highway appears to have 25% to 75% canopy cover; and,
- Very Dense is defined as an area of land that when viewed from the highway appears to have greater than 75% canopy cover.

In some instances the tree spacing within a TSU was linear; in this situation the plantings were characterized as “double row” or “planted four deep.” Understory plants or community types were noted (refer to Tables 4, 5, and 6) if the information was applicable and assisted in TSU characterization.

Photographs depicting the general character of areas along the highway were taken between each highway access point (see Attachment A). As seen from the highway, the photographic recording started south of Larkin Valley Road heading northbound and continued north to the end of the project BSA. The same method was employed heading southbound before Morrissey Boulevard to the end of the BSA, past San Andreas Road. The photo document contains descriptions and TSU references to compliment the aerial key (Figures 3a and 3b). However, not every TSU was photographed. The order and direction that the photos were taken correspond to the TSU numbering system (refer to Figures 3a and 3b).

3. RESULTS

The research and field study established some general inferences about the study area as a whole. Throughout the project site, the setting of the study area was considered "Dense" on average. The tree ordinances for each of the jurisdictions had the greatest influence on the numbers of significant trees. For example, in Capitola there were a greater quantity of trees tallied because of the 6" or greater DBH specification than in Santa Cruz County areas where only trees at or above 20"were tallied. This information does not judge the character of the environment; rather it addresses the value that these communities place on the trees. This trend can be seen in the "Trees per Acre" column in Table 2, where Capitola has the most trees per acre and the most inclusive (6" or greater DBH) definition of a significant tree. The Trees per Acre columns in Tables 2, 4, 5, and 6 can be used by project planners for estimating potential mitigation requirements for trees that may be removed by a project activity in a particular TSU.

For detailed tabulation of field results from each TSU, refer to Tables 4, 5 and 6.

Table 2. Total Significant Trees per Jurisdiction

Area	Total Significant Trees	Acres of TSU	Trees per Acre
City of Capitola	1,227	36.79	33
City of Santa Cruz	327	20.06	16
County of Santa Cruz	1,878	134.28	14
Study Totals	**3,432**	**191.13**	**~**

Table 3. Tree Species Observations

Species	Area			Total Trees Per Species
	City of Capitola	City of Santa Cruz	County of Santa Cruz	
Acacia sp.	132	8	115	**255**
Quercus agrifolia	463	149	467	**1079**
Eucalyptus sp.	129	86	235	**450**
Cupressus macrocarpa	48	16	145	**209**
Pinus radiata	95	44	247	**386**
Sequoia sempervirens	235	10	374	**619**
Salix sp.	33	9	105	**147**
Prunus sp.	9	0	1	**10**
Alnus rubra	32	0	23	**58**
Phoenix canariensis	1	0	0	**1**
Populus balsamifera	18	0	21	**39**
Platanus x hispanica	8	0	0	**8**
Aesculus californica	2	3	22	**27**
Pinus attenuata	6	0	0	**6**
Platanus racemosa	12	0	2	**14**
Arbutus menziesii	1	0	0	**1**
Umbellaria californica	0	2	59	**61**
Pseudotsuga menziesii	0	0	10	**10**
Lithocarpus densiflorus	0	0	1	**1**
Juniperus sp.	0	0	1	**1**
Acer negundo	0	0	11	**11**
Acer macrophyllum	0	0	39	**39**
Total Trees per Jurisdiction	**1227**	**327**	**1878**	**3432**

Figure 3a. Tree Survey Unit Keymap

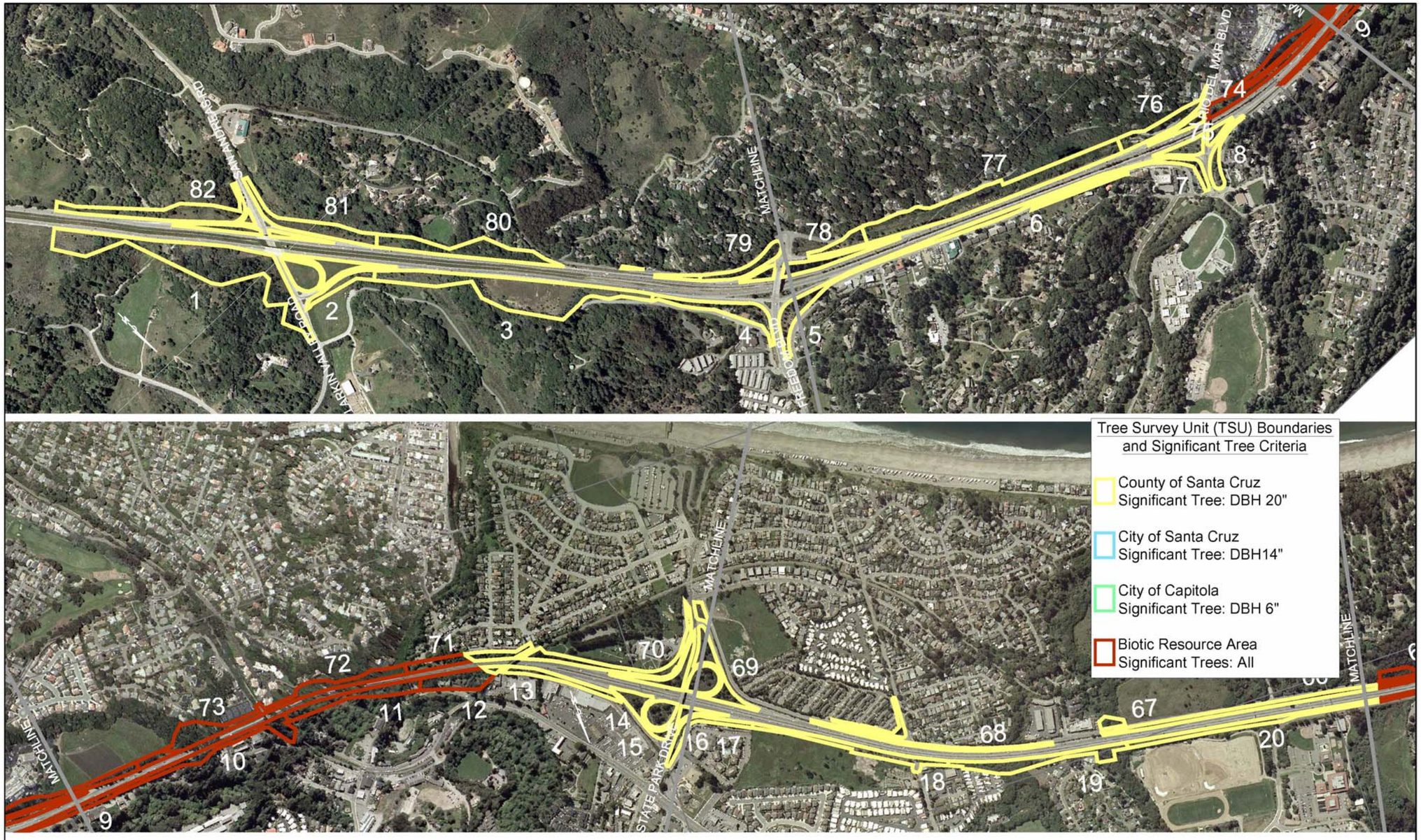

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Figure 3b. Tree Survey Unit Keymap

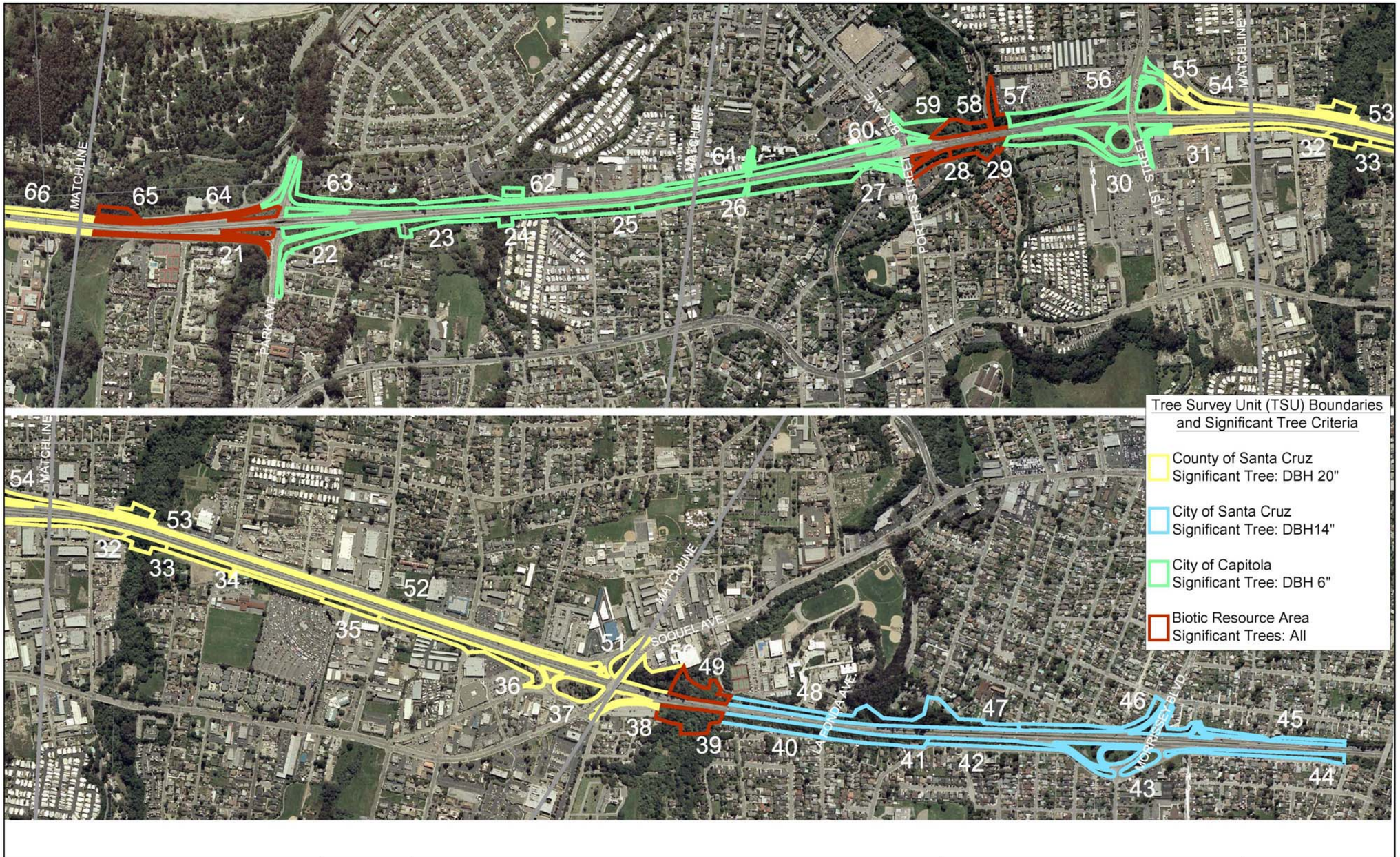

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Table 4. County of Santa Cruz "Significant" Trees per TSU

Biotic Area	TSU [1]	Total Significant Trees	Acre of TSU	Trees per Acre	Character of TSU
Note: "Significant" tree is one of any species with DBH of 20 inches or greater, and clumping trees with more than 4 stems where each stem is 12 inches or greater; and in biotic areas, all trees regardless of size.					
	1	23	12.10	2	Dense to Very Dense
	2	0	4.04	0	Sparse, grass
	3*	27	9.73	3	Sparse to Very Dense, large grassy slope
	4	27	2.52	11	Dense, steep drainage along roadside, about 2 trees deep
	5	22	1.86	12	Dense, 5'-20' o.c.
	6*	2	2.43	1	Sparse, front yards
	7*	17	1.70	10	10' o.c., behind office space, part of cloverleaf, young redwoods
	8	19	1.40	14	Dense, 10'-15' o.c., part of cloverleaf
Biotic	9	79	1.17	68	Very Dense, 10' o.c.
Biotic	10	136	2.38	57	Very Dense, steep slope, very large Monterey pines and Monterey cypress, young oaks and eucalyptus
Biotic	11*	139	2.46	57	Dense areas of Monterey pine and Monterey cypress
	12	65	2.20	30	Dense, limited access, behind shopping center, young oaks
	13	7	1.43	5	Sparse mix
	14	8	1.29	6	Sparse, 50' o.c.
	15	11	1.26	9	Dense, 30' o.c., slight slope, mix of heights
	16*	4	0.46	9	Dense, 20' o.c., mix of sizes, median landscape
	17	8	1.18	7	Dense, single row of screen trees, Sparse young oaks, 6' o.c.
	18	10	2.23	4	Sparse, 10-20 o.c. single to double row
	19	21	2.95	7	Dense, double to triple row of 10' o.c.
	20	7	2.12	3	Sparse, young landscape trees 10' o.c., single row
	32	15	1.62	9	Dense, single to double deep, 15' o.c.
	33	25	0.92	27	Dense lots of trees under 20" DBH, planted 4 deep, 5-10' o.c.
	34	9	1.01	9	Dense to Very Dense, many oak

Table 4. County of Santa Cruz "Significant" Trees per TSU

Biotic Area	TSU [1]	Total Significant Trees	Acre of TSU	Trees per Acre	Character of TSU
Note: "Significant" tree is one of any species with DBH of 20 inches or greater, and clumping trees with more than 4 stems where each stem is 12 inches or greater; and in biotic areas, all trees regardless of size.					
	35*	8	1.61	5	Dense, single row, screening drive-in theatre
	36	1	2.57	0	Sparse
	37*	13	1.87	7	Sparse to Dense various ages and heights, 10-25' o.c.
	38	6	0.83	7	Dense, 10-20' o.c., steep slope, mixed species, planted single to triple deep
Biotic	39	91	2.39	38	Dense, 10-15' o.c., steep slope, riparian native shrub understory
Biotic	49*	109	1.89	58	Very Dense steep slope, Dense thicket, sapling understory
	50	51	2.07	25	Dense, steep slope, variety of trees
	51	7	0.85	8	Sparse to Dense, 20' o.c. in tree area, landscaped ramp
	52*	8	3.03	3	Sparse, single row mostly landscape shrubs
	53	7	0.63	11	altered natural drainage feature
	54	7	2.24	3	Sparse, single row screen with landscape shrubs
Biotic	65	129	0.61	211	Very Dense, eucalyptus grove adjacent to state park
	66	5	2.32	2	Sparse
	67	8	0.44	18	Sparse, landscape cloverleaf with mostly redwoods on slope
	68*	27	2.05	13	Sparse to Dense
	69*	28	3.64	8	Sparse to Dense, landscaped cloverleaf, 20' o.c. at Densest in center of clover
	70	20	4.64	4	Dense, 20' sporadic young trees
Biotic	71	30	1.14	26	Dense
Biotic	72	127	2.37	54	Very Dense, part of TSU associated with riparian
	73*	255	5.18	49	Very Dense
Biotic	74	84	1.84	46	Dense sloped landscape off ramp, 10-20' o.c., dominated by redwoods
	75	10	0.58	17	Dense median

Table 4. County of Santa Cruz "Significant" Trees per TSU

Biotic Area	TSU [1]	Total Significant Trees	Acre of TSU	Trees per Acre	Character of TSU
Note: "Significant" tree is one of any species with DBH of 20 inches or greater, and clumping trees with more than 4 stems where each stem is 12 inches or greater; and in biotic areas, all trees regardless of size.					
	76	4	2.08	2	Dense slope
	77*	56	10.08	6	Very Dense, wetland
	78	21	2.01	10	Sparse, mature Monterey pines
	79*	21	1.80	12	Very Dense, steep slope
	80	24	4.32	6	Very Dense
	81	13	3.39	4	Sparse to Dense
	82	27	5.37	5	Sparse to Dense
Totals		**1878**	**134.28**	**14**	

Notes:

1 TSU = Tree Survey Unit

* Asterisk denotes Photo Documentation of the TSU; refer to Photo Documentation, Appendix A

- Biotic = Biotic Resource Areas which are identified using the Local Coastal Program Sensitive Habitats maps, the General Plan Resources and Constraints maps and other biotic resources maps on file in the County Planning Department.
- Sparse is defined as an area of land that when viewed from the highway appears to have less than 25% canopy cover.
- Dense is defined as an area of land that when viewed from the highway appears to have 25% to 75% canopy cover.
- Very Dense is defined as an area of land that when viewed from the highway appears to have greater than 75% canopy cover.

Table 5. City of Santa Cruz "Heritage" Trees per TSU

Biotic Area	TSU *	Total Trees per TSU	Acre of TSU	Trees per Acre	Character of TSU
Note: Significant or "Heritage" tree is one of any species with a DBH of 14 inches or greater.					
	40*	58	2.04	28	Dense, native Coast Live Oak woodlands, 5'-20' o.c.
	41	25	1.95	13	Dense, steep slope, planted 4 deep, 15' o.c., understory thicket of willows
	42	6	2.00	3	Sparse, single row of shrubby bay, construction zone
	43*	18	2.85	6	Sparse, open grassy landscape, 20'-30' o.c
	44*	1	1.71	1	Sparse, new finished sound wall
	45*	8	1.93	4	Sparse, construction
	46	21	2.09	10	Dense
	47	148	4.18	35	Very Dense, steep slope, very large eucalyptus- 100" DBH, large adult oaks, 10'-20' o.c., thick understory poison oak & blackberry
	48	42	1.32	32	Sparse, large trees, 30' o.c., thicket of 1"-4" young acacia
Totals		**327**	**20.06**	**16**	

Notes:

1 TSU = Tree Survey Unit

* Asterisk denotes Photo Documentation of the TSU; refer to Photo Documentation, Appendix A

- Biotic Area = Biotic Resource Areas identified in the Local Coastal Program Sensitive Habitats maps, the General Plan Resources and Constraints maps and other biotic resources maps on file in the County Planning Department.
- Sparse is defined as an area of land that when viewed from the highway appears to have less than 25% canopy cover.
- Dense is defined as an area of land that when viewed from the highway appears to have 25% to 75% canopy cover.
- Very Dense is defined as an area of land that when viewed from the highway appears to have greater than 75% canopy cover.

Table 6. City of Capitola "Significant" Trees per TSU

Biotic Area	TSU [1]	Total Trees per TSU	Acre of TSU	Trees per Acre	Character of TSU
Note: Significant tree is one of any species with a DBH of 6 inches or greater, and in biotic areas, all trees regardless of size.					
Biotic	21*	46	1.62	28	patches of Sparse and Dense landscape slope
	22	49	2.67	18	Sparse trees with Dense understory of Myoporum and mixed shrubs
	23	59	1.19	49	Dense adult trees associated with riparian corridor, double row
	24	89	0.62	145	Very Dense, dominated by eucalyptus , limited understory consisting of willow along drainage canal
	25	85	1.47	58	Dense mature stand of mixed native trees, 10'-15' o.c.
	26*	43	1.88	23	Sparse to Dense, 10-15' o.c., planted double to triple deep, shrub screen
	27*	91	3.13	29	Dense to Very Dense, one very large relic oak, 10' o.c., planted 4 deep
Biotic	28	47	0.77	61	Dense, 20' o.c., along steep slope, planted 4 deep
Biotic	29*	82	1.25	66	Dense adult trees associated with riparian corridor, 10'-30' o.c.
	30*	85	4.33	20	Sparse to Dense, double row, 10'-15' o.c.
	31	5	0.62	8	Sparse median
	55	22	1.76	12	Sparse landscape cloverleaf, 15' o.c.
	56	50	2.86	17	Dense to Very Dense, 10-30' o.c. most on top of the slope, thick understory of landscape shrubs
Biotic	57	116	0.93	125	Very Dense, steep slope near overpass at Soquel Creek
Biotic	58*	31	1.30	24	Sparse, slope down from off ramp, variety of informally planted trees
	59	37	1.24	30	Sparse screen area between offramp and apartment parking lot, 15' o.c.
	60*	63	2.05	31	Dense, landscape trees 10'-20' o.c., mature shrub understory
	61	43	1.65	26	Sparse to Dense, 15' o.c., along slope
	62	24	0.30	81	Very Dense, willow thicket associated with riparian corridor
	63*	137	3.78	36	Dense to Very Dense, adult trees Very Dense

Table 6. City of Capitola "Significant" Trees per TSU

Biotic Area	TSU [1]	Total Trees per TSU	Acre of TSU	Trees per Acre	Character of TSU
Note: Significant tree is one of any species with a DBH of 6 inches or greater, and in biotic areas, all trees regardless of size.					
					understory of trees under 6"
Biotic	64	23	1.36	17	Sparse, mostly Myoporum screen planting
Totals		**1227**	**36.79**	**33**	

Notes:

1 TSU = Tree Survey Unit

* Asterisk denotes Photo Documentation of the TSU; refer to Photo Documentation, Appendix A

- Biotic Area = Biotic Resource Areas which are identified using the Local Coastal Program Sensitive Habitats maps, the General Plan Resources and Constraints maps and other biotic resources maps on file in the County Planning Department.
- Sparse is defined as an area of land that when viewed from the highway appears to have less than 25% canopy cover.
- Dense is defined as an area of land that when viewed from the highway appears to have 25% to 75% canopy cover.
- Very Dense is defined as an area of land that when viewed from the highway appears to have greater than 75% canopy cover.

4. ESTIMATED IMPACTS BY ALTERNATIVE

During the tree survey, SWCA divided the project area into Tree Survey Units (TSUs) based on City/County jurisdictional boundary lines. The estimated number of trees within each TSU includes only the "significant" trees, as described by each jurisdiction.

The potential effect of the HOV and TSM alternatives was estimated by overlaying the proposed impact area for each alternative (provided by the project engineers) with the TSU map. The acreage of the overlapping areas was calculated as the "acres affected" for each TSU, and for each alternative. The "estimated number of trees affected" was derived by multiplying the area of impact in acres by the number of trees per acre for each TSU. The results are detailed in Table 7.

This estimation assumes that the tree coverage is uniform in each TSU, which is not always the case. Therefore, the estimated number of trees affected may be greater than the actual number of trees affected, especially in situations where the impact area and TSU overlap is narrow and close to the road edge. By this estimation, the HOV alternative would affect twice as many trees as the TSM alternative.

Table 7. Estimated Number of Significant Trees Affected within Each TSU

Biotic Area	Jurisdiction	TSU	Significant Trees per Acre	HOV Alternative		TSM Alternative	
				Acres Affected	Estimated Number of Trees Affected	Acres Affected	Estimated Number of Trees Affected
	County	1	2	0.00	**0**	0.00	**0**
	County	2	0	0.13	**0**	0.00	**0**
	County	3	3	0.00	**0**	0.00	**0**
	County	4	11	0.00	**0**	0.00	**0**
	County	5	12	0.15	**2**	0.00	**0**
	County	6	1	1.89	**2**	1.33	**1**
	County	7	10	0.74	**7**	0.00	**0**
	County	8	14	0.36	**5**	0.04	**0**
Biotic	County	9	68	1.17	**79**	0.31	**21**
Biotic	County	10	57	0.21	**12**	0.53	**30**
Biotic	County	11	57	0.63	**36**	0.79	**45**
	County	12	30	0.14	**4**	0.31	**9**
	County	13	5	0.40	**2**	1.79	**9**
	County	14	6	0.18	**5**	0.00	**0**

Table 7. Estimated Number of Significant Trees Affected within Each TSU

Biotic Area	Jurisdiction	TSU	Significant Trees per Acre	HOV Alternative		TSM Alternative	
				Acres Affected	Estimated Number of Trees Affected	Acres Affected	Estimated Number of Trees Affected
	County	15	9	0.62	**5**	0.00	**0**
	County	16	9	0.46	**4**	0.07	**1**
	County	17	7	1.09	**7**	0.40	**3**
	County	18	4	0.40	**2**	0.99	**4**
	County	19	7	0.00	**0**	0.89	**6**
	County	20	3	0.50	**2**	1.17	**4**
	City of Capitola	21	28	0.73	**21**	0.97	**27**
	City of Capitola	22	18	0.70	**13**	0.99	**18**
	City of Capitola	23	49	0.35	**17**	0.22	**11**
	City of Capitola	24	145	0.23	**34**	0.24	**35**
	City of Capitola	25	58	1.16	**67**	1.14	**66**
	City of Capitola	26	23	1.28	**29**	1.16	**27**
	City of Capitola	27	29	2.21	**64**	0.79	**23**
	City of Capitola	28	61	0.57	**35**	0.00	**0**
	City of Capitola	29	66	0.73	**48**	0.00	**0**
	City of Capitola	30	20	3.68	**72**	0.85	**17**
	City of Capitola	31	8	0.44	**4**	0.43	**3**
	County	32	9	1.08	**10**	0.76	**7**
	County	33	27	0.18	**5**	0.63	**17**
	County	34	9	0.32	**3**	0.00	**0**
	County	35	5	1.14	**6**	0.78	**4**
	County	36	0	2.08	**1**	1.11	**0**
	County	37	7	1.81	**13**	0.35	**2**
	County	38	7	0.72	**5**	0.20	**1**
Biotic	County	39	38	0.55	**21**	0.89	**34**

Table 7. Estimated Number of Significant Trees Affected within Each TSU

Biotic Area	Jurisdiction	TSU	Significant Trees per Acre	HOV Alternative		TSM Alternative	
				Acres Affected	Estimated Number of Trees Affected	Acres Affected	Estimated Number of Trees Affected
	City of Capitola	40	28	1.53	**43**	1.01	**29**
	City of Capitola	41	13	0.91	**12**	0.43	**6**
	City of Capitola	42	3	0.81	**2**	0.00	**0**
	City of Capitola	43	6	0.00	**0**	0.00	**0**
	City of Capitola	44	1	0.00	**0**	0.00	**0**
	City of Capitola	45	4	0.86	**4**	0.00	**0**
	City of Capitola	46	10	1.50	**15**	0.24	**2**
	City of Capitola	47	35	1.47	**51**	0.87	**31**
	City of Capitola	48	32	0.79	**25**	0.25	**8**
Biotic	County	49	58	1.24	**72**	0.28	**16**
	County	50	25	2.07	**52**	0.25	**6**
	County	51	8	0.67	**5**	0.01	**0**
	County	52*	3	2.39	**7**	0.63	**2**
	County	53	11	0.00	**0**	0.28	**3**
	County	54	3	1.54	**5**	0.00	**0**
	City of Capitola	55	12	1.54	**18**	1.30	**16**
	City of Capitola	56	17	2.50	**43**	0.26	**4**
	City of Capitola	57	125	0.24	**30**	0.65	**81**
	City of Capitola	58	24	0.81	**19**	0.08	**2**
	City of Capitola	59	30	0.29	**9**	0.00	**0**
	City of Capitola	60	31	1.01	**31**	0.49	**15**
	City of Capitola	61	26	0.81	**21**	0.71	**18**
	City of Capitola	62	81	0.00	**0**	0.00	**0**
	City of Capitola	63	36	1.85	**67**	0.99	**35**
	City of Capitola	64	17	1.36	**23**	1.10	**19**

Table 7. Estimated Number of Significant Trees Affected within Each TSU

Biotic Area	Jurisdiction	TSU	Significant Trees per Acre	HOV Alternative		TSM Alternative	
				Acres Affected	Estimated Number of Trees Affected	Acres Affected	Estimated Number of Trees Affected
Biotic	County	65	211	0.26	**54**	0.17	**36**
	County	66	2	1.63	**3**	1.69	**3**
	County	67	18	0.44	**8**	0.00	**0**
	County	68	13	1.36	**18**	0.65	**8**
	County	69	8	1.08	**9**	1.43	**11**
	County	70	4	0.68	**3**	1.48	**6**
Biotic	County	71	26	0.84	**22**	0.49	**13**
Biotic	County	72	54	1.63	**88**	0.77	**42**
	County	73	49	2.15	**106**	0.93	**46**
Biotic	County	74	46	1.67	**77**	0.00	**0**
	County	75	17	0.58	**10**	0.00	**0**
	County	76	2	0.15	**0**	0.45	**1**
	County	77	6	0.58	**4**	1.17	**7**
	County	78	10	0.16	**2**	0.23	**2**
	County	79	12	1.80	**22**	0.00	**0**
	County	80	6	0.00	**0**	0.00	**0**
	County	81	4	0.00	**0**	0.00	**0**
	County	82	5	0.91	**5**	0.00	**0**
				Total	**1627**		**893**

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Appendix A.
Photo Documentation

PHOTO 1:

Representative view of TSU: 3
Northbound, south of Larkin Valley Road.

Jurisdiction: Santa Cruz County
Significant Tree: 20” DBH

Includes grassy sloped areas with sparse trees and areas with dense trees.

PHOTO 2:

Representative view of TSU: 6
Northbound, south of Freedom Boulevard

Jurisdiction: Santa Cruz County
Significant Tree: 20” DBH

Contains areas with sparse trees in a flat, narrow landscape median.

PHOTO 3:

Representative view of TSU: 7
Northbound, south of Rio Del Mar

Jurisdiction: Santa Cruz County
Significant Tree: 20” DBH

Includes areas with young trees and shrubs on a sloped median.

PHOTO 4:

Representative view of TSU: 7
Northbound, at Rio Del Mar

Jurisdiction: Santa Cruz County
Significant Tree: 20” DBH

Contains a sloped landscape median at the northbound offramp.

PHOTO DOCUMENTATION

PHOTO 5:

Representative view of TSU: 11
Northbound, South of State Park Drive

Jurisdiction: Santa Cruz County and Biotic Resource Area
Significant Tree: all trees

Made up of a mix of species and sizes of trees on a slope.

PHOTO 6:

Representative view of TSU: 16
Northbound, median between onramp at State Park Drive

Jurisdiction: Santa Cruz County
Significant Tree: 20” DBH

Contains a landscape median with young trees.

PHOTO 7:

Representative view of TSU: 21
Northbound, south of Park Avenue

Jurisdiction: City of Capitola and Biotic Resource Area
Significant Tree: all trees

Includes areas of sparse and dense trees on a slope, mostly Coast live oak.

PHOTO 8:

Representative view of TSU: 26
Northbound, south of Capitola

Jurisdiction: City of Capitola and Biotic Resource Area
Significant Tree: all trees

Includes sparse trees with a dense screen understory of Myoporum shrub.

PHOTO DOCUMENTATION

PHOTO 9:

Representative view of TSU: 27
Northbound, south of Porter Avenue

Jurisdiction: City of Capitola
Significant Tree: 6" DBH

Contains areas with dense mature stands of mixed native trees on a slope.

PHOTO 10:

Representative view of TSU: 29
Northbound, south of 41st Avenue

Jurisdiction: City of Capitola and Biotic Resource Area
Significant Tree: all trees

Includes areas of dense adult trees associated with riparian corridors.

PHOTO 11:

Representative view of TSU: 30
Northbound, landscaped median, view of onramp at 41st Avenue

Jurisdiction: City of Capitola
Significant Tree: 6" DBH

View of a sparse cloverleaf with sparse to dense trees on a slope.

PHOTO 12:

Representative view of TSU: 35
Northbound, south of Soquel Avenue

Jurisdiction: Santa Cruz County
Significant Tree: 20" DBH

Includes areas with dense trees with a mix of ages and heights.

PHOTO DOCUMENTATION

PHOTO 13:

Representative view of TSU: 37
Northbound, onramp at Soquel Avenue

Jurisdiction: Santa Cruz County
Significant Tree: 20” DBH

View of onramp with sparse trees.

PHOTO 14:

Representative view of TSU: 40
Northbound, south of Morrisey Boulevard

Jurisdiction: City of Santa Cruz
Significant Tree: 14” DBH

Includes areas of dense trees and a shrubby mix of young trees on a flat landscape.

PHOTO 15:

Representative view of TSU: 43
Northbound, view of offramp and onramp at Morrisey Boulevard

Jurisdiction: City of Santa Cruz
Significant Tree: 14” DBH

Shows sparse freeway access point.

PHOTO 16:

Representative view of TSU: 44
Northbound, north of Morrisey Boulevard

Jurisdiction: City of Santa Cruz
Significant Tree: 14” DBH

Ruderal construction area

PHOTO DOCUMENTATION

PHOTO 17:

Representative view of TSU: 45
Southbound, north of Morrisey Boulevard

Jurisdiction: City of Santa Cruz
Significant Tree: 14" DBH

Landscape area under construction.

PHOTO 18:

Representative view of TSU: 49
Southbound, north of Soquel Avenue

Jurisdiction: County of Santa Cruz and Biotic Resource Area
Significant Tree: all trees

Includes very dense trees on a steep slope, with a dense thicket and sapling understory.

PHOTO 19:

Representative view of TSU: 52
Southbound, north of 41st Avenue

Jurisdiction: County of Santa Cruz
Significant Tree: 20" DBH

Includes area with a sparse single row of trees and landscape shrubs.

PHOTO 20:

Representative view of TSU: 55
Southbound at 41st Avenue cloverleaf

Jurisdiction: City of Capitola
Significant Tree: 6" DBH

Sparse landscaped cloverleaf with mostly redwoods on slope.

PHOTO DOCUMENTATION

PHOTO 21:

Representative view of TSU: 58
Southbound, north of Bay Avenue

Jurisdiction: City of Capitola and Biotic Resource Area
Significant Tree: 6” DBH

Includes a sparse screened area between offramp and apartment parking lot.

PHOTO 22:

Representative view of TSU: 60
Southbound, north of Capitola Avenue

Jurisdiction: City of Capitola
Significant Tree: 6” DBH

Includes both sparse areas and dense areas along slope.

PHOTO 23:

Representative view of TSU: 63
Southbound, north of Park Avenue

Jurisdiction: City of Capitola
Significant Tree: 6” DBH

Includes areas of very dense adult trees with a very dense understory of trees under 6” DBH.

PHOTO 24:

Representative view of TSU: 68
Southbound, north of State Park Drive

Jurisdiction: County of Santa Cruz
Significant Tree: 20” DBH

Includes areas of dense trees on a slope, dominated by Coast live oak.

PHOTO DOCUMENTATION

PHOTO 25:
Representative view of TSU: 69
Southbound at State Park Drive offramp

Jurisdiction: County of Santa Cruz
Significant Tree: 20” DBH

Includes a dense patch of Monterey pine and Monterey cypress.

PHOTO 26:
Representative view of TSU: 73
Southbound, north of Rio Del Mar

Jurisdiction: County of Santa Cruz and Biotic Resource Area
Significant Tree: all trees

Shows a very dense area of trees and shrubs dominated by Coast live oak.

PHOTO 27:
Representative view of TSU: 77
Southbound, north of Freedom

Jurisdiction: County of Santa Cruz
Significant Tree: 20” DBH

Includes a very dense area of oaks and plants associated with riparian areas.

PHOTO 28:
Representative view of TSU: 79
Southbound, north of San Andreas Road

Jurisdiction: County of Santa Cruz
Significant Tree: 20” DBH

Contains a very dense group of trees on a steep slope.

PHOTO DOCUMENTATION

Appendix H. CDFW Staff Report on Burrowing Owl Mitigation

Staff Report on Burrowing Owl Mitigation

State of California

Natural Resources Agency

Department of Fish and Game

March 7, 2012[1]

[1] This document replaces the Department of Fish and Game 1995 Staff Report On Burrowing Owl Mitigation.

TABLE OF CONTENTS

INTRODUCTION AND PURPOSE

Maintaining California's rich biological diversity is dependent on the conservation of species and their habitats. The California Department of Fish and Game (Department) has designated certain species as "species of special concern" when their population viability and survival is adversely affected by risk factors such as precipitous declines or other vulnerability factors (Shuford and Gardali 2008). Preliminary analyses of regional patterns for breeding populations of burrowing owls (*Athene cunicularia*) have detected declines both locally in their central and southern coastal breeding areas, and statewide where the species has experienced modest breeding range retraction (Gervais et al. 2008). In California, threat factors affecting burrowing owl populations include habitat loss, degradation and modification, and eradication of ground squirrels resulting in a loss of suitable burrows required by burrowing owls for nesting, protection from predators, and shelter (See Appendix A).

The Department recognized the need for a comprehensive conservation and mitigation strategy for burrowing owls, and in 1995 directed staff to prepare a report describing mitigation and survey recommendations. This report, "1995 Staff Report on Burrowing Owl Mitigation," (Staff Report) (CDFG 1995), contained Department-recommended burrowing owl and burrow survey techniques and mitigation measures intended to offset the loss of habitat and slow or reverse further decline of this species. Notwithstanding these measures, over the past 15+ years, burrowing owls have continued to decline in portions of their range (DeSante et al. 2007, Wilkerson and Siegel, 2010). The Department has determined that reversing declining population and range trends for burrowing owls will require implementation of more effective conservation actions, and evaluating the efficacy of the Department's existing recommended avoidance, minimization and mitigation approaches for burrowing owls.

The Department has identified three main actions that together will facilitate a more viable, coordinated, and concerted approach to conservation and mitigation for burrowing owls in California. These include:

1. Incorporating burrowing owl comprehensive conservation strategies into landscape-based planning efforts such as Natural Community Conservation Plans (NCCPs) and multi-species Habitat Conservation Plans (HCPs) that specifically address burrowing owls.
2. Developing and implementing a statewide conservation strategy (Burkett and Johnson, 2007) and local or regional conservation strategies for burrowing owls, including the development and implementation of a statewide burrowing owl survey and monitoring plan.
3. Developing more rigorous burrowing owl survey methods, working to improve the adequacy of impacts assessments; developing clear and effective avoidance and minimization measures; and developing mitigation measures to ensure impacts to the species are effectively addressed at the project, local, and/or regional level (the focus of this document).

This Report sets forth the Department's recommendations for implementing the third approach identified above by revising the 1995 Staff Report, drawing from the most relevant and current knowledge and expertise, and incorporating the best scientific information

available pertaining to the species. It is designed to provide a compilation of the best available science for Department staff, biologists, planners, land managers, California Environmental Quality Act (CEQA) lead agencies, and the public to consider when assessing impacts of projects or other activities on burrowing owls.

This revised Staff Report takes into account the California Burrowing Owl Consortium's Survey Protocol and Mitigation Guidelines (CBOC 1993, 1997) and supersedes the survey, avoidance, minimization and mitigation recommendations in the 1995 Staff Report. Based on experiences gained from implementing the 1995 Staff Report, the Department believes revising that report is warranted. This document also includes general conservation goals and principles for developing mitigation measures for burrowing owls.

DEPARTMENT ROLE AND LEGAL AUTHORITIES

The mission of the Department is to manage California's diverse fish, wildlife and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. The Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitats necessary to maintain biologically sustainable populations of those species (Fish and Game Code (FGC) §1802). The Department, as trustee agency pursuant to CEQA (See CEQA Guidelines, §15386), has jurisdiction by law over natural resources, including fish and wildlife, affected by a project, as that term is defined in Section 21065 of the Public Resources Code. The Department exercises this authority by reviewing and commenting on environmental documents and making recommendations to avoid, minimize, and mitigate potential negative impacts to those resources held in trust for the people of California.

Field surveys designed to detect the presence of a particular species, habitat element, or natural community are one of the tools that can assist biologists in determining whether a species or habitat may be significantly impacted by land use changes or disturbance. The Department reviews field survey data as well as site-specific and regional information to evaluate whether a project's impacts may be significant. This document compiles the best available science for conducting habitat assessments and surveys, and includes considerations for developing measures to avoid impacts or mitigate unavoidable impacts.

CEQA

CEQA requires public agencies in California to analyze and disclose potential environmental impacts associated with a project that the agency will carry out, fund, or approve. Any potentially significant impact must be mitigated to the extent feasible. Project-specific CEQA mitigation is important for burrowing owls because most populations exist on privately owned parcels that, when proposed for development or other types of modification, may be subject to the environmental review requirements of CEQA.

Take

Take of individual burrowing owls and their nests is defined by FGC section 86, and prohibited by sections 3503, 3503.5 and 3513. Take is defined in FGC Section 86 as "hunt, pursue, catch, capture or kill, or attempt to hunt, pursue, catch, capture or kill."

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the United States and Canada, Japan, Mexico, and Russia for the protection of migratory birds, including the burrowing owl (50 C.F.R. § 10). The MBTA protects migratory bird nests from possession, sale, purchase, barter, transport, import and export, and collection. The other prohibitions of the MBTA - capture, pursue, hunt, and kill - are inapplicable to nests. The regulatory definition of take, as defined in Title 50 C.F.R. part 10.12, means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to hunt, shoot, wound, kill, trap, capture, or collect. Only the verb "collect" applies to nests. It is illegal to collect, possess, and by any means transfer possession of any migratory bird nest. The MBTA prohibits the destruction of a nest when it contains birds or eggs, and no possession shall occur during the destruction (see Fish and Wildlife Service, Migratory Bird Permit Memorandum, April 15, 2003). Certain exceptions to this prohibition are included in 50 C.F.R. section 21. Pursuant to Fish & Game Code section 3513, the Department enforces the Migratory Bird Treaty Act consistent with rules and regulations adopted by the Secretary of the Interior under provisions of the Migratory Treaty Act.

Regional Conservation Plans

Regional multiple species conservation plans offer long-term assurances for conservation of covered species at a landscape scale, in exchange for biologically appropriate levels of incidental take and/or habitat loss as defined in the approved plan. California's NCCP Act (FGC §2800 et seq.) governs such plans at the state level, and was designed to conserve species, natural communities, ecosystems, and ecological processes across a jurisdiction or a collection of jurisdictions. Complementary federal HCPs are governed by the Endangered Species Act (7 U.S.C. § 136, 16 U.S.C.§ 1531 et seq.) (ESA). Regional conservation plans (and certain other landscape-level conservation and management plans), may provide conservation for unlisted as well as listed species. Because the geographic scope of NCCPs and HCPs may span many hundreds of thousands of acres, these planning tools have the potential to play a significant role in conservation of burrowing owls, and grasslands and other habitats.

Fish and Game Commission Policies

There are a number of Fish and Game Commission policies (see FGC §2008) that can be applied to burrowing owl conservation. These include policies on: Raptors, Cooperation, Endangered and Threatened Species, Land Use Planning, Management and Utilization of Fish and Wildlife on Federal Lands, Management and Utilization of Fish and Wildlife on Private Lands, and Research.

GUIDING PRINCIPLES FOR CONSERVATION

Unless otherwise provided in a statewide, local, or regional conservation strategy, surveying and evaluating impacts to burrowing owls, as well as developing and implementing avoidance, minimization, and mitigation and conservation measures incorporate the following principles. These principles are a summary of Department staff expert opinion and were used to guide the preparation of this document.

1. Use the Precautionary Principle (Noss et al.1997), by which the alternative of increased conservation is deliberately chosen in order to buffer against incomplete knowledge of burrowing owl ecology and uncertainty about the consequences to burrowing owls of potential impacts, including those that are cumulative.
2. Employ basic conservation biology tenets and population-level approaches when determining what constitutes appropriate avoidance, minimization, and mitigation for impacts. Include mitigation effectiveness monitoring and reporting, and use an adaptive management loop to modify measures based on results.
3. Protect and conserve owls in wild, semi-natural, and agricultural habitats (conserve is defined at FGC §1802).
4. Protect and conserve natural nest burrows (or burrow surrogates) previously used by burrowing owls and sufficient foraging habitat and protect auxiliary "satellite" burrows that contribute to burrowing owl survivorship and natural behavior of owls.

