State Route Highway 1 Auxiliary Lanes and Bus-on-Shoulder Improvements Freedom Boulevard to State Park Drive and Coastal Rail Trail Segment 12
Santa Cruz County, California
05-SCR-01 PM 8.1/10.7; EA 05-0C7340; Project ID 052000083

Preliminary Drainage Report

Prepared for:

SCCRTC

Caltrans

September 2022

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State Route Highway 1 Auxiliary Lanes and Bus-on-Shoulder Improvements
Santa Cruz County, California

Preliminary Drainage Report

Submitted to:
California Department of Transportation
Santa Cruz County Regional Transportation Commission

This report has been prepared by or under the supervision of the following Registered Engineer. The Registered Civil Engineer attests to the technical information contained herein and has judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

Analette Ochoa

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Registered Civil Engineer

9/13/2022

Date

September 2022

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Executive Summary

The California Department of Transportation (Caltrans), in cooperation with the Santa Cruz County Regional Transportation Commission (SCCRTC) and the Santa Cruz County (County), proposes to widen State Route Highway 1 (SR 1) to include auxiliary lanes, accommodate Bus-On-Shoulder (BOS) operations between the Freedom Boulevard and State Park Drive interchanges, and construct Coastal Rail Trail Segment 12.

One build alternative and the no-build alternative are proposed for further consideration. The project is in Santa Cruz County on SR 1 from post mile (PM) 8.1, south of Freedom Boulevard, to PM 10.7, north of State Park Drive, with 1.14 miles of trail along the SCCRTC-owned Santa Cruz Branch Rail Line (SCBRL) between State Park Drive and Rio Del Mar Boulevard.

The purpose of the Project is to:

- Reduce congestion along SR 1 through the Project limits;
- Enhance bicycle and pedestrian connectivity along Segment 12 of the Coastal Rail Trail;
- Promote the use of alternative transportation modes to increase transportation system capacity and reliability; and
- Provide Coastal Rail Trail access across SR 1 at the two railroad bridges.

Improvements in the Project area were addressed previously, as a part of a larger 8.9-mile project, in a combined Tier I/Tier II Environmental Impact Report/Environmental Assessment with a Finding of No Significant Impact, which was adopted in December 2018.

The purpose of this *Preliminary Drainage Report* is to evaluate the existing drainage conditions and drainage criteria at the Project site, to determine the potential impacts from the proposed improvements, to provide guidelines for drainage design, and to assess the susceptibility to hydromodification resulting from the added impervious area within the Project.

The Project is within the Central Coast Regional Water Quality Control Board (RWQCB), Region 3 jurisdiction. The Project's receiving water bodies are Aptos Creek, Valencia Creek, Valencia Lagoon, and Pacific Ocean. Runoff from the Project is collected and conveyed through a system of culverts that ultimately discharge to the receiving water bodies. Work is proposed within the Town of Aptos and the County within the Aptos Creek crossing. The Project build alternative seeks to widen Aptos Creek bridge on the southside, and abutments will be placed along the existing embankments located in the south side of Aptos creek and the north side of Spreckles Drive.

The drainage design for the Project within Caltrans right-of-way (ROW) will comply with Chapter 800 of the Caltrans' *Highway Design Manual* and procedures presented in the Hydraulic Engineering Circular Number 22, a publication for highway pavement

drainage from the Federal Highway Administration (FHWA). Any drainage improvement proposed for the local roads and drainage within Town of Aptos complies with the County's design criteria as the Town of Aptos falls under the jurisdiction of the County outlined in, *Design Criteria Containing Standards for the Construction of Streets, Storm Drains, Sanitary Sewers, Water Systems, and Driveways within the Unincorporated Portion of Santa Cruz County* (Santa Cruz County, 2019).

Due to the 2.6 miles of road widening, proposed retaining walls, and bridge work, the existing conveyance system including storm drain inlets, cross culverts, asphalt concrete dikes would have to be removed and reconstructed to align with the new edge of roadway and shoulders. In addition, verification of existing cross-culvert sizing and any improvements needed due to service life, maintenance or due to capacity needs from the added impervious. The overall drainage pattern of area will be maintained.

For proposed Ultimate Coastal Rail Trail Segment 12, the Project aims to use to the extent possible the use of deck drains, if feasible, from the proposed pedestrian and bike bridge to capture and route runoff to adjacent bioswales. For accessibility and drainage, the cross slope of the traveled way would be between 1% and 2%. Further evaluation of the Coastal Rail Trail Segment 12 preliminary drainage will be discussed in the Project's next phase, Plans, Specifications, and Estimates (PS&E).