CONSERVATION GOALS FOR THE BURROWING OWL IN CALIFORNIA

It is Department staff expert opinion that the following goals guide and contribute to the short and long-term conservation of burrowing owls in California:

1. Maintain size and distribution of extant burrowing owl populations (allowing for natural population fluctuations).
2. Increase geographic distribution of burrowing owls into formerly occupied historical range where burrowing owl habitat still exists, or where it can be created or enhanced, and where the reason for its local disappearance is no longer of concern.
3. Increase size of existing populations where possible and appropriate (for example, considering basic ecological principles such as carrying capacity, predator-prey relationships, and inter-specific relationships with other species at risk).
4. Protect and restore self-sustaining ecosystems or natural communities which can support burrowing owls at a landscape scale, and which will require minimal long-term management.
5. Minimize or prevent unnatural causes of burrowing owl population declines (e.g., nest burrow destruction, chemical control of rodent hosts and prey).
6. Augment/restore natural dynamics of burrowing owl populations including movement and genetic exchange among populations, such that the species does not require future listing and protection under the California Endangered Species Act (CESA) and/or the federal Endangered Species Act (ESA).
7. Engage stakeholders, including ranchers; farmers; military; tribes; local, state, and federal agencies; non-governmental organizations; and scientific research and education communities involved in burrowing owl protection and habitat management.

ACTIVITIES WITH THE POTENTIAL TO TAKE OR IMPACT BURROWING OWLS

The following activities are examples of activities that have the potential to take burrowing owls, their nests or eggs, or destroy or degrade burrowing owl habitat: grading, disking, cultivation, earthmoving, burrow blockage, heavy equipment compacting and crushing burrow tunnels, levee maintenance, flooding, burning and mowing (if burrows are impacted), and operating wind turbine collisions (collectively hereafter referred to as "projects" or "activities"

whether carried out pursuant to CEQA or not). In addition, the following activities may have impacts to burrowing owl populations: eradication of host burrowers; changes in vegetation management (i.e. grazing); use of pesticides and rodenticides; destruction, conversion or degradation of nesting, foraging, over-wintering or other habitats; destruction of natural burrows and burrow surrogates; and disturbance which may result in harassment of owls at occupied burrows.

PROJECT IMPACT EVALUATIONS

The following three progressive steps are effective in evaluating whether projects will result in impacts to burrowing owls. The information gained from these steps will inform any subsequent avoidance, minimization and mitigation measures. The steps for project impact evaluations are: 1) habitat assessment, 2) surveys, and 3) impact assessment. Habitat assessments are conducted to evaluate the likelihood that a site supports burrowing owl. Burrowing owl surveys provide information needed to determine the potential effects of proposed projects and activities on burrowing owls, and to avoid take in accordance with FGC sections 86, 3503, and 3503.5. Impact assessments evaluate the extent to which burrowing owls and their habitat may be impacted, directly or indirectly, on and within a reasonable distance of a proposed CEQA project activity or non-CEQA project. These three site evaluation steps are discussed in detail below.

Biologist Qualifications

The current scientific literature indicates that only individuals meeting the following minimum qualifications should perform burrowing owl habitat assessments, surveys, and impact assessments:

1. Familiarity with the species and its local ecology;
2. Experience conducting habitat assessments and non-breeding and breeding season surveys, or experience with these surveys conducted under the direction of an experienced surveyor;
3. Familiarity with the appropriate state and federal statutes related to burrowing owls, scientific research, and conservation;
4. Experience with analyzing impacts of development on burrowing owls and their habitat.

Habitat Assessment Data Collection and Reporting

A habitat assessment is the first step in the evaluation process and will assist investigators in determining whether or not occupancy surveys are needed. Refer to Appendix B for a definition of burrowing owl habitat. Compile the detailed information described in Appendix C when conducting project scoping, conducting a habitat assessment site visit and preparing a habitat assessment report.

Surveys

Burrowing owl surveys are the second step of the evaluation process and the best available scientific literature recommends that they be conducted whenever burrowing owl habitat or sign (see Appendix B) is encountered on or adjacent to (within 150 meters) a project site

(Thomsen 1971, Martin 1973). Occupancy of burrowing owl habitat is confirmed at a site when at least one burrowing owl, or its sign at or near a burrow entrance, is observed within the last three years (Rich 1984). Burrowing owls are more detectable during the breeding season with detection probabilities being highest during the nestling stage (Conway et al. 2008). In California, the burrowing owl breeding season extends from 1 February to 31 August (Haug et al. 1993, Thompsen 1971) with some variances by geographic location and climatic conditions. Several researchers suggest three or more survey visits during daylight hours (Haug and Diduik 1993, CBOC 1997, Conway and Simon 2003) and recommend each visit occur at least three weeks apart during the peak of the breeding season, commonly accepted in California as between 15 April and 15 July (CBOC 1997). Conway and Simon (2003) and Conway et al. (2008) recommended conducting surveys during the day when most burrowing owls in a local area are in the laying and incubation period (so as not to miss early breeding attempts), during the nesting period, and in the late nestling period when most owls are spending time above ground.

Non-breeding season (1 September to 31 January) surveys may provide information on burrowing owl occupancy, but do not substitute for breeding season surveys because results are typically inconclusive. Burrowing owls are more difficult to detect during the non-breeding season and their seasonal residency status is difficult to ascertain. Burrowing owls detected during non-breeding season surveys may be year-round residents, young from the previous breeding season, pre-breeding territorial adults, winter residents, dispersing juveniles, migrants, transients or new colonizers. In addition, the numbers of owls and their pattern of distribution may differ during winter and breeding seasons. However, on rare occasions, non-breeding season surveys may be warranted (i.e., if the site is believed to be a wintering site only based on negative breeding season results). Refer to Appendix D for information on breeding season and non-breeding season survey methodologies.

Survey Reports

Adequate information about burrowing owls present in and adjacent to an area that will be disturbed by a project or activity will enable the Department, reviewing agencies and the public to effectively assess potential impacts and will guide the development of avoidance, minimization, and mitigation measures. The survey report includes but is not limited to a description of the proposed project or proposed activity, including the proposed project start and end dates, as well as a description of disturbances or other activities occurring on-site or nearby. Refer to Appendix D for details included in a survey report.

Impact Assessment

The third step in the evaluation process is the impact assessment. When surveys confirm occupied burrowing owl habitat in or adjoining the project area, there are a number of ways to assess a project's potential significant impacts to burrowing owls and their habitat. Richardson and Miller (1997) recommended monitoring raptor behavior prior to developing management recommendations and buffers to determine the extent to which individuals have been sensitized to human disturbance. Monitoring results will also provide detail necessary for developing site-specific measures. Postovit and Postovit (1987) recommended an analytical approach to mitigation planning: define the problem (impact), set goals (to guide mitigation development), evaluate and select mitigation methods, and monitor the results.

Define the problem. The impact assessment evaluates all factors that could affect burrowing owls. Postovit and Postovit (1987) recommend evaluating the following in assessing impacts to raptors and planning mitigation: type and extent of disturbance, duration and timing of disturbance, visibility of disturbance, sensitivity and ability to habituate, and influence of environmental factors. They suggest identifying and addressing all potential direct and indirect impacts to burrowing owls, regardless of whether or not the impacts will occur during the breeding season. Several examples are given for each impact category below; however, examples are not intended to be used exclusively.

Type and extent of the disturbance. The impact assessment describes the nature (source) and extent (scale) of potential project impacts on occupied, satellite and unoccupied burrows including acreage to be lost (temporary or permanent), fragmentation/edge being created, increased distance to other nesting and foraging habitat, and habitat degradation. Discuss any project activities that impact either breeding and/or non-breeding habitat which could affect owl home range size and spatial configuration, negatively affect onsite and offsite burrowing owl presence, increase energetic costs, lower reproductive success, increase vulnerability to predation, and/or decrease the chance of procuring a mate.

Duration and timing of the impact. The impact assessment describes the amount of time the burrowing owl habitat will be unavailable to burrowing owls (temporary or permanent) on the site and the effect of that loss on essential behaviors or life history requirements of burrowing owls, the overlap of project activities with breeding and/or non-breeding seasons (timing of nesting and/or non-breeding activities may vary with latitude and climatic conditions, which should be considered with the timeline of the project or activity), and any variance of the project activities in intensity, scale and proximity relative to burrowing owl occurrences.

Visibility and sensitivity. Some individual burrowing owls or pairs are more sensitive than others to specific stimuli and may habituate to ongoing visual or audible disturbance. Site-specific monitoring may provide clues to the burrowing owl's sensitivities. This type of assessment addresses the sensitivity of burrowing owls within their nesting area to humans on foot, and vehicular traffic. Other variables are whether the site is primarily in a rural versus urban setting, and whether any prior disturbance (e.g., human development or recreation) is known at the site.

Environmental factors. The impact assessment discusses any environmental factors that could be influenced or changed by the proposed activities including nest site availability, predators, prey availability, burrowing mammal presence and abundance, and threats from other extrinsic factors such as human disturbance, urban interface, feral animals, invasive species, disease or pesticides.

Significance of impacts. The impact assessment evaluates the potential loss of nesting burrows, satellite burrows, foraging habitat, dispersal and migration habitat, wintering habitat, and habitat linkages, including habitat supporting prey and host burrowers and other essential habitat attributes. This assessment determines if impacts to the species will result in significant impacts to the species locally, regionally and range-wide per CEQA Guidelines §15382 and Appendix G. The significance of the impact to habitat depends on the extent of habitat disturbed and length of time the habitat is unavailable (for example: minor – several days, medium – several weeks to months, high - breeding season affecting juvenile survival,

or over winter affecting adult survival).

Cumulative effects. The cumulative effects assessment evaluates two consequences: 1) the project's proportional share of reasonably foreseeable impacts on burrowing owls and habitat caused by the project or in combination with other projects and local influences having impacts on burrowing owls and habitat, and 2) the effects on the regional owl population resulting from the project's impacts to burrowing owls and habitat.

Mitigation goals. Establishing goals will assist in planning mitigation and selecting measures that function at a desired level. Goals also provide a standard by which to measure mitigation success. Unless specifically provided for through other FGC Sections or through specific regulations, take, possession or destruction of individual burrowing owls, their nests and eggs is prohibited under FGC sections 3503, 3503.5 and 3513. Therefore, a required goal for all project activities is to avoid take of burrowing owls. Under CEQA, goals would consist of measures that would avoid, minimize and mitigate impacts to a less than significant level. For individual projects, mitigation must be roughly proportional to the level of impacts, including cumulative impacts, in accordance with the provisions of CEQA (CEQA Guidelines, §§ 15126.4(a)(4)(B), 15064, 15065, and 16355). In order for mitigation measures to be effective, they must be specific, enforceable, and feasible actions that will improve environmental conditions. As set forth in more detail in Appendix A, the current scientific literature supports the conclusion that mitigation for permanent habitat loss necessitates replacement with an equivalent or greater habitat area for breeding, foraging, wintering, dispersal, presence of burrows, burrow surrogates, presence of fossorial mammal dens, well drained soils, and abundant and available prey within close proximity to the burrow.

MITIGATION METHODS

The current scientific literature indicates that any site-specific avoidance or mitigation measures developed should incorporate the best practices presented below or other practices confirmed by experts and the Department. The Department is available to assist in the development of site-specific avoidance and mitigation measures.

Avoiding. A primary goal is to design and implement projects to seasonally and spatially avoid negative impacts and disturbances that could result in take of burrowing owls, nests, or eggs. Other avoidance measures may include but not be limited to:

- Avoid disturbing occupied burrows during the nesting period, from 1 February through 31 August.
- Avoid impacting burrows occupied during the non-breeding season by migratory or non-migratory resident burrowing owls.
- Avoid direct destruction of burrows through chaining (dragging a heavy chain over an area to remove shrubs), disking, cultivation, and urban, industrial, or agricultural development.
- Develop and implement a worker awareness program to increase the on-site worker's recognition of and commitment to burrowing owl protection.
- Place visible markers near burrows to ensure that farm equipment and other machinery does not collapse burrows.
- Do not fumigate, use treated bait or other means of poisoning nuisance animals in areas where burrowing owls are known or suspected to occur (e.g., sites observed with nesting

owls, designated use areas).

- Restrict the use of treated grain to poison mammals to the months of January and February.

Take avoidance (pre-construction) surveys. Take avoidance surveys are intended to detect the presence of burrowing owls on a project site at a fixed period in time and inform necessary take avoidance actions. Take avoidance surveys may detect changes in owl presence such as colonizing owls that have recently moved onto the site, migrating owls, resident burrowing owls changing burrow use, or young of the year that are still present and have not dispersed. Refer to Appendix D for take avoidance survey methodology.

Site surveillance. Burrowing owls may attempt to colonize or re-colonize an area that will be impacted; thus, the current scientific literature indicates a need for ongoing surveillance at the project site during project activities is recommended. The surveillance frequency/effort should be sufficient to detect burrowing owls if they return. Subsequent to their new occupancy or return to the site, take avoidance measures should assure with a high degree of certainty that take of owls will not occur.

Minimizing. If burrowing owls and their habitat can be protected in place on or adjacent to a project site, the use of buffer zones, visual screens or other measures while project activities are occurring can minimize disturbance impacts. Conduct site-specific monitoring to inform development of buffers (see Visibility and sensitivity above). The following general guidelines for implementing buffers should be adjusted to address site-specific conditions using the impact assessment approach described above. The CEQA lead agency and/or project proponent is encouraged to consult with the Department and other burrowing owl experts for assistance in developing site-specific buffer zones and visual screens.

Buffers. Holroyd et al. (2001) identified a need to standardize management and disturbance mitigation guidelines. For instance, guidelines for mitigating impacts by petroleum industries on burrowing owls and other prairie species (Scobie and Faminow, 2000) may be used as a template for future mitigation guidelines (Holroyd et al. 2001). Scobie and Faminow (2000) developed guidelines for activities around occupied burrowing owl nests recommending buffers around low, medium, and high disturbance activities, respectively (see below).

Recommended restricted activity dates and setback distances by level of disturbance for burrowing owls (Scobie and Faminow 2000).

Location	Time of Year	Level of Disturbance		
		Low	Med	High
Nesting sites	April 1-Aug 15	200 m*	500 m	500 m
Nesting sites	Aug 16-Oct 15	200 m	200 m	500 m
Nesting sites	Oct 16-Mar 31	50 m	100 m	500 m

* meters (m)

Based on existing vegetation, human development, and land uses in an area, resource managers may decide to allow human development or resource extraction closer to these area/sites than recommended above. However, if it is decided to allow activities closer than

the setback distances recommended, a broad-scale, long-term, scientifically-rigorous monitoring program ensures that burrowing owls are not detrimentally affected by alternative approaches.

Other minimization measures include eliminating actions that reduce burrowing owl forage and burrowing surrogates (e.g. ground squirrel), or introduce/facilitate burrowing owl predators. Actions that could influence these factors include reducing livestock grazing rates and/or changing the timing or duration of grazing or vegetation management that could result in less suitable habitat.

Burrow exclusion and closure. Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls, or permanently exclude burrowing owls and close burrows after verifying burrows are empty by site monitoring and scoping. Exclusion in and of itself is not a take avoidance, minimization or mitigation method. Eviction of burrowing owls is a potentially significant impact under CEQA.

The long-term demographic consequences of these techniques have not been thoroughly evaluated, and the fate of evicted or excluded burrowing owls has not been systematically studied. Because burrowing owls are dependent on burrows at all times of the year for survival and/or reproduction, evicting them from nesting, roosting, and satellite burrows may lead to indirect impacts or take. Temporary or permanent closure of burrows may result in significant loss of burrows and habitat for reproduction and other life history requirements. Depending on the proximity and availability of alternate habitat, loss of access to burrows will likely result in varying levels of increased stress on burrowing owls and could depress reproduction, increase predation, increase energetic costs, and introduce risks posed by having to find and compete for available burrows. Therefore, exclusion and burrow closure are not recommended where they can be avoided. The current scientific literature indicates consideration of all possible avoidance and minimization measures before temporary or permanent exclusion and closure of burrows is implemented, in order to avoid take.

The results of a study by Trulio (1995) in California showed that burrowing owls passively displaced from their burrows were quickly attracted to adjacent artificial burrows at five of six passive relocation sites. The successful sites were all within 75 meters (m) of the destroyed burrow, a distance generally within a pair's territory. This researcher discouraged using passive relocation to artificial burrows as a mitigation measure for lost burrows without protection of adjacent foraging habitat. The study results indicated artificial burrows were used by evicted burrowing owls when they were approximately 50-100 m from the natural burrow (Thomsen 1971, Haug and Oliphant 1990). Locating artificial or natural burrows more than 100 m from the eviction burrow may greatly reduce the chances that new burrows will be used. Ideally, exclusion and burrow closure is employed only where there are adjacent natural burrows and non-impacted, sufficient habitat for burrowing owls to occupy with permanent protection mechanisms in place. Any new burrowing owl colonizing the project site after the CEQA document has been adopted may constitute changed circumstances that should be addressed in a re-circulated CEQA document.

The current scientific literature indicates that burrow exclusion should only be conducted by qualified biologists (meeting the Biologist's Qualifications above) during the non-breeding

season, before breeding behavior is exhibited and after the burrow is confirmed empty by site surveillance and/or scoping. The literature also indicates that when temporary or permanent burrow exclusion and/or burrow closure is implemented, burrowing owls should not be excluded from burrows unless or until:

- A Burrowing Owl Exclusion Plan (see Appendix E) is developed and approved by the applicable local DFG office;
- Permanent loss of occupied burrow(s) and habitat is mitigated in accordance with the Mitigating Impacts sections below. Temporary exclusion is mitigated in accordance with the item #1 under Mitigating Impacts below.
- Site monitoring is conducted prior to, during, and after exclusion of burrowing owls from their burrows sufficient to ensure take is avoided. Conduct daily monitoring for one week to confirm young of the year have fledged if the exclusion will occur immediately after the end of the breeding season.
- Excluded burrowing owls are documented using artificial or natural burrows on an adjoining mitigation site (if able to confirm by band re-sight).

Translocation (Active relocation offsite >100 meters). At this time, there is little published information regarding the efficacy of translocating burrowing owls, and additional research is needed to determine subsequent survival and breeding success (Klute et al. 2003, Holroyd et al. 2001). Study results for translocation in Florida implied that hatching success may be decreased for populations of burrowing owls that undergo translocation (Nixon 2006). At this time, the Department is unable to authorize the capture and relocation of burrowing owls except within the context of scientific research (FGC §1002) or a NCCP conservation strategy.

Mitigating impacts. Habitat loss and degradation from rapid urbanization of farmland in the core areas of the Central and Imperial valleys is the greatest of many threats to burrowing owls in California (Shuford and Gardali, 2008). At a minimum, if burrowing owls have been documented to occupy burrows (see Definitions, Appendix B) at the project site in recent years, the current scientific literature supports the conclusion that the site should be considered occupied and mitigation should be required by the CEQA lead agency to address project-specific significant and cumulative impacts. Other site-specific and regionally significant and cumulative impacts may warrant mitigation. The current scientific literature indicates the following to be best practices. If these best practices cannot be implemented, the lead agency or lead investigator may consult with the Department to develop effective mitigation alternatives. The Department is also available to assist in the identification of suitable mitigation lands.

1. Where habitat will be temporarily disturbed, restore the disturbed area to pre-project condition including decompacting soil and revegetating. Permanent habitat protection may be warranted if there is the potential that the temporary impacts may render a nesting site (nesting burrow and satellite burrows) unsustainable or unavailable depending on the time frame, resulting in reduced survival or abandonment. For the latter potential impact, see the permanent impact measures below.
2. Mitigate for permanent impacts to nesting, occupied and satellite burrows and/or burrowing owl habitat such that the habitat acreage, number of burrows and burrowing owls impacted are replaced based on the information provided in Appendix A. Note: A

minimum habitat replacement recommendation is not provided here as it has been shown to serve as a default, replacing any site-specific analysis and discounting the wide variation in natal area, home range, foraging area, and other factors influencing burrowing owls and burrowing owl population persistence in a particular area.

3. Mitigate for permanent impacts to nesting, occupied and satellite burrows and burrowing owl habitat with (a) permanent conservation of similar vegetation communities (grassland, scrublands, desert, urban, and agriculture) to provide for burrowing owl nesting, foraging, wintering, and dispersal (i.e., during breeding and non-breeding seasons) comparable to or better than that of the impact area, and (b) sufficiently large acreage, and presence of fossorial mammals. The mitigation lands may require habitat enhancements including enhancement or expansion of burrows for breeding, shelter and dispersal opportunity, and removal or control of population stressors. If the mitigation lands are located adjacent to the impacted burrow site, ensure the nearest neighbor artificial or natural burrow clusters are at least within 210 meters (Fisher et al. 2007).
4. Permanently protect mitigation land through a conservation easement deeded to a non-profit conservation organization or public agency with a conservation mission, for the purpose of conserving burrowing owl habitat and prohibiting activities incompatible with burrowing owl use. If the project is located within the service area of a Department-approved burrowing owl conservation bank, the project proponent may purchase available burrowing owl conservation bank credits.
5. Develop and implement a mitigation land management plan to address long-term ecological sustainability and maintenance of the site for burrowing owls (see Management Plan and Artificial Burrow sections below, if applicable).
6. Fund the maintenance and management of mitigation land through the establishment of a long-term funding mechanism such as an endowment.
7. Habitat should not be altered or destroyed, and burrowing owls should not be excluded from burrows, until mitigation lands have been legally secured, are managed for the benefit of burrowing owls according to Department-approved management, monitoring and reporting plans, and the endowment or other long-term funding mechanism is in place or security is provided until these measures are completed.
8. Mitigation lands should be on, adjacent or proximate to the impact site where possible and where habitat is sufficient to support burrowing owls present.
9. Where there is insufficient habitat on, adjacent to, or near project sites where burrowing owls will be excluded, acquire mitigation lands with burrowing owl habitat away from the project site. The selection of mitigation lands should then focus on consolidating and enlarging conservation areas located outside of urban and planned growth areas, within foraging distance of other conserved lands. If mitigation lands are not available adjacent to other conserved lands, increase the mitigation land acreage requirement to ensure a selected site is of sufficient size. Offsite mitigation may not adequately offset the biological and habitat values impacted on a one to one basis. Consult with the Department when determining offsite mitigation acreages.
10. Evaluate and select suitable mitigation lands based on a comparison of the habitat attributes of the impacted and conserved lands, including but not limited to: type and structure of habitat being impacted or conserved; density of burrowing owls in impacted and conserved habitat; and significance of impacted or conserved habitat to the species range-wide. Mitigate for the highest quality burrowing owl habitat impacted first and foremost when identifying mitigation lands, even if a mitigation site is located outside of

a lead agency's jurisdictional boundary, particularly if the lead agency is a city or special district.

11. Select mitigation lands taking into account the potential human and wildlife conflicts or incompatibility, including but not limited to, human foot and vehicle traffic, and predation by cats, loose dogs and urban-adapted wildlife, and incompatible species management (i.e., snowy plover).
12. Where a burrowing owl population appears to be highly adapted to heavily altered habitats such as golf courses, airports, athletic fields, and business complexes, permanently protecting the land, augmenting the site with artificial burrows, and enhancing and maintaining those areas may enhance sustainability of the burrowing owl population onsite. Maintenance includes keeping lands grazed or mowed with weed-eaters or push mowers, free from trees and shrubs, and preventing excessive human and human-related disturbance (e.g., walking, jogging, off-road activity, dog-walking) and loose and feral pets (chasing and, presumably, preying upon owls) that make the environment uninhabitable for burrowing owls (Wesemann and Rowe 1985, Millsap and Bear 2000, Lincer and Bloom 2007). Items 4, 5 and 6 also still apply to this mitigation approach.
13. If there are no other feasible mitigation options available and a lead agency is willing to establish and oversee a Burrowing Owl Mitigation and Conservation Fund that funds on a competitive basis acquisition and permanent habitat conservation, the project proponent may participate in the lead agency's program.

Artificial burrows. Artificial burrows have been used to replace natural burrows either temporarily or long-term and their long-term success is unclear. Artificial burrows may be an effective addition to in-perpetuity habitat mitigation if they are augmenting natural burrows, the burrows are regularly maintained (i.e., no less than annual, with biennial maintenance recommended), and surrounding habitat patches are carefully maintained. There may be some circumstances, for example at airports, where squirrels will not be allowed to persist and create a dynamic burrow system, where artificial burrows may provide some support to an owl population.

Many variables may contribute to the successful use of artificial burrows by burrowing owls, including pre-existence of burrowing owls in the area, availability of food, predators, surrounding vegetation and proximity, number of natural burrows in proximity, type of materials used to build the burrow, size of the burrow and entrance, direction in which the burrow entrance is facing, slope of the entrance, number of burrow entrances per burrow, depth of the burrow, type and height of perches, and annual maintenance needs (Belthoff and King 2002, Smith et al. 2005, Barclay et al. 2011). Refer to Barclay (2008) and (2011) and to Johnson et al. 2010 (unpublished report) for guidance on installing artificial burrows including recommendations for placement, installation and maintenance.

Any long-term reliance on artificial burrows as natural burrow replacements must include semi-annual to annual cleaning and maintenance and/or replacement (Barclay et al. 2011, Smith and Conway 2005, Alexander et al. 2005) as an ongoing management practice. Alexander et al. (2005), in a study of the use of artificial burrows found that all of 20 artificial burrows needed some annual cleaning and maintenance. Burrows were either excavated by predators, blocked by soil or vegetation, or experienced substrate erosion forming a space beneath the tubing that prevented nestlings from re-entering the burrow.

Mitigation lands management plan. Develop a Mitigation Lands Management Plan for projects that require off-site or on-site mitigation habitat protection to ensure compliance with and effectiveness of identified management actions for the mitigation lands. A suggested outline and related vegetation management goals and monitoring success criteria can be found in Appendix E.

Mitigation Monitoring and Reporting

Verify the compliance with required mitigation measures, the accuracy of predictions, and ensure the effectiveness of all mitigation measures for burrowing owls by conducting follow-up monitoring, and implementing midcourse corrections, if necessary, to protect burrowing owls. Refer to CEQA Guidelines Section 15097 and the CEQA Guidelines for additional guidance on mitigation, monitoring and reporting. Monitoring is qualitatively different from site surveillance; monitoring normally has a specific purpose and its outputs and outcomes will usually allow a comparison with some baseline condition of the site before the mitigation (including avoidance and minimization) was undertaken. Ideally, monitoring should be based on the Before-After Control-Impact (BACI) principle (McDonald et al. 2000) that requires knowledge of the pre-mitigation state to provide a reference point for the state and change in state after the project and mitigation have been implemented.

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Appendix A. Burrowing Owl Natural History and Threats

Diet

Burrowing owl diet includes arthropods, small rodents, birds, amphibians, reptiles, and carrion (Haug et al. 1993).

Breeding

In California, the breeding season for the burrowing owl typically occurs between 1 February and 31 August although breeding in December has been documented (Thompson 1971, Gervais et al. 2008); breeding behavior includes nest site selection by the male, pair formation, copulation, egg laying, hatching, fledging, and post-fledging care of young by the parents. The peak of the breeding season occurs between 15 April and 15 July and is the period when most burrowing owls have active nests (eggs or young). The incubation period lasts 29 days (Coulombe 1971) and young fledge after 44 days (Haug et al. 1993). Note that the timing of nesting activities may vary with latitude and climatic conditions. Burrowing owls may change burrows several times during the breeding season, starting when nestlings are about three weeks old (Haug et al. 1993).

Dispersal

The following discussion is an excerpt from Gervais et al (2008):

> "The burrowing owl is often considered a sedentary species (e.g., Thomsen 1971). A large proportion of adults show strong fidelity to their nest site from year to year, especially where resident, as in Florida (74% for females, 83% for males; Millsap and Bear 1997). In California, nest-site fidelity rates were 32%–50% in a large grassland and 57% in an agricultural environment (Ronan 2002, Catlin 2004, Catlin et al. 2005). Differences in these rates among sites may reflect differences in nest predation rates (Catlin 2004, Catlin et al. 2005). Despite the high nest fidelity rates, dispersal distances may be considerable for both juveniles (natal dispersal) and adults (postbreeding dispersal), but this also varied with location (Catlin 2004, Rosier et al. 2006). Distances of 53 km to roughly 150 km have been observed in California for adult and natal dispersal, respectively (D. K. Rosenberg and J. A. Gervais, unpublished data), despite the difficulty in detecting movements beyond the immediate study area (Koenig et al. 1996)."

Habitat

The burrowing owl is a small, long-legged, ground-dwelling bird species, well-adapted to open, relatively flat expanses. In California, preferred habitat is generally typified by short, sparse vegetation with few shrubs, level to gentle topography and well-drained soils (Haug et al. 1993). Grassland, shrub steppe, and desert are naturally occurring habitat types used by the species. In addition, burrowing owls may occur in some agricultural areas, ruderal grassy fields, vacant lots and pastures if the vegetation structure is suitable and there are useable burrows and foraging habitat in proximity (Gervais et al 2008). Unique amongst North

American raptors, the burrowing owl requires underground burrows or other cavities for nesting during the breeding season and for roosting and cover, year round. Burrows used by the owls are usually dug by other species termed host burrowers. In California, California ground squirrel (*Spermophilus beecheyi*) and round-tailed ground squirrel (*Citellus tereticaudus*) burrows are frequently used by burrowing owls but they may use dens or holes dug by other fossorial species including badger (*Taxidea taxus*), coyote (*Canis latrans*), and fox (e.g., San Joaquin kit fox, *Vulpes macrotis mutica*; Ronan 2002). In some instances, owls have been known to excavate their own burrows (Thompson 1971, Barclay 2007). Natural rock cavities, debris piles, culverts, and pipes also are used for nesting and roosting (Rosenberg et al. 1998). Burrowing owls have been documented using artificial burrows for nesting and cover (Smith and Belthoff, 2003).

Foraging habitat. Foraging habitat is essential to burrowing owls. The following discussion is an excerpt from Gervais et al. (2008):

> "Useful as a rough guide to evaluating project impacts and appropriate mitigation for burrowing owls, adult male burrowing owls home ranges have been documented (calculated by minimum convex polygon) to comprise anywhere from 280 acres in intensively irrigated agroecosystems in Imperial Valley (Rosenberg and Haley 2004) to 450 acres in mixed agricultural lands at Lemoore Naval Air Station, CA (Gervais et al. 2003), to 600 acres in pasture in Saskatchewan, Canada (Haug and Oliphant 1990). But owl home ranges may be much larger, perhaps by an order of magnitude, in non-irrigated grasslands such as at Carrizo Plain, California (Gervais et al. 2008), based on telemetry studies and distribution of nests. Foraging occurs primarily within 600 m of their nests (within approximately 300 acres, based on a circle with a 600 m radius) during the breeding season."

Importance of burrows and adjacent habitat. Burrows and the associated surrounding habitat are essential ecological requisites for burrowing owls throughout the year and especially during the breeding season. During the non-breeding season, burrowing owls remain closely associated with burrows, as they continue to use them as refuge from predators, shelter from weather and roost sites. Resident populations will remain near the previous season's nest burrow at least some of the time (Coulombe 1971, Thomsen 1971, Botelho 1996, LaFever et al. 2008).

In a study by Lutz and Plumpton (1999) adult males and females nested in formerly used sites at similar rates (75% and 63%, respectively) (Lutz and Plumpton 1999). Burrow fidelity has been reported in some areas; however, more frequently, burrowing owls reuse traditional nesting areas without necessarily using the same burrow (Haug et al. 1993, Dechant et al. 1999). Burrow and nest sites are re-used at a higher rate if the burrowing owl has reproduced successfully during the previous year (Haug et al. 1993) and if the number of burrows isn't limiting nesting opportunity.

Burrowing owls may use "satellite" or non-nesting burrows, moving young at 10-14 days, presumably to reduce risk of predation (Desmond and Savidge 1998) and possibly to avoid nest parasites (Dechant et al. 1999). Successful nests in Nebraska had more active satellite burrows within 75 m of the nest burrow than unsuccessful nests (Desmond and Savidge

1999). Several studies have documented the number of satellite burrows used by young and adult burrowing owls during the breeding season as between one and 11 burrows with an average use of approximately five burrows (Thompsen 1984, Haug 1985, Haug and Oliphant 1990). Supporting the notion of selecting for nest sites near potential satellite burrows, Ronan (2002) found burrowing owl families would move away from a nest site if their satellite burrows were experimentally removed through blocking their entrance.

Habitat adjacent to burrows has been documented to be important to burrowing owls. Gervais et al. (2003) found that home range sizes of male burrowing owls during the nesting season were highly variable within but not between years. Their results also suggested that owls concentrate foraging efforts within 600 meters of the nest burrow, as was observed in Canada (Haug and Oliphant 1990) and southern California (Rosenberg and Haley 2004). James et al. (1997), reported habitat modification factors causing local burrowing owl declines included habitat fragmentation and loss of connectivity.

In conclusion, the best available science indicates that essential habitat for the burrowing owl in California must include suitable year-round habitat, primarily for breeding, foraging, wintering and dispersal habitat consisting of short or sparse vegetation (at least at some time of year), presence of burrows, burrow surrogates or presence of fossorial mammal dens, well-drained soils, and abundant and available prey within close proximity to the burrow.

Threats to Burrowing Owls in California

Habitat loss. Habitat loss, degradation, and fragmentation are the greatest threats to burrowing owls in California. According to DeSante et al. (2007), “the vast majority of burrowing owls [now] occur in the wide, flat lowland valleys and basins of the Imperial Valley and Great Central Valley [where] for the most part,...the highest rates of residential and commercial development in California are occurring.” Habitat loss from the State’s long history of urbanization in coastal counties has already resulted in either extirpation or drastic reduction of burrowing owl populations there (Gervais et al. 2008). Further, loss of agricultural and other open lands (such as grazed landscapes) also negatively affect owl populations. Because of their need for open habitat with low vegetation, burrowing owls are unlikely to persist in agricultural lands dominated by vineyards and orchards (Gervais et al. 2008).

Control of burrowing rodents. According to Klute et al. (2003), the elimination of burrowing rodents through control programs is a primary factor in the recent and historical decline of burrowing owl populations nationwide. In California, ground squirrel burrows are most often used by burrowing owls for nesting and cover; thus, ground squirrel control programs may affect owl numbers in local areas by eliminating a necessary resource.

Direct mortality. Burrowing owls suffer direct losses from a number of sources. Vehicle collisions are a significant source of mortality especially in the urban interface and where owls nest alongside roads (Haug et al. 1993, Gervais et al. 2008). Road and ditch maintenance, modification of water conveyance structures (Imperial Valley) and discing to control weeds in fallow fields may destroy burrows (Rosenberg and Haley 2004, Catlin and Rosenberg 2006) which may trap or crush owls. Wind turbines at Altamont Pass Wind Resource Area are known to cause direct burrowing owl mortality (Thelander et al. 2003). Exposure to

pesticides may pose a threat to the species but is poorly understood (Klute et al. 2003, Gervais et al. 2008).

Appendix B. Definitions

Some key terms that appear in this document are defined below.

Adjacent habitat means burrowing owl habitat that abuts the area where habitat and burrows will be impacted and rendered non-suitable for occupancy.

Breeding (nesting) season begins as early as 1 February and continues through 31 August (Thomsen 1971, Zarn 1974). The timing of breeding activities may vary with latitude and climatic conditions. The breeding season includes pairing, egg-laying and incubation, and nestling and fledging stages.

Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls or permanently exclude burrowing owls and excavate and close burrows after confirming burrows are empty.

Burrowing owl habitat generally includes, but is not limited to, short or sparse vegetation (at least at some time of year), presence of burrows, burrow surrogates or presence of fossorial mammal dens, well-drained soils, and abundant and available prey.

Burrow surrogates include culverts, piles of concrete rubble, piles of soil, burrows created along soft banks of ditches and canals, pipes, and similar structures.

Civil twilight - Morning civil twilight begins when the geometric center of the sun is 6 degrees below the horizon (civil dawn) and ends at sunrise. Evening civil twilight begins at sunset and ends when the geometric center of the sun reaches 6 degrees below the horizon (civil dusk). During this period there is enough light from the sun that artificial sources of light may not be needed to carry on outdoor activities. This concept is sometimes enshrined in laws, for example, when drivers of automobiles must turn on their headlights (called lighting-up time in the UK); when pilots may exercise the rights to fly aircraft. Civil twilight can also be described as the limit at which twilight illumination is sufficient, under clear weather conditions, for terrestrial objects to be clearly distinguished; at the beginning of morning civil twilight, or end of evening civil twilight, the horizon is clearly defined and the brightest stars are visible under clear atmospheric conditions.

Conservation for burrowing owls may include but may not be limited to protecting remaining breeding pairs or providing for population expansion, protecting and enhancing breeding and essential habitat, and amending or augmenting land use plans to stabilize populations and other specific actions to avoid the need to list the species pursuant to California or federal Endangered Species Acts.

Contiguous means connected together so as to form an uninterrupted expanse in space.

Essential habitat includes nesting, foraging, wintering, and dispersal habitat.

Foraging habitat is habitat within the estimated home range of an occupied burrow, supports suitable prey base, and allows for effective hunting.

Host burrowers include ground squirrels, badgers, foxes, coyotes, gophers etc.

Locally significant species is a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region (CEQA §15125 (c)) or is so designated in local or regional plans, policies, or ordinances (CEQA Guidelines, Appendix G). Examples include a species at the outer limits of its known range or occurring in a unique habitat type.

Non-breeding season is the period of time when nesting activity is not occurring, generally September 1 through January 31, but may vary with latitude and climatic conditions.

Occupied site or occupancy means a site that is assumed occupied if at least one burrowing owl has been observed occupying a burrow within the last three years (Rich 1984). Occupancy of suitable burrowing owl habitat may also be indicated by owl sign including its molted feathers, cast pellets, prey remains, eggshell fragments, or excrement at or near a burrow entrance or perch site.

Other impacting activities may include but may not be limited to agricultural practices, vegetation management and fire control, pest management, conversion of habitat from rangeland or natural lands to more intensive agricultural uses that could result in “take”. These impacting activities may not meet the definition of a project under CEQA.

Passive relocation is a technique of installing one-way doors in burrow openings to temporarily or permanently evict burrowing owls and prevent burrow re-occupation.

Peak of the breeding season is between 15 April and 15 July.

Sign includes its tracks, molted feathers, cast pellets (defined as 1-2” long brown to black regurgitated pellets consisting of non-digestible portions of the owls’ diet, such as fur, bones, claws, beetle elytra, or feathers), prey remains, egg shell fragments, owl white wash, nest burrow decoration materials (e.g., paper, foil, plastic items, livestock or other animal manure, etc.), possible owl perches, or other items.

Appendix C. Habitat Assessment and Reporting Details

Habitat Assessment Data Collection and Reporting

Current scientific literature indicates that it would be most effective to gather the data in the manner described below when conducting project scoping, conducting a habitat assessment site visit and preparing a habitat assessment report:

1. Conduct at least one visit covering the entire potential project/activity area including areas that will be directly or indirectly impacted by the project. Survey adjoining areas within 150 m (Thomsen 1971, Martin 1973), or more where direct or indirect effects could potentially extend offsite. If lawful access cannot be achieved to adjacent areas, surveys can be performed with a spotting scope or other methods.
2. Prior to the site visit, compile relevant biological information for the site and surrounding area to provide a local and regional context.
3. Check all available sources for burrowing owl occurrence information regionally prior to a field inspection. The CNDDB and BIOS (see References cited) may be consulted for known occurrences of burrowing owls. Other sources of information include, but are not limited to, the Proceedings of the California Burrowing Owl Symposium (Barclay et al. 2007), county bird atlas projects, Breeding Bird Survey records, eBIRD (http://ebird.org), Gervais et al. (2008), local reports or experts, museum records, and other site-specific relevant information.
4. Identify vegetation and habitat types potentially supporting burrowing owls in the project area and vicinity.
5. Record and report on the following information:
   a. A full description of the proposed project, including but not limited to, expected work periods, daily work schedules, equipment used, activities performed (such as drilling, construction, excavation, etc.) and whether the expected activities will vary in location or intensity over the project's timeline;
   b. A regional setting map, showing the general project location relative to major roads and other recognizable features;
   c. A detailed map (preferably a USGS topo 7.5' quad base map) of the site and proposed project, including the footprint of proposed land and/or vegetation-altering activities, base map source, identifying topography, landscape features, a north arrow, bar scale, and legend;
   d. A written description of the biological setting, including location (Section, Township, Range, baseline and meridian), acreage, topography, soils, geographic and hydrologic characteristics, land use and management history on and adjoining the site (i.e., whether it is urban, semi-urban or rural; whether there is any evidence of past or current livestock grazing, mowing, disking, or other vegetation management activities);
   e. An analysis of any relevant, historical information concerning burrowing owl use or occupancy (breeding, foraging, over-wintering) on site or in the assessment area;
   f. Vegetation type and structure (using Sawyer et al. 2009), vegetation height, habitat types and features in the surrounding area plus a reasonably sized (as supported with logical justification) assessment area; (Note: use caution in discounting habitat based on grass height as it can be a temporary condition variable by season and conditions (such as current grazing regime) or may be distributed as a mosaic).

g. The presence of burrowing owl individuals or pairs or sign (see Appendix B);
h. The presence of suitable burrows and/or burrow surrogates (>11 cm in diameter (height and width) and >150 cm in depth) (Johnson et al. 2010), regardless of a lack of any burrowing owl sign and/or burrow surrogates; and burrowing owls and/or their sign that have recently or historically (within the last 3 years) been identified on or adjacent to the site.

Appendix D. Breeding and Non-breeding Season Surveys and Reports

Current scientific literature indicates that it is most effective to conduct breeding and non-breeding season surveys and report in the manner that follows:

Breeding Season Surveys

Number of visits and timing. Conduct 4 survey visits: 1) at least one site visit between 15 February and 15 April, and 2) a minimum of three survey visits, at least three weeks apart, between 15 April and 15 July, with at least one visit after 15 June. Note: many burrowing owl migrants are still present in southwestern California during mid-March, therefore, exercise caution in assuming breeding occupancy early in the breeding season.

Survey method. Rosenberg et al. (2007) confirmed walking line transects were most effective in smaller habitat patches. Conduct surveys in all portions of the project site that were identified in the Habitat Assessment and fit the description of habitat in Appendix A. Conduct surveys by walking straight-line transects spaced 7 m to 20 m apart, adjusting for vegetation height and density (Rosenberg et al. 2007). At the start of each transect and, at least, every 100 m, scan the entire visible project area for burrowing owls using binoculars. During walking surveys, record all potential burrows used by burrowing owls as determined by the presence of one or more burrowing owls, pellets, prey remains, whitewash, or decoration. Some burrowing owls may be detected by their calls, so observers should also listen for burrowing owls while conducting the survey.