The Project proposes 3.61 acres of net new impervious area within Caltrans' ROW. The Project Initiation Document (PID) for this Project was signed in 2002 and therefore, the Project is grandfathered under the 1999 Caltrans Permit (Section E.2.d). This Project is subject to the treatment threshold requirements contained within the 1999 Caltrans Permit. Per the 1999 Caltrans Permit, the Project will treat the net new impervious (NNI) to the maximum extent possible (MEP).

The Project proposes a total 2.67 acres (Interim Trail) or 2.90 acres (Ultimate Trail) of NNI area within the County's ROW. Per the Phase II MS4 permit, sidewalks, bicycle lanes, and trails constructed with permeable surfaces, or sidewalks, bicycle lanes, and impervious trails built to direct stormwater to adjacent vegetated areas are excluded from the post construction stormwater treatment control and hydromodification management requirements of this permit. Because all the Project's rail trail improvements within unincorporated Santa Cruz County's ROW fit the criteria of exclusion described above, these improvements would be exempt from implementing stormwater treatment and baseline hydromodification management.

For non-exempt portions of the Project within County's right-of-way, the Project would have to comply with the hydromodification management requirements included under the Central Coast RWQCB Post-Construction Stormwater Requirements of the Phase II MS4 permit. The Project proposes to add or replace less than 15,000 square feet of non-exempt impervious areas within Santa Cruz County's right-of-way; therefore, the Project would not be subject to hydromodification requirements. Although the Project's 2002 PID were under the 1999 Caltrans MS4 permit, which does not include hydromodification.

Acronyms

BFE	base flood elevation
BIR	Bridge Inspection Report
BMP	best management practice
BOS	bus-on-shoulder
Caltrans	California Department of Transportation
CFR	California Federal Regulation
cfs	cubic feet per second
County	Santa Cruz County
EA	Environmental Assessment
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FONSI	Finding of No Significant Impact
ft	feet, foot
GIS	Geographic information system
HDM	Highway Design Manual
HOV	High Occupancy Vehicle
HSG	Hydrologic soil group
LiDAR	Light Detection and Ranging
MBSST	Monterey Bay Sanctuary Scenic Trail
mi	mile
NAVD 88	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Association
PFDS	Precipitation Frequency Data Server
PID	Project Initiation Documents
PM	post mile
Project	State Highway Route 1 Auxiliary Lanes and Bus-on-Shoulder Improvements—Freedom Boulevard to State Park Drive—and Coastal Rail Trail Segment 12 Project
PS&E	Plans, Specifications, and Estimate
ROW	right-of-way
RWQCB	Regional Water Quality Control Board
SCBRL	Santa Cruz Branch Rail Line
SCCRTC	Santa Cruz County Regional Transportation Commission
SCR	Santa Cruz
SFHA	Special Flood Hazard Area
SLR	sea level rise
SR	State Route

STB	Surface Transportation Board
SWDR	Storm Water Data Report
SWMP	Storm Water Management Plan
SWPPP	Storm Water Pollution Prevention Plan
TMP	Transportation Management Plan
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

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1 GENERAL DESCRIPTION

The following is the *Preliminary Drainage Report* for the State Route Highway 1 (SR 1) Auxiliary Lanes and Bus-on-Shoulder (BOS) Improvements—Freedom Boulevard to State Park Drive—and Coastal Rail Trail Segment 12 Project (Project).

1.1 Project Description

The California Department of Transportation (Caltrans), in cooperation with the Santa Cruz County Regional Transportation Commission (SCCRTC) and Santa Cruz County, proposes to widen SR 1 to include auxiliary lanes, accommodate BOS operations between the Freedom Boulevard and State Park Drive interchanges, and construct Coastal Rail Trail Segment 12.