Care should be taken to minimize disturbance near occupied burrows during all seasons and not to “flush” burrowing owls especially if predators are present to reduce any potential for needless energy expenditure or burrowing owl mortality. Burrowing owls may flush if approached by pedestrians within 50 m (Conway et al. 2003). If raptors or other predators are present that may suppress burrowing owl activity, return at another time or later date for a follow-up survey.

Check all burrowing owls detected for bands and/or color bands and report band combinations to the Bird Banding Laboratory (BBL). Some site-specific variations to survey methods discussed below may be developed in coordination with species experts and Department staff.

Weather conditions. Poor weather may affect the surveyor’s ability to detect burrowing owls, therefore, avoid conducting surveys when wind speed is >20 km/hr, and there is precipitation or dense fog. Surveys have greater detection probability if conducted when ambient temperatures are >20º C, <12 km/hr winds, and cloud cover is <75% (Conway et al. 2008).

Time of day. Daily timing of surveys varies according to the literature, latitude, and survey method. However, surveys between morning civil twilight and 10:00 AM and two hours before sunset until evening civil twilight provide the highest detection probabilities (Barclay pers. comm. 2012, Conway et al. 2008).

Alternate methods. If the project site is large enough to warrant an alternate method, consult current literature for generally accepted survey methods and consult with the Department on the proposed survey approach.

Additional breeding season site visits. Additional breeding season site visits may be necessary, especially if non-breeding season exclusion methods are contemplated. Detailed information, such as approximate home ranges of each individual or of family units, as well as foraging areas as related to the proposed project, will be important to document for evaluating impacts, planning avoidance measure implementation and for mitigation measure performance monitoring.

Adverse conditions may prevent investigators from determining presence or occupancy. Disease, predation, drought, high rainfall or site disturbance may preclude presence of burrowing owls in any given year. Any such conditions should be identified and discussed in the survey report. Visits to the site in more than one year may increase the likelihood of detection. Also, visits to adjacent known occupied habitat may help determine appropriate survey timing.

Given the high site fidelity shown by burrowing owls (see Appendix A, Importance of burrows), conducting surveys over several years may be necessary when project activities are ongoing, occur annually, or start and stop seasonally. (See Negative surveys).

Non-breeding Season Surveys

If conducting non-breeding season surveys, follow the methods described above for breeding season surveys, but conduct at least four (4) visits, spread evenly, throughout the non-breeding season. Burrowing owl experts and local Department staff are available to assist with interpreting results.

Negative Surveys

Adverse conditions may prevent investigators from documenting presence or occupancy. Disease, predation, drought, high rainfall or site disturbance may preclude presence of burrowing owl in any given year. Discuss such conditions in the Survey Report. Visits to the site in more than one year increase the likelihood of detection and failure to locate burrowing owls during one field season does not constitute evidence that the site is no longer occupied, particularly if adverse conditions influenced the survey results. Visits to other nearby known occupied sites can affirm whether the survey timing is appropriate.

Take Avoidance Surveys

Field experience from 1995 to present supports the conclusion that it would be effective to complete an initial take avoidance survey no less than 14 days prior to initiating ground disturbance activities using the recommended methods described in the Detection Surveys section above. Implementation of avoidance and minimization measures would be triggered by positive owl presence on the site where project activities will occur. The development of avoidance and minimization approaches would be informed by monitoring the burrowing owls.

Burrowing owls may re-colonize a site after only a few days. Time lapses between project activities trigger subsequent take avoidance surveys including but not limited to a final survey conducted within 24 hours prior to ground disturbance.

Survey Reports

Report on the survey methods used and results including the information described in the Summary Report and include the reports within the CEQA documentation:

1. Date, start and end time of surveys including weather conditions (ambient temperature, wind speed, percent cloud cover, precipitation and visibility);
2. Name(s) of surveyor(s) and qualifications;
3. A discussion of how the timing of the survey affected the comprehensiveness and detection probability;
4. A description of survey methods used including transect spacing, point count dispersal and duration, and any calls used;
5. A description and justification of the area surveyed relative to the project area;
6. A description that includes: number of owls or nesting pairs at each location (by nestlings, juveniles, adults, and those of an unknown age), number of burrows being used by owls, and burrowing owl sign at burrows. Include a description of individual markers, such as bands (numbers and colors), transmitters, or unique natural identifying features. If any owls are banded, request documentation from the BBL and bander to report on the details regarding the known history of the banded burrowing owl(s) (age, sex, origins, whether it was previously relocated) and provide with the report if available;
7. A description of the behavior of burrowing owls during the surveys, including feeding, resting, courtship, alarm, territorial defense, and those indicative of parents or juveniles;
8. A list of possible burrowing owl predators present and documentation of any evidence of predation of owls;
9. A detailed map (1:24,000 or closer to show details) showing locations of all burrowing owls, potential burrows, occupied burrows, areas of concentrated burrows, and burrowing owl sign. Locations documented by use of global positioning system (GPS) coordinates must include the datum in which they were collected. The map should include a title, north arrow, bar scale and legend;
10. Signed field forms, photos, etc., as appendices to the field survey report;
11. Recent color photographs of the proposed project or activity site; and
12. Original CNDDB Field Survey Forms should be sent directly to the Department's CNDDB office, and copies should be included in the environmental document as an appendix. (http://www.dfg.ca.gov/bdb/html/cnddb.html).

Appendix E. Example Components for Burrowing Owl Artificial Burrow and Exclusion Plans

Whereas the Department does not recommend exclusion and burrow closure, current scientific literature and experience from 1995 to present, indicate that the following example components for burrowing owl artificial burrow and exclusion plans, combined with consultation with the Department to further develop these plans, would be effective.

Artificial Burrow Location

If a burrow is confirmed occupied on-site, artificial burrow locations should be appropriately located and their use should be documented taking into consideration:

1. A brief description of the project and project site pre-construction;
2. The mitigation measures that will be implemented;
3. Potential conflicting site uses or encumbrances;
4. A comparison of the occupied burrow site(s) and the artificial burrow site(s) (e.g., vegetation, habitat types, fossorial species use in the area, and other features);
5. Artificial burrow(s) proximity to the project activities, roads and drainages;
6. Artificial burrow(s) proximity to other burrows and entrance exposure;
7. Photographs of the site of the occupied burrow(s) and the artificial burrows;
8. Map of the project area that identifies the burrow(s) to be excluded as well as the proposed sites for the artificial burrows;
9. A brief description of the artificial burrow design;
10. Description of the monitoring that will take place during and after project implementation including information that will be provided in a monitoring report.
11. A description of the frequency and type of burrow maintenance.

Exclusion Plan

An Exclusion Plan addresses the following including but not limited to:

1. Confirm by site surveillance that the burrow(s) is empty of burrowing owls and other species preceding burrow scoping;
2. Type of scope and appropriate timing of scoping to avoid impacts;
3. Occupancy factors to look for and what will guide determination of vacancy and excavation timing (one-way doors should be left in place 48 hours to ensure burrowing owls have left the burrow before excavation, visited twice daily and monitored for evidence that owls are inside and can't escape i.e., look for sign immediately inside the door).
4. How the burrow(s) will be excavated. Excavation using hand tools with refilling to prevent reoccupation is preferable whenever possible (may include using piping to stabilize the burrow to prevent collapsing until the entire burrow has been excavated and it can be determined that no owls reside inside the burrow);
5. Removal of other potential owl burrow surrogates or refugia on site;
6. Photographing the excavation and closure of the burrow to demonstrate success and sufficiency;

7. Monitoring of the site to evaluate success and, if needed, to implement remedial measures to prevent subsequent owl use to avoid take;
8. How the impacted site will continually be made inhospitable to burrowing owls and fossorial mammals (e.g., by allowing vegetation to grow tall, heavy disking, or immediate and continuous grading) until development is complete.

Appendix F. Mitigation Management Plan and Vegetation Management Goals

Mitigation Management Plan

A mitigation site management plan will help ensure the appropriate implementation and maintenance for the mitigation site and persistence of the burrowing owls on the site. For an example to review, refer to Rosenberg et al. (2009). The current scientific literature and field experience from 1995 to present indicate that an effective management plan includes the following:

1. Mitigation objectives;
2. Site selection factors (including a comparison of the attributes of the impacted and conserved lands) and baseline assessment;
3. Enhancement of the conserved lands (enhancement of reproductive capacity, enhancement of breeding areas and dispersal opportunities, and removal or control of population stressors);
4. Site protection method and prohibited uses;
5. Site manager roles and responsibilities;
6. Habitat management goals and objectives:
    a. Vegetation management goals,
        i. Vegetation management tools:
            1. Grazing
            2. Mowing
            3. Burning
            4. Other
    b. Management of ground squirrels and other fossorial mammals,
    c. Semi-annual and annual artificial burrow cleaning and maintenance,
    d. Non-natives control – weeds and wildlife,
    e. Trash removal;
7. Financial assurances:
    a. Property analysis record or other financial analysis to determine long-term management funding,
    b. Funding schedule;
8. Performance standards and success criteria;
9. Monitoring, surveys and adaptive management;
10. Maps;
11. Annual reports.

Vegetation Management Goals

- Manage vegetation height and density (especially in immediate proximity to burrows). Suitable vegetation structure varies across sites and vegetation types, but should generally be at the average effective vegetation height of 4.7 cm (Green and Anthony 1989) and <13 cm average effective vegetation height (MacCracken et al. 1985*a)*.
- Employ experimental prescribed fires (controlled, at a small scale) to manage vegetation structure;

- Vegetation reduction or ground disturbance timing, extent, and configuration should avoid take. While local ordinances may require fire prevention through vegetation management, activities like disking, mowing, and grading during the breeding season can result in take of burrowing owls and collapse of burrows, causing nest destruction. Consult the take avoidance surveys section above for pre-management avoidance survey recommendations;
- Promote natural prey distribution and abundance, especially in proximity to occupied burrows; and
- Promote self-sustaining populations of host burrowers by limiting or prohibiting lethal rodent control measures and by ensuring food availability for host burrowers through vegetation management.

Refer to Rosenberg et al. (2009) for a good discussion of managing grasslands for burrowing owls.

Mitigation Site Success Criteria

In order to evaluate the success of mitigation and management strategies for burrowing owls, monitoring is required that is specific to the burrowing owl management plan. Given limited resources, Barclay et al. (2011) suggests managers focus on accurately estimating annual adult owl populations rather than devoting time to estimating reproduction, which shows high annual variation and is difficult to accurately estimate. Therefore, the key objective will be to determine accurately the number of adult burrowing owls and pairs, and if the numbers are maintained. A frequency of 5-10 years for surveys to estimate population size may suffice if there are no changes in the management of the nesting and foraging habitat of the owls.

Effective monitoring and evaluation of off-site and on-site mitigation management success for burrowing owls includes (Barclay, pers. comm.):

- Site tenacity;
- Number of adult owls present and reproducing;
- Colonization by burrowing owls from elsewhere (by band re-sight);
- Evidence and causes of mortality;
- Changes in distribution; and
- Trends in stressors.

Appendix I. California Bat Mitigation Techniques, Solutions, and Effectiveness

CALIFORNIA BAT MITIGATION TECHNIQUES, SOLUTIONS, AND EFFECTIVENESS

Prepared by:

H. T. Harvey & Associates
Dave Johnston, Ph.D.

with

Greg Tatarian
Wildlife Research Associates
Santa Rosa, CA

and

Elizabeth Pierson, Ph.D., Consultant
Berkeley, CA

Prepared for:

California Department of Transportation (Caltrans)
Office of Biological Studies and Technical Assistance
Sacramento, California

and

Gene R. Trapp, Ph.D., Coordinator
Professor Emeritus
California State University Sacramento Foundation
6000 J Street
Sacramento, California

December 29, 2004

Project Number 2394-01

TABLE OF CONTENTS

FIGURES:

TABLES:

APPENDICES:

1.0 INTRODUCTION

The purpose of this project is to provide a critical review of mitigation options for bats in relation to Caltrans projects. This work has been administered through California State University Sacramento (CSUS), and conducted in cooperation with California Department of Transportation (Caltrans), California Department of Fish & Game (DFG), University of California, and private researchers.

This report has, therefore, been developed to provide Caltrans with the most effective possible mitigation strategies for the bats of California when maintenance of construction activities could potentially reduce, eliminate, or compromise bat populations and their habitats. Current laws protecting bats are discussed, and these laws form the foundation of mitigations. Because collective experience is far more valuable in developing guidelines for mitigation strategies, many persons were interviewed and many projects that included bat mitigations were reviewed. Data from twenty California bridges that recently mitigated for impacts to bats and bat habitat is incorporated into a table providing information about successful, and not so successful, mitigations. Thus, any conclusions about the effectiveness of mitigations would draw on the largest possible pool of knowledge. We also provide the details of nine case studies in the hope that these examples will help readers learn from the successes and failures of specific projects (Appendices A to I). The literature review also includes many other guidelines and examples that are searchable through EndNote, enabling the reader to search for specific species and situations. This document builds on, and should be considered a companion to, the Caltrans technical report, Bats and Bridges Technical Bulletin (Erickson 2003).

2.0 PROJECT GOALS

Part of the intent of this report is to incorporate this document into the transportation-related component of the California Bat Conservation Strategy currently being developed as part of the California Comprehensive Wildlife Plan. The intended outcome will facilitate communication between Caltrans and the Department of Fish and Game (DFG), consistent with the cooperative approach outlined in the 1991 MOU between the two agencies.

We approached this project with four goals in mind:

1. provide a synthesis of existing information regarding bats and mitigation efforts worldwide and throughout the United States, but with a particular focus on transportation issues in California;

2. evaluate a range of mitigation alternatives and their relative effectiveness in California;

3. provide mitigation guidelines for bats as they apply to Caltrans projects;

4. develop the transportation related components of the California Bat Conservation Strategy.

The first three goals are addressed in this document. Because the California Bat Conservation Strategy is still in an early phase of development, the transportation related component must necessarily be incorporated at a later stage, but will be largely an extrapolation from this document.

3.0 CONSERVATION STATUS OF BATS

3.1 CONTEXT

The California Department of Transportation is one of the largest property managers in California. Their property includes tens of thousands of miles of state and interstate highways, as well as associated structures, buildings, right-of-way easements, and connected parcels. The highway system crosses and interacts with nearly every bioregion and habitat type in California, a state containing some of the richest diversity of species and ecosystems in the nation.

Maintenance, rehabilitation, and improvements to California's transportation infrastructure are ongoing. Caltrans and other transportation agencies plan, design, and supervise changes to hundreds of miles of roads, railroads, and other transportation subsystems. They also team with other federal, state, and local agencies involved in infrastructure planning and repair, such as those involving bridges.

Bats often use many of the structures, buildings, mines, bridges, and surrounding habitats associated with these projects. Although our understanding of the ecological requirements of bats is far from complete, enough data are now available to generate predictions about those requirements and plan mitigation strategies that have a high probability of success.

3.2 MITIGATION FOR BATS: AN OVERVIEW AND INTRODUCTION TO THE URL SITES TABLE AND THE ENDNOTE LIBRARY

California has twenty-five bat species, eighteen of which are rare and/or considered Species of Special Concern by Department of Fish and Game, Species of Concern by the U.S. Fish and Wildlife Service or Sensitive by the U.S. Forest Service. All of these species are known to have behavioral and ecological interactions with the transportation system, and are potentially affected by transportation related projects.

As a part of this section, a library of references has been compiled, both as a searchable electronic library (EndNote) of specific pieces of literature relating to bat mitigation (Appendix J) and as a table of URL sites (Appendix K). The EndNote library is printed out as a table, but the usefulness of this program is not as a table to browse information, but rather, to be able to search for a specific keyword. For this particular electronic library, there are 10 fields (e.g., author, title, species, habitat, etc.) that can be used for searches. Information most germane to this report is incorporated in various parts of the text (e.g., Franklin Boulevard Bridge and Causeway bat mitigation project [a project not designed or affiliated with Caltrans] is referred to several times in this report). On the other hand, those references that are not particularly germane to bat mitigation measures associated with highway systems in California (e.g., a gift of 420,000 sterling pounds for the renovation of a 16th century English barn for the barbestelle [*Barbestella barbastellus*]) are included in the EndNote library of bat mitigation references but are not included anywhere else in this report. Therefore, there is no separate synthesis of the EndNote references because this would not necessarily provide the reader with particularly useful information.

All of the URL sites in the table are included in the EndNote library. However, the table provides the reader with a means to browse through comments and summaries before selecting a particular URL site for more information. The EndNote has some references, such as hard copy articles and books, which are not included in the table of URL sites.

In recent years there has been an increasing recognition of the importance to bats of transportation related structures and habitats as detailed in the references titled Bats and Bridges Technical Bulletin (Erickson 2003). As a result, an increasing number of projects have required mitigation. However, there has been no central repository of information regarding bat mitigation efforts, and little attempt to evaluate and track their collective effectiveness. Johnston (1999) suggested there are few guidelines addressing what situations should trigger mitigation, and what mitigation measures are appropriate. Furthermore, more information about the status of some populations and natural history aspects of some bat species is needed to develop the best possible mitigation strategies (Johnston 1999). While this document is not intended as a training manual, it is a first step toward compiling a database of mitigation efforts for bats, and offers a number of case studies to illustrate some measures that appear to work, and others that require further experimentation and research.

Proposed mitigation should be consistent with the impact that is being mitigated. Most typically, this impact involves the alteration or loss of a roosting site. In general, the closer the mitigation action comes to providing replacement habitat for that which is lost the more likely it is to be successful. This means that on-site and in-kind solutions have the highest probability of success. While experimental roost designs require further exploration, off-site solutions need to offer habitat conditions comparable to on-site roosts. In the case of bridges, caves and mines, replacement roosts should have comprable thermal stability and durability, the same or similar search image, and the same cryptic roosting conditions as those roosts they replace.

Bat houses in common use, even the largest "condominium" style, are generally made of wood. Consequently they lack durability and require ongoing, and sometimes costly, maintenance. Some medium and smaller-sized bat houses are being made of synthetic materials or wood coated in stucco, epoxy or other materials, but the performance of these materials is not proven, and known drawbacks exist for several of these alternative materials.

When mounted on poles, or even on other structures, bat houses are quite visible, which can make them a public nuisance or target for vandalism. Important from a biological viewpoint, they may not provide the same temperatures, or may not offer the same thermal buffering as large concrete structures like bridges, or subterranean habitat like caves and mines. These thermal limitations of bat houses can result in lack of, or reduced, occupancy by bats. Experimental designs incorporating bat habitat into structures without compromising structural integrity and designs offering off-structure habitat with all the required roost parameters are needed. Off-structure designs would almost certainly have to be far more substantial than those that have been most commonly attempted in the past.

Projects typically involve a fairly small site – *e.g.*, maintenance, alteration, or replacement of a bridge. In these cases, mitigation strategies have typically and appropriately focused primarily on the structure and whatever surrounding habitat is defined as being contained within the project boundaries. This approach is necessary but not sufficient, because it does not account for the regional importance of the site to the particular species in question. Specifically, what mitigation is appropriate, and how

extensive these measures need to be, depends to some degree on the regional significance of the bat population located at the project site. Many North American vespertilionids have commuting distances of several kilometers or less between roosts and foraging areas (Brigham et al. 1997, Kunz and Lumsden 2003). However, recent radiotelemetry studies suggest a number of bat species, even in the absence of disturbance, can have home ranges of > 20 kilometers (Barclay 1989, Pierson 1998). Thus, the standard used in a number of recent transportation projects has been to survey bridges within a 25 km radius of a project site (Johnston 2004, Pierson 2000, Pierson and Rainey 2002, Pierson and Rainey 2004, Pierson et al. 2004). This approach has been used whether or not the target site is a bridge, because bridges offer a convenient and time efficient method for surveying a number of species (Pierson et al. 1996). This serves the dual purpose of identifying potential alternate habitat for a population, and offering some perspective on the regional significance of the target population – *e.g.*, whether it is the only colony of this species within the 25 km radius.

4.0 BATS AND TRANSPORTATION RELATED STRUCTURES

4.1 RELEVANT BIOLOGICAL AND ECOLOGICAL FACTORS

There are several features of bat biology and ecology that distinguish this group of small mammals that need to be considered when evaluating potential impacts to bat populations from human-related activities.

One significant factor is the tendency for many species of bats to aggregate in colonies – hibernating colonies in the winter and maternity colonies, composed of adult females and their young, from spring through early fall. Typical colony size varies from species to species. A few species form small colonies or are non-colonial, but most aggregate, with a few species forming large colonies (from several hundred to many thousand). The patterns of colony formation need to be considered when evaluating impacts, because the entire population for a large area may be concentrated in a single roost.

Additionally, bats are unusual for small mammals in that they are long-lived (up to 15 years is not uncommon), and have a low reproductive rate. Most species have only one young per year; only a few species have twins or multiple births. Females are often two years old before bearing their first young. Thus project impacts to a population can be potentially severe. It can take a colony many years to recover from activities that cause mortality or even temporary reduced fecundity.

Like most other long-lived mammals, bats have complex social systems. Maternity colonies are often matrilineal, with females returning to their natal roosts throughout their lives. For many species the nursery colonies show high fidelity to their chosen roost sites, particularly sites like caves, which typically have high structural stability. Breeding females are usually behaviorally sensitive to disturbance. Bats have few natural predators and few behavioral defenses against predation. Instead they rely on being able to find safe and cryptic roosts for raising their young.

Finally, bats are unusual mammals in that they have a labile body temperature. While they are capable of thermoregulating like other mammals (maintaining a constant body temperature in a fluctuating temperature environment), bats also have the capacity to allow their body temperature to track ambient temperatures. A primary criterion for roost selection is the diurnal and seasonal temperature pattern for a roost. In the summer, while raising young, they tend to seek very warm, but thermally buffered, environments – settings that provide enough thermal diversity that by moving around, bats can maintain a fairly constant and preferred temperature regime. In the winter, especially in areas where temperatures frequently drop below freezing, bats hibernate, seeking cool, thermally stable roosts (ideally just a couple of degrees above freezing). In areas with predominantly non-freezing temperatures, bats most typically seek cool roosts that allow them to save energy by using torpor.

4.2 ROOSTING ECOLOGY

4.2.1 An Overview

Bats use different roosts for different purposes, but common to all are an appropriate temperature regime and protection from predators and undesirable weather. During the summer when bats are

most active and raising their young, they frequently use one roost during the day where they sleep and keep their young, and another roost at night for resting and digesting food. Day roosts tend to be cryptic and concealed; night roosts more open and exposed. Both day roosts and night roosts can be used by multiple species, and fidelity to both kinds of roosts can be very high.

Bats also change roosts seasonally. Although timing varies with species and with geographic location, in general bats form maternity colonies in the spring. These aggregations stay together until the young are independent in the late summer or early fall. During this time, adult males most typically roost singly or, less commonly, in bachelor colonies.

In the fall, some species, such as Mexican free-tailed bats, migrate to warmer climates, and may have roosts that they use for short periods as migratory stop-over sites (Johnston 1998). Other species, such as pallid bats, remain in the range of their summer roosts and hibernate or, in warmer areas, maintain a low level of activity throughout the winter (Johnston 2003). Although large hibernating aggregations are common in some parts of the United States, they are relatively rarer in California. Most California species, when found hibernating in the winter, roost singly or in small groups. The largest aggregations have been found only in caves and mines. However, large aggregations (>1,000) of non-hibernating Mexican free-tailed bats overwinter in bridges along the coast and portions of the Central Valley.

Some roosts are used primarily for the purposes of mating (Brown and Berry 1994). All the vespertilionids and *Macrotus californicus* mate in the fall, although the vespertilionid females do not actually become pregnant until the spring, and *M. californicus* has a delayed development. Molossids, on the other hand, usually mate in late winter or early spring.

4.2.2 Structural Features of Roosts

Bats use a variety of roost sites, which, for North American species, fall into three general categories: crevices, cavities, and foliage. In natural settings, cavity roosting species aggregate on open surfaces inside dark chambers, such as caves or large tree hollows; crevice roosting species occupy a variety of narrow “slots” (e.g., rock crevices, exfoliating tree bark, damaged wood in snags). While some species appear to be obligate cavity or crevice dwellers, there is a continuum between crevices and cavities, and many species use a range of roosts. With the exception of a few foliage roosting species, all North American bat species also roost in cave-like spaces and/or crevices in man-made structures, such as bridges, buildings, old mine workings, silos, towers, and tunnels.

Many of the habitats and structures associated with transportation projects are likely to be inhabited by bats. The most frequently encountered issue requiring mitigation involves bats roosting in bridges; and hence, most of this document focuses on that issue. There are, however, other related structures and habitat features that should be considered in an environmental evaluation, the loss of which could potentially trigger mitigation actions. All twenty-five bat species that occur in California use one or more of these structures (Table 4-1).

Fifteen of California's bat species are known to use bridges. Four species use bridges commonly, eight species use bridges more sporadically, and three species use bridges rarely. Of these 15, 10 have special status (SSC, FSS, or SC), and impacts to these species often trigger mitigation measures

Table 4-1. Roosting Patterns for California Bat Species.*

Species Name	Common Name	Status	Bridge	Cave/ Mine	Building	Cliff/ Rock Crevice	Tree Bark/ Hollow	Tree Foliage	Rip-Rap
Family Phyllostomidae (leaf-nosed bats)									
Choeronycteris mexicana	Mexican long-tongued bat	SSC, SC		1	2				
Leptonycteris curasoae	Lesser long-nosed bat	FE		1					
Macrotus californicus	California leaf-nosed bat	SSC, SC	3	1					
Family Molossidae (free-tailed bats)									
Eumops perotis	Western mastiff bat	SSC, SC			3	1			
Nyctinomops femorosaccus	Pocketed free-tailed bat	SSC				1			
Nyctinomops macrotis	Big free-tailed bat	SSC, SC				1			
Tadarida brasiliensis	Mexican free-tailed bat		1	2	1	1	3		
Family Vespertilionidae (mouse-eared bats)									
Antrozous pallidus	Pallid bat	FSS, SSC	1	2	1	2	1		
Corynorhinus townsendii	Townsend's big-eared bat	FSS, SSC, SC	2	1	2		3		
Eptesicus fuscus	Big brown bat		1	2	1	2	1		
Euderma maculatum	Spotted bat	SSC, SC				1			
Lasionycteris noctivagans	Silver haired bat		3				1		
Lasiurus blossevillii	Western red bat	FSS, PSSC						1	
Lasiurus cinereus	Hoary bat							1	
Lasiurus xanthinus	Western yellow bat	PSSC, SC						1	
Myotis californicus	California myotis		2	2	1	1	2		
Myotis ciliolabrum	Small-footed myotis	SC	2	2		1			
Myotis evotis	Long-eared myotis	SC	2	2	2	2	1		2
Myotis lucifugus	Little brown myotis		2	2	1	2	2		
Myotis occultus	Arizona myotis	SSC, SC	2		?		1		
Myotis thysanodes	Fringed myotis	PSSC, SC	2	1	2	2	1		
Myotis velifer	Cave myotis	SSC, SC	2	1	?				
Myotis volans	Long-legged myotis	PSSC, SC	2	2	2		1		
Myotis yumanensis	Yuma myotis	SC	1	2	1	3	2		
Pipistrellus hesperus	Western pipistrelle		3	2	3	1			

* 1 = use frequently; 2 = use sometimes; 3 = use rarely; Blank = not known to use

Status:

FE = Federally Endangered
FSS = USDA Forest Service Sensitive
SSC = California Department of Fish and Game, Mammal Species of Special Concern
PSSC= Proposed, California Department of Fish and Game, Mammal Species of Special Concern
SC = Former Candidate (Category 2) for listing under U.S. Endangered Species Act; Species of Concern

under CEQA and Best Management Practices (BMP) under a DFG Section 1600 Streambed Alteration Agreement. In many cases, when surveys are conducted within a 15 to 25 km radius of a bridge roost, the bridge supports the most significant, and in some cases the only, population for a particular species in the area. Many colonies have resided in chosen bridges for many years, and have come to depend on these resources. This is particularly true in areas where surrounding natural habitat (*e.g.*, the valley riparian forests of the Central Valley) has been lost.

Most of the species that roost on bridges also roost in buildings (particularly abandoned structures), mines, and caves. Mines and caves are especially important for several special-concern species – i.e., *Corynorhinus townsendii*, *Macrotus californicus*, *Myotis thysanodes*, and less frequently, *Antrozous pallidus*. Other species will roost in cliff faces and rock crevices often found along highway corridors in the Sierra Nevada and the Coast Ranges, particularly highways that follow major river drainages. Additionally, a number of species that roost in tree cavities or under flaking bark – the kinds of flaws that are commonly found in conifer snags and in live, mature cottonwoods, sycamores, and oaks. These roosts can occur within the highway right-of-way, particularly along stream and river corridors. Other species are foliage roosting, and are particularly concentrated in stands of mature riparian cottonwood and sycamore. Finally, *Myotis evotis* has been observed roosting in highway rip-rap (Rainey and Pierson 1996).

4.2.3 Why Bridges?

A number of factors converge to explain the disproportionate importance of bridges to bats. Bridges frequently have structural features that offer remarkably suitable analogs to natural roosts, and the large mass, particularly in concrete bridges, offers the kind of thermal buffering that these animals require. Also, bridges frequently serve to replace natural roosts in anthropogenically-altered landscapes.

Crevice roosts, suitable for day-roosting maternity colonies, are most frequently found in expansion and hinge joints, in abutment crevices, and in spaces formed at the junction between old and new portions of a widened bridge. Less commonly, crevices will occur where a bridge, or more typically a viaduct, interfaces with rock features in the road cut. Anomalous features such as crevices behind signs can also offer roosting habitat.

Bridges can also provide day roosts for cavity dwelling species. When there are access points, the interiors of closed box construction bridges can offer large cavities for bats. Also, cavities can often be found in many abutments, particularly where the slope meets the abutment in such a way that the created space is cave-like. Many older bridges have hollow piers with openings to the interior, and these cavities can accommodate large numbers of bats.

Night roosts are most commonly found in concrete girder bridges, where the girders create warm air pockets, and the temperature at the bridge deck is typically warmer, and more stable, than ambient (Perlmeter 1996, 2004, Pierson et al. 1996). These sites generally offer the protection from weather and predators that bats require. Additionally, because bats forage most frequently in association with water, and the majority of bridges cross water features, these sites have the distinct advantage of offering proximity to foraging areas.

When assessing the importance of a bat roost in a bridge, it is important to recognize that multiple species frequently use the same bridge, and to be aware that the species assemblage may vary seasonally (Pierson et al. 2001). Because the most common species may dominate, it is easy to miss the presence of rarer species. Thus documenting the full range of species using a bridge frequently requires that the bridge be examined both day and night, and that surveys be repeated seasonally.

A detailed discussion of bats and bridges, including a survey and evaluation protocol, can be found in The Bats and Bridges Technical Bulletin (Erickson et al. 2003).

4.3 FORAGING ECOLOGY

Twenty-three of the species found in California are predominantly insectivorous (with a few also consuming other arthropods such as scorpions and spiders). The two remaining species (*Choeronycteris mexicana* and *Leptonycteris curasoae*) are primarily nectarivorous. Both are confined to southern California and occur only seasonally (*C. mexicana*) or are known only from a few specimens likely to have been vagrants (*L. curasoae*) (Constantine 1998).

While bat species show some specialization for particular foraging styles and habitats, they also will opportunistically exploit locally abundant prey (Kunz 1982, Johnston and Fenton 2001, Whitaker 1994). Diet studies conducted in the upper Sacramento River drainage showed that, while there were marked differences in average diet composition across species, several species took advantage of substantial hatches of particular insects, such as winged termites and caddisflies (Rainey and Pierson 1996).

Nevertheless, species divide potential foraging space in ways that can be partially predicted from wing size and shape (which constrains flight speed and maneuverability). Recent studies in Canada (Grindal et al. 1999) and the Sierra Nevada (Pierson et al. 2001) are consistent with earlier work in finding that bat activity is concentrated over water in forested areas of western North America. Some species (e.g., *Myotis yumanensis*) feed largely on emergent aquatic insects by skimming near the surface of still or slow moving water. Others may feed higher over the water surface. Some forage primarily along the water edge in association with riparian vegetation. A number of species also forage, however, partially or exclusively away from water along dry creek channels, around the canopy of forest trees, or in oak savannah.

Thus bridge replacements, new bridge construction, highway realignments, and new highway corridors have the potential to impact bats' foraging habitat. An assessment of foraging patterns should be considered whenever a project has the potential to reduce or alter available foraging habitat, either by elimination of foraging areas (e.g., removal of riparian vegetation) or changes in density or diversity of insect prey (e.g., stream and floodplain restoration). For example, an assessment of bat foraging activity in the habitats associated with various route alternatives for the Hopland by-pass project documented more bats and greater species diversity (including special-concern species) in areas of oak savannah than in orchards or vineyards (Pierson and Rainey 2004).

5.0 LEGAL STATUS AND ITS IMPLICATIONS FOR PROJECTS

There are no specific laws in California protecting bats as a specific type of wildlife; however, various agencies and groups have established status designations providing guidelines for the most sensitive and threatened species without actually providing any extra legal protection. The National Forest Service, Bureau of Land Management, and the Western Bat Working Group have evaluated threats to bats of California and have rated them accordingly (Appendix L). Nine species are currently considered Species of Special Concern by the DFG, and three additional species are proposed for that status. Additionally, the Forest Service and the Bureau of Land Management lists some species as Sensitive and the Western Bat Working Group lists some as High Priority (for consideration of conservation measures). The following section provides a discussion of specific laws and how they may influence projects and reduce potential impacts to bats.

5.1 NO FEDERALLY-LISTED BAT SPECIES IN CALIFORNIA

No regularly occurring bats in the State of California are federally-listed species. Although records for the lesser long-nosed bat (*Leptonycteris curasoae*), a federally endangered species, occur rarely in various parts of Southern California, these bats were not part of the naturally occurring fauna until nectar producing plants were established in landscaped situations. Consequently, the Federal Endangered Species Act (FESA) does not normally apply to projects involving bat species in California. For states where federally listed bat species regularly occur, FESA provides legislated protection against loss (take) of any individuals, or the loss of any occupied habitat within designated Critical Habitat as published in the Federal Register. Because these federally-listed species are protected as such, other more common bat species in states with endangered bat species, likely receive better protection than bats in those states without significant populations of federally-listed species. Furthermore, FESA provides a mechanism to mitigate for the loss, or potential loss, of these affects to the species so that there are no adverse affects to the population. Additionally, FESA provides for heavy fines to enforce protective legislation. Because many bat species' habitats overlap, protection for many bat species is thus provided indirectly.

5.2 NO STATE-LISTED BAT SPECIES IN CALIFORNIA

There are also no California state-listed bat species. Under the California Endangered Species Act a state-listed species could be given additional protection. The California Endangered Species Act does not, however, provide as much protection as the Federal Endangered Species Act.

5.3 CALIFORNIA CODE, TITLE 14, §465.5: USE OF TRAPS AND EXISTING CCR 4152, 4180

The use of traps to kill or remove wildlife is regulated by the state in order to project wildlife. However, these laws do not necessarily protect wildlife when "loss of property" or "damage to property" by wildlife can be established.

State Assembly Bill 1645 for trapping animals has been under discussion for a couple of years. Previously trappers removing or eliminating "nuisance" wildlife were not required to be licensed. Originally the proposed law would require predator and "nuisance" control trappers to

be licensed and regulated, and pass a competency tests and file an annual report. Although the recent bill was meant to help protect wildlife including bats, the bill does not protect the bats from being excluded from anthropomorphic situations. Because of objections raised by wildlife rehabilitation centers and members of the public regarding the lack of protection for bats in the final version of this bill, specific language to protect bats has been withdrawn because bats ultimately received no additional protection under the proposed law. This bill was in discussion as of October, 2004.

5.4 CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Because no federal laws protect bats in California and the DFG code is limited in its ability to enforce general DFG statutes, the CEQA planning process becomes probably the single most important law protecting bat populations in California. Therefore, the driving legal force behind protecting bats on bridges and other structures is to avoid significant effects on the environment (See definitions for Significant effect on the environment and Mandatory Findings of Significance" in Appendix M). For a project to proceed, Caltrans' first approach to potential significant effects is avoidance, then minimization, and lastly, other forms of accommodation or habitat replacement. Caltrans' goal is to reduce the effects of a project below the level of significance, thereby removing the requirement for the preparation of an Environmental Impact Report (EIR) or an Environmental Impact Statement (EIS) and having the least impact to the environment as practicable. When no practical alternative can be found (or the project is controversial), Caltrans plans appropriate mitigation for significant impacts that require an EIR or EIS . The decision to produce an environmental document is not the decision of the Caltrans biologist, but that of the Environmental Planners and the Environmental Management team. However, a Caltrans or consulting biologist may recommend that an EIR/EIS or Negative Declaration (ND)/Findings of No Significant Impacts (FONSI), or other environmental document, be prepared.

When roosts and other important bat habitats are threatened because of a project, EIRs become the vehicle to protect bats and their habitats. Mitigation measures to eliminate, or reduce, impacts to less-than-significant levels become a part of the EIR. It is up to the biologist writing the EIR to ensure appropriate mitigation measures are written and up to the lead agency to adopt and implement these mitigations should the agency find them adequate. The Department of Fish and Game does not necessarily have to accept the lead agency's (or project proponent's) environmental document(s) and can require mitigation measures, as described below. CEQA requires monitoring of mitigation to ensure the success of mitigation measures. Unfortunately, too often there are no provisions for monitoring mitigation measures for wildlife; the assumption is that the mitigation will work if you provide the habitat. Even experienced bat biologists cannot guarantee when prescribed mitigation measures will work as intended.

5.5 STREAMBED ALTERATION AGREEMENTS §1600

The Department of Fish and Game also provides permits for Streambed Alteration Agreements §1600 of the Fish and Game Code. This permit process provides a vehicle to reduce impacts to bats when the project needs clearance from DFG because construction enters the low flow channel of a creek or stream. In such cases, the DFG can include conditions to reduce impacts to the wildlife associated with that project, including bats and birds. DFG is also required to

comply with CEQA when issuing §Section 1600 Streambed Alteration Agreement permits, and can require the applicant to mitigate for impacts to bats and bat habitat. (Office of Planning and Research 2004)

5.6 PROPOSED DRAFT CALTRANS BAT POLICY

Caltrans staff has proposed a Draft Caltrans Bat Policy that will be reviewed prior to adoption. This study will provide information prior to internal review and approval. Caltrans has been, and will continue to be, exploring options for accommodating bats on transportation structures. For transportation structures known to be utilized by bats, accommodating these bats on the structures is the preferred approach; however, innovative design and construction are used as practicable. Innovative and effective mitigation strategies are a priority, including off-site efforts. Caltrans' goal is to maintain and operate structures for the purposes of transportation without adversely affecting bat populations, while also balancing the needs of bats with the safety of transportation workers.

6.0 ROLES AND RESPONSIBILITIES

6.1 CALTRANS

Caltrans, the Department of Fish and Game (DFG), environmental consultants, and Non-Governmental Organizations (NGO's) all play a role in the management of impacts to bats that may result from transportation projects in California. Caltrans, as one of the largest property owners and managers in California, is involved with other federal, state, and local agencies concerned with transportation projects. Many times projects require permits from, or interaction with, one or more of these agencies and groups; this section will introduce their roles, management and survey guidelines.

Many of the structures, roads, bridges and habitats provide important roosting and foraging habitat for bats. Large bridges can provide suitable roosting habitat for large colonies of bats over vast spatial and multiple temporal scales. As a result, the potential for negative impacts to bats resulting from transportation projects is high. However, at this time, there are no State or Federal listed Threatened or Endangered bat species in California. Eleven of the state's 25 bat species are California Special Concern species (CSC), and an additional three species, western red bat (*Lasiurus blossevillii*), long-legged myotis (*Myotis volans*) and fringed myotis (*Myotis thysanodes*) will soon be moved to this status (Bolster, pers. comm.). Although no recovery plan based on state or federally listed species exists for California, the California Bat Conservation Strategy is being developed in 2005 as a part of the California Comprehensive Wildlife Plan.

The following has been summarized, excerpted and adapted from the Bats and Bridges Technical Bulletin – A Hitchhiker's Guide to Bat Roosts (Erickson et al. 2003). Please refer to those documents for a more detailed discussion of the goals and policies of the Department.

Using an appropriate combination of structure inspection, sampling, exit counts, and acoustic surveys, a biologist with specific bats and bridges training is to survey each structure (and surrounding area) that may be affected by the project.

If bats are found, the biologist will identify them to species and evaluate the colony to determine the CEQA significance and/or NEPA effects by analyzing the potential impacts to bats and bat habitat. Typically, this is accomplished through a Natural Environmental Study (NES) which complies with CEQA and NEPA laws.

Caltrans is currently developing two documents; a "Bat Policy" and "Guidelines for Accommodating Bats in Transportation Projects," both of which are in draft form. In general, the draft policy suggests that Caltrans protects and enhances wildlife habitat in balance with environmental, economic and social goals of California. Projects are to "avoid, minimize, mitigate, and provide enhancement for potentially substantial adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the Department of Fish & Game or U.S. Fish & Wildlife Service." Accommodation of bat populations utilizing transportation structures is the preferred approach; however, innovative design and construction are used as practicable. Innovative and effective mitigation strategies are a priority, including

off-site efforts. This report presents an evaluation of a variety of innovative mitigation strategies for bats in California, and references mitigation strategies in the United States and other countries.

Caltrans does not unlawfully take, harass or intentionally disturb bat activities, except as legal to prevent damage to private or public property. Movement and migratory corridors are not substantially interfered with, and impacts are avoided, minimized, mitigated, or habitat enhancement provided, for any candidate, sensitive or special-status species. Caltrans strives to provide ample time for the planning of bat surveys and mitigation measures, and to continuously train biologists so that they maintain a level of understanding of bat biology so that surveys, bat detection, exclusions, and mitigation can occur when seasonally appropriate to avoid take, harm, or harassment of roosting individuals.

Caltrans may enter into species recovery plans by the DFG or the US Fish and Wildlife Service (USFWS) in certain circumstances and where feasible.

6.2 DEPARTMENT OF FISH AND GAME (DFG)

The Mission Statement for the DFG, as shown on the agency's web site (http://www.dfg.ca.gov//html/dfgmiss.html) is as follows:

> "… to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.
>
> "The Department of Fish and Game maintains native fish, wildlife, plant species and natural communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance in a sufficient amount and quality to ensure the survival of all species and natural communities. The department is also responsible for the diversified use of fish and wildlife including recreational, commercial, scientific and educational uses."

As a trustee agency, the DFG provides guidance to Caltrans regarding measures to avoid, minimize or mitigate project impacts to bat species. DFG maintains the California Natural Diversity Data Base (CNDDB), which although by no means a complete inventory of wildlife species in California, provides a basis for understanding of a species' local occurrences. Local wardens and biologists should be consulted when needed to provide site visits and guidance.

6.3 ENVIRONMENTAL CONSULTANTS

Environmental consultants can provide specialized expertise in bat capture and identification, species surveys, and field research such as mark-recapture and telemetry studies. In addition, bat-specialist consultants can propose a variety of possible mitigation measures that may not otherwise be readily available to the local state biologist, engineer, or planner.

Some bat specialists may have particular expertise with bats in anthropogenic roosts such as transportation projects, particular knowledge of landscape-level or regional habitat issues, and many specialize in rare bat species. Some bat specialists have extensive knowledge of artificial roost habitat. Consultants can provide agency coordination during the life of the project, as well as pre-project baseline population studies and post-project monitoring.

It is the responsibility of the consultant to be knowledgeable about the species, range and occurrence appropriate for the project. A thorough understanding of bat biology is critical, and it is recommended that consultants hold a Scientific Collection Permit and MOU for work with bats through the DFG. Consultants are responsible for providing useful and transportation project-appropriate advice on presence or absence of special-status bat species, survey design, and mitigation measures. Consultants should also be able to successfully coordinate with Caltrans and the other agencies and NGOs involved in a project.

6.4 NON-GOVERNMENTAL ORGANIZATIONS

The activities of NGO's involved with bats in California include education, rehabilitation, habitat enhancement, and other conservation efforts. The largest national organization, Bat Conservation International (BCI), has been active in California as well as in many other states. In its home state of Texas, the organization collaborated with the Texas Department of Transportation to protect a large population of bats in the Congress Avenue Bridge in Austin. BCI published the Bats in American Bridges and the Texas Bats and Bridges Handbook. BCI is also field testing new artificial roost designs for transportation projects (e.g., bat houses for interim bat roosting habitat at Franklin Causeway, Case Study Number 7).

Local groups such as the California Bat Conservation Fund and various wildlife rehabilitation centers provide general education about bats and bat rehabilitation, and can be an important resource in the event bats are injured or non-volant bats are displaced during project activities.

7.0 PERMIT REQUIREMENTS

Conducting a bat-roost-habitat assessment and some types of focused surveys at transportation projects usually does not entail capture or handling of bats. In these cases, no permits are required.

Specifically, no permits are generally required to conduct the following:

- Echolocation surveys.
- Exit counts that do not disturb bats.
- Remote sensing outside roosts.
- Radio telemetry tracking (not including attachment of transmitters).

Echolocation studies involve the use of one or more "bat detectors", devices with ultrasonic-sensitive microphones and some type of signal processing hardware to store, compress, or convert ultrasonic signals for real-time or later analysis. Exit counts are conducted so that no visible light shines on the roost area or openings. Noise and other disturbance must be minimized or eliminated, so that bats will emerge normally from roosts. Remote sensing utilizes bat detectors, night-vision cameras or video cameras, telemetry receivers, or similar devices. Radio telemetry tracking involves reception of radio signals from tagged bats. Tracking can be passive (observer stationary) or active (observer following bat's movements).

For all studies that do not satisfy these limitations, two permits are required from the California Department of Fish and Game (DFG); a Scientific Collecting Permit - and because bats are designated as standard exceptions to the Scientific Collecting Permit (SCP) - a Memorandum of Understanding (MOU). The MOU describes the type of surveys, methods, and species proposed, and purpose of bat captures.

Applicants must show that they possess experience with trapping and handling bats before they are issued an MOU. Such experience is usually accumulated by working with a licensed bat worker under their permits, and demonstrating the necessary skills and abilities to DFG.

The following text ***(requirements and wording subject to change at any time)*** is copied from the DRAFT document from DFG, titled:

SKILL LEVEL REQUIREMENTS FOR CALIFORNIA DEPARTMENT OF FISH AND GAME BAT PERMITS[1_/]

Level 1 Permitee Requirements:

-Familiarity with key literature on bat ecology and research techniques.

-Understanding of basic bat biology (e.g., torpor, reproduction, energy budgets) and ecology (e.g., maternity colonies, hibernation, foraging behavior, migration, night roosting).

-Ability to handle live bats without causing undue stress or injury.

-Ability to readily identify bats to species level with the exception of *Myotis lucifugus* versus *M. yumanensis* and *M. californicus* versus *M. ciliolabrum (=M. leibii, M. subulatus*).

-Ability to age and evaluate the reproductive condition of bats.

-Basic understanding of how to set and operate mist nets and harp traps. This includes the ability to remove bats (and expected birds) from nets in an efficient and humane fashion. Ability to use hand nets appropriately.

-Basic understanding of and ability to operate standard equipment typically used in bat research (e.g., bat detector, night vision, telemetry equipment).

Level II Permitee Requirements:[2]

-Meets all Level I criteria.

-Experience with banding bats and an understanding of the pros and cons of various band types and potential for injury to bats.

-Ability to attach temporary light tags to bats for one-night tracking.

-Ability to survey or sample night roosts.

-Ability to collect hair samples.

Level III Permitee Requirements:[3]

-Meets all Level II criteria.

-Experience with attachment of radio transmitters to bats.

-Ability to enter known day roosts, maternity roosts, and hibernacula.

-Ability to collect blood or tissue samples.

[1] Skill levels are not necessarily equivalent to permit authority, e.g., a DFG permit that authorizes radiotelemetry does not automatically authorize collection of blood or tissue samples. For new MOU applicants, skill levels must be supported by 3 letters of recommendation from Level ll or Level lll bat biologists who have personally observed the applicant perfoming those skills and will attest to the applicant's ability to perform them. Issuance of permits is at DFG's discretion.

[2] Experience at Level I to be obtained by working under the close supervision of a person with Level II or III experience.

[3] Experience at Level II and III to be obtained by working under the close supervision of a person with Level III experience.

The Scientific Collecting Permit is available online, at:
http://www.dfg.ca.gov/licensing/pdffiles/fg1379e.pdf

The DFG license and Revenue Branch can be accessed online at:
http://www.dfg.ca.gov/licensing/specialpermits/specialpermits.html

8.0 PREDICTING THE IMPACTS

8.1 INTRODUCTION

Applicable mitigation measures can only be provided after appropriate surveys are complete enough to provide the needed information on specific bat populations. This usually requires surveys conducted for a minimum of a 12-month period (See Erickson et al. 2003). Natural history parameters and ecological requirements vary considerably among species, making it critically important that individual species occurring at a project site be correctly identified, and that species assemblage be adequately characterized. Additionally, detailed plans with timelines, pre-development and post-development site layouts and roosts need to be incorporated into the assessment of impacts to the bat populations potentially affected. Scale is important when assessing impacts to bats; impacts need to be considered at the site level, the regional level, and on a cumulative level. Building a replacement roost that does not work or does not provide the intended habitat function (e.g., maternity roost) is not mitigation. Similarly, constructing a replacement roost and destroying it during a later phase of construction, or installing a replacement roost and allowing it to disintegrate, is not mitigation.

8.2 TEMPORARY IMPACTS: DISTURBANCE

Extra noise, vibration, increased lights or the reconfiguration of large objects can lead to the disturbance of roosting bats which may have a negative impact on the animals. Human disturbance can also lead to a change in humidity, temperatures, or the approach to a roost that could force the animals to change their mode of egress and/or ingress to a roost. Although temporary, such disturbance can lead to the abandonment of a maternity roost, which in most cases would be considered a significant impact.

8.3 TEMPORARY IMPACTS: SHORT-TERM LOSS OF THE USE OF A BAT ROOST

When the same, unaltered, roost is unavailable to a population of bats for a relatively short period of time, the loss can truly be called a temporary loss as long as it does not result in displacement or harm to the animals – *e.g.*, for a maternity colony with dependent young even a very brief disturbance could result in animals abandoning the roost and/or mortality to the young. However, in most situations when bats loose the use of a roost, significant impacts should be called out for the permanent loss of a roost. Some environmental documents have called out the temporary loss of bat roosts as less-than-significant impacts when the original roost is lost but a new roost will be built. Mitigation may be possible with replacement roosts, but these replacement roosts are provided as a result of lost roosting habitat and should only be considered fully successful mitigation when these new roosts are utilized with the same species in about the same numbers as the original roosts.

8.4 PERMANENT IMPACTS: MODIFICATION OF ROOSTS

Modifications to roost sites can have significant impacts on the bats' usability of the roost. The reduction or increase in size, material that partially occludes an entrance, or other modifications can change the airflow, temperature, and humidity of the roost. Such physical changes can be critical to the bats' fitness and survivability (Kunz 2004). Species are unique in their

requirements and roosting preferences, so any changes to roosts, including entrances and flight paths, need to be carefully examined when determining potential impacts. Briggs (2002) found that some species deserted roosts during barn conversions although bats were not intended to be permanently evicted.

8.5 PERMANENT IMPACTS: LOSS OF ROOSTS

Generally, the loss of roosting habitat is considered one of the primary conservations issues facing bat populations (Fenton 2001, Pierson 1998). Roosts become focal points for conservation efforts possibly partly because roosting habitat is more readily defined than foraging habitat. However, the loss of a single roost is not well understood because many species of bats use several roosts. Some populations may or may not have adequate alternative roosts, so it is difficult to fully understand impacts resulting in roost loss. What may be a catastrophic loss for one population of bats may not be nearly as significant in another population. Usually the loss of a maternity roost is considered a significant impact and there needs to be concerted efforts to fully mitigate for the loss of these roosts. The importance of other roosts to fecundity and survivorship is not as well documented or understood. For example, little is known about winter roosts in California, and some have been overlooked even during initial surveys for bats (see Case Study Number 4). Such winter roosts may be far more important than biologists realize if these roosts serve many species from a wide geographic area. Because it is often difficult to assess the real importance of roosts to bat populations and natural roosts are becoming scarcer with expanding human development, every effort should be made to avoid the loss of a roost and there should be no overall loss of roosts. Permanent Impacts: Fragmentation and isolation

Foraging areas and roosts can become isolated by housing developments or other major changes in the landscape. Radio-tracking studies indicate that bats frequently use linear features in the landscape suggesting that bats use these features to help navigate between roosts and foraging areas. When these linear features (e.g., row of trees, road, waterway) are removed, an impact on bats is likely to occur. Additionally, when a night roost is eliminated, the energetic cost to the bats of commuting to the surrounding foraging area may be so greatly increased, that this habitat is effectively lost, too. Similarly, even though a maternity roost may be protected, important nearby foraging areas could be lost to development. As development expands over the foraging areas, the costs of the commuter distances to foraging areas may exceed the benefits of the roost. The latter situation likely contributes, for example, to the extirpation of pallid bats from valleys under development (Dave Johnston, unpublished data).

8.6 PERMANENT IMPACTS: FRAGMENTATION AND ISOLATION

Foraging areas and roosts can become isolated by housing developments or other major changes in the landscape. Radio-tracking studies indicated that bats frequently use linear features in the landscape suggesting that bats use these features to help navigate between roosts and foraging areas. When these linear features (e.g., row of trees, road, waterway) are removed, an impact on bats is likely to occur. Additionally, when a night roost is eliminated, the energetics for bats to successfully utilize the surrounding foraging area may be compromised or lost because it may no longer be economical for bats to use that foraging area given an increase in commuter costs. Similarly, a maternity roost may be protected but nearby foraging areas are lost to development.

As the development expands over the foraging areas, the costs of the commuter distances to foraging areas may exceed the benefits of the roost. The latter situation contributes to the continuing extirpation of pallid bats from valleys under development.

8.7 PERMANENT IMPACTS: INCREASE IN HUMAN ACTIVITY

The long-term impact of human activity (e.g., additional lighting, vibration, nearby foot traffic, etc.) near a roost should be considered when determining impacts and mitigation. So foot paths designed along streams and bridges should separate foot traffic, as much as possible, from roosts, and intense lights for cars or pedestrians should be directed away from roosts or possibly shaded by trees.

9.0 MITIGATION STRATEGIES*

Mitigation should always focus first on avoidance; if avoidance is not possible, then impacts should be minimized. Replacement should only be used as a last resort and must be species-specific, lest increased harm to the bat assemblage occur. The best solutions are usually simple and fit within the parameters of normal operations.

Accommodation and mitigation should use the following approach:

1) Existing roosts are to be accommodated to the extent feasible while, maintaining the safety, operation, maintenance, and inspection aspects of the structure.
   a. Impacts and interactions with the species are to be avoided whenever possible through timing of work, method selection, and retention of features that provide naturalized habitat.
   b. If avoidance is not possible, impacts are to be minimized by careful planning of activities to complement the life history of the animal. Measures might include items such as temporary humane exclusions at appropriate times of year to avoid take, and the retention of portions of the features that provide naturalized habitat.
   c. Where appropriate, measures to minimize accumulation of guano from existing roosts and to allow inspection without disturbance to the bats are to be incorporated into projects.

2) Cost effective and ecologically sound mitigation should be considered where impacts to the roost could:
   a. Affect substantial values for migration, breeding, rearing of young, hibernation, or scientific study;
   b. Result in substantial adverse effects on any species or habitat identified as candidate, sensitive, or special status in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or the U.S. Fish & Wildlife Service; or
   c. Cause a wildlife population to drop below self-sustaining levels that are based on careful analysis of the best scientific and commercially available data for the local population.

3) Options for mitigation are to be considered at the watershed scale and should include such measures as:
   a. Ecologically sound compensation and/or enhancement, integrated with regional habitat planning to offset affected functions and natural systems.
      i. Off-Structure measures that provide suitable replacement roosting opportunities, such as mine gate closures or enhancements of structures in wildlife areas, should be considered as the highest priority option where feasible and cost effective.
      ii. Off-Structure, out-of-kind habitat improvements should be considered as a preferred comprehensive solution, in coordination with appropriate resource agencies, where roosting is not necessarily the limiting factor for the species present, and where sufficient information is available to indicate that habitat enhancement would benefit the population to an equal or greater extent than in-kind enhancements. The

* Adapted and updated from Erickson et al. 2003

implementation of resource management measures can cumulatively offset impacts and rectify chronic issues through the application of proven resource management principles, such as riparian restoration to proportionally improve ecological system function and species production.

iii. On-structure measures may be considered where:
   1. Offsite measures are not available, economically feasible or ecologically effective.
   2. Structural integrity and safety are not compromised.
   3. They are compatible with social, economic and environmental goals of the local area, such that
      (a) density and distribution of species is not increased in areas of human occupation, e.g., urban, residential, farms, and recreational areas;
      (b) presence of the colony complements the surrounding natural communities;
      (c) design is aesthetic and discourages vandalism or tampering;
      (d) the site is not in close proximity to homes, businesses, schools, or public areas.
   4. A design detail or structural design selection is available from the designer that
      (a) does not compromise structural integrity or safety;
      (b) allows routine maintenance and inspection of the bridge structure with features to prevent
         (i) accumulation of guano and or/urine,
         (ii) deterioration of materials;
         (iii)wildlife contact by
            - temporary containment of animals if bats and people are present at the same time,
            - easy temporary removal of features during maintenance and inspection, or
            - placement of features, such as panels away from catwalks (<20') and other areas routinely used for inspection.
   5. Related resource agencies accept the following disclaimer in any agreements in order to allow required operations:

      Disclaimer:

      The structural elements and features that facilitate the life history of bat species on a bridge or other transportation facility are subject to regular inspection, repair, rehabilitation, alteration, and/or replacement as part of normal operations and maintenance, and may on occasion reduce or eliminate the habitat values provided.

      The Department will take reasonable measures to avoid and minimize unnecessary disruptions to the animal's normal behavior patterns, which include, but are not limited to, breeding, feeding and sheltering. However, this accommodation does not preclude the Department from future engineering actions that are found to be necessary to meet the transportation needs of California, or from measures to ensure the safety of the public or Department personnel. Habitat values may be removed with little or no advanced notice in those situations where it is necessary to immediately prevent or inspect damage or where the stability of the structure is in question.

i. The recovery of information through focused research would result in more effective resource management techniques and contribute to the improvement of ecological function and production. In some cases, such research would be acceptable to offset impacts; however, participation and reimbursement by the Federal Highway Administration may be limited.

4) Enhancement of a structure where habitat does not currently exist should be considered where the following conditions are met:
   a. The need for a specific habitat, such as night roosting, is outlined in a species recovery plan or land-use plan provided by the Department of Fish and Game or U.S. Fish and Wildlife Service.
   b. The appropriate environmental and engineering managers concur that the proposal is consistent with operations and stewardship goals.
   c. The approach meets the criteria of these guidelines.

9.1 ON-SITE NIGHT ROOST AVOIDANCE, MINIMIZATION, MITIGATION MEASURES

Night roosts are typically utilized from the approach of sunset until sunrise. In most parts of the state, night-roost use will only occur from spring through fall. The following example measures apply when bats are present, the evaluation criteria are met, and where work cannot occur during the off-season, before the bats arrive or after the bats leave. Each site is unique and thus, potentially requires site-specific measures.

Each generic approach is designed to control disturbance to a specific level for the most sensitive species. Specific project measures may be less stringent once site conditions, species sensitivity, and relative significance of the impact are considered.

9.1.1 Avoidance (No Impact)

Work activities are not to occur within 100 feet of the bridge between sunset and sunrise. Airspace access to and from the bridge is to remain approximately the same. Bird-exclusion netting must not be used. No clearing and grubbing is to occur adjacent to the structure. Lighting is not to be used near the structure where it would shine on the structure. Combustion equipment, such as generators, pumps, and vehicles are not to be parked, nor operated, under or adjacent to the structure. Personnel are not to be present under the bridge during the evening or at night.

9.1.2 Minimization (Minor Impact)

Work activities are not to occur under the structure between 10:00 p.m. and sunrise. Airspace access is not to be severely restricted. Bird exclusion netting must not be used. Clearing and grubbing near the bridge is to be minimized. Lights are not to be used under the structure. Combustion equipment, such as generators, pumps, and vehicles, are not to be parked or operated under the structure. Personnel are not to be present under the bridge during the evening and at night.

9.1.3 Minimization (Moderate Impact)

Between 10:00 p.m. and sunrise, work activities are to be limited to one portion of the structure at a time. Airspace access is not to be eliminated. Constant (daily) exclusion is to be in place at the work areas. If netting is used, it is to be made of thick plastic and with no exposed overlap joints. Lighting is to focus very specifically on the portion of the bridge actively under construction. Combustion equipment, such as generators or pumps, are not to be parked nor operated under the structure unless they are required to be in contact with the structure. Use ESA flagging to delineate work active work areas from non-active work areas. Personnel are not to be present under the bridge during the evening and night in non-active areas.

9.1.4 Mitigation (Major Impact)

The configuration that supports night roosting should be retained where feasible. Bridge replacements should consider use of a similar bridge design when the roost is large, unique or supports a rare species.

Should an alternate design be used, consideration is to be given to minor modifications that will provide semi-open cavities. The cavities should have sidewalls that are at least 0.6 meters tall and hang from the underside of the structure. The longitudinal walls should be spaced approximately 2 meters apart. Transverse walls, which can double as shear walls, should be 4+ meters apart.

Other options could include surveying the surrounding area and improving other potential sites with minor modifications or careful brush removal.

9.2 ON-SITE DAY ROOST AVOIDANCE, MINIMIZATION, MITIGATION

Day-roost use usually only occurs during the spring, summer, and fall in California, except in coastal areas, the Central Valley, and some other areas where large, non-hibernating, winter colonies can be found. These measures apply to those circumstances where the bats are present. The most critical time, known as the non-volant period, occurs during the breeding season when young are present, but are not yet ready to fly. The non-volant period is generally May through July. Due to seasonal variation between sites, April and August (and sometimes the beginning of September) are to be avoided.

The best avoidance measure is to work when the colony is not present and to retain or restore the roost characteristics after work is complete. If this measure is not feasible, measures taken should be consistent with the general approach guidelines. As noted in the general guidelines, day-roost replacement is to be considered as a last resort for avoiding further impacts to the species when structures are regularly inspected, maintained, and replaced. Furthermore, on-structure day roosts are always preferred over off-structure day roost replacement. Each generic approach is designed to control disturbance to a specific level for the most sensitive species. Specific project measures may be less stringent after site conditions, species sensitivity, and the relative significance of the impacts are considered.

9.2.1 Avoidance (No Impact)

Work is not to occur within 100 feet of an active roost. The area around the bridge is to be designated as an ESA. Airspace access to and from the bridge should remain approximately the same. No clearing and grubbing is to occur adjacent to the structure. Combustion equipment, such as generators, pumps, and vehicles, are not to be parked nor operated under or adjacent to the structure. Personnel are not to be present under the colony, especially during the evening exodus.

9.2.2 Minimization (Minor Impact)

Work is not to occur directly under or adjacent to the roost. The area under the roost within visual sight of the bats is to be designated as an ESA. Airspace access to and from the bridge is not to be severely restricted. Clearing and grubbing is to be minimized wherever possible. Combustion equipment such, as generators, pumps, and vehicles, should not be parked nor operated under or adjacent to the structure. Personnel should are not to be present directly under the colony, especially during the evening exodus.

9.2.3 Minimization (Moderate Impact)

Where work must occur in the area of a seasonal colony:

> Bats are to be excluded from directly affected work areas prior to April 15 of the construction year. Exclusion is to be done selectively, and only to the extent necessary, to prevent morbidity or mortality to the colony. Expandable foam, steel wool, or other method is to be used. Exclusionary devices are to be removed between August 31 and April 15, once construction is complete.
>
> Airspace access to and from the bridge is not to be eliminated. Colony ventilation and protection is to remain the same. Clearing and grubbing is to be minimal, whenever possible. Combustion equipment, such as generators, pumps, and vehicles, are not be parked nor operated under or adjacent to the structure unless they are required to be in contact with the structure. The presence of personnel directly under the colony is to be minimized.
>
> Provision of alternative roost sites may be considered when a substantial portion of the colony is to be excluded for a season or more. However, this is very experimental and close monitoring and reporting of observations is needed to document performance strengths and weaknesses of this measure.

9.2.4 Mitigation (Major Impact)

The ideal situation is to replace the current roost habitat with an identical roost containing the same species-specific physical parameters. If this is not possible due to engineering requirements, e.g., safety, replacement habitat may be considered. Supplemental habitat may also be considered when exclusion will occur for more than one season.

If an alternate design is used, consideration of minor modifications to provide similar roost characteristics is important where feasible.

Critical issues include access, ventilation, and protection, search image and thermal conditions. Crevice roosts should be replaced with crevices of similar area and cavities should be replaced with cavities of similar parameters.

Note: All potential on-site measures must be coordinated in advance with the structural engineer and incorporated into the project planning process.

9.2.4.1. Replacement Cavity Roosts

Replacement cavities that make the roost compatible with the bridge design and operation must be closely coordinated with structural engineers in order to incorporate the physical and ecological parameters that are of key importance to the specific species affected.

9.2.4.2. Replacement Crevice Roosts

Crevice Modification. Within engineering limitations, minor modifications of existing or proposed expansion joints or similar crevices may provide adequate replacement habitat without compromising the structure.

The gap of the joint should be between 1.9 and 3.8 centimeters unless engineering considerations make it unfeasible. Ideally, the replacement gap should match the original gap. The larger end of the range is better for larger crevice dwellers, such as mastiff bats, pallid bats, and big brown bats. Smaller crevices tend to favor smaller species, such as Mexican free-tail bats and pocketed free-tail bats. The inside surface area of the replacement crevice should be located near the original roost. The replacement roost should have an equivalent inside surface area as close as possible to the same compass orientation.

The crevice should have good aerial access, such as a clear 2-meter drop below or a lateral launching pad, where bats can drop down out of the crevice. The top of the crevice should be protected from sunshine, precipitation, and debris, but should have a small shelf for the bats to tuck their babies. The cover may be made of metal, concrete, gasket material, or other nontoxic substances. Gasket material should be omitted from the bottom thirty or more centimeters of the joint. The surface should remain rough; it should not be smoothed.

The replacement crevice should be swabbed with bat guano and urine collected from the original roost and additional guano should be placed in a row under the new roost.

Add-on Panels. Supplemental panels made of lightweight concrete or wood may provide some habitat value. These panels have been successful in California, but are of limited size. The panels must be very carefully placed vertically to avoid compromising the structural integrity or the ability to inspect the structure. The design and placement is extremely critical to allow proper temperature control and variety, as well as to allow for routine bridge inspections and maintenance. Airspace access to an entrance at the bottom of the panel should also be considered. A small ledge must be provided at the top for the bats to place their young.

The 1-meter tall panels are bolted on to the structure and must be sealed at the top to prevent rain from entering. The opportunity for limited ventilation should be provided at the top to allow temperature control. The surface should remain rough; it should not be smoothed.

Figure 9-1. Add-on Panels (Brian Keeley)

Add-on Collars. Collars around large piers are similar to flat panels, with a broader internal temperature range. Since their design may hamper column inspections, use of this method must be coordinated with the structural engineer to ensure accessibility. Collars are to be at least one meter high and subdivided internally by vertical staves that extend a quarter of the way down the inside. These collars may be made of lightweight concrete or as simple sheet metal. The opportunity for limited ventilation should be provided at the top to allow temperature control. The surface should remain rough; it should not be smoothed.

Capped-edge Drains. Standard-edge drains can provide small day roosts. The 6-8 inch, steel, cylindrical drain is capped with the bottom of coffee can tin paved over with asphalt. This creates a tube about 18 inches deep with a ledge at the top. The bats can use the edge to grip and the ledge to rest upon or hold their young.

Wooden-backed Signs. Metal or wood signs with wooden backing that are bolted to chain-link fence and suspended more than two meters off the ground can provide small to medium crevice day roosts. These signs provide tight spaces, the signboards being kept apart approximately one inch, and they can also provide places for maternal bats to tuck their young.

Note: This has only been recorded being used by Yuma myotis from one record in Tuolumne County. Future observations might yield additional species use. This observation importantly

illustrates that suitable crevices can be very deceiving and cryptic.

Bat Houses. Bat houses may provide limited habitat in some cases. There are a variety of designs and ready-made houses available. Bat Conservation International evaluates and approves bat houses for effectiveness and is a good source for information and approved designs. Important considerations include opportunities for behavioral thermal regulation, thermal mass, interior size, ventilation, maintenance, permanency, protection from vandalism, correlation with the original structure, and effectiveness. When mitigating for the loss of a bridge roost, bat "houses" are unlikely to provide a thermal environment comparable to the roosts being lost. Design and location also need to be compatible with the bats' search image of their original roost. Appropriate mitigation is likely to require a substantial structure, using materials comparable to those used in the original roost.

9.3 WINTERING AND HIBERNATION ROOSTS

Wintering-or hibernation-roosting usually occurs from late fall through early spring in California. In many cases, the sites are also used as day roosts during the balance of the year. These measures apply when the bats are present for wintering or hibernation purposes.

The critical time is when the temperatures are low and the bats are in hibernation or deep torpor. The metabolic cost of waking a bat from hibernation can be very high and could be enough to reduce their energy supply to the point where survival of the individual is not possible. It is especially costly to disturb bats during cold spells when the cost of maintaining body temperature is high.

The best avoidance measure is to schedule work when the colony is not present and to retain the roost characteristics when work is complete. If this cannot be done, the following measures are to be considered:

9.3.1 Avoidance (No Impact)

To avoid stimulating energy-draining arousal, several measures are essential. Designate the area around the bridge as an ESA site. No work will take place or occur within 100 feet of an active roost. Airspace access to and from the bridge should remain consistent. No clearing and grubbing should occur adjacent to the structure. Combustion equipment, such as generators, pumps, and vehicles are not to be parked or operated under or adjacent to the structure. Personnel are not to be present under the colony, especially during the evening exodus from day roosts.

9.3.2 Minimization (Minor Impact)

Work must not occur directly under or adjacent to the roost. Designate the area around the bridge as an ESA site. Airspace access to and from the bridge would not be severely restricted. Clearing and grubbing will be minimized wherever possible. Combustion equipment, such as generators, pumps, and vehicles will not be parked or operated under or adjacent to the structure. Personnel shall not be present directly under the colony, especially during the evening exodus. Vibration and noise will be avoided.

9.3.3 Minimization (Moderate Impact)

Exclusions, when needed, will be installed at directly effected sites in late August, after completion of the maternity season. Exclusion is to be done selectively and only to the extent necessary to prevent morbidity or mortality in the colony. An expandable foam or steel wool should be used. Remove exclusionary devices after November 1 when temperatures have dropped and the animals have relocated. After construction is complete, the exclusionary device is removed.

Airspace access to and from the bridge must not be eliminated. Colony ventilation and protection should remain the same. Clearing and grubbing will be minimized, where feasible. Combustion equipment, such as generators, pumps, and vehicles should not be parked or operated under or adjacent to the structure unless they are required to be in contact with the structure. Minimize presence of personnel directly under the colony. Minimize vibration, noise and light to the maximum extent possible.

Provision of alternative roost sites is to be considered when a substantial portion of the colony will be excluded for a season or more.

9.3.4 Mitigation (Major Impact)

The magnitude of impacts to hibernation and wintering roosts can be substantial from a species and wildlife perspective. Therefore, major impacts, such as removal, must only be considered when there are no other alternatives. In such a case, a bat expert familiar with the particular species must be consulted.

10.0 MITIGATION RESULTS FOR RECENT PROJECTS IN CALIFORNIA

10.1 OVERVIEW

Table 10-1 summarizes information for 22 Caltrans bat mitigation projects, with more detailed information on each of these projects provided in Appendix N – Master Table. Nine of these projects were selected for a more in-depth analysis, and are presented as Case Studies (see Appendices A - I).

All projects were in some phase of development over the past five years. At the time of our assessment, two were still in the planning phase, five were under construction, and 15 were completed.

These projects fall primarily into two general categories: seismic retrofit or bridge replacement. We have evaluated five seismic retrofit projects and 16 bridge replacement projects. There was one additional project in which the original bridge, scheduled for removal, was left intact as mitigation. Mitigation was provided on site for 20 of these projects; for one mitigation was off site, and for one the decision regarding on versus off site has not yet been made. Off-site mitigation was used as a temporary measure during the construction phase in five projects.

Bat mitigation structures fall into several categories, and are discussed in more detail below. For all five seismic-retrofit projects, , bats were (or will be) allowed to return to their original roost (which in all cases was a hinge, expansion joint, concrete girder or abutment cavity), with additional habitat provided on one bridge in the form of applied concrete panels.

In one bridge replacement project the mitigation solution was to leave a portion of the old bridge in place, retaining original roosting habitat. Bat habitat was constructed for the fifteen other bridge replacement projects. One project involved installing a concrete bunker installed at the site of the original bridge alignment; fourteen were incorporated into the structure, or applied to the surface of the new bridge. These can be characterized as cast-in place crevices, concrete or wooden panels applied to the inside of a closure pour or some other surface, bat houses applied to some bridge surface, a bat box recessed into the ventral surface of the deck, expanded weep holes, and/or an open hinge. The distribution of these structural types and an evaluation of their effectiveness are summarized in Table 10-2.

10.2 BAT MITIGATION STRUCTURES

10.2.1 Original Habitat Retained

10.2.1.1. No Action

Sometimes the easiest mitigation measure is simply to take no action. The abandoned Hicks Haul Bridge was originally scheduled for demolition as a part of a development plan. Because a large colony of bats occupied the bridge expansion joints, the most effective mitigation measure to conserve bat habitat was to retain the bridge and incorporate it in a county-owned pedestrian trail.

Table 10-1. Bat Mitigation Results

10.2.1.2. A Portion of Original Bridge Retained

In bridge replacement projects, the alignment for the new bridge is frequently different from that for the old bridge, offering the opportunity to mitigate for bats by retaining all or part of the old bridge. This option has a high probability of success because the bats do not need to accommodate new habitat. Although it may also be the most cost effective solution, safety and liability issues must be addressed. This option was used successfully for the Auberry Road Bridge over the upper San Joaquin River (Case Study #1).

10.2.1.3. Seismic Retrofit – Temporary Exclusion

For seismic retrofit projects, the portions of the bridge used by bats (most typically expansion joints, hinges, abutment cavities, and/or concrete girders) are typically only impacted during construction. For those bat colonies roosting in hinges or expansion joints, it is important that neither Styrofoam, nor any other filler, is used to fill these hinges and joints during construction as is often called for in retrofitting plans. Examples of this type of mitigation, and problems that may arise, are discussed in more detail in Case Studies #2 (I-880 over Patterson Slough), #3 (Monterey Bridge No. 450 over Salinas River), and #4 (Hacienda Road over Arroyo de la Laguna).

Seismic retrofit projects often impose a risk of disturbance to bats during construction. There are two obvious ways to try to mitigate this impact. One is to schedule the construction during a time of year when bats are not present (winter in most, but not all, localities – see Case Study #2). However, due to other wildlife constraints (generally fish protection) winter construction is frequently not an option (see Case Study #4).

Another approach is to limit construction to one portion of the bridge at a time – e.g., one end of the bridge, as for Monterey Bridge No. 450 (Case Study #3), or one half of the lanes, as for I-800 (Case Study #2). By using this approach, at least half of the roosting habitat remains in place during construction. In both of these situations, bats were humanely excluded, outside of the maternity season, using one-way doors when known roosts of the same species occurred in those other areas of the bridge away from the construction area (1000 feet for Monterey Bridge No. 450 and about 200 feet for the I-880 bridge). In both these projects, the bat biologist requested a change order to the existing plans so that Styrofoam was not inserted into the spaces created by the hinges and expansion joints. Two of three species present in the Monterey Bridge No. 450 prior to construction were present in post-construction surveys. The pallid bat, present prior to construction in this bridge, and the species considered the most sensitive to disturbance, had not returned to the bridge four years after construction. Although bats did move from the eastern portion of the bridge to the western portion of the bridge as a result of using one-way doors, the I-880 Bridge has not been evaluated for the post construction return of over-wintering bats.

Another mitigation option is to humanely exclude (also with one-way doors) bats from the entire structure, and offer temporary off-site habitat. For example, bat boxes were mounted on a near-by bridge for the Hacienda Road project (Case Study #4). Although these were not successful, bats have returned to the retrofitted bridge in the same or greater numbers than before construction. The necessity to supply interim habitat for bats should be assessed on a case by

case basis, and will depend on both, the species of bats being affected, and on the characteristics of the surrounding habitat (i.e., whether alternative roosting habitat is available in the vicinity of the project). To date, interim roosts have met with only very limited success and are reviewed in Section 10.2.3.1 below.

10.2.2 Original Habitat Lost; New On-Site Habitat Provided

In bridge-replacement projects, the structures used as roost sites by bats are inevitably lost. Depending on the number of bats, the species of bats, and/or the type of roost (*e.g.*, maternity roost), mitigation, particularly the provision of new roost sites, may be needed. New roost sites that come closest to replicating the original roost site will offer the greatest potential for success. Important parameters include roost dimensions, roost temperature, proximity to the original site, and physical similarity to the original roost, which may provide a familiar search image for returning bats. All these requirements are more easily met with on-site mitigation structures. Such structures can either be applied to a surface of the bridge after construction or, with careful coordination with engineers, be incorporated into the bridge structure. They can be constructed of lightweight concrete or wood (generally plywood).

10.2.2.1. Bat Roost Applied to Bridge Surface

Ten of the on-site mitigation structures considered in our review involve bat roosts applied to bridge surfaces. Seven of these are either still in the planning stage or have not yet been evaluated (see Table 10-2). The measure that appears to have the greatest potential for occupancy and require the least maintenance is the application of lightweight concrete panels to create roosting crevices inside closure pours. An example of this approach is supplied in Case Study # 5 (Appendix E, Saint John's River Bridge). A comparable approach using wooden panels has only been partially successful (Mill Creek Bridge, see Table 10-1 and Appendix N).

Significantly, pallid bats were originally present in day roosts and night roosts at the Saint John's River Bridge and Mill Creek Bridge. Although both bridges are still used as night roosts for either big brown bats or Mexican free-tailed bats, only the Saint John's River Bridge is occupied as a day roost, and only Saint John's River Bridge has roosting pallid bats. This comparison has its limitations because the dimensions of the wooden slots for the Mill Creek mitigation roost may have been inappropriate at 2" wide. Nevertheless, given its greater durability and thermal stability, concrete is likely to be more successful than wood for roost panels that are applied to a bridge surface. Concrete panels have also been successful at another bridge (South Fork Cottonwood #8-21, see Table 10-1 and Appendix N).

An additional experiment in roost design was implemented for a temporary roost during the construction phase of the Main Street Cottonwood Creek project (Case Study #6). In this project, because thousands of bats belonging to three species were to be displaced during construction, interim roosts – collars constructed of plywood panels – were installed near the tops of four round piers on the adjacent I-5 Bridge. Mexican free-tailed bats occupied these collar roosts almost immediately; big brown bats used them to a limited extent, and pallid bats never used them. Although collar roosts were highly effective for Mexican free-tailed bats as temporary roosting habitat, collars cannot be used as permanent roosting habitat because of

structural inspection issues. Bat houses applied to a bridge surface as an interim measure during construction also failed to work for pallid bats in the Hacienda Bridge project (Case Study #4).

10.2.2.2. Bat Roost Incorporated into Bridge Structure

Incorporating bat roosts into the structure of a new bridge requires design assistance from bridge engineers to insure that the roost does not interfere with the structural integrity of the bridge. Engineers have approved two experimental roost designs. One, the inclusion of deep, cast-in-place, tight-grain redwood or plywood crevices has been tried for two projects: the Franklin Causeway (Case Study #7) and the Main Street Bridge over Cottonwood Creek (Case Study #6). Details regarding the placement and design of these roost structures are provided in the case studies. Both projects have been highly successful for Mexican free-tailed bats. Because the Mexican free-tailed bat was the only species involved in the Franklin Causeway project, this mitigation can be considered effective. The Main Street Bridge project involved three to four species, including the pallid bat. In the first season after completion of construction, two species occupied the new roosts, but the pallid bat, a target species for mitigation, was not present. This project is still under evaluation.

A second experimental roost design calls for the inclusion of an open bat box recessed into underside of a closed-box girder. Such a structure has already been included in the new Skaggs Bridge over the San Joaquin River (Table 10-1, Appendix N), and is included in the design for the replacement bridge on SR104 over Dry Creek (Case Study #8). Because the new Skaggs Bridge was completed late in the summer of 2004, it is too soon to evaluate its effectiveness. The the lack of bats when it was surveyed in September 2004 does not mean the project was not successful. Because both these bridges had pallid bats roosting in the original structures, it will be especially important to monitor the success of these projects.

In another project for which only limited data were available, the I-5 Cottonwood Creek Bridge #6-0204 (Table 10-1, Appendix N), vent covers were enlarged for 15 weep holes, with the intention that bats could be provided access to the interior of the box beam. Although bat use of the hinge in this bridge was considered in the context of another project (Main Street Cottonwood Creek project, Case Study #6), to our knowledge, the effectiveness of the enlarged vents has not been evaluated.

10.2.3 Original Habitat Lost; New Off-Site Habitat Provided

Off-site mitigation was attempted as a temporary measure (*i.e.*, offering interim habitat during construction) in five of the projects we reviewed, and as the proposed permanent solution in only one (Pieta Creek, Case Study #9). Two of these interim roosts were applied to a nearby bridge structure and thus are discussed in Section 10.2.2.1 above.

10.2.3.1. Freestanding Bat Houses

Freestanding bat houses were available to bats during construction for three projects. In two cases they were part of the mitigation plan (Appendix G, Franklin Causeway, Case Study # 7 and Mojave River Bridge [see Table 10-1 and Appendix N]). For the I-880 project (Case Study #2) a bat house already existed approximately 70 m from the project bridge. Although small numbers

of bats occupied the bat houses installed for Mojave River, in no case did the bat houses adequately replace the habitat lost, and these free-standing bat houses should generally be considered failures. Even the fairly large, condominium-style bat houses installed for the Franklin Causeway project were used only to a limited degree, whereas the cast-in-place crevices of that project were occupied as soon as they were available. Freestanding bat houses likely fail to provide the thermal stability that bats seek in a roost, and are particularly inadequate for very large colonies. Also, because they are highly visible they have the potential to become an attractive nuisance, increasing the chances that bats will be harassed by and/or come in contact with humans.

10.2.3.2. Bunker

Case Study #9 describes an attempt on SR 101 over Pieta Creek to construct a roost for pallid bats. In this project a bunker, known to meet the size qualifications for a pallid bat roost, was installed in the bank, within the alignment of the old bridge. This roost had not been occupied after one season, and thus, so far has not been effective. We have suggested some minor modifications to this design, which should be tried before the project is considered a failure.

10.3 CONCLUSIONS AND RECOMMENDATIONS

Researching and assembling information on bat mitigation projects in California has illuminated certain problems and resulted in a series of recommendations.

10.3.1 Problems with Bat Mitigation Projects

10.3.1.1. Initial Evaluation

Because such a large percentage of bridges are used by bats and because bats have come to rely on these structures, bat surveys should always be included in the environmental assessment process for bridge projects. Planning appropriate and successful mitigation requires that the person conducting the environmental evaluation be able to determine whether or not bats are using the bridge, what species are present, what structural features are being used as roosts, and for what roosting purpose (e.g., day or night, maternity) the bridge is being used. Caltrans biologists are often put in the untenable position of being asked to make these determinations without adequate background and training. Consequently, there are cases in which bats were discovered too late to provide adequate mitigation measures, and cases in which mitigation is proposed even though the species of bats and function of the roost is unknown.

10.3.1.2. Mitigation Planning Process

It was apparent from our review that the mitigation planning process was frequently flawed and led to unnecessary problems. It is critical, particularly for all on-site mitigation projects, that engineers and biologists engage in a cooperative planning process. Engineers and biologists should consult with each other early enough in the planning process that an ecologically successful, cost-effective, and structurally satisfactory solution can be worked out.

Once Caltrans biologists and engineers have agreed upon a mitigation solution, clear instructions need to be given to the contractors. Furthermore, a biological monitor should be used to insure mitigation measures are adhered to and that bats are not harmed.

10.3.1.3. Evaluation of Mitigation Measures

Of the fifteen completed projects included in our review, monitoring mitigation measures has generally been inadequate. For six projects, the only monitoring of the effectiveness of the mitigation measure was a single visit by one of our team in the context of this project. For six other projects, consulting biologists had been involved, and some follow up evaluation was conducted, although in a couple of cases, the monitoring was not adequate (*e.g.*, limited to a single visit). No monitoring had occurred for two completed projects. Generally, Caltrans biologists recognize the need for monitoring, and try to work it into their schedules, but when such measures are not mandated, it is difficult for them to justify the time expenditure.

10.3.1.4. Special Considerations for Pallid Bats

It is evident from this review that mitigation is far easier for some species than for others. Three species commonly found in bridges, the Mexican free-tailed bat (*Tadarida brasiliensis*), the big brown bat (*Eptesicus fuscus*), and the Yuma myotis (*Myotis yumanensis*) are fairly adaptable. In general, mitigation measures have worked for these species. Accommodating the pallid bat (*Antrozous pallidus*), a California species of special concern, which also relies heavily on bridge roosts, is far more challenging. Pallid bats were identified in seven of the 22 projects we reviewed. Two of these projects are still in the planning or construction phase, so the effectiveness of the proposed mitigation cannot yet be evaluated. For the five completed projects, the mitigation appears to have failed in three cases, and been successful in two.

The two projects that appeared to be successful for pallid bats were a seismic retrofit in which the bats were excluded during construction and then allowed to return to their original roost (Hacienda Bridge, Case Study #4) and the Saint John's River Bridge replacement (Case Study #5) in which pallid bats have occupied the crevices provided by concrete panels installed inside a closure pour.