One build alternative and the no-build alternative are proposed for further consideration. The Project is located in Santa Cruz County on SR 1 from post mile (PM) 8.1, south of Freedom Boulevard, to PM 10.7, north of State Park Drive, with 1.14 miles of trail along the SCCRTC-owned Santa Cruz Branch Rail Line (SCBRL) between State Park Drive and Rio Del Mar Boulevard. The total length of the Project on SR 1 is 2.6 miles, and on the SCBRL is 1.14 miles. Within the limits of the proposed Project, SR 1 is a controlled access freeway with two 12-foot (ft) lanes; shoulder width varies within Project limits. The average width of the inside shoulders is approximately 5 ft, and the average width of the outside shoulders is approximately 10 ft. Within the Project area, the existing railroad right-of-way is generally in the range of 40- to 55-ft-wide, with the existing railroad tracks generally in the center of the right-of-way. The existing railroad has at-grade crossings at State Park Drive, Aptos Creek Road, and Trout Gulch Road, with bridges over SR 1 at two locations, Soquel Drive, Aptos Creek and Valencia Creek, and crosses under Rio Del Mar Boulevard. The SCBRL is currently an active freight railroad. The Project vicinity and location are shown in Figure 1 and Figure 2, respectively. Figure 3, Figure 4, and Figure 5 shows the Project components.

1.2 Purpose and Need

The purpose of the Project is to do the following.

- Reduce congestion along SR 1 through the Project limits.
- Enhance bicycle and pedestrian connectivity along Segment 12 of the Coastal Rail Trail.
- Promote the use of alternative transportation modes to increase transportation system capacity and reliability.
- Provide Coastal Rail Trail access across SR 1 at the two railroad bridges.

This Project is needed for the following reasons.

- Several bottlenecks along SR 1 in the southbound and northbound directions cause congestion during peak hours, significantly delaying drivers.

- Cut-through traffic, or traffic on local streets, is increasing because drivers are seeking to avoid congestion on SR 1.

- There are limited opportunities for pedestrians and bicyclists to safely cross SR 1 and navigate the Project corridor, even though portions of the Project area are designated as regional bicycle routes.

- There are insufficient incentives to increase transit service in the SR 1 corridor because congestion threatens reliability and cost-effective transit service delivery.

Figure 1. Project Location

Source: ICF, 2021

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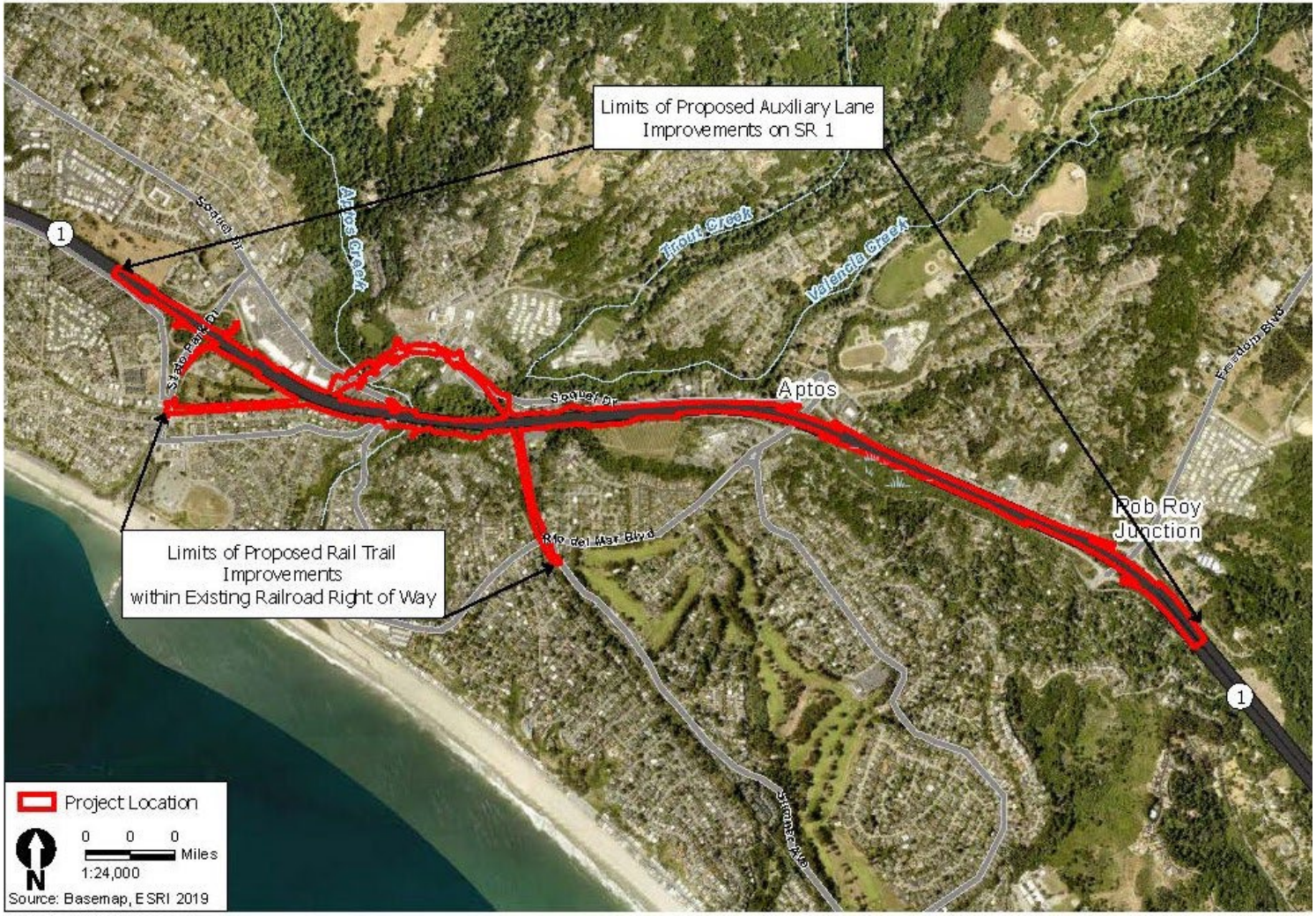