There were also three attempts to mitigate for pallid bats that to date have failed. Although the original roosting habitat is virtually unchanged on Monterey Bridge No. 450 (Case Study #3), pallid bats have not been observed in this roost for four years since the construction disturbance for a seismic retrofit. In this case, the construction contractor did not follow mitigation guidelines, and there is the possibility that the pallid bat colony was disturbed to such an extent that it has not returned. Pallid bats also have not occupied the cast-in-place crevices provided on the new Main Street Cottonwood Creek Bridge (Case Study #7), despite attempts to duplicate the dimensions, location, and temperature conditions of the original roost. Additionally, pallid bats have not so far occupied a concrete bunker roost provided for them (Case Study # 9), using the dimensions and configuration of known roosts.

10.3.2 Recommendations

Based on a review of these 22 projects, our recommendations are:

1. A protocol for evaluating bat use of bridges, such as that proposed in Erickson et al. 2003, needs to be formally adopted and implemented as policy.

2. Caltrans biologists need to be given adequate training to conduct bat surveys and formulate biologically appropriate mitigation plans for bats. Because the effectiveness of most mitigation measures has not been adequately determined, and thus few guidelines are available, Caltrans biologists should have the flexibility to consult with bat specialists (*e.g.*, for highly significant roosts, or particularly challenging mitigation problems).

3. A procedure that insures adequate communication between Caltrans biologists, Caltrans engineers, and contractors should be established for biological consultation.

4. Future research should be conducted, including more experimental roost designs, to determine mitigation measures most appropriate for specific species. This approach is particularly critical for special-concern species like the pallid bat or Townsend's big-eared bat.

5. Monitoring should be an integral part of the mitigation process. The lack of monitoring data seriously hindered our ability to conduct a quantitative analysis of the mitigation measures already in place. Although we have made preliminary assessments regarding the effectiveness of various mitigation measures, there were no projects for which adequate quantitative data were available. For adequate evaluation, post-construction monitoring should occur seasonally (four time/year) for up to three years, or until the mitigation can be considered successful. Success would be defined as the mitigation roost or roosts being occupied by comparable numbers of bats belonging to the same species as were present pre-construction.

6. A central repository needs to be established for bat/bridge data. Such a data base should be made available to all Caltrans biologists, and should include information with respect to which bridges have been surveyed for bats, exactly when they were surveyed and under what conditions, which bridges have bats present, species if known, what features the animals are using, what mitigation measures have been tried, contact information, and the effectiveness of these measures.

7. On-structure mitigation roosts should be considered before off-site roosts, due to their greater effectiveness. At this time, designs such as the lightweight concrete panels mounted inside a closure pour may offer ease of design and implementation, with minimal maintenance and interference with bridge inspection and maintenance, while providing effective roost habitat for some species. Experimental designs should be continued until all species can be confidently mitigated for all situations.

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11.4 PERSONS CONTACTED

Contact	Caltrans District or Institution	Phone Number	E-Mail Address
Caltrans			
Copeland, Donald	District 8	909-383-5927	donald_copeland@dot.ca.gov
Durio, Hal	District 4	510-286-7195	hal_durio@dot.ca.gov
Garrett, Kelly	District 2		kelly_garrett@dot.ca.gov
Guidi, C. Scott	District 6	559-243-8317	scott_guidi@dot.ca.gov
Kirk, Morgan	District 6	559-243-8288	morgan_kirk@dot.ca.gov
Klima, Michael	District 7	213-897-2597	michael_klima@dot.ca.gov
Lee, Rhianna	District 10	209-942-6012	rhianna_lee@dot.ca.gov
Stacy, Sharon	District 2	530-225-3513	sharon_stacy@dot.ca.gov
Other persons			
Shirwan Aran	Georgia Department of Transportation		Shirwan.Aran@dot.state.ga.us
Eric Stackhouse	County of Sacramento, Dept. of Environmental Review and Assess.	916) 874-8117	stackhouse@saccounty.net
Betsy Bolster	Department Fish and Game		BBOLSTER@dfg.ca.gov
Patricia Brown	Brown-Berry Biological Consultants	(760) 387-2005	PatBobBat@aol.com
Mark Kiser	Bat Conservation International	(512) 327-9721	mkiser@batcon.org
A.J. Mitchell-Jones	English Nature		Tony.Mitchell-Jones@english-nature.org.uk
Melisa Montemayhor	Texas Department of Transportation		mmontema@dot.state.tx.us
Stuart Pearlmeter	Willamette National Forest		sperlmet@sps.lane.edu
William Rainey	Consultant, Berkeley, Calif.		weredp@aol.com
Stephanie Remmington	Consultant, Orange County	(949) 233-0765	stremington@earthlink.net
Merlin Tuttle	Bat Conservation International	(512) 327-9721	mtuttle@batcon.org

Appendix A.

Case Study 1
San Joaquin River Bridge, #42C0003
(Auberry Road Bridge)

San Joaquin River Bridge, #42C0003 (Auberry Road Bridge)

Dave Johnston, Bat Biologist
H.T. Harvey & Associates

Case Study 1. Replacing a Bridge While Allowing the Old Bridge with Bats to Remain.

Location	Madera/Fresno County line
Species Involved	Mexican free-tailed bat (*Tadarida brasiliensis*), and likely other species
Type of Work	Bridge replacement
Potential Impacts	Loss of maternity colony
Type of Roost	Maternity roost, day roosts, night roosts
Size of Colony before Construction	estimated at 200 + in 1999
Size of Colony after Mitigation	estimated at 200 + in 2004

Overview

The original bridge was composed of a steel trestle attached to wooden abutments. Public works was unable to provide roosting habitat on the new replacement bridge because of budgetary constraints. Consequently, public works was willing to leave the wooden abutments as roosting habitat for bats. The wooden abutments were retrofitted with additional safety rails and structures were strengthened. The number of bats in the colony was estimated based on the guano pile below roosts and a single count in 1999.

Location and Ownership

The Auberry Road Bridge is located on the Madera/Fresno County line over the upper San Joaquin River, seven miles north of Auberry on Powerhouse Road (222) and 6.5 miles south of North Fork on Auberry Road. The steel and wooden bridge is owned and maintained by the counties of Madera and Fresno.

Background

The Fresno County Public Works and Development and Madera County Road Department had proposed removing the existing bridge and replacing it with a new bridge at a site downstream several hundred feet. Because the new bridge would provide no potential for bat roosting habitat, members of the local community requested that mitigation for the bats be provided. The bat biologist first suggested that the old bridge should remain so that bats were not disturbed. County and Caltrans engineers had already decided to remove the old bridge for liability reasons after a replacement was completed. The engineers therefore believed it was better to remove the old bridge with its roosts and simply build new roosts off the site or incorporate new roosts on the new bridge. However, none of the proposed bat roosting habitats to be added to the new bridge were acceptable to both engineers and the bat biologist. Consequently, the steel trestle was removed, but the old bridge abutments were reinforced and safety rails were installed at the ends of the abutments. With very little additional work, these structures could be handicap or wheel chair accessible.

Features Important to Bats

The Auberry Road Bridge and nearby Powerhouse plant has been a well-known roost for large numbers of Mexican free-tailed bats. Additionally, smaller numbers of other species, such as the big-brown bat and the Yuma myotis, also likely bred in these wooden abutments. The spaces or crevices between the large wooden beams provide day roosting habitat for bats. Additionally, the warm surfaces generated by the heat from the bridge decking provides bats with night roost habitat.

Photo 1. Image taken from under wooden abutment of original Auberry Road Bridge. Notice the urine staining on the concrete beam. Photo by Dave Johnston.

Project Approach and Design

Initially, the wildlife biologist assigned to conduct reconnaissance-level wildlife surveys did not observe the bats roosting on the bridge structure. Public comment for the Natural Environmental Study suggested that bats roosted on the bridge and such roosting habitat would be lost when the steel and wood bridge was removed. A bat biologist made a daytime survey of the bridge on October 30, 1996 and found evidence of roosting Mexican free-tailed bats. Because this project included destroying the original bridge, Caltrans offered to add features in the new bridge to provide bat roosting habitat. However, any design provided by the bat biologist was too expensive to incorporate into the bridge design. The bat biologist suggested leaving the wooden abutments and removing only the steel trestle. Although initially the Caltrans engineers rejected the idea of leaving the wooden abutments, that was the most economical solution to mitigate for lost habitat. For safety reasons, guard railing was installed at the raw ends of the abutments to help prevent visitors from falling off the bridge. The abutments should ultimately become wheelchair accessible and the public also has platforms above the water's edge that provide excellent views of the river as well as fishing platforms.

Photo 2. Abutments left with new railing around top. If railing in the immediate foreground is removed, these structures could allow handicap access to a beautiful view of the river. Photo by Dave Johnston.

Photo 3. View of the abutments from the new Auberry Road Bridge. Photo by Dave Johnston.

Schedule of Work

1996 – Initial surveys of bat roosts and first draft for Natural Environmental Study

1997 – Final Draft for NES
1999 – Construction begins for the new bridge, the new bridge is finished, the steel trestle on the old bridge is removed and guard rails are installed.
2004 – Post construction survey of bats

Lessons Learned

If a lead agency proposes mitigation that, in the opinion of the bat biologist, will likely not mitigate impacts to bats, than that opinion needs to be established in hopes that planners and engineers will ultimately come to agreement to provide adequate mitigation with a high probability of working. In other words, sometimes a "compromise" in design for bat mitigation may never work until the replacement habitat meets some threshold acceptable by bats. The engineers' initially-proposed changes to the new bridge, as a compromise to recommended mitigation, to provide roosting habitat for bats was not, in the opinion of the consulting bat biologist, likely to work.

Additional input and pressure from citizens in the community helped facilitate the lead agency's decision to retain those parts of the bridge, the abutments, to continue to provide roosting habitat for bats in the area.

Although there was a cost benefit to leaving the abutments and not removing these structures from the low flow channel of the San Joaquin River, these abutments were reinforced for long-term stability that offset most potential savings derived from not removing the structures. Nonetheless, the net result of the outcome preserved bat roosting habitat situated in a relatively undisturbed environment.

The retained abutments, functioning as new features along a transportation route, may enhance the recreational activities of handicapped persons and other travelers.

Recommendations

Caltrans biologists need sufficient training to conduct complete and accurate bat surveys. Personnel inspecting bridges for bats should have enough knowledge to detect bats, and preferably, be able to conduct surveys for species identification. Such persons should have at least a level one Memmorandum of Understanding with the DFG

Biologists (state and consulting) should be involved in the early stages of planning in order to provide the best possible mitigation strategy.

Avoidance (of removing roosting habitat) should be considered first when deciding upon appropriate mitigation.

Appendix B.

Case Study 2
U.S. Interstate 880/Alameda Creek Bridge #33-0240

U.S. Interstate 880/Alameda Creek Bridge #33-0240

Dave Johnston, Bat Biologist
H.T. Harvey & Associates

Case Study 2. Mitigation Strategies for a Winter Roost

Location	U.S. Interstate 880 over Patterson Slough, Alameda County
Species Involved	Mexican free-tailed bat (*Tadarida brasiliensis*), and Yuma myotis (*Myotis yumanensis*).
Type of Work	Bridge Deck replacement and seismic retrofitting.
Potential Impacts	Loss of a bat hibernaculum for Mexican free-tailed bats; loss of a maternity colony of Yuma myotis.
Type of Roost	Permanent loss of Mexican free-tailed bat hibernaculum day roosts, night roosts
Size of Colony before Construction	estimated at 1000 for Mexican free-tailed bats
Size of Colony after Mitigation	unknown

Overview

The large U.S. Interstate 880/Alameda Creek Bridge over Patterson Slough comprises a box girder bridge with two large expansion joints occurring over the water. The northbound side of the bridge needed a replacement deck, the southbound side needed grinding and resurfacing of the top of the deck, and many piers needed reinforcing. Bats were not observed during the original biological surveys of the bridge; however, a bat biologist did not conduct these surveys. A colony of 1,000 Mexican free-tailed bats was observed in January 2004 when the construction contractor installed netting to prevent birds from nesting on the bridge. After a failure to find suitable alternative roosting habitat for these bats before they were excluded from the bridge, approximately 950 of the Mexican free-tailed bats left the winter roost. The approximate fifty individuals left were not likely breeding (at least all those examined were either non-breeding males or females, or compromised physically because of old injuries). Although the contractor preferred to exclude all bats and birds from the bridge, bat biologists suggested that to move bats without knowing if other roosts occurred in the area could lead to the loss of those individuals and possible the loss of a maternity colony of Yuma bats. Netting was pulled back from known roosts on the southbound side of the bridge to provide roosts to bats that were about to be excluded from the northbound side. One-way doors were then installed on the northbound roosts, and bats were observed in southbound roosts thereafter. Bat biologists argued that the abandonment of filling expansion joints with Styrofoam for the Monterey Bridge #450 (Bradley Road Bridge) should set a precedence. In Spring of 2004 Caltrans engineers approved leaving the expansion joints void of any filler, such as Styrofoam.

Photo 1. U.S. Interstate 880/Alameda Creek Bridge over Patterson Slough in Alameda County.

Location and Ownership

The U.S. Interstate 880/Alameda Creek Bridge in Alameda County comprises is located approximately one mile north of the Alvarado Boulevard overpass on U.S. Interstate 880. The Caltrans-owned-bridge is situated over Patterson Slough, a flood control channel bypass for Alameda Creek.

Features Important to Bats

The U.S. Interstate 880/Alameda Creek Bridge in Alameda County provided an important winter roost for the Mexican free-tailed bat. Johnston (1998) studied fluctuating populations of Mexican free-tailed bats and reviewed recapture data in Central California that suggested that populations that breed in the Central Valley over-winter along the coast. The bridge roost is located approximately five miles from edge of the San Francisco Bay suggesting this roost site provides bats with a cool but even temperature during winter months. No maternity colony of the Mexican free-tailed bats occurred during the spring or summer of 2004; however, Yuma myotis likely breed on this bridge. Bats did not appear to use roosts for only night roosting; rather, bats that day-roosted appeared to also night roost in these expansion joints.

Photo 2. About 200 feet from the bridge, a bat box had been placed in a wetlands mitigation site. No bats or any evidence that there were bats, were observed in the bat box. Bat biologists rejected the concept that this bat box could provide habitat for the over-wintering bats in the bridge. Photo by Dave Johnston.

Project Approach and Design

This project had only generalized mitigation in the environmental documents to protect bats and resources (roosting habitat) for bats. Although no bats had been observed during initial surveys by biologists, mitigation measures did require a biologist to monitor the bridge as netting was attached to the underside of the bridge. These nets were used to prevent birds and bats from forming breeding colonies and the monitor was needed to prevent animals from being trapped.

Because the biology monitor subcontracted to the construction contractor, all communications and decisions had to be made through the contractor, as opposed to Caltrans. Ultimately, as the situation became more complicated, decisions were made with a combination of the Caltrans biologist, Caltrans engineers, administrators, the contractor and the consulting biologist as a subcontractor.

After bats were found to roost in the bridge in January, plans were drawn to exclude all bats from the bridge. However, no alternative roosts, or even suitable roosts, were found within a few miles. Plans to retrofit nearby bridges failed because other government agencies would not provide permission to alter bridges in anyway. After much discussion, nets were pulled back to a point that bats could re-enter a roost on the southernmost expansion joint on the southbound side of the bridge. Bats in the northbound expansion were then excluded with one-way door devices. In March, approximately 80 Yuma myotis occupied a section of the northbound bridge and were excluded and moved from this impact area. Both Yuma bats and Mexican free-tailed bats occurred in the westernmost sections of the expansion joints (in the southbound bridge).

Photo 3. One of several one-way doors (designed by Dave Johnston) used to move bats away from the impact areas of a bridge to another side of the bridge. Photo by Dave Johnston.

Part of the description of the bridge included the filling of all hinges and joints with Styrofoam. The filling of these crevices would have permanently eliminated breeding habitat for birds and bats. Because Caltrans engineers decided there were no negative effects from not filling in joints and hinges (and because of the precedent established when such crevices were not filled on Bradley Road Bridge in Monterey) joints and hinges were not to be filled.

Results of Post Construction Monitoring

Although bats were monitored at various times during construction when bats were moved, no post construction surveying has taken place. A survey of the bats in January is needed to better understand possible changes to the wintering Mexican free-tailed bat population. Likewise, the Yuma myotis population in May and June has not been surveyed since bats were moved.

Lessons Learned

1. Biologists inspecting bridges may not be trained enough to detect bats, or the evidence of bats, on bridges.

2. Partly because bats were not initially detected on the bridge, adequate funding was not available to mitigate for bats in ways preferred by the bat biologist (i.e., a better job of mitigation could have been provided if bats were discovered prior to the contractor bidding the job so mitigation for bats would have been budgeted.)

3. Bridges may provide important roosting habitat for wintering bats (i.e., bridges may provide a winter roost).

4. The bat biologist was in a subordinate position to the contractor; and therefore, the bat biologist did not have full control over some bat excluding activities.

5. Although surveys were conducted to ensure bats were not in impact areas prior to construction and the exclusion devices used to move bats worked well, no follow-up surveys were conducted to determine if bats returned to the original roosts.

6. Although the hinges and joints of many bridges are designed with a filler (e.g., Styrofoam), Caltrans engineers have approved not filling these crevices for retrofits.

Recommendations

1. Personnel inspecting bridges for bats should have enough knowledge to detect bats, and preferably, be able to conduct surveys for species identification. Such persons should have at least a level one Memorandum of Understanding (MOU) with the DFG.

2. Construction contractors should not be able to claim they can manage bird and bat exclusion without the oversight of qualified biologists. When known populations of wildlife exists in bridges, qualified biologists should be required as part of the Statement of Qualifications (i.e., if a contractor bids on a project with bats that could potentially be

in harms way or at risk, the contractor should be required to either subcontract out to a bat biologist as a part of his/her proposal, or otherwise provide proof of a qualified bat biologist (as defined by an MOU with DFG).

3. Surveys should be conducted enough times during the year that the environmental documents can safely determine if impacts could potentially occur to bats or bat habitat (e.g., a single survey determining there are no maternity roosts associated with a project may not adequately address potential impacts to wintering bats).

4. Bat biologists should not be placed in a subordinate position to construction contractors, particularly when little or no money was budgeted to manage bats.

5. There should be adequate funding to follow up with surveying to determine if mitigation was effective.

6. Bridge retrofits should not be designed to include a filler, such as Styrofoam, if bats or other wildlife utilize hinges and joints as resources.

Literature Cited

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Appendix C.

Case Study 3
Salinas River Bridge #44C0051
(Monterey Bridge No. 450 – Bradley Road Bridge)

Salinas River Bridge #44C0051 (Monterey Bridge No. 450 – Bradley Road Bridge)

Dave Johnston, Bat Biologist
H.T. Harvey & Associates

Case Study 3. Maternity Colony Found during the Construction Period

Location	Southern Monterey County
Species Involved	Yuma myotis *Myotis yumanensis*, Mexican free-tailed bat (*Tadarida brasiliensis*), and pallid bat (*Antrozous pallidus*)
Type of Work	Bridge seismic retrofit
Potential Impacts	Loss of maternity colony
Type of Roost	Maternity roost, day roosts, night roosts
Size of Colony before Work	212 in 1999
Size of Colony after Work	200 in one cluster, about 40 in another expansion joint in 2004

Overview

The seismic retrofitting of this bridge required drilling through the concrete girders at the bridge hinges. Because day roosts and at least one maternity colony occurred in these hinges, drilling through these hinges could potentially disrupt active maternity colonies. The mitigation provided that only one half of the bridge was to be worked on at one time to allow bats to move to other roosts occurring in undisturbed portions of the bridge. After construction was completed in the first half of the bridge, construction could commence in the other half after the maternity season and under the direction of the bat biologist. The first work area would need to be free from bats and birds before construction commencement.

The contractor disregarded the written mitigation measures provided in the Natural Environmental Study (NES) and drilled through a maternity colony of Yuma myotis. Only after pressure from the Caltrans administration, Monterey County personnel instructed the contractor to hire the bat biologist to determine the best way to proceed, given the current situation. Although the Yuma myotis colony remained in place during and after drilling of the occupied hinge, construction was moved, and limited to, the easternmost ½ of the bridge. The bat biologist monitored the development of the young *Myotis yumanensis* to determine when they were volant and regularly leaving the roost so that one-way doors could be installed to "move" bats to other alternative bridge roosts. Instead of moving to another roost within the same bridge, the Yuma myotis colony moved to a different nearby bridge, at least initially.

Location and Ownership

The Bradley Road Bridge (Monterey County Bridge # 450) comprises a concrete box girder structure across the floodplain and concrete arched bridges over the low flow channels of the Salinas River. The county-owned bridge is located approximately 4 miles south of Bradley, Monterey County and immediately north of the northern boundary of the Camp Roberts Military Reservation in San Luis Obispo County.

Background

The Monterey County Department of Public Works had proposed retrofitting this approximately 1,110 foot- long bridge to meet current Caltrans seismic codes. Retrofits for this bridge include: construction of hinges and an abutment seat extension and strengthen pier walls and joints. Pier walls were strengthened by enlargement accomplished by drilling and jack hammering existing piers to add steel and concrete to the bases. Holes were drilling through the joints and bridge sections were tied together with large cables.

Features Important to Bats

The Bradley Road bridge (Monterey County bridge # 450) provided roosting habitat for hundreds of Mexican free-tailed bats, about 200 Yuma myotis and about 20 pallid bats (*Antrozous pallidus*). The majority of the bridge is box girder construction providing numerous night roosts. Over the water and between sections of the approaches, joints and hinges provide 7 large crevices of about 18 - 36 inches deep, depending on the amount of remaining cork, and of varying widths. Yuma bats form a maternity colony on this bridge, and although unconfirmed, Mexican free-tailed bats and pallid bats are suspected of also forming maternity colonies. This bridge does not have a history of being monitored for bats prior to 1999, but we believe populations here are stable based on recent surveys in 2004. Starting at this point and for six miles to the north comprises probably the most mature and unspoiled stand of valley riparian habitat along the Salinas River. A survey of Least Bell's Vireo (*Vireo bellii pusillus*), a federally- and state-listed endangered species, produced three singing males along this reach of the Salinas River in the early 1980s (Robertson 1985). Excellent foraging habitat occurs in adjacent areas and over this riparian habitat near the confluence of the San Antonio, Naciemento, and Salinas Rivers.

Project Approach and Design

To avoid significant impacts to a maternity colony of pallid bats, the project's mitigation measures suggested only one-half of the bridge be under construction at a time. This would allow bats movement among roosts of 4 hinges and joints while the other 3 hinges and joints were under construction and without bats. Because no mitigation for birds or bats was initially followed, and no biological monitors were initially present during the initial construction, it is unknown what impacts were made on these biological resources.

When contractors have the obligation to provide “adequate” biological monitoring, and Caltrans is not directing activities to conserve biological resources, it is easy for biological resources to be either unprotected or under-protected.

Part of the description of the bridge included the filling of all hinges and joints with Styrofoam. This was not disclosed with the initial description of the project design yet would certainly have a negative impact on breeding habitat for bats and birds. The bat biologist got the approval of Caltrans staff (and contract) engineers to agree that the Styrofoam was not necessary and the bridge would not be compromised if no material was inserted in the joints and hinges. The fact

that this saved money and reduced the actual budget facilitated the decision not to fill these crevices.

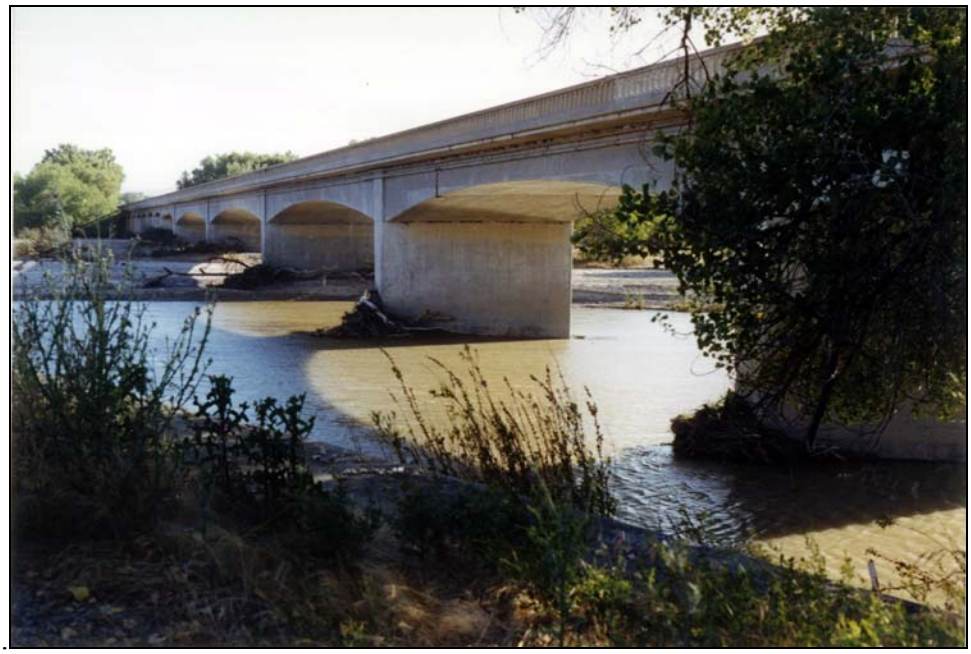

Photo 1. Bradley Bridge located over the Salinas River at the southern end of Monterey County. Photo by Dave Johnston.

Photo 2. Bradley Bridge showing hinge providing day roosting and maternity colony habitat. The box girder construction to the left of the hinge provides night roosting habitat. Photo by Dave Johnston.

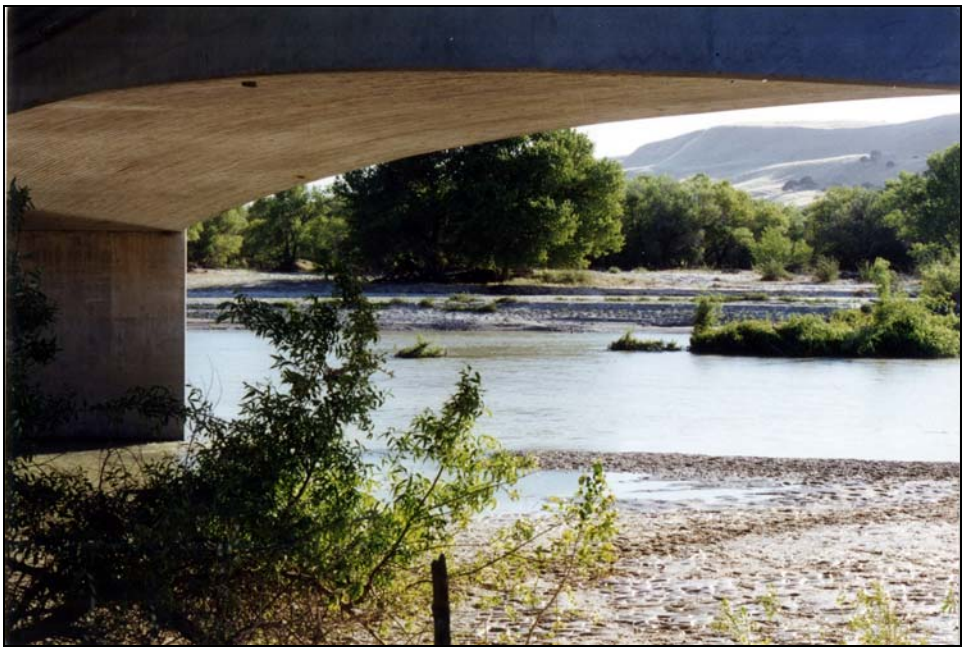

Photo 3. This view of an arched portion of the bridge looking north and across the Salinas River illustrates the adjacent habitats. Habitats occurring in the area were relatively undisturbed to the north and provided good foraging habitat for those species found roosting on the bridge. Yuma myotis forage over the Salinas River and in the well-developed mature cottonwood – willow riparian habitat and pallid bats likely forage in the grassland habitat covering the hills in the distance. Photo by Dave Johnston.

Photo 4. Location of a pallid bat colony in June 1999. Seen flying on the right side of the photograph is a White-thoated Swift (*Aeronautus saxatalis*) exiting from the crevice. Photo by Dave Johnston.

Photo 5. Detail of the roost site for pallid bats. White-throated Swifts were roosting only about 25 cm from the pallid bat colony. Notice urine staining and cork material falling out of the crevice. No animals were present at the time the photograph taken in August 1999. Photo by Dave Johnston.

Schedule of Work

1998 – Initial surveys of bat roosts and first draft for Natural Environmental Study
1999 – Final Draft for NES
1999 – Construction begins
August 1999 – Yuma myotis colony excluded after young are volant; relocated in another bridge
Winter 2004 – Caltrans approves hinges and joints to be left open and not filled with Styrofoam
August 2004 – Post mitigation survey of bats roosting on bridge

Results of Post Construction Monitoring

Field Notes for the Bradley Road Bridge Retrofit Project
8-20-04; 14:00 – 16:30; Sunny, light breeze, temp. 92º F
Dave Johnston (H. T. Harvey & Associates).

Table 1. Pre- and Post-construction Survey Results for Bradley Road Bridge (Monterey Bridge # 450) for Crevice Roosting Bats and Birds.

Hinge or joint	Species	Survey 1999	Survey 2004
#1 (Westernmost hinge)	*Myotis yumanensis*	212	~200
#2	*Tadarida brasiliensis*	Estimated at several hundred	Guano and staining but no bats present
#3	*Myotis yumanensis*	None present	~40
#4	White-throated Swifts Northern Rough-winged Swallows	Not specifically noted	2 Evidence but none present
#5	White-throated Swifts	Not specifically noted	1
#6	*Tadarida brasiliensis*	~100	~16
#7	Pallid bats White-throated Swifts	20 4	No recent evidence Evidence but none present

Lessons Learned

Because the burden of biological monitoring rested upon the contractor or subcontractor, no effective monitoring was conducted during the initial phases of construction. Most mitigation requires qualified personnel to monitor specific potential significant impacts or affects to endangered species. However, the burden of how often and when monitoring should occur is largely left up to the construction contractor, especially if a Streambed Alteration Agreement (1600) from DFG is not needed because work occurs when the low flow channel is dry. While projects in metropolitan areas are likely better monitored, bats occurring on projects in more remote areas, such as retrofitting Monterey Bridge #450, appear to be at greater risk. Thanks to Caltrans biologist, Kelley Phillips, and some supportive administrators, construction on a hinge with a maternity colony of bats was stopped until alternative roosts were located, all young were flying, and the colony was excluded from the construction zone.

For the Bradley Road Bridge, Yuma myotis were successfully "moved" from a maternity roosting site after all young were volant. Individuals were excluded and they relocated to an alternative nearby roost that had been previously located. When this colony was surveyed four years later, the colony approximated the same number of individuals (212 in 1999 and approximately 240 between two clusters in 2004).

Bat biologists requested that hinge and joint crevices not be filled with Styrofoam because doing so would eliminate the bridge's day roosting habitat. CalTrans engineers supported the idea when they determined amongst themselves that the lack of Styrofoam would not risk the integrity of the bridge structure and by allowing these crevices to remain open meant saving important bat and bird breeding habitat.

Recommendations

1. Personnel inspecting bridges for bats should have enough knowledge to detect bats, and preferably, be able to conduct surveys for species identification. Such persons should have at least a level one Memorandum of Understanding (MOU) with the DFG.

2. Construction contractors should not be able to claim they can manage bird and bat exclusion without the oversight of qualified biologists. When known populations of wildlife exists in bridges, qualified biologists should be required as part of the Statement of Qualifications (i.e., if a contractor bids on a project with bats that could potentially be in harms way or at risk, the contractor should be required to either subcontract out to a bat biologist as a part of his/her proposal, or otherwise provide proof of a qualified bat biologist (as defined by an MOU with DFG).

3. Styrofoam should not be used as filler for the expansion joints for bridges. Caltrans engineers have approved retrofitting bridges without filling in expansion joints with Styrofoam or some other filler.

Appendix D.

Case Study 4
Hacienda Bridge #33-0180

Hacienda Bridge over Arroyo De La Laguna Seismic Retrofit Project
Paul Heady assisted by Winifred Frick

Case Study 4. Hacienda Bridge over Arroyo De La Laguna Seismic Retrofit Project.

Location	Hacienda Bridge over Arroyo De La Laguna, Alameda County
Species Involved	Pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), Yuma myotis (*Myotis yumanensis*), and Mexican free-tailed bat (*Tadarida brasiliensis*)
Type of Work	Seismic Retrofit
Potential Impacts	Loss of maternity roost for three species, loss of day roost for *C. townsendii*, and night roost for four species.
Type of Roost	Maternity roost, day roost, and night roost
Size of Colony before Work	*A. pallidus* – ca.>100, *M. yumanensis* – >150; *T. brasiliensis* – >100
Size of Colony after Work	*A. pallidus* – >150 ; *M. yumanensis* – >150; *T. brasiliensis* – >100

Overview

The primary objective of this project was to reduce impacts to bats by:

1. Excluding bats during construction to avoid direct and indirect take of bats during seismic retrofit construction activities; and maintain suitable bat day, night, and maternity roosting habitat at Hacienda Bridge following seismic retrofit construction activities.

2. Designing and installing alternative habitat.

3. Monitoring the effectiveness of this mitigation.

Location and Ownership

This bridge over Arroyo De La Laguna is located in Alameda County, in Pleasanton ½-mile west of Highway 680 on Hacienda Drive. The bridge is owned and maintained by the County of Alameda.

Background

This bridge was scheduled for seismic retrofit in the spring/summer of 2000. Harding Lawson and Associates, under contract for the County of Alameda, hired contract bat biologist Paul Heady to conduct a preliminary survey of the bridge to determine if any bats were using the bridge. The initial survey was conducted June 15th 1999. The cavity created by the east abutment showed signs of night roosting activity (guano and staining) by *Myotis* species as well

as Townsend's big eared bat. The guano deposition suggested that a small to moderate-sized colony of bats roosted in an expansion joint. No bats were observed day roosting during the initial survey, but Yuma myotis were found night roosting in the west abutment cavity.

Surfaces below the east expansion joint showed signs of abundant bat activity (large historic and recent guano deposition and staining). The joint was occupied by Yuma myotis, pallid bats, and Mexican free-tailed bats. Yuma myotis pups were present. No pallid bat or Mexican free-tailed bat young were observed. Many of the pallid bats appeared to be pregnant.

The center expansion joint also showed signs of both current and historic high levels of bat use. Yuma myotis with young made up the majority of the bats. Pallid bats and Mexican free-tailed bats were also using the crevice.

The west expansion joint also showed signs of large numbers of Yuma myotis, pallid bats and Mexican free-tail bats. The cavity created by the west abutment also showed signs of night roosting by a myotis species and pallid bats.

An acoustic monitoring station was set up approximately 60 feet downstream of the bridge. Echolocation calls were recorded from 2040 to 2207 and 240 files were collected representing constant activity of bats leaving the bridge. The species recorded were Yuma myotis, pallid bats, and Mexican free-tailed bats.

Because of the presence of pregnant pallid bats, a follow-up survey was conducted in July to determine if the pallid bats were in fact using the bridge as a maternity roost. The follow-up visual survey was conducted on July 26, 1999. An inspection of the bridge revealed the presence of juvenile pallid bats, volant juvenile Yuma myotis, and newborn Mexican free-tailed bats. This confirmed the bridge as an active maternity roost for the three species.

A second acoustic survey station was established on July 26, 1999 approximately 50 feet upstream of the bridge. Bats began emerging from the bridge at approximately 2035 and constant activity was observed until 2140. Species recorded were Yuma Myotis, Mexican free-tailed bats, and Pallid bats. At 2155 Yuma myotis were observed night roosting in the east abutment cavity. The east expansion joint had juvenile pallid bats, and newborn Mexican free-tailed bats

The seismic retrofit work for the Hacienda Bridge was extensive. The area around the base of the central footing was excavated to expose the three columns resting on the base footing. The space between the columns was filled to create a monolithic pier. This work also involved installation of a water diversion barrier around the excavation area. Seat extenders were enlarged on both abutments and the central pier. The eastern abutment had extensive work involving excavation around the abutment to replace the dead-man anchor rods. The existing cross frame was replaced with all new high strength steel. Finally, the entire structure was sand-blasted, cleaned and painted which required tenting to contain all hazardous materials associated with the old paints and materials.

Features Important to Bats

The primary roosting features provided by this bridge are the three expansion joints. The Hacienda Bridge is constructed from two slabs that make up the deck resting on steel beams anchored at each end by abutments and supported in the middle by a central pier. The western expansion joint between the deck slab and the abutment is situated in an enclosed space that traps air and provides a stable environment around the roost. The central expansion joint above the central pier provides a very isolated roosting site. The east and west expansion joints are similar. Each abutment forms a cave like space that provides excellent night-roosting and day-roosting space. Townsend's big-eared bats were found day roosting in the west abutment and the space near the east expansion joint.

Extensive valley and live oak savannah as well as sycamore riparian near this site provide important foraging and day-roosting habitat for pallid bats.

Project Approach and Design

The initial survey of Hacienda Bridge illustrated the importance of this structure to the bat fauna of the surrounding area. A maternity roost of this size for three bat species required proper mitigation.

Ideally, scheduling of the work would avoid impact to the bats by working in the winter. However, the in-stream work around the central pier did not allow for work conducted between November and April due to fish protection constraints. This schedule meant bats would be disturbed during their breading season from late April through September.

It was decided that mitigation would involve safely excluding bats from the roosting features during construction to avoid direct and indirect loss of individuals during construction. The mitigation would also involve maintaining suitable day-roost, night-roost, and maternity-roost habitat on the Hacienda Bridge after the completion of the project. An alternate roost structure was constructed on the Verona Street Bridge, roughly 2/3-mile downstream from the Hacienda Bridge. Finally, monitoring was conducted at the Hacienda Bridge and the alternative roost on the Verona Street Bridge to determine the level of re-occupation of the Hacienda Bridge and use of the alternate roost structure.

Exclusion of the bats involved installing tubular foam pipe insulation in the crevices used by bats in January 2000. The abutment cavities were closed off in late April 2000 by gluing wood slats around the openings of the cavities and stapling sheet plastic in place.

The alternate roost was constructed as follows: Two boxes made up of six, 4-foot by 2-foot plywood baffles were mounted on the under side of the Verona Street Bridge at mid-span. These boxes were mounted on a cross beam tight against the cement deck in hopes of benefiting from the thermal mass of the deck.

Schedule of Work

15 June 1999 –Initial survey of bridge

26 July 1999 – Follow up survey of bridge to determine if pallid bats were in fact using the bridge as a maternity roost.

2 October 1999 – Fall survey of bridge.

2 December 1999 – Meeting with Alameda County staff, Harding Lawson staff, and Bat Biologist Paul Heady to discuss implementation of designed mitigation.

January 2000 –Installation of exclusion devices in roosting crevices

27 March 2000 – Construction and installation of alternate roost on the Verona Street Bridge.

Late April 2000 –Installation of exclusion sheeting on the abutments.

June 2000 – Emergence survey of alternate roost at the Verona Street Bridge and night survey of the Hacienda Bridge during construction to determine effectiveness of exclusion efforts

Late September 2000 – Removal of exclusion devices.

6 July 2001 – Monitoring of the Hacienda Bridge and the Verona Street Bridge structure post construction

Survey and Monitoring Results

The June 2000 survey of the Verona Street Bridge alternate roost at emergence found no sign of bat occupation of the structure. The night survey of the Hacienda Bridge to determine the effectiveness of the exclusion measures found that pallid bats were very active at the site despite the completely altered appearance of the structure due to exclusion measures and the construction tenting. Bats were continuously flying up to the blocked crevices emitting social calls.

July 06 2001 Monitoring

East Abutment. The cavity created by the east abutment showed signs of night roosting activity (guano and staining) by *Myotis* species The guano deposition was very light indicating light-to-moderate use.

East Expansion Joint. The crevice formed by the expansion joint was filled to capacity with pallid bats with young, Mexican free-tailed bats, and Yuma myotis.

Center Expansion Joint. Pallid bats and Mexican free-tailed bats were using the joint, although the majority of the bats were Yuma myotis.

West Expansion Joint. This joint had large numbers of Yuma myotis, pallid bats and Mexican free-tailed bats.

West Abutment. The cavity created by the west abutment showed signs of night roosting by myotis and pallid bats.

Verona Street Bridge. The roost structures placed under the bridge were visually surveyed and no bats were observed using the structures.

The first acoustic monitoring station was established in the rip-rap stones at the bridge abutment. Echolocation calls were recorded from 2040 to 2200 hours, and 93 files were collected representing constant activity of bats leaving the bridge. The species recorded were Yuma myotis, pallid bat, and Mexican free-tailed bat.

A second acoustic survey station was established under the Verona Street Bridge. Monitoring was conducted from 2040 until 21500. Species recorded were Yuma myotis and Mexican free-tailed bats. No bats were observed emerging from the roost structures under the bridge.

Bat occupation of the Hacienda Bridge appears to have increased slightly in the expansion joints, most notably in the center joint. This may be due to the fact that habitat was increased by the removal of historic guano build up. All three species have re-occupied the bridge in numbers equal to or exceeding pre-construction levels.

Evidence that Hacienda Bridge was being used as a maternity roost by the three species Yuma myotis, pallid bat, and Mexican free-tailed bat had been observed on July 06 2001. No further monitoring seemed necessary due to the fact that the bridge was being used at levels exceeding pre-construction levels.

The roost structures under the Verona Street Bridge had not shown use by the middle of maternity season 2001 and therefore were unlikely to be used later that season. These structures may be used in subsequent years and visual assessment should be conducted by county staff each summer season.

Discussion

The efforts to protect the pallid bat colony in the Hacienda Bridge were successful. Maintaining the original roost structure (the bridge expansion joints) is likely responsible for the successful re-establishment of the pallid bat maternity colony. Although the bats were excluded from their roost structure for an entire maternity season, bats were able to return to the original bridge features after construction was completed, rather than being forced to habituate to an unfamiliar alternative structure.

In an effort to provide available roosting habitat during the exclusion period, an alternative roost structure was built and placed under the adjacent Verona St. Bridge. The original intent behind the Verona St. bridge roost habitat was a temporary roosting structure for bats displaced by the exclusion. Bat biologists met with the Alameda County planning staff and gave a presentation about the roosting ecology of bats and the importance of the local bat fauna to the ecosystem.

After this brief educational presentation, the Alameda County planning staff agreed to allow the Verona St. Bridge roost structure to become permanent as a net gain of available bat habitat in the area. Although the Verona St. Bridge roost habitat was available, there was no evidence that pallid bats used this structure during the exclusion period. The Hacienda Bridge pallid colony must have had near-by alternative roost habitat because bats were seen active in the area during the exclusion period.

Lessons Learned and Recommendations

1. The timeline on this project were appropriate for determining and implementing proper mitigation efforts. The initial surveys were conducted a year in advance of the proposed construction which allowed bat biologists to observe bat behavior and seasonal usage of the roost structure. Exclusion devices were implemented prior to the arrival of the maternity colony in spring, so no bats were physically removed.

2. Bat banding and radio-tracking would have greatly benefited our understanding the local movements and fidelity of the bat colony. Radio-tracking would have permitted biologists to know if there were alternative roost structures that animals could have used during the exclusion period (and possible protect them during that critical period). Banding would have confirmed that the same individuals returned to the structure after a season of exclusion.

3. A timeline should be developed early in the planning stages to provide successful mitigation.

4. Radio-tracking will greatly facilitate understanding the importance of the roost(s) to any given colony. When providing successful mitigation measures, radio-tracking should be used as a method of determining if (and where) a colony has alternative roosts.

Appendix E.

Case Study 5
Saint John's River Bridge #46-0108

Saint John's River Bridge
Greg Tatarian

Case Study 5. Duplicating Roosting Habitat in a New Bridge.

Location	Bridge over Saint John's River, Tulare County, SR 216, PM 7.9
Species Involved	Pallid bat (*Antrozous pallidus*), Mexican free-tailed bat (*Tadarida brasiliensis*), and Myotis sp. (possibly *Myotis yumanensis* or other *Myotis* species)
Type of Work	Bridge replacement
Potential Impacts	Loss of roosting sites for maternity colony of at least one species, night roost for at least two species
Type of Roost	Maternity and night roost
Size of Colony before Work	*A. pallidus* – ?, *T. brasiliensis* – >?, *M. yumanensis* or other *Myotis* species – ?
Size of Colony after Work	*A. pallidus* – 30; *T. brasiliensis* – >500; *Myotis* species >20

Overview

The primary objectives of this project were to reduce impacts to bats by:

1. humanely exclude bats roosting in the original bridge's expansion joint, and

2. working with engineers to provide roosting habitat in the new bridge, similar to that being lost by demolition of the old bridge.

Location and Ownership

The Saint John's River Bridge on Route 216 is located in Tulare County, at Post Mile 7.9, and is represented on the U.S. Geological Survey Quadrangle for Exeter, at Township 18S, Range 25E, Section 24. The bridge is owned by Caltrans.

Background

The Saint John's River Bridge on Route 216 was an open girder design built in 1951, and a variety of upgrade plans were considered and rejected, in favor of replacement, which was conducted in stages to move both directions of traffic through one lane. The original 7.9 meter wide bridge was replaced with a new 12.0-meter-wide structure. Construction started in Spring 2000.

Bat surveys, conducted by Gregg Erickson, revealed that the old bridge served as a day and night roost for Mexican free-tailed bats (*Tadarida brasiliensis*), big brown bats (*Eptesicus fuscus*), and

unidentified Myotis species. In addition, some evidence was observed of roosting by a CDFG Species of Special Concern, the pallid bat, *Antrozous pallidus.* Gregg Erickson and the district biologist then worked with the bridge engineers to design replacement habitat for incorporation into the new bridge.

Features Important to Bats

The Saint John's River Bridge on Route 216 served as a day and night roost for at least three species, and was likely used by one or more additional species. Bats primarily used the single expansion joint that spanned the width of the bridge.

Replacement Habitat in New Bridge

The replacement bridge was opened in the winter of 2003, and that spring, day and night roosting bats were observed. The replacement bridge design is being used increasingly for new bridges, and consists of two separate box girder structures, with a separation of several feet between the two structures, which is finally sealed with a closure pour. This closure pour connects the bridge deck, but not the bottom surface of the box girders, so a vertical recess remains between the two sections.

Photo 1. New bridge with closure pour recess and bat roost habitat panel at left. Photograph by Greg Tatarian.

A lightweight concrete panel approximately 2" thick, running the full height of the closure pour recess, was installed in the portion of the bridge that is situated mostly above the water. The roost area created by the panel provides 3-4 times that of the original expansion joint.

Photo 2. Closer view of roost panel, showing staining signs of bat roosting activity. Photograph by Greg Tatarian.

Monitoring Results

Post-Construction Surveys

Surveys conducted in the spring of 2004 by District biologist Morgan Kirk revealed that *T. brasiliensis* were day-roosting in the new habitat, and *A. pallidus* were observed night-roosting. A day survey conducted by Greg Tatarian on August 10, 2004, revealed roosting by *T. brasiliensis* along approximately 80% of the length of the panel, and ca. 30 *A. pallidus*. In addition, several Myotis individuals, tentatively identified as *Myotis yumanensis*, were observed.

Photo 3. Closeup of urine staining showing active roosting by bats. Photograph by Greg Tatarian.

Discussion

One of the species first observed in the old bridge, *E. fuscus*, was not observed in the new bat roost habitat on the new bridge. Despite this, the short interval between completion of construction and roosting by *T. brasiliensis*, and subsequent day-roosting by *A. pallidus*, is extremely encouraging, especially so because *A. pallidus* was not observed day-roosting in the old bridge.

The bottom of the new bridge is situated fairly low to the grade (ca. 5 m.), which brings the bat roost within reach of vandals. Graffiti was observed elsewhere within the closure pour, and over time, additional vandalism is likely to occur. The roost panel is made of material visually identical to the bridge, does not protrude from the closure pour, and appears to be an integral part of the vertical wall of the box girder, is extremely well-disguised. Additionally, the crevice requires viewing from directly below to discern any bats roosting inside, and the height of the panel allows bats to retreat to the upper portions of the roost crevice, which should protect them from all but the most determined vandals. One concern might be accumulation of smoke inside the crevice in the event of human campfire activity beneath the roost, but because most of the panel is situated above the water, this seems rather unlikely to occur.

Photo 4. Pallid bats day-roosting in the panel crevice. Photograph by Greg Tatarian.

In addition to the day-roost potential of the crevice, the closure pour design appears to offer significant potential night-roosting habitat. This design can be modified in future bridges to provide even better habitat – for example by casting in separating walls within the closure pour recess, perpendicular to the pour, creating additional roosting pockets that trap warm air and provide additional roosting surface area.

Lessons Learned and Recommendations

The design of the replacement bat roost habitat panel has been successful to date, and offers significant advantages over other designs, and especially so compared to off-structure mitigation roosts such as bat houses. Although there is an interest by Caltrans engineers and maintenance staff in exploring off-structure alternatives, panels such as this can be constructed at relatively low cost, and are inherently inconspicuous. In addition, with this design the panel is attached to a portion of the bridge that does not require the same degree of inspection and maintenance, and impacts to sensitive portions of the bridge, such as expansion joints and abutments, are minimized. This design would provide an excellent platform for experimentation with subtle variations to accommodate different species, and its use should be strongly encouraged for future closure pour bridge mitigation roosts.

Appendix F.

Case Study 6
Main Street Bridge over Cottonwood Creek

Main Street Bridge over Cottonwood Creek
Elizabeth D. Pierson and William E. Rainey

Case Study 6. Duplicating Roosting Habitat in a New Bridge with Other nearby Bridge Roosts

Location	Main Street Bridge over Cottonwood Creek, Cottonwood, Shasta-Tehama County line
Species involved	Pallid bat (*Antrozous pallidus*), Mexican free-tailed bat (*Tadarida brasiliensis*), big brown bat (*Eptesicus fuscus*), and Yuma myotis (*Myotis yumanensis*) or other *Myotis* species
Type of Work	Bridge replacement
Potential impacts	Loss of roosting sites for large maternity colonies for three species
Type of Roost	Maternity roost
Size of colony before work	*A. pallidus*– >100, *T. brasiliensis* –>1,000, and *E. fuscus*– >300; *M. yumanensis* or other *Myotis* species – a few individuals
Size of colony after work	*A. pallidus* – 0; *T. brasiliensis* – >1,000, *E. fuscus* 0; *Myotis* species >200

Overview

The primary objectives of this project were to reduce impacts to bats by:

1. installing exclusion devices in the bridge during the winter prior to construction, at a time when no bats were present;

2. working with engineers and the Department of Public Works to design and install temporary roosting habitat during demolition of the old bridge and construction of the new bridge; and

3. working with engineers and the Department of Public Works to provide roosting habitat in the new bridge, similar to that being lost by demolition of the old bridge.

Additionally, in cooperation with the engineers, the replacement habitat was designed to test the roosting requirements of the species present by providing crevices of differing widths.

Location and Ownership

The Main Street Bridge over Cottonwood Creek is located on the Shasta-Tehama County line, just south of the town of Cottonwood, and just east of the I-5 crossing of Cottonwood Creek. The bridge is under the jurisdiction of Shasta County, and the project was administered by the Shasta County Department of Public Works in Redding.

Background

The Main Street Bridge over Cottonwood Creek, just south of the Town of Cottonwood, was built in 1930, and was replaced for structural reasons (Photo 1).

Photo 1. Old bridge early in demolition. Piers for new bridge are being installed under the old bridge. Photo by William E. Rainey.

This bridge was located approximately 100 m east of, and parallel to, an I-5 crossing of the same creek. Also, a few hundred meters to the west is a railroad trestle that also crosses Cottonwood Creek. A large sand bar on the south shore and ready access to the north shore make the area around this bridge an attractive recreational site for swimming, fishing, and picnicking by local residents.

Bat surveys, initiated by Shasta County in the summer of 2000, revealed that the old bridge served as a significant maternity roost for three bat species, including a CDFG Species of Special Concern, the pallid bat, Antrozous pallidus. The consulting bat biologists then worked with the bridge engineers to design replacement habitat for incorporation into the new bridge.

Features Important to Bats

The Main Street Bridge over Cottonwood Creek served as an important day roost and maternity site for three species, and was used by occasional individuals of one or two additional species. Bats primarily used the expansion joints, each extending about 2 meters deep and located over each of the 20 bents that supported the bridge deck (Photo 2). Some night-roosting also took place among the concrete girders under the deck.

Photo 2. Corbel used by bats as entry point to expansion joint roost in the old bridge. Photo by William E. Rainey.

The depth of these expansion joints offered a thermal gradient to the animals, allowing them to be near the sun-warmed surface of the bridge deck when ambient temperatures were cool, and to move down into cooler areas when temperatures on the deck got too hot. Temperature monitors, placed at a range of depths in the crevices, indicated that temperatures in the expansion joints were less variable than ambient air temperature, and lagged behind air temperature as a consequence of the mass and diurnal warming of the deck. Temperatures near the deck surface often exceeded 120°F during the summer afternoons and remained higher than ambient throughout much of the night.

The expansion joints, edged on the deck by metal angle stock, were open both top and bottom, allowing inspection of these crevices from the bridge deck. While this structural feature was convenient for an evaluation of bat use, it offered no shelter to the animals in the case of rain. Expansion joints were consequently not usually occupied in fall and winter subsequent to the seasonal onset of rain.

Two other nearby bridges were used by bats prior to the removal of the old bridge, and used more extensively after that roost structure was removed. The roost in the I-5 structure is located in a single large expansion joint (Photo 3). Use of this site varied seasonally, and at times was only used as a night roost.

Photo 3. Bat roost located in expansion joint on U.S. Interstate 5 Bridge. Photograph by William E. Rainey.

The railroad trestle, to the west of the I-5 Bridge, is composed of a series of four longitudinal pre-cast beams and has three longitudinal crevices that run the length of the trestle within each segment. The upper portion of each crevice had been previously filled with foam, so that the crevices were largely sealed against precipitation from above. While this structure is used year-round by bats, it is the only local winter roost currently known in the area for Mexican free-tailed bats (Photo 4).

Photo 4. Railroad trestle showing longitudinal crevices used as bat roosts. Photography by William E. Rainey.

The gravel and cobble-bedded creek, the broad flood plain, and the adjacent cottonwood riparian corridor in the vicinity of the bridge offers foraging habitat to bats roosting on the bridge.

Project Approach and Design

Bat surveys were initiated by Shasta County in the summer of 2000. It was immediately evident that this was a very significant roost, both in terms of total numbers of animals and in species diversity – particularly the presence of a large colony of pallid bats, a CDFG Species of Special Concern.

The Shasta County Department of Public Works then initiated a project in which the consulting bat biologists (E.D. Pierson and W. E. Rainey) worked cooperatively with the engineers (CH2M Hill) to design replacement habitat. This involved bat roosts to be incorporated into the structure of the new bridge and an interim roost for the one season when the old bridge would be unavailable and the new bridge would not yet be completed.

The existing bridge was monitored nine times between July 2000 and August 2001 to establish seasonal patterns of bat use, and gather data for planning effective mitigation. In two capture efforts (May and August), 106 *E. fuscus* and 71 *A. pallidus* were captured upon emergence from the roost, and banded with numbered, colored bands. Both commercial harp traps and custom traps designed to fit the corbel were used in the capture (Photo 5).

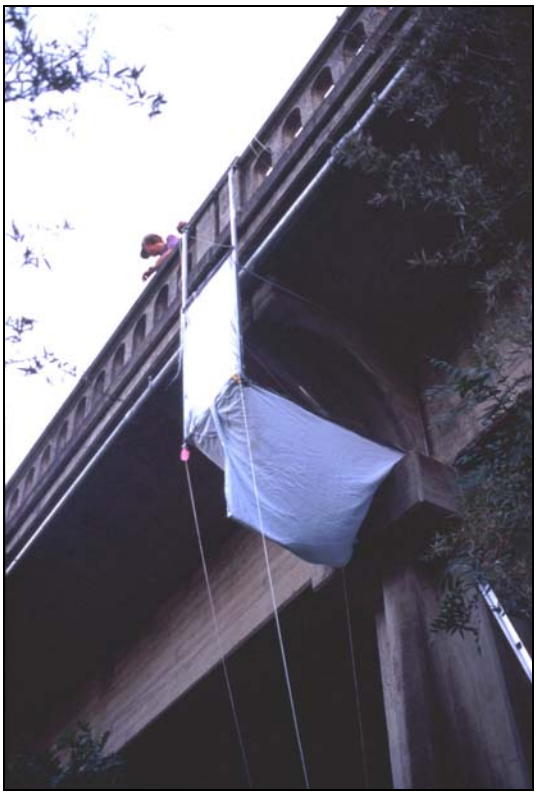

Photo 5. Custom adapted harp trap installation, designed for capturing pallid bats. Photograph by William E. Rainey.

In early January 2002, when no bats were present in the bridge, foam backer rod was installed in the deck crevices by the consulting biologists and plywood panels were installed on the bents by the contractor to exclude access to roosting areas (Photo 6). These installations were subsequently checked by the consulting biologists and bat activity around the structure was evaluated during deck demolition.

Photo 6. Plywood panels installed over bents to exclude bats from expansion joints. Photograph by William E. Rainey.

Temporary Roost. Four temporary roosts were installed at the tops of four round piers on the adjacent I-5 structure (Photo 7). These were collars made of fitted plywood sections, lined with polyurethane mesh, and positioned one to two inches from the column surface by wood spacers.

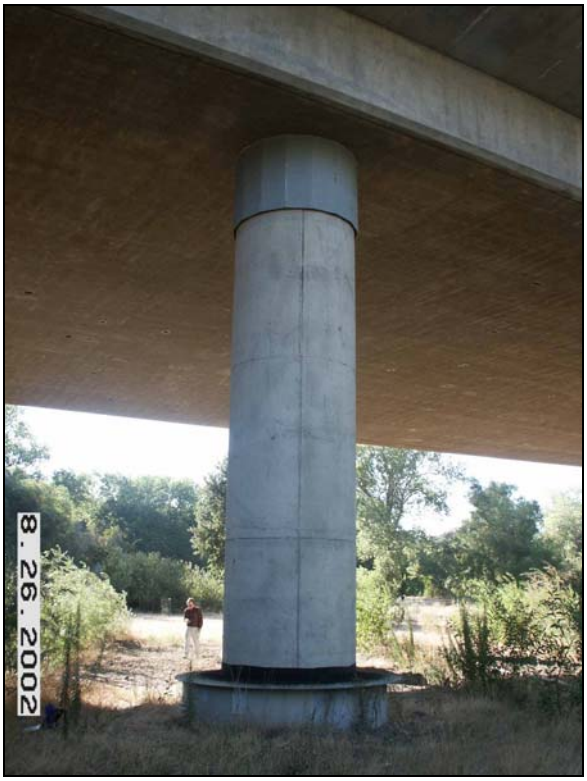

Photo 7. Interim collar roost installed on U.S. Interstate 5 bridge piers. Photograph by William E. Rainey.

Replacement Habitat in New Bridge. The bats had used 18 of the 20 expansion joints at the bents in the old Main Street Bridge, but the new bridge design provided for only eight bents. To generate a comparable amount of roosting habitat, twelve pre-constructed bat crevices, each made of plywood, with wooden spacers, and lined with polyurethane mesh, were installed in each bent cap – six to the north of the piers, and six to the south, for a total of 96 bat roosts (Photos 8 and 9).

The width of the crevice was varied – 1/3 were 1.0", 1/3 were 1.5", and 1/3 were 2.0" while the length remained a constant 39 inches long and depths varied only slightly, from 59 to 70 inches deep. Each roost was constructed such that one wall of the roost was longer than the other, thus creating a landing platform for the bats. The goal was to obtain quantitative data on the preferred crevice width for the species in question. Because of the north -south orientation of the bridge solar exposure of the sides varied daily and seasonally. Thus, the position of the crevices of differing width classes was varied so that preference for both crevice width and solar exposure might be evaluated statistically.

Schematic for Allocation of Bat Crevices.

	Eastern Bay		Middle Bay		Western Bay	
Pier 1	2.0"	2.0"	1.5"	1.5"	1.0"	1.0"
S. End	2.0"	2.0"	1.5"	1.5"	1.0"	1.0"
Pier 2	1.5"	1.5"	1.0"	1.0"	2.0"	2.0"
	1.5"	1.5"	1.0"	1.0"	2.0"	2.0"
Pier 3	1.0"	1.0"	2.0"	2.0"	1.5"	1.5"
	1.0"	1.0"	2.0"	2.0"	1.5"	1.5"
Pier 4	2.0"	2.0"	1.5"	1.5"	1.0"	1.0"
	2.0"	2.0"	1.5"	1.5"	1.0"	1.0"
Pier 5	1.5"	1.5"	1.0"	1.0"	2.0"	2.0"
	1.5"	1.5"	1.0"	1.0"	2.0"	2.0"
Pier 6	1.0"	1.0"	2.0"	2.0"	1.5"	1.5"
	1.0"	1.0"	2.0"	2.0"	1.5"	1.5"
Pier 7	2.0"	2.0"	1.5"	1.5"	1.0"	1.0"
	2.0"	2.0"	1.5"	1.5"	1.0"	1.0"
Pier 8	1.5"	1.5"	1.0"	1.0"	2.0"	2.0"
N. End	1.5"	1.5"	1.0"	1.0"	2.0"	2.0"

Photo 8. Bat crevice forms prior to incorporation into structure of new bridge. Photograph by William E. Rainey.

Photo 9. Bat crevices as installed in bents of new bridge. Photograph by William E. Rainey.

Schedule of Work

Surveys to document seasonal patterns of bat use were conducted at the old bridge between July 2000 and August 2001.

In early January 2002, when no bats were present in the bridge, modifications were made to exclude bats from returning to the bridge, and four interim roosts were installed on adjacent I-5 bridge. The deck of the old bridge was removed in the spring of 2002, and the new bridge was completed in the winter of 2003.

Monitoring Results

Table 1 summarizes the bat survey results between 2000 and 2004, including the surveys of both old and new bridges, the interim mitigation roost, and the other available structures (I-5 expansion joint and RR trestle).

Bat Use of Old Bridge. Repeated surveys of the old bridge revealed seasonal patterns of use by the three dominant species.

A nursery colony of 150 reproductive female pallid bats (*A. pallidus*) occupied the bridge from spring through fall, and with that year's young the colony increased to >300 in August. This species was absent from the bridge from late fall until spring.

Similarly there was a nursery colony of ca. 300 big brown bats (*E. fuscus*) that occupied the bridge during their reproductive season (May through July). Their numbers declined in August, and they were absent from the bridge in the winter.

A large population of Mexican free-tailed bats (*T. brasiliensis*) occupied the old bridge, plus the nearby I-5 Bridge and railroad trestle. The animals appeared to move among these structures, be present year round, with a local numbers in the range of 4,000-8,000. It was difficult to get an accurate count for a colony of this size since there were typically few observers, and the bats were distributed among multiple narrow roost crevices. Movement patterns of Mexican free-tailed bats in the Central Valley, and in California as a whole, are poorly understood. Thus, it should not be assumed that the same bats are present year-round.

Bat Roosting Patterns during Construction. Although specific population counts of the railroad trestle and I-5 structure roosts were not made prior to the demolition of the old bridge, the number of bats in these structures increased after the old bridge was removed.

While there was no evidence of big brown bats using the I-5 Bridge prior their exclusion from the old bridge, individuals identifiable as big brown bats were observed with a spotlight and binoculars in the expansion joint after exclusion had taken place, and recorded emerging and returning to this roost with an infra-red video system. Also, a few banded big brown bats were observed roosting in the railroad trestle after exclusion.

Table 1. Monitoring Data for Main Street Bridge over Cottonwood Creek Project

Date	Number of Bats					Number of Bats				Number of Bats					Number of Bats	
	Anpa	*Epfu*	*Tabr*	*Mysp*	Notes	*Anpa*	*Epfu*	*Tabr*	*Mysp*	*Anpa*	*Epfu*	*Tabr*	*Mysp*	Notes	*Epfu*	*Tabr*
	OLD MAIN STREET BRIDGE									**RR TRESTLE**					**I-5 EXPANSION JOINT**	
09-Jul-00	ca. 150	>300	>700	1								>,1000				
19-Jul-00	ca. 200	>300	ca. 1,000	0												
21-Aug-00	>300	30	>1,000	0												
11-Sep-00	ca. 300	60	>1,000	2								>1,000				Present
27-Nov-00	0	0	0	0							1	>1,000				Present
17-Mar-01	13	ca. 35	ca. 20	0								WER emerg		Water too high		
10-Apr-01	0	ca. 12	ca. 1,000	0										Water too high		
17-May-01	>100	>300	>1,000	0										Water too high		
21-May-01		106	16		Capture effort											
13-Aug-01	ca. 85	ca.35	>800	0												
13-Aug-01	55				Capture effort											
08-Jan-02	0	0	0	0	Exclusion performed											
	BATS EXCLUDED FROM OLD BRIDGE					**I-5 MITIGATION ROOST**										
11-Mar-02	0	0	0	0		0	0	0	0	0	1 cluster	0		Water too high for 60% structure		
18-May-02	0	0	0	0		0	0	0	little guano	0	35	>200		Water too high for 60% structure	>50	Present

Date	Number of Bats					Number of Bats				Number of Bats					Number of Bats	
	Anpa	***Epfu***	***Tabr***	***Mysp***	**Notes**	***Anpa***	***Epfu***	***Tabr***	***Mysp***	***Anpa***	***Epfu***	***Tabr***	***Mysp***	**Notes**	***Epfu***	***Tabr***
	OLD BRIDGE REMOVED															
05-Jul-02	NA	NA	NA	NA	NA	0	2	0	little guano	1	ca. 200	>8,000	1		Guano	Exit count-550
26-Aug-02	NA	NA	NA	NA	NA	0	0	>200	0	0	37	>4,000	6		0	Exit count - 1186
	NEW MAIN STREET BRIDGE															
11-Jul-03	0	0	0	1		NA	NA	NA	Removed earlier	0	>200	>8,000	3	4 banded *Epfu*	Guano	0-Day Roost Hundreds - Night Roost
10-Jun-04	0	0	ca. 500	> 125						0	ca. 100	ca. 5	0	2 banded *Epfu*		Guano

The numbers of Mexican free-tailed bats greatly increased in both the railroad trestle and the I-5 expansion joint after the old bridge was removed. Although a few pallid bats were detected in evening acoustic surveys conducted during the construction period, only one roosting pallid bat was seen (in the RR trestle in July 2002, subsequent to the removal of the old bridge).

U.S. Interstate 5 Interim Mitigation Roost. The four interim collar roosts installed on the I-5 bridge were modeled after an artificial roost design that had proven effective for *Myotis* species in the southeastern United States (Clawson and Gardner 1992, 1993). Because it can take up to three years for bats to occupy a new roost (Tuttle and Hensley 1993), the fact that bats were present within 5 months indicates this roost design has considerable potential (Photo 10). *E. fuscus*, *T. brasiliensis*, and a *Myotis* species roosted in these collars during the first year of installation. By the end of August, there were >200 *T. brasiliensis* using these sites. These roosts were removed once the new bridge was completed during the winter of 2002.

Photo 10. Guano below U.S. Interstate 5 collar roost, showing evidence of bat use. Photo by William E. Rainey.

Bat Use of the New Bridge. The new bridge was completed during the winter of 2002-2003. In July 2003, the first summer after construction, only one bat was observed using the bridge, but by June 2004, the numbers had increased dramatically, with about 500 *T. brasiliensis* and about 125 *M. yumanensis*. Roosting patterns in the old bridge and the railroad trestle indicated that *T. brasiliensis* preferred roosts over water. There was no evidence of roosting pallid bats or big brown bats. Because 12 out of 96 roosts in the new bridge occurred above high water, many *T. brasiliensis* roosting above water could have been missed in surveys.

Of the 84 bat crevices in the new structure that could be surveyed, in June 2004 – 5 were used by a *Myotis* species and 6 were used by *T. brasilliensis*. One bat was observed roosting in a 2"

crevice. Four 1" crevices were being used and 6 1.5" crevices. The majority of the *Myotis* were in 1" crevices, and the majority of *T. brasiliensis* in the 1.5" crevices.

Two minor problems were evident after installation. The contractor lined the bat boxes with a more open mesh material and used a lower density of staples for attachment than recommended by the consulting biologists. Consequently, in some cases, the mesh buckled into the cavity interior, partly occluding it. Also, a few of the refuge sites had experienced compression during installation (Photo 11).

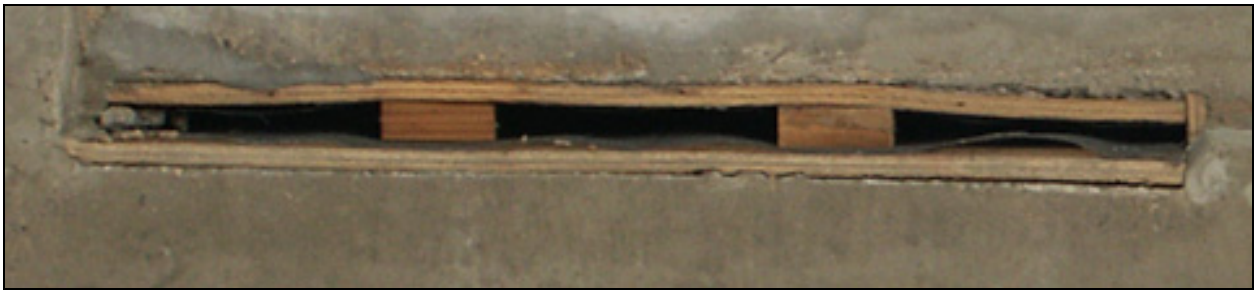

Photo 11. Bat crevice showing compression of plywood and buckling of polyurethane mesh. Photo by William E. Rainey.

Discussion

It is still too soon to evaluate fully the effectiveness of this mitigation. It is not surprising that *T. brasiliensis* is one of the first species to colonize the bridge. This species is known to be quite adaptable in its roosting requirements and is locally the most abundant species. It was evident in the both the July 2003 and June 2004 surveys that a number of *T. brasiliensis* were also using the I-5 structure (as a night roost in July 2003 and as a day-roost or night roost, based on the deposition of fresh guano below the roost, in June 2004).

While *M. yumanensis* occupies the new bridge roosts in much higher numbers than those in the old bridge the reason is unclear. The new roosts might be more attractive, but where were these bats before the new bridge was constructed? Was a nearby colony recently evicted from a roost?

It would appear, based on the June 2004 surveys, that the big brown bats, which had moved to the I-5 Bridge and railroad trestle when the old bridge was removed, were still occupying one or both of these structures. No big brown bats were observed in the new bridge, but the observation of 2 banded bats in the railroad trestle indicated that at least some of the bats that had originally used the old bridge, were now using the RR trestle. We do not know why the new bridge roosts are unoccupied by this species, but additional years of surveys may reveal the answer to this question.

The issue of greatest concern is the apparent disappearance of pallid bats. No *A. pallidus* have been observed using the interim roost or the new bridge. Only one individual (not banded) was observed in the railroad trestle. A working hypothesis for the design of the mitigation roosts had been that the 2.0" crevices would attract pallid bats. Because this species is considerably larger than *T. brasiliensis* or *M. yumanensis*, we hypothesized it would require and prefer wider

crevices than either of the other species. In the old bridge, the expansion joints used by the A. *pallidus* had been slightly larger than those used by *Tadarida*.

Although the mandate for the consulting biologists on this project was to evaluate bridge use and mitigate for loss of bridge roosting habitat, there was an associated riparian restoration project that involved extensive planting on cottonwoods on the floodplain. Mature cottonwood riparian habitat is preferred habitat for western red bats, *L. blossevillii*, a species that is proposed for CDFG Species of Special Concern status. This foliage roosting species is not known to use bridges, but it was detected acoustically in the vicinity of the bridge. Western red bats will likely benefit from the cottonwood riparian restoration.

Lessons Learned and Recommendations

This project demonstrated the importance of having all the concerned parties work together from the beginning of the project. The cooperation between the engineers and consulting biologists allowed for the accommodation of the biological concerns in a cost effective way, without compromising the structural requirements for the bridge. There was also frequent communication between the construction foreman and the biologist, insuring, for example, that the exclusion devices were closely monitored during the early construction phase when bats could have still reoccupied the old bridge. The construction crew went out of its way to monitor the exclusion devices, and correct problems as they arose. Closer communication during the construction of the bat boxes, however, could have insured that the proper mesh was used.

This project also demonstrates the need for long-term monitoring before the effectiveness of mitigation measures can be fully evaluated. It is still possible that both *E. fuscus* and *A. pallidus* will occupy the new bridge. The failure of *A. pallidus* to reoccupy the bridge indicates that more research and experimentation are needed to understand the roosting requirements of this species. One measure that could be taken at this site would be the installation of temperature probes in a subset of crevices to determine if a temperature regime comparable to that observed at the old bridge has been achieved. The bent caps receive no direct solar exposure and likely remain significantly cooler that the old bridge roost.

Seasonal monitoring of this site should continue for several years to evaluate the effectiveness of this mitigation.

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Appendix G.

Case Study 7
Franklin Boulevard Causeway

Franklin Boulevard Causeway
Dave Johnston, Bat Biologist
H.T. Harvey & Associates

Case Study 7. Duplicating Roosting Habitat in a New Bridge.

Location	Southern Sacramento County
Species involved	Mexican free-tailed bat (*Tadarida brasiliensis*) Likely much smaller populations of Yuma myotis *Myotis yumanensis* and big brown bat *Eptesicus fuscus*
Type of Work	Bridge replacement
Potential impacts	Loss of a very large maternity colony
Type of Roost	Maternity roost
Size of colony before works	Estimated at 60,000
Size of colony after works	15,500 two months after construction completed. (Bridge should be completed by end of 2004.)

Overview

The primary mitigation objective was to a) reduce impacts to bats by excluding all bats prior to the development of the seasonal maternity colony, b) provide temporary roosting habitat during the bridge demolition and construction of the new bridge, and c) provide new permanent roosting habitat as similar as possible to the lost habitat.

Location and Ownership

The Franklin Boulevard Causeway comprises a timber trestle structure across the overflow floodplain north of the Mokelumne River and a steel truss swing bridge over the Mokelumne River. The steel truss bridge is jointly owned by San Joaquin County to the south and Sacramento County to the north; whereas the causeway extends over private lands with public easement.

Background

Franklin Boulevard and Thorton Road serve as an alternate route for Interstate 5 (U.S. INTERSTATE 5) and acts as a collector highway for rural areas east of I 5 in the region. The trestle bridge consisted of a 230-foot long steel truss swing bridge with a concrete slab bridge on the north and south approaches and the causeway consisted of a timber trestle 1700 feet long. The timber trestle bridge was closed to traffic in 1997 due to extensive scour and substructure damage from flooding that year. The trestle bridge crosses through species rich valley riparian habitat and is home to one of the largest maternity colonies of bats in Northern California.

Features Important to Bats

The Franklin Boulevard Causeway over the Mokelumne River was a well-known roost for tens of thousands of Mexican free-tailed bats. Additionally, smaller numbers of other species, such

as the big-brown bat and the Yuma myotis, also likely bred in this wooden structure. Excellent foraging habitat occurs in adjacent areas over wetlands and riparian habitat near the confluence of the Mokelumne and Consumnes Rivers owned by The Nature Conservancy and other private landowners.

Project Approach and Design

To avoid significant impacts to bats and bat habitat, the project incorporated mitigation measures into the project design over the course of several years. The first phase included bat surveys conducted in 1999. To reduce impacts from the temporary loss of bridge roosting habitat, bat houses were placed over open grassland alongside riparian vegetation to the east of the bridge about 100 yards. These "Maberry" style bat houses were installed with the consultation of DFG and Bat Conservation International. Three were installed on the Kirkham property and three installed on The Nature Conservancy's (TNC) Cosumnes River Preserve. Each house was capable of housing 14,000 to 16,000 bats. Additionally, Bob Wisecarver, a private wildlife habitat restoration enthusiast, installed an additional bat house on the TNC property. All seven houses were to be monitored for up to six years or until the new bridge was completed. The three houses on private property have now been removed, and the remaining four bridges are to remain on the TNC preserve indefinitely.

In an effort to exclude the existing population from using the bridge as a maternity colony roost or day roosting habitat, the plan was to seal crevices after the bats left in October. Bats were reported to begin roosting in February and March, so exclusion had to take place between November 1 and early February. Data from banded bats and winter observations suggest that these bats over-winter along central coastal California (unpubl. data, Phil Leitner and Dave Johnston).

Photo 1. Bat House #6 at the Cosumnes Preserve, before modifications, used as temporary mitigation for lost roosting habitat. Photo by Eric Stackhouse.

Photo 2. Bat House #6, with experimental modifications as of April 3, 2002 to hopefully increase use by bats for more successful mitigation results. Photo by Eric Stackhouse.

The new bridge design incorporated bat roosting habitat within the underside of the bridge decking. The old redwood timbers were sawn on-site to 1" by 12" planks. Each bat roosting unit was assembled and then incorporated into the deck forms for concrete pouring (Photo 3). The bridge and causeway were rebuilt in 2004, and in July 2004, some of the first sections of built-in bat habitat were available to crevice roosting bats.

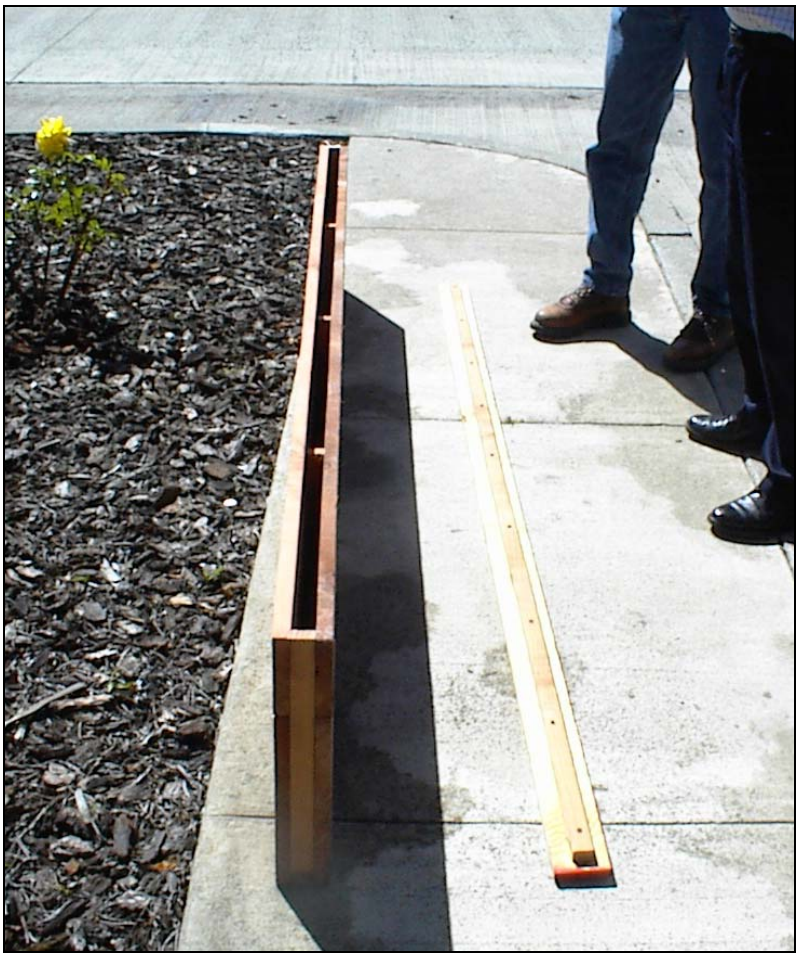

Photo 3. Permanent replacement habitat to be installed as part of the new bridge and causeway. The strip of plywood attached to the roosting habitat above helped maintain its location during the pour. Photo by Tom Barnard.

Schedule of Work

1999 – Initial surveys
2000 – 2002 Installation of bat houses
2002 – Exclusion of bats from bridge
2003 – Final total exclusion of bats from bridge
2004 – Construction of new bridge and causeway
2004 – Begin long-term monitoring of bats roosting in bridge and causeway and bat houses on the Consumnes River Preserve.

Photo 4. Placement of the roosting habitat inserts just prior to the pour. Photo courtesy Sacramento County Public Works.

Photo 5. Section of completed bridge and causeway replacement with new roosting habitat. Three of the five rows of roosting habitat inserts are shown. The outer two rows of each side comprise two slots (crevices) and the third or middle cast-in-place insert has three slots. Photo by Dave Johnston.

Results of Post Construction Monitoring

Field Notes for the Franklin Bridge Construction Project (98-0362)
8-20-04; 14:00 – 16:30; Sunny, light breeze, temp. 92º F
Alison Cunningham and Eric Stackhouse (Sacramento County Department of Environmental Review and Assessment), Bob Wisecarver (volunteer), Scott Smith (Senior Construction Inspector County of Sacramento), Dave Johnston (HT Harvey & Associates).

Abutments 35 thru 13 of the new Franklin Boulevard Causeway, which is partially still under construction, was surveyed by the above personnel. The largest aggregation of bats occurred underneath the slough at approximately abutment 27 and on the south end of the bridge starting at abutment 19 thru to 13 (Table 1). This observation was also made during a bat survey by Scott Smith (Construction Inspector) previous to this survey. As expected this late in the season, no non-volant young were observed.

Table 1. Post-construction Survey for Franklin Boulevard Causeway. Middle row with 3 Slots. Outer two rows on each side with only 2 slots each.

Bridge Abutment	Middle row (3) and eastern most rows 4 and 5 (ELS & AC)	Bridge abutment	2nd Row from the West (Dave Johnston)	Western Most Row (Bob Wiscarver)*
35-28	100	35-30	0	
27-28 (est. over H20)	80	29-28	3	
26-24	150	28-27 (est over H_20)	200	
23-21	5	27	78	
20-19	800	26	107	
19-18	2000	25	5	
18-17	1000	24	2	
17-16	2000	23	0	
15-16	1000	22	0	
15-14	2000	21	0	
14-13	4500	20	0	
		19	148	
		18	225	
		17	98	
		16	44	
		15	315	
		14-13	16	
Totals	13,635		1241	650
Total Bat estimate = 15,526				

* Did not tally by sections

Lessons Learned and Recommendations

Probably the single most important message learned about bat mitigation during the Franklin Road Causeway/Bridge project is that bat houses do not make the equivalent of a lost bridge habitat. Although the bat houses did provide habitat for many free-tailed bats, the completed bridge attracted ten-fold that number after only two months.

The importance of the tempering effects of a concrete bridge provided by its thermal mass should not be underestimated. This is not the only variable that changes when considering differences between bat houses and concrete bridges with crevices. However, the heat was so intense in this San Joaquin Valley site that the plastic inserts making crevices in the bat houses warped badly. A concrete bridge not only provides warmer than ambient temperatures in the evening, but these concrete roosts also prevent summer daytime temperatures in California from exceeding the tolerance levels of day roosting bats.

Search image and location of new roosting habitat likely contributes greatly to the success of anthropomorphic roosts used for mitigation. Over 15,000 bats roosted in the new bat roosts after only about two months after these new roosts were made available.

Excellent mitigation strategies need not necessarily cost more than inadequate or less desirable mitigation strategies. The cast-in-place concrete with bat roosts strategy saved $200,000 over the original plan to build the bridge with pre-cast concrete and off-bridge mitigation, bringing the total cost of the trestle and causeway price down from 9.2 million dollars to 9.0 million dollars.

This bridge project demonstrates how a cooperative community of environmental planners, engineers, and biologists can work together to plan and implement an outstanding, successful mitigation strategies for large numbers of bats.

Appendix H.

Case Study 8
Dry Creek Bridge #26-0007

Dry Creek Bridge, #26-0007

Elizabeth D. Pierson and William E. Rainey
Assisted by Paul A. Heady, Rhianna Lee, and Winifred Frick

Case Study 8. Bridge Replacement with Experimental On-site Mitigation Roost, and Radio-tracking to Locate Alternate Roosts

Location	SR104 Bridge over Dry Creek, Amador County
Species Involved	Pallid bat (*Antrozous pallidus*), Mexican free-tailed bat (*Tadarida brasiliensis*), and Yuma myotis (*Myotis yumanensis*)
Type of Project	Bridge replacement
Potential Impacts	Loss of night-roosting site for three species, including a maternity colony of *A. pallidus.*
Type of Roost	Night roost for maternity colony
Size of Colony before Construction	*A. pallidus* – ca. 45 adult females – ca. 100 w/ young; *T. brasiliensis*--hundreds; *M. yumanensis* – few
Size of Colony after Construction	Work in progress. Outcome unkown

Overview

The primary objective of this project was to reduce impacts to bats by gathering information on the behavior of the animals to help design appropriate mitigation, and to provide replacement roosting habitat by taking the following steps:

1. capturing and marking (with wing bands) bats at the old bridge prior to bridge removal;

2. radio-tracking pallid bats to locate day-roosts, alternate night-roosts, and gather information on foraging range;

3. monitoring seasonal patterns of bat occupancy at the old bridge with long-term acoustic monitoring and periodic collection of guano and culled insect parts;

4. surveying bridges for a 25 km radius around this site to identify other pallid bat roosts, identify potential alternate roosts for target colony, and gain a perspective on the regional importance of the study colony;

5. working with Caltrans to design and install replacement roosting habitat for *A. pallidus*; and

6. monitoring the effectiveness of this mitigation.

This project offered an important opportunity to evaluate the impact of roost loss. Because the location of day roosts was known, and occupancy of the primary roost could be monitored, it was

possible to test the hypothesis that the loss of a night-roost had no effect on the choice of a day roost.

A more complete reporting on this project can be found in Pierson et al. 2004.