Figure 2. Project Area Map

Source: ICF, 2022

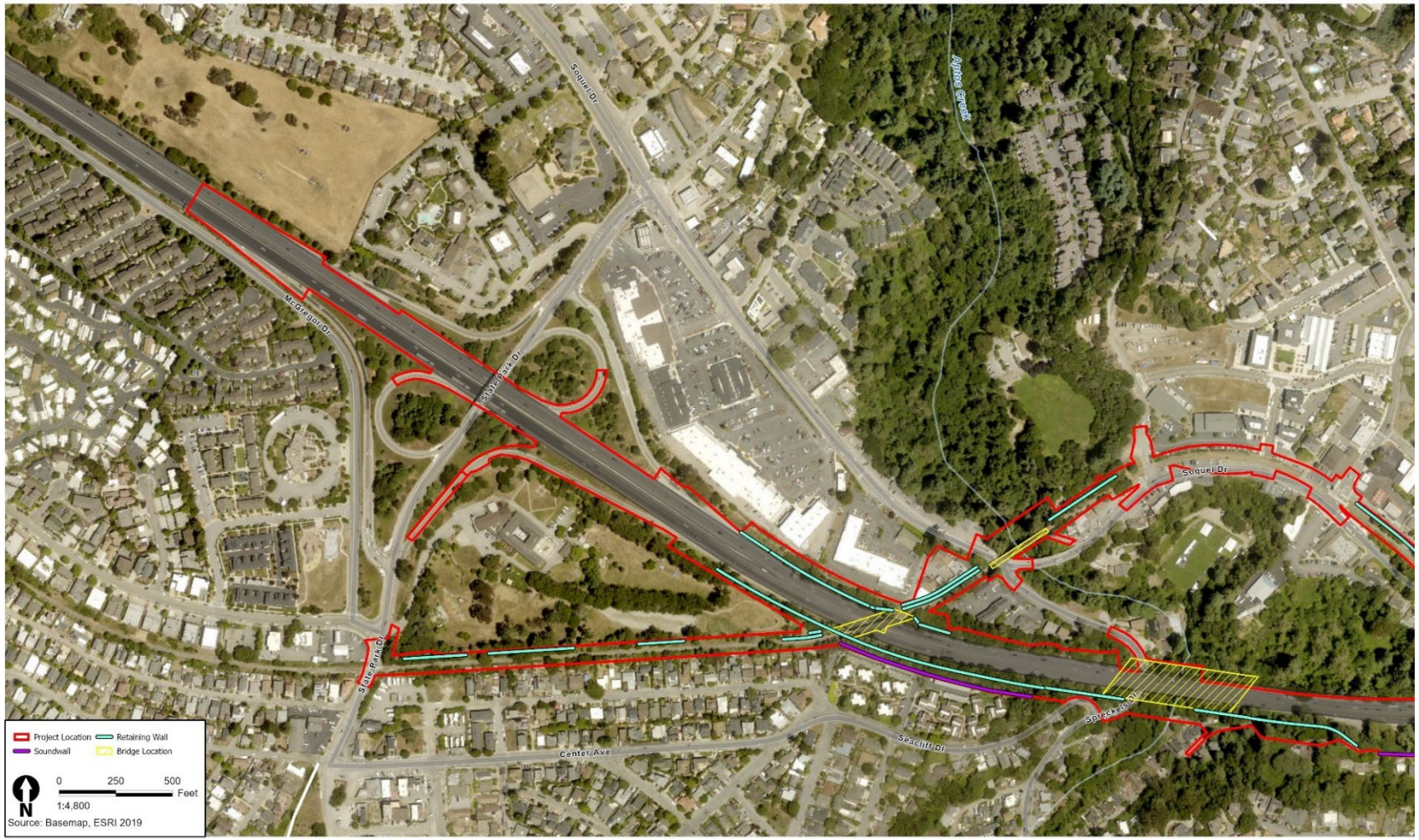

Figure 3. Project Components (page 1 of 3)

Source: ICF, 2021

Figure 4 Project Components (page 2 of 3)

Source: ICF, 2021

Figure 5. Project Components (page 3 of 3)

Source: ICF, 2021

1.3 Project Alternatives

1.3.1 Build Alternative

1.3.1.1 Auxiliary Lanes

Auxiliary lanes are designed to improve merging operations and reduce conflicts between traffic entering and exiting SR 1 by connecting the on-ramp of one interchange to the off-ramp of the next; they are not designed to serve through traffic. A southbound auxiliary lane and a northbound auxiliary lane would be added to the following segments of SR 1.

- Between the Freedom Boulevard and Rio Del Mar Boulevard interchanges.
- Between Rio Del Mar Boulevard and State Park Drive interchanges.

The total roadway widening would be approximately 2.6 miles in length. Southbound, the auxiliary lanes would begin at the existing State Park Drive loop on-ramp and end at the existing off-ramp to Freedom Boulevard. Northbound, the auxiliary lanes would begin at the existing Freedom Boulevard on-ramp and end at the existing diagonal off-ramp to State Park Drive.

The new auxiliary lanes would be 12-ft-wide. From Freedom Boulevard to Rio Del Mar Boulevard, the width needed for the new lane would be added in the median. The existing median barrier would be reconstructed in its current location. From Rio Del Mar Boulevard to State Park Drive, the width needed for the new lane would be added outside the existing shoulders; the outside shoulders would be standard 10-ft-wide.

Moosehead Drive to the south of SR 1, south of Aptos Creek, would be realigned where it runs parallel to SR 1 due to the outside widening of SR 1. A new retaining wall would be placed along the outside freeway shoulder to support the realignment that would include horizontal and vertical adjustments.

Structures – State Route 1

The Build Alternative would include the replacement of the two SCBRL railroad bridges over SR 1 and widening of the SR 1 bridge over Aptos Creek and Spreckels Drive to accommodate the proposed auxiliary lanes. The existing two-span SCBRL railroad bridges (underpass structures) are proposed to be replaced with longer spans to accommodate the planned SR 1 ultimate improvements that are a six-through-lane concept plus an auxiliary lane in each direction between interchanges. The Ultimate SR 1 configuration was approved in the *Final Environmental Impact Report/Environmental Assessment with a Finding of No Significant Impact for the Tier I High Occupancy Vehicle (HOV) Lanes and Tier II 41st Avenue to Soquel Avenue/Drive Auxiliary Lanes Project* (Tier I/Tier II Final EA/EIR/FONSI). In addition to the railroad bridges, new trail overcrossings would be constructed adjacent to the new railroad bridges for the Ultimate Trail configuration of the Coastal Rail Trail Segment 12 for the SR 1 improvements.

The widening of the SR 1 bridge over Aptos Creek and Spreckels Drive would occur on the south side of SR 1 only and require abutment walls along the existing embankments along the south side of Aptos Creek and the embankment on the north side of Spreckels Drive. The widened bridge would accommodate six lanes, each 12-ft-wide (four through-lanes plus an auxiliary lane in each direction), 10-ft-wide outside shoulders, and a 9-ft-wide median with a 2-ft-wide inside shoulder in the northbound direction and 5-ft-wide inside shoulder in the southbound direction. To accommodate the SR 1 ultimate improvements of six through-lanes plus an auxiliary lane in each direction, the SR 1 bridge over Aptos Creek and Spreckels Drive would be widened to the north (inland) side as part of a future Project.

Retaining Walls – State Route 1

The build alternative would include retaining walls at the following locations along SR 1 (Figure 3 and Figure 4).