Location and Ownership

This bridge over Dry Creek is located in Amador County, 3.5 km north of the town of Ione on State Route 104 – Bridge #26-007) (Photo 1).

Photo 1. The SR104 Bridge over Dry Creek, Amador County. Photograph by Elizabeth D. Pierson.

Background

It was learned in the context of another project (Pierson and Rainey 2002) that the bridge on SR104 over Dry Creek, just north of Ione in Amador County, served as a night roost for a significant colony of pallid bats (*Antrozous pallidus*), considered a Mammal Species of Special Concern by California Department of Fish and Game. Thus, when plans to replace this bridge, built in 1960, were initiated, a bat survey and monitoring program were included in the environmental assessment process. A mitigation roost was designed and proposed by Caltrans for inclusion in the new bridge.

Features Important to Bats

The concrete girders found on this bridge, a dominant design style for bridges of this era, are one of the features most important for night-roosting bats (Photo 2).

Photo 2. Underside of Dry Creek Bridge showing the concrete girder construction. Photograph by Elizabeth D. Pierson.

Cottonwood riparian, oak savannah, and non-native grassland near this site provided habitat for pallid bats (Photo 3).

Photo 3. View of habitat looking north from the Dry Creek Bridge. Photograph by Elizabeth D. Pierson.

Project Approach and Design

Radio-tracking Study. Pallid bats were captured in the night roost in August 2003. Eleven post-lactating females were outfitted with radio-transmitters (Model Lb-2, Holohil Systems), and tracked for 6-7 days. Attempts were made each day to identify roost sites for all radio-tagged animals. The radio-tagged animals were also followed in the evening to investigate foraging range, and to determine whether any of the marked individuals used an alternate night roost.

Monitoring of Seasonal Patterns of Bat Use of Bridge. Seasonal patterns of bat activity at the bridge were monitored by two methods: an automated acoustic system and the collection of guano and culled prey. An Anabat detector and storage zcaim (Titley Electronics) were placed inside an ammo can, and concealed in the rip-rap slope or under a tarp (Photo 4). An external microphone was pointed at the night roost. This system was programmed to turn itself on before sunset and turn itself off at dawn, and to store bat calls on a compact flash card for later analysis.

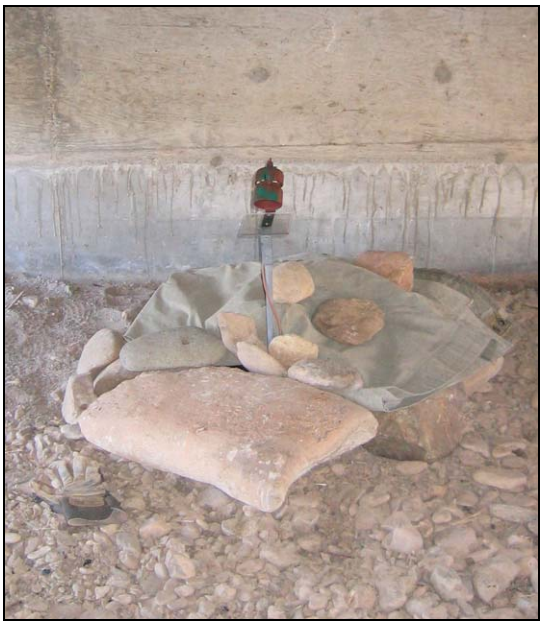

Photo 4. Anabat detector is stored under protective covering, with external microphone exposed and oriented towards night roost. Photograph by Elizabeth D. Pierson.

Additionally, plastic sheeting was placed below the bat roosting areas at both ends of the bridge to collect guano and culled insect parts as an index of bat use (Photo 5). A Stowaway temperature logger (Onset Computing) was placed inside a small tin, sealed with silicone glue, and applied with Velcro to the under-surface of the bridge (Photo 6). It was located in the corner of one of the concrete girders to monitor roost temperature.

Photo 5. Plastic sheeting placed below night roost to collect guano and culled insect parts. Photograph by Elizabeth D. Pierson.

Photo 6. Temperature logger inside tin can, secured to bridge surface with Velcro, placed adjacent to stained area of night-roost. Photograph by Elizabeth D. Pierson.

Regional Bridge Survey. A log of state and county bridges was obtained from the Caltrans web-site. All state bridges, and any county bridges that appeared to have potential as bat roosts (based on bridge type as provided in the data base), and were located within a 25 km radius of the Dry Creek Bridge, were surveyed in March 2004. Each bridge was examined for the presence of bats, bat guano, staining created by bat roosting, or habitat suitable for roosting.

Those bridges determined to have potential as bat roosts, particularly for pallid bats, were revisited in May 2004.

Schedule of Work

17 July 2000 – Pallid bat night-roost originally identified under SR104 Bridge over Dry Creek

18-25 August 2003 – Radio-tracking study

9 March 2004 – plastic sheets for guano collection installed at north end of bridge

24 March 2004 – guano collected from north end of bridge; plastic sheets for guano collection installed at south end of bridge; bat detector system installed at north end of bridge.

1 April 2004 – CF card replaced. Very windy; guano blown off plastic; not collected

10 May 2004 – guano collected; CF card replaced

3 June 2004 – guano collected; CF card replaced

5 July 2004 – guano collected; detector removed in anticipation of start of construction

14 September 2004 – Installed detector at south end of bridge; reinstalled guano sheet at south end.

29 September 2004 – R. Lee, Caltrans biologist, collected guano; CF card replaced

4 November 2004 – R. Lee collected guano; detector removed

Survey and Monitoring Results

Radio-tracking Study. Five different day roosts were identified during the radio-tracking study: four trees (cottonwood and valley oak) and one private dwelling. All roosts were located between 0.15 and 2.8 km from the night-roost. The primary roost was an old cottonwood tree located about 150 m upstream from the bridge, where the bats were roosting in a cavity formed at a broken limb about 6 m above the ground (Photo 7).

Photo 7. Cottonwood tree that was the primary day roost for radio-tagged pallid bats. Photograph by Elizabeth D. Pierson.

Although the focus of this study was on locating roosts, animals were followed on their foraging beats from emergence until most had returned to the bridge night roost, generally by mid-night. In general, the bats remained within detection range, and appeared to be foraging in the dry creek bed and the surrounding grassland. The only night-roost that was identified during this study was the SR104 Bridge over Dry Creek where the animals had originally been captured.

A total of 61 pallid bats were captured and banded from this colony. While the primary purpose was to capture pallid bats, twenty *Tadarida brasiliensis* and one *Myotis yumanensis* were included in the captures.

Monitoring of Bat Activity at the Bridge Night Roost. Although the intent had been to monitor seasonal use of the bridge by pallid bats using the automated acoustic system and collected guano, this effort was compromised by the unexpected finding that the bridge was being used as a night roost by a significant number of Mexican free-tailed bats. Their guano deposits and their vocalizations in the night-roost overwhelmed the monitoring systems, making it inefficient (although not impossible) to separate out pallid bat guano, and impossible to distinguish pallid bat vocalizations from those of Mexican free-tails.

Nevertheless, night to night fluctuations in bat acoustic activity correlated with fluctuations in deck temperature. Because the amount of guano deposited by Mexican free-tailed bats greatly exceeded that deposited by pallid bats, these fluctuations in acoustic activity most likely reflected fluctuations in the number of Mexican free-tailed bats using the night-roost.

Because separating the pallid guano from the Mexican-free tailed guano (ca. 2 liters per month) was time inefficient, culled prey was used as an indicator of seasonal patterns of night-roosting by pallid bats (Figure 1). The presence of body parts (*e.g.*, legs, wings, tails) derived from

Jerusalem crickets (*Stenopelmatus fuscus*), long-horned beetles (*Prionus californicus*), and/or scorpions (Scorpionida) is considered diagnostic for pallid bats, as they are the only species known to take this relatively large, mostly ground-dwelling prey (Johnston and Fenton 2001). The amount of prey deposited by pallid bats increased consistently between March and July.

Regional Bridge Survey. A total of 69 bridges were surveyed. Twenty-three were state highway bridges; forty-six were on county roads. Nine bridges, including the study site bridge, were used by pallid bats. One was a day-roost; eight were night roosts. The closest known pallid bat roost to the study site bridge, also a night roost, was another bridge over Dry Creek, ca. 10 km upstream. Based on guano/culled prey deposits the SR 104 Dry Creek colony was one of the largest.

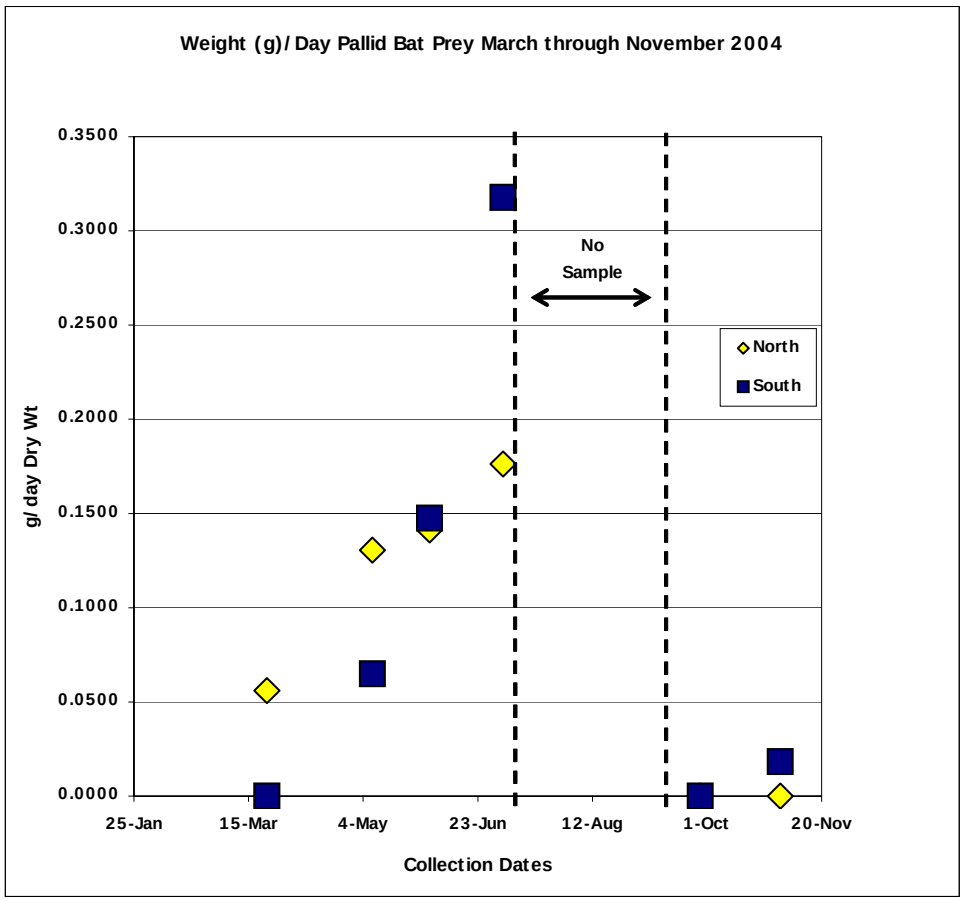

Figure 1. Scatter plot showing the g/day dry weight of prey items collected from beneath pallid bat roosting sites under Dry Creek Bridge. North and south ends of the bridge are depicted separately. The interval of no sampling reflects the removal of all sampling equipment on July 5 in anticipation of the beginning of construction. It was replaced at the south end of the bridge only on September 14.

Mitigation. Staff in the Caltrans Environmental Division recognized the significance of this bridge as early as July 2001 when a night-time survey of this site was included in a field training class for Caltrans biologists. Consequently, on the initiative of this department and with the

cooperation of agency engineers, a mitigation roost was designed for incorporation in two locations in the new bridge. Each roost will be a plywood box 1180 mm wide X 800 mm wide X 850 mm tall, incorporated into the box beam. It will have an opening flush with the ventral surface of the box beam of 600 mm X 600 mm While it will not have the same open access as the concrete girder sites typically used by pallid bats, it is a worthwhile experiment, and because it will be surrounded by the concrete mass of the bridge, it will potentially maintain a temperature profile comparable to that of the original roost. Figure 2 shows the engineer's design for this roost.

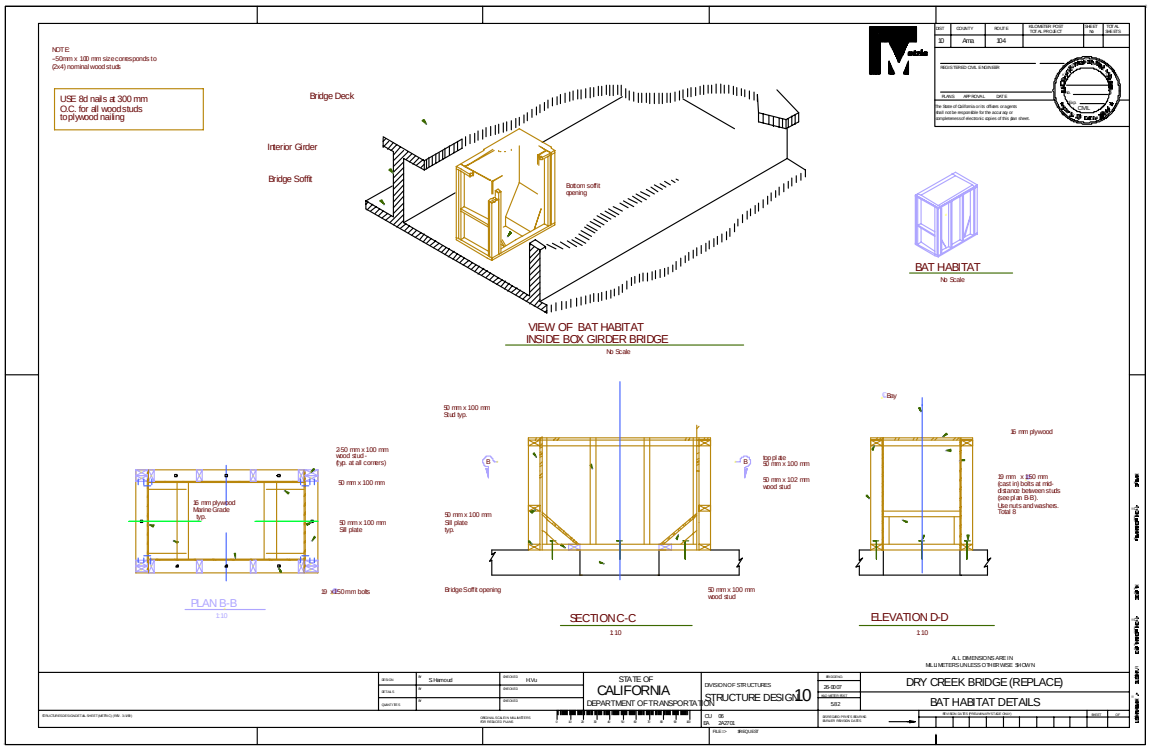

Figure 2. Caltrans engineers' design for bat box to be installed in new bridge.

Discussion

Monitoring Bat Activity at Project Bridge

This project used two independent methods for evaluating bat night-roosting activity at the project bridge: a passive acoustic detector system and collection of guano and culled prey. While the acoustic system served to show broad seasonal patterns of bat activity -- low in the spring, peaking in the summer, declining in the fall -- it did not serve to assess use of the bridge by pallid bats due to the presence of large numbers of Mexican free-tailed bats. Because it is common for bridges to be used by more than one species, acoustic monitoring may not serve to track the presence of the target species to the degree desired.

Collection of guano and culled prey items has been used in other settings as an index of levels of bat activity at roosting sites (Gellman and Zielinski 1996; Rainey et al 1992; Zielinski and Gellman 1999). In the non-desert regions of California, culled prey, distinctive to pallid bats, can be used to identify the presence of this species, and evaluate its levels of activity. While this may be less reliable in desert regions where there is prey overlap with the California leaf-nosed bat (*Macrotus californicus*), in northern and central California this technique can be highly effective.

Radio-tracking Study

This radio-tracking study provided the first record of pallid bats roosting in a cottonwood tree. The location of this day-roost (and the four other less used roosts) within a few kilometer radius of the night-roost is consistent with findings in other studies suggesting that night roosts for pallid bats are in fairly close proximity to day roosts, and that their foraging range is limited to a few kilometers around the roosts (Hermanson and O'Shea 1983; Orr 1954; Pierson et al. 2002; Rainey and Pierson 1996).

The radio-tracking study also strongly suggested that pallid bats from the study colony did not use any other bridges in the area. Although individuals in the colony moved among five day roosts, no animal used more than one night roost. This is consistent with findings in a study conducted on the upper Sacramento River showing very high fidelity to night roosts by a number of species (Pierson et al. 1996; Rainey and Pierson 1996).

Mitigation Options

This colony is of sufficient significance that a replacement roost is the appropriate mitigation, and two bat boxes have been approved by Caltrans for incorporation into the new bridge design. Having the new habitat incorporated into the new bridge has several advantages. The thermal mass of the new bridge will increase the likelihood that the new roost will have a temperature profile comparable to the old roost. Since roost temperature is a critical parameter in roost selection (Perlmeter 1996, 2004; Pierson et al.1996; Pierson et al. 2001), creating a new roost that meets the species temperature criteria is critical to success. Additionally, a roost incorporated into the bridge structure is more cryptic than an off-site roost would be, thus lessening the risk of human contact with the animals. Also, the animals are more likely to use a roost that fits their search image for a night roost – *i.e.*, one that is as close in location and structure to the one that was lost.

The significant finding of a pallid bat roost in a mature cottonwood tree high-lights the importance of cottonwood riparian habitat. Since many Caltrans bridges cross streams or rivers, cottonwood riparian is frequently found in the right-of-way and impacted by bridge projects. Restoration of cottonwood riparian, and when possible, the preservation of mature trees, will likely benefit many wildlife species, including pallid bats.

There is an implicit assumption in the literature that bats select day roosts and night roosts independently. This may well be true for those species that occupy night roosts located many kilometers from their day roosts. For pallid bats, however, the day roost and night roost are

generally in close proximity, raising the question of a possible inter-relationship. When a pallid bat colony selects a day roost, does it also require having a night roost near by? Day roosts are assumed to be more critical to a maternity colony than night roosts, since that is where they shelter their young. Could it be, however, that when a colony loses its night roost, it also loses its day roost? The answers to these questions are not known, and yet are critical to evaluating project impacts. Thus monitoring seasonal occupancy of the cottonwood day roost was recommended as a critical component of evaluating the effectiveness of mitigation.

Lessons Learned and Recommendations

This project offered a number of useful lessons.

- This project illustrated both the power and the limitations of the two monitoring techniques used. Using acoustic monitoring systems can be very useful for tracking relative activity under a bridge, and for elucidating nightly and seasonal patterns. Because calls become distorted in a cluttered acoustic environment, because many of the calls recorded at a roost setting are social calls, and because multiple species frequently use the same roost, acoustic monitoring is of limited usefulness in assessing colony size for a particular species.

- Collecting guano at a roost is useful for tracking seasonal patterns and relative amounts of roosting activity, but in a multi-species situation it can be of limited use for monitoring individual species. This is particularly true when the species of interest is the rarer species.

- Collection of culled prey parts may be the most accurate and time efficient method for tracking activity by pallid bats at a night roost.

- This project demonstrated the importance of locating both the day roosts and the night roost for pallid bats when one or the other are known to be impacted by a transportation project. Although in this case the day roost will not be physically affected by project activities, it well could have been. Removal of cottonwood trees is frequently required with alterations in corridor alignment. Also, the radio-tracking data obtained in this project highlight the limited home range of pallid bat colonies, and raise the possibility of an inter-relationship between day roosts and night roosts.

- Distribution of bat species is sufficiently poorly known in California that regional surveys are required to determine the significance of a particular roost, and to located potential alternate roosts.

- The mitigation roost proposed for incorporation into the new bridge is an experimental design, and offers an opportunity to learn important lessons regarding the roosting requirements of pallid bats. It is extremely important that follow-up monitoring be conducted.

Because the mitigation phase of this project has not yet begun it is not possible to evaluate its effectiveness. It is critical that Caltrans engineers work together with bat biologists for the final design and installation of the proposed bat boxes, and that these mitigation roosts are monitored

for at least three breeding seasons. Also, the primary day roost used by this colony should be monitored during the construction and post-construction phases of this project.

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Appendix I.

Case Study 9
S.R. 101 Bridge over Pieta Creek

S.R. 101 Bridge over Pieta Creek

Elizabeth D. Pierson and William E. Rainey

Case Study 9. Bridge Replacement with Experimental Off-structure Roost Design.

Location	SR101 Bridge over Pieta Creek, Mendocino County
Species involved	Pallid bat (*Antrozous pallidus*), California myoitis (*Myotis californicus*), Yuma myotis (*Myotis yumanensis*), and Mexican free-tailed bat (*Tadarida brasiliensis*)
Type of Work	Bridge replacement
Potential Impacts	Loss of night-roosting site for four species, including a maternity colony of *A. pallidus.*
Type of Roost	Night roost for maternity colony
Size of Colony Before Work	*A. pallidus*– ca. 100, *M. californicus* – >6; *M. yumanensis* – >6; *T. brasiliensis* – a few
Size of Colony After Work	*A. pallidus*–0; *M. californicus* – 0; *M. yumanensis* – 0; *T. brasiliensis* -0

Overview

The primary objective of this project was to reduce impacts to bats by:

1. capturing and marking bats at old bridge prior to bridge removal;

2. working with Caltrans engineers to design and install replacement roosting habitat for *A. pallidus*; and

3. monitoring the effectiveness of this mitigation.

Location and Ownership

This bridge over Pieta Creek is located in Menodcino County, 4.5 miles south of the town of Hopland on State Route 101 – MP 5.94.

Background

The removal of the SR 101 bridge over Pieta Creek (Br. 10-83, built in 1932) was part of a larger project to widen SR 10l, leading to a by-pass of the town of Hopland (Pierson and Rainey 2004). The original survey of this bridge was conducted by a Caltrans biologist who reported no sign of bat use at the bridge. A consulting biologist (E.D. Pierson) inspected this bridge on 4 July 2002 as part of the survey protocol for an evaluation of potential impacts to bats resulting from the proposed alternatives for the Hopland by-pass. Although this bridge was outside the immediate project area for the Hopland by-pass, it was surveyed in the context of an evaluation of bridge use by bats for a 25 km radius around the Hopland by-pass site.

Photo 1. SR101 Bridge 10-83 over Pieta Creek, showing surrounding oak habitat. Photograph by William E. Rainey

The July 4 survey documented large piles of bat guano with abundant Jerusalem cricket (*Stenopalnatus* sp.) parts (diagnostic for use by pallid bats), and extensive staining in the oblique corners of concrete girders on the underside of the bridge deck – an indication this was a significant roost that had been used for many years.

This bridge was scheduled for removal in early September, creating an unfortunate situation that required Caltrans biologists and engineers, the construction contractor, and the consulting biologist to design mitigation that was workable for all concerned on an emergency time-line.

Features Important to Bats

The concrete girders found on this bridge, a dominant design style for bridges of this era, are one of the features most important for night-roosting bats. The open chambers created by the girders provide reduced circulation, warm air-pockets where temperatures generally remain far warmer than ambient for most of the night. They also provide shelter from the wind, allow ready entry and exit, and are typically high enough above the ground to provide protection from predators. They also provide extensive accessible roosting areas.

Photo 2. Concrete girder construction, and urine staining from pallid bats. Photograph by William E. Rainey

Extensive blue oak savannah near this site provided important foraging and day-roosting habitat for this species. There also were several old buildings within ca. 100 m of the bridge, which were not surveyed, and may have been the day-roost site for the night-roosting colony.

Project Approach and Design

The SR 101 Bridge over Pieta Creek was initially surveyed on 4 July 2002 in the context of regional bat surveys for the Hopland SR101 by-pass. It was discovered at that time that this bridge served as a significant night-roosting site for pallid bats. This conclusion was reached during a day-time survey based on patterns of staining and guano deposition; the morphological characteristics of the guano; and the association of Jerusalem cricket parts with the guano. Jerusalem cricket parts are diagnostic for the presence of pallid bats since this is the only bat species known to consume large numbers of this ground-dwelling arthropod.

This finding presented logistic challenges since the bridge had been cleared for removal by a Caltrans biologist who did not detect the bat roost. A bridge was under construction in a new alignment ca. 100 meters to the west, and the old bridge was scheduled for removal in early September. Caltrans was informed immediately regarding the significance of this roost – a large night roost for a special concern species – and the need for mitigation.

Ideally this roost would have been discovered early enough to work with bridge engineers and project planners to design a mitigation that had a maximum likelihood of success – either the inclusion of a roost on the new bridge or retention of a portion (*e.g.*, one of the abutments) of the

old bridge. The eleventh hour compromise was to try an experimental roost to be installed in the slope of the southern abutment for the old bridge.

This roost, installed in early April 2003, is a small, poured concrete bunker – 8' deep, 8'10" tall, and 5'4" wide. It has a single opening 4' wide by 4" high, located 5' above the ground surface. There is a 1'10" high baffle located 1'8" back from the opening to provide darkness and protection for potential bat occupants.

Photo 3. Mitigation roost at site of old bridge abutment. Photograph by Caltrans Staff.

In July 2002 the consulting biologist had also proposed that a radiotracking study be conducted to determine foraging patterns and identify day-roosting sites for this colony. Unfortunately, there was not sufficient lead-time to put such a project together. Thus the team settled for capturing as many bats as possible at the night roost, and banding all pallid bats that could be caught. This offered a way to track the fate of individuals from this roost and their occupation of the mitigation structure.

Since there was only a limited budget for monitoring, the plan to check bridges in the area for banded bats after demolition of the roost was not carried out. The new roost and its immediate area were monitored on 10 July 2003 and 21 September 2003. On both occasions the roost was observed with night-vision goggles at emergence time to check for day-roosting bats, and monitored with an infra-red camera and acoustic detector until after mid-night to record any night-roosting activity. At the same time mist-nets and four to six acoustic detectors were deployed in the area to check for the presence of pallid bats. The site was checked during the day on 11 June 2004.

Schedule of Work

4 July 2002 – Initial day-time survey of bridge

July 2002 – Consulting bat biologist initiates discussion with Caltrans regarding need for mitigation

9 August 2002 – Night-time survey of bridge

7 September 2002 – Capture of bats at night roost

15 September 2002 – First draft of Caltrans engineers plans for mitigation bat roost

28 March 2003 – Final plans for mitigation bat roost reviewed and approved by consulting biologist

Early April 2003 – Installation of roost

10 July 2003 – Monitor new roost; acoustic and mist-netting survey of area

21 September 2003 – Monitor new roost; acoustic and mist-netting survey of area

11 June 2004 – Monitor new roost

Survey and Monitoring Results

Capture and Marking of Bats at Original Roost. The original assessment that this was a significant pallid bat night roost was based on the large accumulations of fresh guano and Jerusalem cricket parts that were observed during a daytime survey on 4 July 2002. On the night of 9 August 2002 when a night-roost survey was conducted at 01:30 a.m. there were 11 pallid bats night-roosting under the bridge at the time of survey.

On 7 September 2002 a team of people constructed, and applied to the bridge surface, a pulley system for hanging curtains made of surplus parachute fabric. These curtains were hung on the pulleys prior to dark, and left in an open position until 1:00 a.m., when, on cue, team members pulled the curtains closed, with the goal of containing all night-roosting bats within the two land-based bridge bays. Three harp traps were set side by side to close off the bay that was over the creek. Additionally one 7' by 30' net was set at dusk over the creek.

Photo 4. Curtain made from parachute silk, used to contain bats within night roost and facilitate capture. Photograph by William E. Rainey

Table 1 documents the number of bats captured during the three netting efforts at this site.

Table 1. Numbers of Individuals Captured by Date And by Species at Pieta Creek.*

Date	Locality	*Anpa*	*Myca*	*Myyu*	*Tabr*	# of bats	# of spp.
Pieta Creek at SR 101 Crossing							
7-Sep-02	Night Roost at Old Bridge	34	8	6	5	**53**	**4**
7-Sep-02	Creek	10	0	0	1	**11**	**2**
TOTALS		**44**	**8**	**6**	**6**	**64**	**4**

* Anpa = *Antrozous pallidus*, Myca = *Myotis californicus*, Myyu = *Myotis yumanensis*, and Tabr = *Tadarida brasiliensis*.

A total of 64 bats of four species were captured, including 44 pallid bats. All the pallid bats were banded with numbered, lipped wing bands.

Table 2 gives the reproductive condition for the 64 bats captured September 7. All four species had post-lactating females, and three had juveniles, indicating that this bridge was used as a night-roost by reproductive populations of all four species.

Table 2. Capture Records for Pieta Creek by Species by Date, Including Information on Age, Sex, and Reproductive Condition when Known.†

Species	Date	Adult Males	Adult Females		Juveniles		Unk.	Total
			Pl	Nl	M	F		
Antrozous pallidus								
	7-Sep-02	18	13	5	3	5		44
Myotis californicus								
	7-Sep-02	2	4	1		1		8
Myotis yumanensis								
	7-Sep-02		2			2	2	6
Tadarida brasiliensis								
	7-Sep-02		5	1				6
TOTALS		**20**	**24**	**7**	**3**	**8**	**2**	**64**

† Pl = post-lactating; Nl = nulliparous; Unk = Sex and/or reproductive status unknown; M = male; F = female.

Monitoring of Mitigation Roost. The new concrete bunker roost was monitored on three occasions – 10 July 2003, 21 September 2003, and 11 June 2004. No bats were observed using the roost on any of the visits.

On the first two occasions the roost was monitored acoustically and visually for emergence and for possible night-roosting until after mid-night .Four bat detectors were depaloyed in the vicinity of the roost and run all night in both July and September. They detected very few pallid bats on either night.

Additionally, mist-nets were set over the creek, and four bat detectors were deployed in the vicinity of the roost. A total of ten bats of three species, including one pallid bat were captured. That pallid bat was an unbanded adult male. Tables 3 and 4 summarize the capture data.

Table 3. Numbers of Individuals Captured by Date and by Species at Pieta Creek.

Date	Locality	*Anpa*	*Myca*	*Myyu*	# of bats	# of spp.
Pieta Creek at SR 101 Crossing						
10-Jul-03	Creek	1	3	3	**7**	**3**
21-Sep-03	Creek	0	1	2	**3**	**2**
TOTALS		**1**	**4**	**5**	**10**	**4**

Table 4. Capture Records for Pieta Creek by Species by Date, Including Information on Age, Sex, and Reproductive Condition when Known.‡

Species	Date	Adult Males	Adult Females		Juveniles		Unk.	Total
			Lc	Pl	M	F		
Antrozous pallidus								
	10-Jul-03	1						1
	Subtotal	**1**	**0**	**0**	**0**	**0**		**1**
Myotis californicus								
	10-Jul-03	1	1			1		3
	21-Sep-03						1	1
	Subtotal	**1**	**1**	**0**	**0**	**1**		**4**
Myotis yumanensis								
	10-Jul-03					3		3
	21-Sep-03						2	2
	Subtotal	**0**	**0**	**0**	**0**	**3**		**5**
TOTALS		**2**	**1**	**0**	**0**	**4**	**3**	**10**

‡ Lc = lactating; Pl = post-lactating; Unk = Sex and reproductive condition not determined; M = male; F = female.

The inspection of the roost in June 2004 was done in the daytime by inserting a Sony F707 digital night shot camera into the roost.

Discussion

Although the dimensions and the materials selected for this mitigation roost were consistent with those found in known pallid bat roosts, no bats of any species have been found so far to be using this roost. It is not surprising that pallid bats have chosen not to use this site as a night roost, since night roosts are generally more open, like the concrete girder roost they lost. The decision to enclose this mitigation roost, making its design more appropriate for a day-roost, was based on the fact that this structure was so highly visible. In order to protect the structure and the bats from vandalism, a decision was made to enclose it, leaving an opening large enough for bats, but not large enough for most predators (including humans). G. Tatartian, who has had considerable success designing artificial roosts for pallid bats, has suggested that the addition of an open covering over the entrance (made of plywood, tile backer board, or roughened pre-cast concrete, and spaced 1" from the roost wall) might make the site more attractive to the bats.

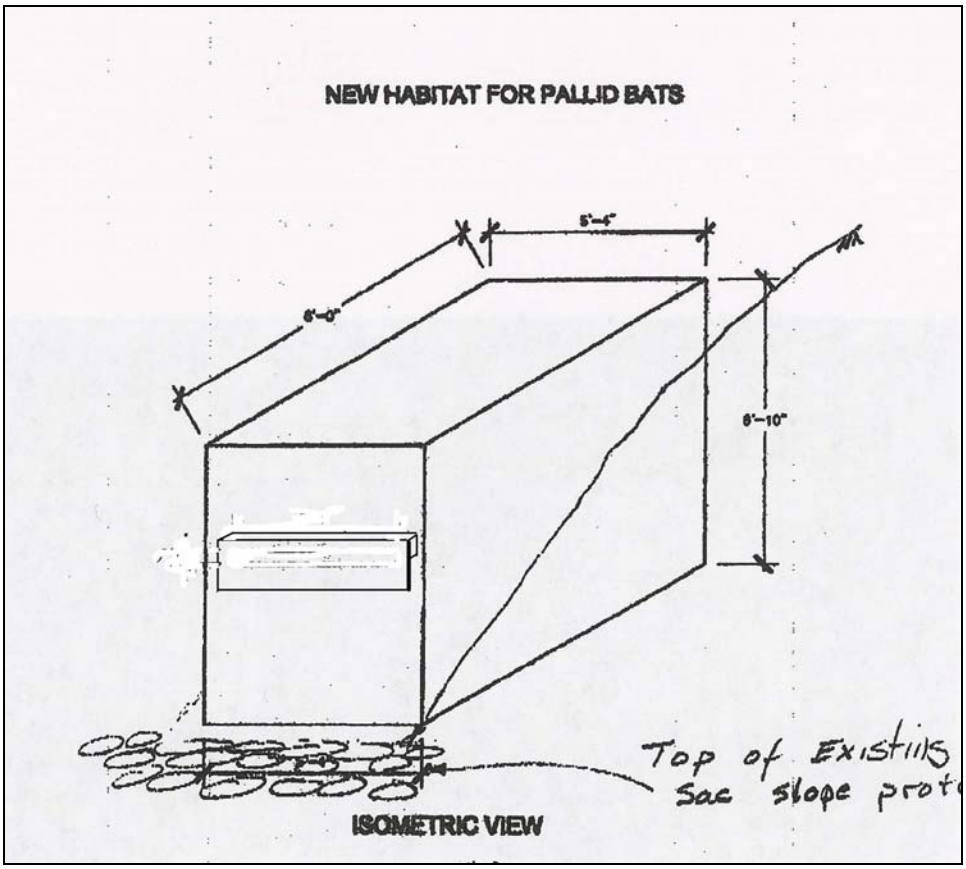

Figure 1. Possible Revised Mitigation Roost Design. Sketch by Greg Tatarian

It is notable that no pallid bats have been observed to use the mitigation roost, which in its overall dimensions is very similar to a known pallid bat night roost. Furthermore, there appeared to be few pallid bats in the area in the July and September 2003 surveys. This is in stark contrast to September 2002 when pallid bats were captured over the creek as well as in the night roost, and were detected repeatedly acoustically. Those animals that were captured in mist-nets in September 2002 were captured early in the evening, suggesting that their activity over the creek in the vicinity of the bridge was related to foraging activity, not night-roosting.

Radio-tracking studies and roost surveys have often shown that pallid bat night-roosts are typically close, often only 300-500 meters, from the day roost (Hermanson and O'Shea 1983). For example, a pallid bat nursery colony on Vandenberg Air Force Base night-roosts in a cave that is less than 500 m from its primary day roost (Pierson et al. 2002). In Amador County, pallid bats night-roosting on the SR104 Bridge over Dry Creek were shown by radio-tracking to be roosting primarily in a mature cottonwood tree located ca. 150 m from the bridge (Pierson et al. 2004).

Historically most of the known pallid bat maternity colonies were in roosts that could be readily located – *i.e.*, caves or mines, rock shelters, buildings, or bridges (Hermanson and O'Shea 1983, Orr 1954). More recently radio-tracking studies in California have revealed that pallid bat

maternity colonies frequently roost in trees (Rainey et al. 1992, Rainey and Pierson 1996, Pierson et al. 2004), and are particularly associated with oaks.

The most likely day roosting sites for the Pieta Creek colony were either in blue oaks on the surrounding hillside or in a complex of old buildings that was in the highway right-of-way and ca. 100 m from the roost. Unfortunately, the proposed radio-tracking study did not take place, and the buildings, which were removed sometime between September 2002 and the spring of 2003, were not surveyed. The apparent absence of pallid bats in the area in the July and September 2003 surveys suggests this species may have been day-roosting in the buildings, and were either killed in the demolition or driven from the area when they lost their roost. It is unlikely that the loss of only the night-roost would cause them to abandon the area.

Lessons Learned and Recommendations

This project offered a number of useful lessons.

1. It illustrates the importance of training for Caltrans biologists. This situation became an emergency because the significance of the site was overlooked by the Caltrans biologist tasked with conducting the environmental assessment. Limited training could have averted this.

2. This project additionally illustrates the importance of identifying the bat issue early enough in the process that the biologists and engineers have the opportunity to work together to design a viable mitigation strategy.

3. When a night-roost for pallid bats is the survey target, the day-roost(s) should also be located. Given the typical proximity of the day-roost to the night-roost, there is some likelihood that both will occur within the project area, and be affected by the project. Although day-roosts in buildings or bridges can generally be located by visually inspecting the structures, many roosts, particularly tree roosts, can only be located by radio-tracking.

4. This project illustrates the need for more research regarding the roosting requirements of various bat species, and the challenge of getting animals to accept a roost that does not match the dimensions and conditions of the roost being lost.

5. As with so many projects, opportunities to learn lessons and correct mistakes are lost when long-term monitoring does not occur. This project ended in 2003. (The 2004 survey was conducted as part of the background research for this document). Thus, even though it often takes several years for artificial roosts to be occupied, leaving open the possibility that this roost may yet be occupied, there is no established procedure by which its fate will be tracked. Also, by not having any follow-up, an opportunity has been lost to look for banded animals at other bridges in the area, and thus to learn something about the response of this colony to the loss of its roost.

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Pierson, E.D., P.W. Collins, W.E. Rainey, P.A. Heady, and C.J. Corben. 2002.Distributioin, status, and habitat associations of bat species on Vandenberg Air Force Base, Santa Barbara County, California. Santa Barbara Museum of Natural History Technical Report 1: 1-135.

Pierson, E.D. and W.E. Rainey. 2004. Bat surveys for State Route 101, Hopland By-Pass, Hopland, CA, Report to California State University at Sacramento Foundation, 55 pp.

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Rainey, W. E., and E. D. Pierson. 1996. Cantara spill effects on bat populations of the upper Sacramento River, 1991-1995. Report to California Department of Fish and Game, Redding, CA, (Contract # FG2099R1). 98 pp.

Rainey, W. E., E. D. Pierson, M. Colberg and J. H. Barclay. 1992 [Abs.]. Bats in hollow redwoods: seasonal use and role in nutrient transfer into old growth communities. Bat Research News 33(4):71.

Appendix J.

EndNote Records for
Literature Relating to Bat Mitigation

Insert Endnote print out (4 pgs)

Appendix K.

URL List

Publication/ Report Name	URL/Publisher	Type of Mitigation
A. J. Mitchell-Jones. 2004. English Nature. Bat Mitigation Guidelines.	http://www.english-nature.org.uk/pubs/publication/PDF/Batmitigationguide2.pdf	Detailed guidance for professionals; surveys, humane eviction, roost reconstruction, enhancement, bat houses, monitoring, case studies.
Indiana Office of Surface Mining Bat Gating Projects website	http://www.mcrcc.osmre.gov/Indianapolis/Bat%20Gate/Indiana%20Bat%20Gate.htm	Photo gallery of bat gating case histories.
FHWA Texas Bat Bridges website	http://www.tfhrc.gov/pubrds/winter96/p96w12.htm	Lay article re: Congress Ave. Bridge
Selah – Bamberger Ranch Chiroptorium website	http://www.bambergerranch.org/news.htm	Website for Bamberger Ranch constructed bat cave – constructed for habitat enhancement by enthusiast, using wire frame and gunnite.
Locke, Robert. 2003. Bats at Last! An artificial bat cave proves its worth. Bats. BCI. Fall.	http://www.batcon.org/	As many as 200,000 bats using Bamberger Cave in Central Texas. Mostly TABR, + ca. 7,000 possible MYVE.
Bat Gates Installed in Abandoned Mines. Lake Mead NRA website	http://www.nps.gov/lame/projects/000524.html	Mine tunnel gates at Lake Mead National Recreation Area.
Brian Keeley & Tuttle, M. Bats in American Bridges. Bat Conservation International	http://www.batcon.org/bridge/ambatsbridges/	Guidance for bat bridge mitigations, designs.
Conserving Bats. The Heritage Council, Ireland	http://www.countycarlow.ie/services/reportspublications/reports/ConservingBats.pdf	Layperson guidance for bat conservation.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Attachment A: Christopher Creek Highway Project Environmental Impact Mitigation Measures. Wildlife Crossings Toolkit website	http://www.wildlifecrossings.info/media/sa024.pdf http://www.wildlifecrossings.info/beta2.htm	Bridge habitat replacement/enhancement. Mitigation for bats: "Because there is an expected direct loss of roosting and foraging habitat for bats as a result of this project, opportunities to replace or enhance roosting habitat for bats will be identified and evaluated during final design. The practicality of the use of bridge designs that enhance bat roosting opportunities (e.g., box bean designs) or modification of wildlife culvert crossings to address the needs of roosting bats will be evaluated. The practicality of incorporating some structural device to the underside of new/old bridges along the highway for bats will be evaluated. Bat boxes/houses will be placed at intervals along the highway in the more remote, forested areas."
Mitigation Matrix. Lower Yosemite Fall Project Yosemite National Park. National Park Service	http://www.nps.gov/yose/planning/yfalls/LYFFONSIMitigation.htm	Pre-thinning surveys, seasonal avoidance.
Turning a Box Culvert Into a Bat Culvert. Keeping it Simple website. U.S. Department of Transportation. Federal Highway Administration	http://www.fhwa.dot.gov/environment/wildlifeprotection/index.cfm?fuseaction=home.viewArticle&articleID=54	Converting culverts into bat roosts, Webb County, Texas.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Herger-Fernstin Quincy Library Group Forest Recovery Act. Final Supplemental Environmental Impact Statement. Record of Decision. 2003. USDA Forest Service. Pacific Southwest Region.	http://www.fs.fed.us/r5/hfqlg/documents/HFQLG_SEIS/rod.pdf	Mitigation: "At the site-specific project level evaluate and implement the following design features, to the extent reasonably practicable, to reduce indirect and cumulative effects to the Western red bat, Townsend's big-eared bat and pallid bats from the following herbicides: hexazinone, sulfometuron methyl, picloram, or the NPE-based surfactant. Within suitable habitat, conduct acoustical, mist-net, and roost surveys for Western red bat, Townsend's big-eared bat and pallid bats when hexazinone, sulfometuron methyl, picloram, or the NPE-based surfactants are proposed for DFPZ maintenance or control of invasive and noxious weeds. If these bat species are located, consider: 1) alternative herbicides near roosts or within foraging areas; 2) no-herbicide buffers around bat roosts; 3) alternative forms of herbicides such as the pellet form of hexazinone; 4) alternative methods of herbicide application, such as "cut and dab", "hack and squirt", "spot-gun", or "basal spray", 5) limited operating periods (i.e. winter months when bats would be hibernating); and 6) reduced application rates. Monitoring of threatened, endangered, or sensitive wildlife."
Limiting Blasting Near Bat Caves Protects Baby Bats Keeping it Simple website. U.S. Department of Transportation. Federal Highway Administration	http://www.fhwa.dot.gov/environment/wildlifeprotection/index.cfm?fuseaction=home.viewArticle&articleID=24	Limiting blasting near caves so no vibration felt past 600 ft. from project area.
Rydell, Jens, and Baagoe, Hans J. 1996. Bats and Streetlamps in Bats Magazine. Bat Conservation International. Winter.	http://www.batcon.org/batsmag/v14n4-4.html	Lay article; negative effects on insects and bats from conversion from mercury vapor or sodium and mercury to orange sodium.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Nieland, Jim. Policies, Management and Monitoring: Protection of Habitat Using Bat Gates. U.S. Forest Service.	http://www.mcrcc.osmre.gov/PDF/Forums/Bat%20Gate/6-4.pdf	Professional guidance re: Federal Cave Resources Protection Act of 1988, bat cave-roost ecology, cave morphology, bat surveys, entrance gating, vegetation retention, equipment limitations, entrance retention, avoidance of drainage into mine or cave, limiting blasting within ¼ mi. when occupied.
The bat worker's manual A.J. Mitchell-Jones, ed. Nature Conservancy Council. 1987.	http://www.jncc.gov.uk/Publications/bat_workers/#download	Professional guidance on laws, handling, surveys, identification, banding, marking, handling, bat groups, public relations, timber treatment, pest control, caves, mines, hollow trees. Incl. adapting roof ridges and dormers for entry by bats, cave gating.
Bat Gate Design Forum EProceedings. 2002. Office of Surface Mining. Mid-Continent Region.	http://www.mcrcc.osmre.gov/PDF/Forums/Bat%20Gate/TOC.pdf	Proceedings of gate design forum.
Sherwin, Richard E., Altenbach, J.Scott, and Haymond, Shauna. 2002. The Responses of Bats to Gates *in* Bat Gate Design Forum. Office of Surface Mining. Mid-Continent Region.	http://www.mcrcc.osmre.gov/PDF/Forums/Bat%20Gate/6-1.pdf	Authors suggest lack of available data re: success of bat gates, propose further research, caution against gating as sole mitigation.
Environmental Program News. National Council of the Paper Industry for Air and Stream Improvement (NCASI). Mar. 11, 1998. Vol. 10 No. 5. Forestry	http://www.ncasi.org/forestry/ForestryNews/1998/fn-10-05.pdf	Collaborative plan with BCI to develop information on forest bats, including distribution, protection, ecology, forest management practices, identification of priorities and future research needs, develop planning and budgeting priorities.
Bridge Usage by Bats in County Leitrim and County Sligo. The Heritage Council. An Chomharirle Oidreachta. Ch. 6.	http://www.heritagecouncil.ie/publications/bats/	Day/night surveys, preconstruction surveys, pre-project planning, retain crevices, artificial roosts, tree planting, inform local authorities, training seminars, mitigation monitoring.