Northbound

- "SR1" Station 258+90 - 261+26; max height = 15 ft
- "SR1" Station 288+07 - 296+00; max height = 15 ft

Southbound

- "SR1" Station 258+55 - 263+01; max height = 20 ft
- "SR1" Station 265+55 - 268+56; max height = 12 ft
- "SR1" Station 269+71 - 270+70; max height = 12 ft
- "SR1" Station 273+20 - 277+02; max height = 20 ft
- "SR1" Station 277+02 - 278+98; max height = 30 ft
- "SR1" Station 281+56 - 284+41; max height = 35 ft
- "SR1" Station 284+41 - 296+45; max height = 15 ft

The build alternative would evaluate sound walls at the following locations along SR 1 (Figure 3, Figure 4, and Figure 5).

Northbound

- "SR1" Station 258+57 – 267+49

Southbound

- "SR1" Station 263+18 – 266+78
- "SR1" Station 267+31 – 272+50
- "SR1" Station 284+79 – 291+52

1.3.1.2 Bus-on-Shoulder Features

BOS features are proposed, which would allow future bus operations on the outside shoulders of SR 1 through the interchanges during peak congestion periods. At the Freedom Boulevard, Rio Del Mar Boulevard, and State Park Drive interchanges, the

Project would widen and improve SR 1 shoulders, which currently lack the width and pavement structural section to support bus operations.

1.3.1.2.1 Cross Section – State Route 1 Bus-on-Shoulder

The added auxiliary lanes coupled with the BOS improvements allow the transit operator to use the auxiliary lane in between interchanges and use the shoulder between the off-ramp and on-ramps through the interchanges. Within the Freedom Boulevard, Rio Del Mar Boulevard, and State Park Drive interchange areas, the highway shoulders would be 12-ft-wide.

1.3.1.2.2 Other Features – State Route 1 Bus-on-Shoulder

New signs would be installed to advise motorists that only buses are allowed to use the highway shoulders through interchanges during peak traffic hours. Along northbound SR 1, a sign would be provided south of each of the three interchanges in the Project area. Along southbound SR 1, a sign would be installed north of each interchange. Shoulders would be painted red to indicate bus-only use.

1.3.1.3 Coastal Rail Trail Segment 12

The limits of Coastal Rail Trail Segment 12 extend from the southern terminus of the trail segment at Sumner Avenue, just of the south of the Rio Del Mar Boulevard underpass, to the northern terminus at State Park Drive. The proposed Coastal Rail Trail Segment 12 includes the construction of a paved bicycle and pedestrian shared use trail within the SCBRL right-of-way on the inland side of the tracks, consistent with the approved *Monterey Bay Sanctuary Scenic Trail (MBSST) Network Master Plan* (MBSST, 2014) (Figure 6), with an optional first phase. The trail segment would include a new at-grade trail connection to Sumner Avenue just south of the Rio Del Mar Boulevard underpass where the existing railroad tracks pass under Rio Del Mar Boulevard and a new sidewalk on the north side of Sumner Avenue between the terminus of the trail and the existing sidewalk on Rio Del Mar Boulevard.

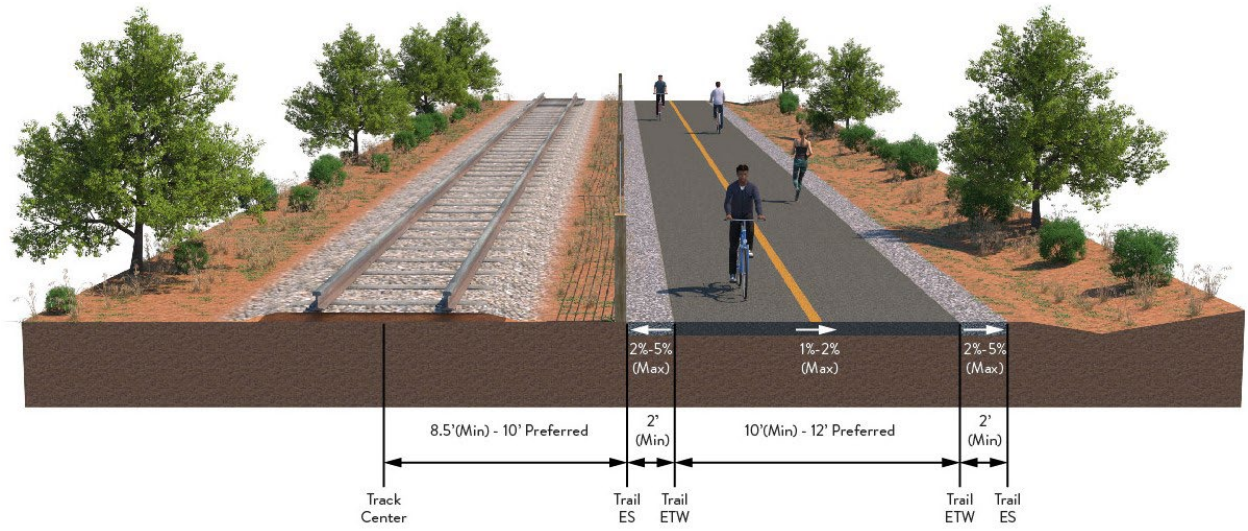

Figure 6. Coastal Rail Trail Segment – Ultimate Trail Configuration

The SCCRTC wishes to preserve the SCBRL corridor for transportation uses, which includes recreational passenger rail, freight rail, a multi-use trail, and future commuter rail transit. The Ultimate configuration to accommodate all proposed transportation uses along the SCBRL is a bicycle and pedestrian shared use trail adjacent to railroad tracks. The SCBRL is currently an active freight railroad with SCCRTC owning the ROW. SCCRTC contracts to serve freight and recreational passenger rail along the freight easement. The SCCRTC's contracted freight operator has indicated that they may file for abandonment of freight along the SCBRL.

As a method of preserving the right-of-way of a corridor that otherwise could be abandoned, the SCCRTC could consider railbanking the corridor. The Department of Interior defines railbanking as the preservation of a railroad corridor for future rail use. Railbanking is accomplished under the National Trails System Act through provisions that allow a railbanked corridor to be used for Interim Trail use purposes through a voluntary agreement reached between a railroad and a trail manager. The right-of-way is preserved for future freight reactivation and could allow the removal of the railroad tracks and construction of a trail in the interim condition.

For this reason, an optional first phase is being considered for Segment 12 of the Coastal Rail Trail, where all or a portion of the trail could be located along the alignment of the existing railroad tracks.

1.3.1.3.1 Ultimate Trail Configuration

Trail Alignment

The Ultimate Trail configuration includes construction of a paved bicycle and pedestrian shared use trail alongside the existing railroad track alignment. New trail bridge crossings of SR 1 at two locations and adjacent to the existing railroad bridges at Soquel Drive, Aptos Creek, and Valencia Creek would be constructed. New at-grade trail crossings will

be constructed at Aptos Creek Drive, Parade Street, and Trout Gulch Road. An at-grade trail connection from the new trail to the Aptos Village County Park between Aptos Creek and Aptos Creek Road would be constructed.

Structures

- At the two locations where the existing railroad bridges cross over SR 1, the Coastal Rail Trail will be placed adjacent to the reconstructed rail underpasses.
- Where the Coastal Rail Trail crosses over Aptos Creek, Valencia Creek and Soquel Drive, the existing structures have been evaluated for their load bearing capacities, and it has been determined there is not enough data to cantilever the Rail Trail. Therefore, the Project would include construction of new Rail Trail bridges adjacent to the existing railroad structures.
- For areas where the Rail Trail is on an independent structure from the railroad bridges or grade, the separation between the two structures would be a minimum of 5 ft.

Retaining Walls

Retaining walls would be constructed in the following locations for the Coastal Rail Trail Segment 12 alignment.

- North of SR 1 (towards State Park Drive) – An approximate 6-ft high, 300-ft-long retaining wall on the inland side of the trail.
- SR 1 to Soquel Drive—Retaining wall varying in height between approximately 5-ft and 20-ft, approximately 300-ft-long on the inland side of the trail.
- Aptos Creek to Aptos Creek Road—Retaining wall varying in height between approximately 2-ft and 18-ft, approximately 400-ft-long on the inland side of the trail.
- Trout Gulch Road to Valencia Creek—Retaining wall varying in height between approximately 2-ft and 18-ft, approximately 450-ft-long on the inland side of the trail.
- South of SR 1 (towards Rio Del Mar Boulevard)—An approximate 12-ft-high, 400-ft-long retaining wall on the inland side of the trail.
- Under Rio Del Mar Boulevard – Retaining wall varying in height between approximately 4-ft and 16-ft, approximately 1,000-ft-long on the inland side of the trail.