Publication/ Report Name	URL/Publisher	Type of Mitigation
The Highway Agency (UK) Biodiversity Action Plan	http://www.highways.gov.uk/aboutus/corpdocs/biodiversity/pdfs/wdland_feat_bats.pdf	Introductory professional guidance on bat protections, species concerns, mitigations.
Opening of the A41 Aston Clinton Bypass. The Highway Agency (UK)	http://www.highways.gov.uk/roads/projects/a_roads/a41/aston_clinton_bypass/a41_astonclinton_bp_oct_03/06.htm	Press release; bat houses around restored canal.
The New A11 Interchange. The Highway Agency (UK)	http://www.highways.gov.uk/roads/projects/a_roads/a11/interchange/a11_news/page03.htm	Press release; surveys, mature tree retention, landscaping to enhance road corridor.
A127 Polegate Bypass. The Highway Agency (UK)	http://www.highways.gov.uk/roads/projects/a_roads/a27/polegate_bypass/a27polegate/02.htm	Progress report; surveys.
A10 Wadesmill to Colliers End Bypass. The Highway Agency (UK)	http://www.highways.gov.uk/roads/projects/a_roads/a10/wadesmill_colliers_end/a10_wadesmill_sept_02/04.htm	Press release; underground mitigation bat cave, tree-mounted bat houses.
A36 Limpley Stoke Stabilisation and Resurfacing Update: Week 2. The Highway Agency (UK)	http://www.highways.gov.uk/roads/projects/a_roads/a36/limpley_stoke/a36_limpley/week_2.htm	Press release; tree bat surveys, tree retention.
Annual Report 2000-2001. Case study: Bat colonies on the A66 Stainburn/Great Clifton bypass. The Highway Agency (UK)	http://www.highways.gov.uk/aboutus/corpdocs/ann_rpt/2000_2001/page_07.htm	Case study: installation of camouflage netting linking intact and logged woodland to "fool" bat echolocation, causing them to continue to forage as if woodland unbroken.
Telephone Flat Geothermal Development Project Mitigation Monitoring and Reporting Program. Siskiyou County	http://www.co.siskiyou.ca.us/telephoneflat/pdf-files/notices/Telephone%20Flat.NOC-3.Exhibit%20A.MMRP.PDF	Preconstruction presence/absence surveys. 250-foot buffer. Snag avoidance. Bat roost management plan. Snag creation.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Planning & Building Inspection Condition Compliance and Mitigation Monitoring and/or Reporting Plan. Monterey County	http://www.co.monterey.ca.us/pbi/docs/resolutions/pc_2003/res_pc03017_MMRP.pdf	Pre-demolition surveys, buffer zones, eviction, and monitoring.
Summary of Environmental Impacts and Mitigations. City of Capitola	http://www.ci.capitola.ca.us/capcity.nsf/vlookup/RISPIN%20SUMMARY%20OF%20ENVIRONMENTAL%20IMPACTS%20AND%20MITIGATION/$file/RISPIN%20SUMMARY%20OF%20ENVIRONMENTAL%20IMPACTS%20AND%20MITIGATION.pdf	Preconstruction surveys, eviction, roost replacement (COTO?).
A507 Ridgmont Bypass Environmental Mitigation Proposals. Bedfordshire County Council	http://216.239.39.104/search?q=cache:uKNdd6OhhccJ:www.bedfordshire.gov.uk/BedsCC/SDroadworks.nsf/8979a9cced1e622d802568a9003dfbdf/7c38490c0c08cacc80256a7f0056da01/%24FILE/MITIGATI.doc+bats+mitigation&hl=en&ie=UTF-8	Presence/absence surveys, seasonal removal of trees and snags, retention, consultation, bat-friendly landscaping, bat-friendly bridge design, bat houses.
Final Environmental Assessment. Ch. 2.0 Alternatatives and Mitigation Measures. Tennessee Valley Authority	http://www.tva.gov/environment/reports/sunsetbay/chapter_2.pdf	Bioacoustic monitoring of tree roosts 1 night prior to removal, removal of <6" dbh between Oct. 15-Mar. 31.
Yosemite Lodge Area Redevelopment Environmental Assessment. National Park Service.	http://www.nps.gov/yose/planning/lodge/pdf/ylarpapdx_c.pdf	Surveys, seasonal avoidance (short spring?), snag retention, eviction.
Mitigation Monitoring and Reporting Program Verona Ridge Residential Development. City of San Mateo	http://www.ci.sanmateo.ca.us/downloads/planning/veronaridge/mitigation_monitoring_&_report.pdf	Seasonal avoidance, tree surveys <12", eviction, opening tree roosts.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Mitigation Monitoring and Reporting Program, Building 49 Project. Lawrence Berkeley Lab	http://www.lbl.gov/Community/pdf/env-rev-docs/4-MMRP.pdf	Seasonal timing, surveys w/in 200 vertical ft. of construction using optics, acoustics, no-disturbance buffer.
Missouri River Mitigation Project. U.S. Army Corps of Engineers Kansas City District	http://www.nwk.usace.army.mil/projects/mitigation/projnews/2002-07-rocheportcave.htm	Cave gating, gray and Indiana bats.
Appendix D Mitigation Measures, Draft Environmental Impact Statement, Spring Creek Project. U.S. Forest Service	http://www.fs.fed.us/r9/allegheny/forest_management/projects/Springcreek/deis%20appendices/Appendix%20D%20Mitigation%20Measures.pdf	Tree retention, tree removal after consultation with USFWS, seasonal timing of tree, building removal.
Lower Yosemite Falls Project Mitigation Matrix. Yosemite National Park. National Park Service	http://www.nps.gov/yose/planning/yfalls/LYFFONSIMitigation.htm	Surveys, seasonal avoidance (short spring?), snag retention, eviction.
Bat Survey Requirements When Submitting Planning Applications. Staffordshire Moorlands District Council	http://www.staffsmoorlands.gov.uk/services/tourismandleisure/countryside/bats/Bat%20Surveys1.pdf	Public/professional guidance re: bat surveys. Full bat surveys required prior to development except for extension to existing dwelling (presence/absence survey required), reporting, mitigation, licensing, and assessment of structures.
Union Railways. Channel Tunnel Rail Link.	http://www.ctrl.co.uk/ecology/ecology.asp?L=5&SL=18	Press release; construction of bat cave, 78 artificial bat roosts.
Trunk Road Biodiversity Action Plan: Review for Discussion. Scottish Executive.	http://www.scotland.gov.uk/library2/doc11/tbap-12.asp	General discussion of impacts and mitigations for bats in bridges.
The TRIZ Journal website	http://www.triz-journal.com/	Theory of inventive problem solving, broad applications.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Agreement on the Conservation of Populations of European Bats (Eurobats). Report on the implementation of the Agreement in the United Kingdom. 2002. Inf. Eurobats.AC8.19.	http://www.eurobats.org/documents/pdf/nat_rep_UK_2003.pdf	Report of actions taken in UK in 2002 under Agreement. Includes information on studies and study methods, enforcement, education, training, management priorities, pesticide concerns, but not project-specific mitigations.
Public Roads. Website, U.S. Dept. of Transportation Federal Highway Administration	http://www.tfhrc.gov/pubrds/02nov/01.htm	"In October 2001, an interdisciplinary delegation of Federal, State, and conservation group representatives visited Slovenia, Switzerland, Germany, France, and the Netherlands. Although each country uses different approaches to address wildlife issues, they have formed an international network to share information. The Infra Eco Network Europe (IENE) brings together state-of-the-art information on wildlife and transportation. Through comprehensive research on wildlife and habitat-related issues, IENE ultimately will benefit all of Europe as well as the rest of the world."
Performing a Needs Assessment for Potentially Gating a Cave or Mine. Rick Olson. Division of Science and Resources Management. Mammoth Cave National Park	http://www.mcrcc.osmre.gov/PDF/Forums/Bat%20Gate/2-1.pdf	Determining whether or not a cave or mine requires a gate, based on safety, human activity, availability of the site, historical and cultural significance, historical and current biological significance, etc.
Finding of No Significant Impact. Bear Gulch Cave Management Plan. Pinnacles National Monument.	http://data2.itc.nps.gov/parks/pinn/ppdocuments/BGFONSI.pdf	Document in support of selection of combined access plan for Bear Gulch Cave. Mitigations: ongoing monitoring, expanded public education, gating, closing portions of cave during maternity and hibernation seasons.
Information Paper. Missouri River Fish and Wildlife Mitigation Project. Rocheport Cave, MO. 2002. U. S. Army Corps of Engineers, Kansas City District. July.	http://www.nwk.usace.army.mil/projects/mitigation/projnews/2002-07-rocheportcave.htm	World's largest cave gate, for Gray and Indiana bat.

Publication/ Report Name	URL/Publisher	Type of Mitigation
The Basingstoke Canal. From the Society Archives – Bats and tunnels. 2003. Surrey and Hampshire Canal Society	http://www.basingstokecanal1.freeserve.co.uk/acrb01.htm	Bat cave built in Kent in a disused chalk pit now part of Monkton Nature Reserve near Birchington. Cave = 50ft. length of 5ft. dia. Concrete pipe sections buried 4ft. with rough concrete shelving with brick and rubble crevices inside. Visited by some bats 10 weeks post-construction.
The Basingstoke Canal. From the Society Archives – Bats and tunnels. 2003. Surrey and Hampshire Canal Society	http://www.basingstokecanal1.freeserve.co.uk/acrb01.htm	Greywell Tunnel – winter breeding roost and hibernaculum. Boaters prohibited from using the tunnel during winter months, and a temporary partition maintains cave-like atmosphere. No results.
The Basingstoke Canal. From the Society Archives – Bats and tunnels. 2003. Surrey and Hampshire Canal Society	http://www.basingstokecanal1.freeserve.co.uk/acrb01.htm	Large bat roost built at Eastleigh. Huge concrete pipes buried in Eastleigh Valley Country Park to make artificial tunnel. No results.
University of Florida Bat House	http://www.wec.ufl.edu/extension/bat_house.htm http://www.afn.org/~ufbat/bathouse.2.html	Construction of large bat house adjacent to Lake Alice wetland for mitigation of lost habitat after stadium remodel. 60,000 (est.) TABR occupying since 1997.
Species Action Plan – Bats.	http://www.nottsbag.org.uk/species/bats.htm	General plan for species conservation, part of the UK species action plans.
Fenn, Peter. *In* Conserving Bats Living in Buildings. 2001. Bats. Bat Conservation International. Fall, Volume 19, No. 3.		Discussion of bat protections in UK, requirements for exclusion as a last resort, conducted by certified excluder. "Bat bricks" provide roost cavities. Some new housing developments include bat houses attached to exterior walls. Example of hotel with colony of *Rhinolophus hipposideros*, marketed as ecotourism attraction.
Lefevre, Alex.*In* Conserving Bats Living in Buildings. 2001. Bats. Bat Conservation International. Fall, Volume 19, No. 3.		Examples of bat roosts in underground quarries, ice-cellars, fortresses, bunkers, churches. Bat-friendly gates at quarries, and bat-friendly doors in ice-cellars. Army commando training facility now protected for bats, small fortress acquired for bat conservation. Church architects and congregations modifying roofs, providing holes for bats.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Altringham, John. D. 1998. Bat Houses in British Forests. Bats. Bat Conservation International. Spring, Vol. 16, No. 1.		Discussion of tree-mounted bat houses in UK: 1) 300+ boxes attached to trees, monitored 12 years, with 90% occupancy. 2) Dorset 20-year bat house and banding project.
Holmes, Mike. 1997. The Old Beech Tree Roost. Bats. Bat Conservation International. Summer, Vol. 15, No. 2.		Account of large beech snag beside road in Woolbeding Estate, West Sussex County, England, shedding branches. Author recommended removal of all limbs. No data regarding return of bats after trimming at time of article.
Habitat Conservation Plan for the Six Points Road Interchange and Associated Development Project No. DEM-070-3(196)68 Des. No.: 9500900. US Department of Transportation Federal Highway Administration Indiana Department of Transportation Indianapolis Airport Authority Indianapolis Department of Public Works Indianapolis Department of Metropolitan Development Hendricks County Board of County Commissioners September 19, 2001	http://midwest.fws.gov/nepa/SixPoints/hcpfinaldraft901.PDF	Trees will not be cleared between April 15 and September 15. Permanent replacement of roosting and foraging habitat includes planting 140 hectares (345 acres) of hardwood seedlings within the approximate area of the project. Approximately 54 hectares (134 acres) will be planted immediately adjacent to the interchange and the creek relocations. Remaining 86 hectares (211 acres) will be planted adjacent to or within the Conservation Management Area on land owned by the Airport. Purchase of proposed mitigation plantings (with USFWS and Task Force consult) immediately adjacent to interchange and creek relocations, or additional mitigation plantings provided within project vicinity. Development of the planting areas no later than the summer following initiation of construction activities. The planting effort will continue over approximately five -year period. The planting areas will have a deed restriction attached to the land title to preserve the planted habitat in perpetuity. The Indianapolis Airport Authority responsible for maintenance of the mitigation property. Provision to permit eventual transfer of land title with accompanying restrictions to appropriate conservation agency or land trust. No manipulation of vegetation will occur without concurrence from USFWS. Monitoring and reporting program to assess the success of seedling planting effort, continuing existence of the Indiana bat in study area, utilization of mitigation areas by Indiana bat, size of maternity

Publication/ Report Name	URL/Publisher	Type of Mitigation
		colony population, and location of any newly established or previously unknown primary maternity roost trees. Permanently protected buffer areas within area of HCP, with deed restrictions to preserve the replacement habitat in perpetuity. IAA responsible for maintenance of the mitigation property. No manipulation of vegetation will occur without concurrence from the USFWS. Approximately 80 hectares of existing Indiana bat habitat owned by IAA outside the HCP boundary but within foraging range of Indiana bats will be permanently protected with deed restriction. IAA responsible for maintenance of the mitigation property. $475,000 to $500,000 previously unprotected lands purchased and protected within vicinity of Indianapolis International Airport Conservation Management Area, after approved by the USFWS. Permanent deed restrictions. IAA responsible for maintenance of mitigation property. No manipulation of vegetation without concurrence from the USFWS. Where possible and appropriate, 50 ft. wide buffers around any existing woodlot or mitigation planting areas, maintained in perpetuity, planted in a naturalized herbaceous seed mix and allowed to revegetate naturally. All Project personnel instructed about the terms of this HCP and the restrictions imposed by it before construction, restrictions will be placed in the special provisions of the Construction Specifications. Informal public outreach program may be expanded into the Indianapolis International Airport terminal area and throughout the project area as feasible and appropriate. Additional 15 years of monitoring the same maternity colony.
Texas Department of Transportation Section 1309, TEA-21 Comprehensive Streamlining Efforts	http://www.dot.state.tx.us/env/pdf/july02.pdf	TxDOT now designs some drainage culverts and bridges to provide habitat for bats, in cooperation with BCI. In Central Texas there is a 94-percent chance that a structure built to accommodate bats will be occupied within five years. Laredo District engineered a drainage culvert to double as bat habitat.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Franklin Boulevard Bridge Replacement Bat Protection Program	http://www.sacdot.com/projects/bat/introduction.asp	Initially planned replacement of wood trestle bridge included temporary roost habitat for est. 30,000 TABR, Myotis sp., EPFU. Six Mayberry houses installed on adjoining private property and The Nature Conservancy Consumnes River Preserve. Bat roosts constructed with "steel structure covered with wood or stucco for strength and correct alignment. The wood is exterior quality, including plywood, redwood and cedar trim. The bat homes are caulked and have three coats of exterior grade paint. Heat transfer ducts located underneath the metal roof maintain proper roosting temperatures. Air vents on each end and on the sides aid in proper ventilation. Vents are shielded to reduce light entry. Plastic mesh is attached inside the wooden frame for additional roosting options and space. The bat homes were welded to support pipes that are cemented into the ground. The houses are 15 feet off the ground to provide an adequate drop zone for the bats and to protect the houses from floodwaters. The bat houses are all located in sunny locations in open areas. The bat house installation diagram is shown on the following page. The first 3 bat houses were installed on the Kirkham property during the summer of 1999. Installation of the first bat house began on June 21, 1999. The third house was installed in August 1999. The remaining 3 bat houses were installed on the TNC lands in October 1999. Fall monitoring of the first 3 bat houses revealed some guano on the ground, indicating use as a night roost. No bats were observed inside the bat houses." Eviction in Mar. 2000 using expanding foam, later netting. Not initially successful – mortality and trapped bats behind net, in crevices outside net, and caulking pulled away some areas, allowing bats inside. Est. 1,000 bats using bat house #2 as late as Oct. 14, 2000, 250 by Nov. 29. Only guano two other houses. Roofs of houses 2 and 5 painted black April 2001, paint on house 5 was extended 2 feet down from the roof. Early April, 2001, no bats present in bridge or at bat houses. Late

Publication/ Report Name	URL/Publisher	Type of Mitigation
		April 30-50 bats in bat houses 2 and 3, guano under house 1. Bats are observed roosting in the northern end of the bridge where caulking is absent. June, 2001, estimated that there are several hundred bats in the bridge. Guano is observed below bridge openings ¾ inch or smaller. Also heard in various bridge locations where they not seen. Pop. in bat houses 2 and 3 est. about 200 bats each. TABR, EPFU using bat houses and bridge. Late June, pups in the bridge crevices. Bat house pops. decreased to ~50 individuals in house 3, and 2 in house 2. Mid-July, est. a few thousand bats occupy bridge. Hundreds of TABR and EPFU pups observed in space that is both tiny (small rotted areas used to enter the hollow areas under the bents) and larger spans not used in previous years, in space up to a foot wide. Estimated 50 bats in house 1, at least 500 bats in house 2 and more than 1,000 bats in house 3. Early September bats completely out of house 2. The slats are warped and the netting is sagging, large yellow jacket nests on the outside of the house, wasps inside the bat houses One bat observed in house 4 at the TNC on September 5, 2001. On September 26, 2001, bats in center slats of house 3 for the first time. Est. 3,000 bats in house 1, wren nest in house 3. Side note: 360 linear feet of bat guano under the Alta Mesa Bridge, first bridge in Sacramento County to have bat habitat built in. Over 2 years for the bats to return and fully occupy the habitat created in that bridge. October 4, 2001, no bats observed in all bat houses and entire bridge. It was decided modifications be made to the houses to increase internal temperatures. October 15, 2001, data loggers were installed in bat house 1, house 6 and under bridge. These loggers ran two weeks, were removed and returned to BCI October 29, 2001. BCI will review the results of the temperature and offer additional recommendations. Any further modifications to the existing bat houses will be completed

Publication/ Report Name	URL/Publisher	Type of Mitigation
		prior to the 2002 bat season, which begins in March 2002. After data loggers were placed in houses, vents on all houses sealed, roof of house 1 was painted black. House 6 on the TNC property modified with new sloped cover over bottom of bat house. In addition to the above modifications, Marvin Maberry donated 1 additional bat house to Sacramento County, installed midway between bat house 1 and 2.
Blackwater Valley Countyside Partnership Bat Conservation Project	http://www.blackwater-valley.org.uk/bat_conservation.htm	Native tree replanting, network of open ditches and ponds for bat flyways and feeding areas, construction of large bat cave, six sites with 150 bat houses. Results: 6 species increased populations.
The Bat Conservation Trust	http://www.bats.org.uk/	UK national organization devoted to conservation of bats and habitats.
Bats settle in ravers' tunnel. BBC News UK Edition. 2003. April 23.	http://news.bbc.co.uk/1/hi/england/oxfordshire/2970557.stm	Conversion of former railway tunnel between Horspath and Littleworth in Oxfordshire.
Rare bats given £420,000 roost	http://news.bbc.co.uk/1/hi/england/2440423.stm	Renovation of 16th century barn, 50-year lease to English Nature for barbastelles.
Project Description – Bridge Replacement on County Road 99W over the Cache Creek (Bridge Number 22C-022). Yolo County	http://www.yolocounty.org/org/bos/agendas/2003/112503/29.pdf	Bat exclusion prior to demo. Bat houses on outside of new bridge. Architectural treatments to new bridge design to provide night-roost habitat for pallid bat. Mitigation monitoring.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Mitigation Monitoring and Reporting Program. Verona Ridge Residential Development. 2003. April	http://www.ci.sanmateo.ca.us/downloads/planning/veronaridge/mitigation_monitoring_&_report.pdf	Potential Impacts to Pallid Bats A pre-demolition survey for roosting bats would be conducted prior to any removal of trees greater than or equal to 12 inches in diameter at 4.5 feet above grade. The survey would be conducted by a qualified bat biologist (i.e., a biologist holding a CDFG collection permit and a Memorandum of Understanding with CDFG. No activities that would result in disturbance to active roosts would proceed prior to the completed surveys. If no active roosts are found, then no further action would be warranted. If a maternity roost is present, a qualified bat biologist would determine the extent of construction-free zones around active nurseries since these species are known to abandon young when disturbed. If either a maternity roost or hibernacula is present, the following mitigation measures shall be implemented. CDFG would also be notified of any active nurseries within the construction zone. - *Exclude Bats Prior to Demolition of Roosts.* If an active nursery roost is located and the project cannot be redesigned to avoid removal of the occupied tree, demolition of that tree shall commence before maternity colonies form (i.e., prior to March 1) or after young are volant (flying) (i.e., after July 31). The disturbance-free buffer zones described in the mitigation above would be observed during the maternity roost season (March 1 - July 31) - If a non-breeding bat hibernacula is found in a tree scheduled to be removed, the individuals can be safely evicted, under the direction of a qualified bat biologist (as determined by a Memorandum of Understanding with CDFG), by opening the roosting area to allow air flow through the cavity. Trees with roosts that need to be removed would first have bats evicted at dusk, just prior to tree removal, to allow bats to escape during the darker hours.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Summary of Impacts and Mitigation Measures Juvenile Justice Facility at the Existing San Leandro Site Alameda County, California FINAL EIS/EIR APPENDIX	http://projects.vanir.com/ajjf/html/Final%20EIS-EIR/Appendix%201-JJF%20Impacts%20and%20Mitigation.pdf	8.1.2b: Preconstruction Roosting Surveys. Preconstruction roosting surveys for pallid bat and Townsend's western big-eared bat shall be conducted prior to demolition of buildings on the site. The surveys shall be conducted by a qualified biologist no more than 30 days prior to demolition. If bat roosts are encountered, demolition shall be postponed until bats have been relocated. Roost entrances shall be fitted with one way doors that allow exits but prevent entrance for a period of several days to encourage bats to relocate. If maternity roosts are found, the structure with the maternity roost shall be avoided and bat relocation efforts postponed until the offspring have fledged. If avoidance is not feasible, mitigation shall be developed in consultation with the CDFG and shall meet with the approval of the County General Services Agency prior to any construction or grading. The results of the preconstruction survey and any required mitigation monitoring shall be submitted to the CDFG and County General Services Agency.
Artificial Roost Designs		
Author, Title, Publisher	**Link, if available**	**Description**
Acker, Elaine. 1999/2000. Backyard Bats. Cal Butchowski, Pennsylvania Game Commission. Petersburg, Pennsylvania. Bats Magazine. 1999/2000. Bat Conservation International. Winter. Vol. 17, No. 4.	http://www.batcon.org/	MYLU-focused large bat house design. Claimed overall success rate 91%. Has been successfully adapted for MYYU in Santa Clara County (Burr 2003, Tatarian, pers. Obs.)

Publication/ Report Name	URL/Publisher	Type of Mitigation
Kiser, Mark. 2002. North American Bat House Research Project. BCI's Volunteer Researchers Design Homes for Bats. Marvin Maberry. Bats. Summer/Fall. Bat Conservation International.	http://www.batcon.org/	Various designs from small to large, including houses fitted under bridges, eg. Sacramento County's Franklin Blvd. Bridge Replacement Project.
Noteman, Laurali. 1998. Hidden Housing. Artificial Bark for Bats. Bats. Bat Conservation International. Fall.	http://www.batcon.org/	Artificial bat bark made from polyurethane and/or fiberglass. PVC spacer at bottom, sealed top, and sides with silicone. Developed by Dan Garcia de la Cadena and Melissa Siders. Summer 1998 results: polyurethane bark = 24% usage, fiberglass bark = 42%. Fall 1998 results: no differential use.
Research Associates in Action: Bob Wisecarver Bat House Researcher. Spring 2002 V. 10 N 1	http://www.batcon.org/	44 houses, 64% occupied, 3,600 bats. Pardee reservoir, near Sacramento, EBMUD, converted one of 16 spillway tunnels into artificial bat cave. Added two 12-inch x 72-inch roost panels against concrete walls. Carpet panels, Maberry roost modules. Barn owl moved in, bats moved out. Modified opening, bats moved in. Est. 2500 TABR.
Kiser, Mark. Meet Myotis evotis. BHR. V. 9 N 1, Spring 2001	http://www.batcon.org/	Plywood panels, ½" spacing, rocket boxes after 2000. Omitted vents, caulked, painted dark blue. Bats in August. Five houses, 4 occupied, 1-10 bats. 6th box 4' tall, black. Bats used within 20 days. Frequent switching.
Burke, Harold S., Jr. Fall 1999. Maternity colony formation in *Myotis septentrionalis* using artificial roosts. The rocket box, a habitat enhancement for woodland bats? Bat Research News. V 40: n. 3.		3 of 3 boxes used. 3 additional boxes with canopy coverage of 50, 80, 100%. All boxes used, differentially.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Clawson, Richard L. and J.E. Gardner. Wood duck predator guards used as roosts by little brown bats. BRN V 33 N. 4.		Sheet metal collars around bald cypress standing in pools. MYKE, MYSO also.
Hampshire bat cave. 1985. Bat News. N. 16		3 precast concrete pipes, 8'l x 5' dia. In excavated trench N-S, set at curve angle. 8' x 2'6" pipes at openings of large pipe joints.
Voute, A.M, and P.H.C. Lina. 1986. Management effects on bat hibernacula in the Netherlands	WWI bunkers, old fortresses.	Previously used houses have 400% more immigration.Daubenton's.
Endangered species technical bulletin. 1994. Region 3. V XIX N4	Crab Orchard National Wildlife Refuge, Illinois.	Convert 2 WWII munitions bunkers. Altering ceilings, MYLU, MYGR, MYSO
BRN V 6 n 2 fall 1998, Observations from the Heat Wave of 1998, New Research Site Yields Valuable Information		
BRN v7 n1. Results from 1998 season		
Bat News N. 49 Spring 1998. Keeping Up the Cold War		Conversion of bomb storage depot into hibernacula
Bat News 47, Nov. 1997. Leicestershire's Gothic Bat Tower	8' dep, 4' wide, 20' from ground. Leicester Water Center. Slots 18 x 15 mm.	
Bat News 46, July 1997. Train	Brick sculpture of train emerging from tunnel, uses 20 bat bricks.	

Publication/ Report Name	URL/Publisher	Type of Mitigation
Kiser, Mark and S. Kiser. 2003. Innovative Homes for Bats That Shun Bat Houses. The Bat House Researcher. BCI. V. 11. No. 1. Spring	http://www.batcon.org/	Construction of artificial roost tree hollows using vertically stacked concrete culverts and manhole shaft sections, August 2000, in southern Georgia, for *Corynorhinus rafinesquii and Myotis austroriparius.* Additional roosts built at two North Carolina state parks – South Mountains State Park, 2001, and Lumber River State Park, 2002. Six of seven already occupied by CORA, including one reproductive female, and one EPFU. **Methods:** Georgia roosts: Finished height: 16 feet (4.9 meters) Roosts 1 & 2: Two 8-foot (2.4-meter) highway culverts. Inside diameter: 3 feet (0.9 meter). Roost 3: One 8-foot highway culvert base and two 4-foot (1.2-meter) manhole shaft sections Inside diameter: 4 feet (1.2 meter) Total cost (three roosts): $5,500 North Carolina roosts: Finished height: 14.5 feet (4.4 meters) Each roosts: Four to five manhole shaft sections Inside diameter: 4 feet (1.2 meters) Total cost (four roosts): $2,860 FOR EACH ROOST: The top five feet of soil was excavated, replaced with clay, and leveled. A concrete pad, six feet (1.8 meters) on a side and eight inches (20.3 centimeters) thick, was installed. Roost sections were stacked on the pads and topped with a concrete cap. An entrance hole was precut in each base section. These varied in size and shape, although most were about 2 x 2 feet (61 x 61 centimeters). One or two 1 x 3-inch (2.5 x 7.6-centimeter) vertical slots were cut 4 to 5 feet (1.2 to 1.5 meters) from the top to provide additional access and escape routes. Floors and lower interior walls were painted dark to reduce interior light. Upper walls and ceilings were roughened by adding lumps of concrete mix, attaching plastic mesh, or cutting grooves to provide footholds for bats.
McCreary, Ann. 2003. Bat House on a Truck. The Bat House Researcher. BCI. V. 11. No. 1. Spring.	http://www.batcon.org/	A dilapidated cabin in Washington was moved to a new location to protect it for Townsend's big-eared bats that had used it for years. To help the bats relocate, a second cabin (*right*) was built at the new site. Some bats used both cabins in the first year.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Arnett, Edward B. and J. P. Hayes. 2003. Oregon Flat-Bottom Bridge Bat House Study. The Bat House Researcher. BCI. V. 11. No. 1. Spring.	http://www.batcon.org/	Study in western Oregon Cascades included 15 flat-bottom bridges along five large streams in managed Douglas fir forests. Authors designed a wood box with no top or bottom, made of rough-cut cedar, installed one beneath bridge in 1996 and 1997. Each box is 2 feet long, 2 feet wide and 12 inches tall (61 x 61 x 30.5 centimeters), with eight boards placed one half or three-quarters of an inch (1.3 or 1.9 centimeters) apart to create roost crevices. Results: Bats used 10 of 15 boxes in 1997. Thirteen (87%) used by end of study. Boxes contained 1-8 bats each.
Kiser, Mark and S. Kiser. 2003. Free-tailed Bats in Rocket Boxes. News and Notes. The Bat House Researcher. BCI. V. 11. No. 1. Spring	http://www.batcon.org/	TABR confirmed using rocket-style bat houses first time, Jan. 2003. Eight species now confirmed using rocket boxes.
Research Papers and Summaries		
Citation	**Summary of Methods**	**Summary of Results**
Carol L. Chambers, Alm, V., Siders, M.S., and M.J. Rabe. 2002. *Use of artificial roosts by forest-dwelling bats in northern Arizona.* Wildlife Society Bulletin, 30(4):1085-1091.	Comparison of tempered hardboard, and fiberglas-reinforced resin curved tree-cover panels to natural snags. Wood panel: 0.6 x 0.6 m x 0.3 cm-thick, 1 smooth, 1 rough side, treated, with wood wedges at bottom to created 5 cm wide opening. FRP roosts: flexible isopthalic polyester resin on fiberglas mat, formed in rubber molds to resemble ponderosa pine snag bark. Both roosts screwed with washer head screws, sealed with brown caulk top and sides.	Presence determined by guano or visual of live bats. Natural snags: n=10, used= 5, unused = 5 Wood roost: n=10, used = 9, unused = 1 FRP roost: n=10, used = 8, unused =2

Publication/ Report Name	URL/Publisher	Type of Mitigation
Arnett, Edward B and J.P. Hayes. 2000. Bat use of roosting boxes installed under flat-bottom bridges in western Oregon. Wildlife Society Bulletin, 28(4):890-894.	Study of 15 flat-bottom bridges located along 5 large streams in Douglas-fir forests, 5-45 yrs. of age in western Oregon Cascades. Bridges ranged from 230-475 m in elevation, 4.9-6.6 m in width, 11.3-27.4 m in length, and 3.1-5.8 m above water. Stream width beneath bridges between 2.3 and 14.0 m. Bridges augmented with wooden boxes of rough-cut western red cedar, 60 x 60 cm long and wide and 30 cm deep, with 8 boards spaced 1.2 cm or 1.9 cm apart to create crevices. Used guano trap under each box, conducted 15 weekly diurnal surveys.	Guano collected at least once from 12 of 15 (80%) of boxes. Observed single bat in box with no guano. 10 boxes used w/in 1 yr. of installation, same 10 plus 3 the following year. Avg. bridge ht. slightly higher than unused sites (3.9 m vs. 3.5m), and stream width slightly larger than unused sites (7.0 m vs. 5.6 m).
Butchokoski, Calvin M. 2002. Surveying the Behavior of Bats Crossing a Two-lane Highway and an Open Field. Bat Research News. Abstracts of Presentations at the 32nd North American Symposium on Bat Research Convened at the University of Vermont, Burlington VT. V43: N. 4. Winter.	Setting: maternity roost, including 40 banded MYSO and ca. 20,000 MYLUO, located in old wood frame country church at Canoe Creek State Park, Blair County, PA, 0.5 km north of a major U.S. highway, Rte. 22. Trees and brush border both sides, bats must cross road many times each night. Methods: on ten evenings between 15 May and 26 July, 2001, surveyors, positioned along a 150-meter length of highway where most bats were crossing, counted bats by crossing height category. Evening counts ranged from 1,636 to 3,351 bat crosses during a 40-minute period. Second study: colony of MYLU travels across 55m mowed field from day roost to foraging site. Bats exit roosts at 8m high, travel 45 m along side of building, flying <4m, enter 15m high tree line. Then exit and cross 55m mowed field to a 14m tree line on other side.	Results: Height of tree canopy on each side of road influenced crossing heights of bats. Where canopy is high (>20m) bats cross well ablve traffic; where canopy is low (~15m), bats cross closer to traffic. Bats avoided lowest (~8m). Second Study Results: over 90% of bats flying lower than 4 meters as they crossed the opening. If over highway, most would be in danger.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Krusac, Dennis L. 2002. Proposed Forest Management Changes in Southern Appalachain Mountain National Forests Should Benefit Bat Conservation. Bat Research News. Abstracts of Presentations at the 32nd North American Symposium on Bat Research Convened at the University of Vermont, Burlington VT. V43: N. 4. Winter.	Five national forests in southern Appalachian Mountains of eastern U.S. are revising forest management plans.	COTO *virginianus*, CORA and MYLE will be protected with a 100 foot buffer above and a t220 foot buffer below cliff face. Only management to occur in buffer will be done to benefit cliffline dependent species. For caves or mines, buffer zones from ½ mi. to 5 mi., depending on species and season. Gates where needed. Mandatory surveys of anthropogenic roosts before modification or demolition. If significant roosting found, structures will be maintained or alternate roosts suitable for species and colony size will be provided before modification or destruction. Forested corridors maintained along watercourses including channeled ephemeral drains. All immediately suitable roost trees retained.
Pierson, Elizabeth D., W.E. Rainey, D.M Koontz. 1991. Bats and Mines: Experimental mitigation for Townsend's big-eared bat at the McLaughlin mine in California. In Proceedings V: Issues and Technology in the Management of Impacted Wildlife. Thorne Ecological Institute	Open pit gold mine – McLaughlin Mine. Surveys conducted 1987-1988, found two suitable alternative roosts – Soda Spring adit, and Reid adit. Both fitted with gates and bats excluded from main roost. Colony moved into gated Soda Spring adit, and has continued to use it as maternity roost since. Reid adit, colder and wetter, not occupied by large number. Bat activity, roost temperature and light levels monitored. Gates bar spacing = 15cm high x 62 cm wide, but also recommend 15 cm x 50 cm. Material =10.3 cm x 10.3 cm angle iron, with 1" reinforcing rod around sides and top. Door with 20.5 cm section of 10.3 cm dia. Pipe used for lock protection. Reid adit reinforced with series of 1.23 m x 1.23 m cement culvert sections, used conveyor belt laid on top, then backfilled with dirt.	Soda Spring adit used primarily as summer roost. Reid adit activity is markedly less. Peak of activity in May, but most used as night roost. Temperatures are suitable for hibernating, but has not been used by many.

Publication/ Report Name	URL/Publisher	Type of Mitigation
Materials Resources		
Coastal Netting Company	P.O. Box 1946, Bakersfield, CA 93303	Torex bird netting for ponds, large areas
Bird Guard bird control products	1-800-331-2973	
Larson Company 6701 S. Midvale Park Rd. Tucson, AZ		Artificial wildlife environments.
Uniek, Inc.	800-248-6435	Quick-Count 7 mesh Plastic Canvas, #57301, clear, stiff, or #57015 black. 10.5 x 13.5 sheets, $0.30 or larger. Internet, Inc. XV-1670 1/8" or XV-1170 ¼"
Schwegler bird boxes and nature conservation products		Bird and bat houses
The Norfolk Bat Group	http://www.norfolk-bat-group.org.uk/	Bat Bricks – description of proper placement

Appendix L.

Western Bat Working Group
Threat Assessment Matrix

Insert 5 page WBWG PDF

Appendix M.

Guidelines for Implementation of the California Environmental Quality Act §15353 "Significant effect on the environment."

Under Chapter 3, Guidelines for Implementation of the California Environmental Quality Act, §15353 "Significant effect on the environment" is defined as a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. Under §15064, Determining the Significance of the Environmental Effects Caused by a Project, and Determining whether a project may have a significant effect plays a critical role in the CEQA process, are covered in detail (OPR 2004). More recently, an amendment to CEQA guidelines became law on 7 September 2004 that provides Mandatory Findings of Significance, Title 14, §15065 as follows:

15065. Mandatory Findings of Significance

(a) A lead agency shall find that a project may have a significant effect on the environment and thereby require an EIR to be prepared for the project where there is substantial evidence, in light of the whole record, that any of the following conditions may occur:

(1) The project has the potential to*:* substantially degrade the quality of the environment*;* substantially reduce the habitat of a fish or wildlife species*;* cause a fish or wildlife population to drop below self-sustaining levels~~,~~*;* threaten to eliminate a plant or animal community*;* substantially reduce the number or restrict the range of an endangered, rare or threatened species*;* or eliminate important examples of the major periods of California history or prehistory.

(2) The project has the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals.

(3) The project has possible environmental effects that are individually limited but cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

(4) The environmental effects of a project will cause substantial adverse effects on human beings, either directly or indirectly.

(b) (1) Where, prior to the commencement of preliminary review of an environmental document, a project proponent agrees to mitigation measures or project modifications that would avoid any significant effect on the environment specified by subsection (a) or would mitigate the significant effect to a point where clearly no significant effect on the environment would occur, a lead agency need not prepare an environmental impact report solely because, without mitigation, the environmental effects at issue would have been significant.

(2) Furthermore, where a proposed project has the potential to substantially reduce the number or restrict the range of an endangered, rare or threatened species, the lead agency need not prepare an EIR solely because of such an effect, if:

(A) the project proponent is bound to implement mitigation requirements relating to such species and habitat pursuant to an approved habitat conservation plan or natural community conservation plan;

(B) the state or federal agency approved the habitat conservation plan or natural community conservation plan in reliance on an environmental impact report or environmental impact statement; and

(C) 1. such requirements avoid any net loss of habitat and net reduction in number of the affected species, or

2. such requirements preserve, restore, or enhance sufficient habitat to mitigate the reduction in habitat and number of the affected species to below a level of significance.

(c) Following the decision to prepare an EIR, if a lead agency determines that any of the conditions specified by subsection (a) will occur, such a determination shall apply to:

(1) the identification of effects to be analyzed in depth in the environmental impact report or the functional equivalent thereof,

(2) the requirement to make detailed findings on the feasibility of alternatives or mitigation measures to substantially lessen or avoid the significant effects on the environment,

(3) when found to be feasible, the making of changes in the project to substantially lessen or avoid the significant effects on the environment, and

(4) where necessary, the requirement to adopt a statement of overriding considerations.

Appendix N.

Bat Mitigation Results

Insert big, Excel table