Fencing

Fencing to separate trail users and the railroad for the Ultimate Trail improvements is proposed as shown in Figure 4. In accordance with the Federal Railroad Administration guidelines, there would be a 10-ft offset from the centerline of the railroad to the edge of the trail, although an 8-ft-6-inch offset from the centerline of the railroad may be allowed in some circumstances. The fencing would be constructed using concrete posts (4 ft, 6 inches in height) etched to resemble wood, and multiple smooth wire strands. Fence post

construction is anticipated to require 3-ft-deep excavation. The new trail bridges over Aptos Creek, Valencia Creek, and Soquel Drive would include a railing.

1.3.1.3.2 Construction of Optional First Phase for Coastal Rail Trail Segment 12

It is possible that the common carrier could file for abandonment of freight operations with the Surface Transportation Board (STB) along the SCBRL at any time, in which case all or a portion of the SCBRL would likely be railbanked to preserve the corridor for future freight re-activation but could then be used for a multi-use trail as an interim condition.

All or a portion of the trail would be constructed in approximately the same location of the existing railroad tracks by removal of the rails and ties from just south of Rio Del Mar Boulevard at the southern terminus with Sumner Avenue to the northern terminus at State Park Drive, as shown in Figure 7. The two existing railroad bridges over SR 1 would be removed and two new trail overcrossings over SR 1 would be constructed in their place. The existing railroad bridges at Aptos Creek and Valencia Creek/Soquel Drive (south) would be repurposed for the new trail by removing the railroad decking and replacing with a new trail deck and railing system. The existing single span railroad bridge superstructure over Soquel Drive (north) would be removed and replaced with a new trail deck and railing system.

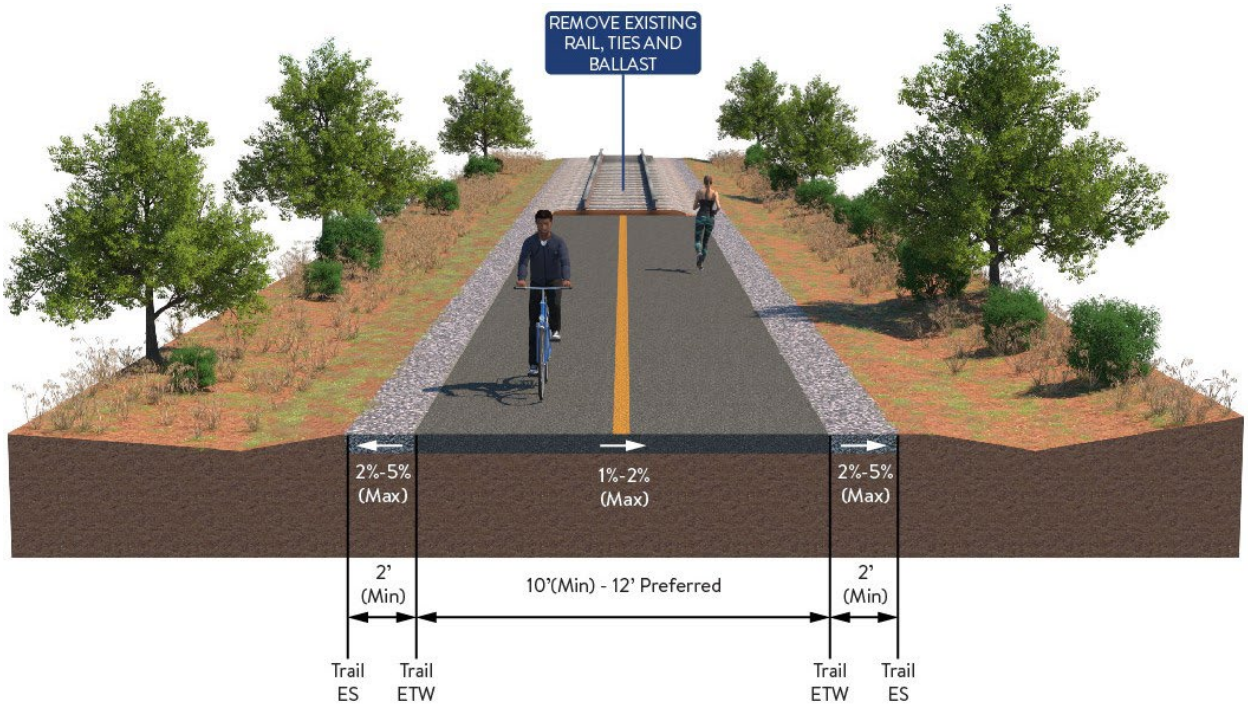

Figure 7. Coastal Rail Trail Segment – Optional First Phase

Stair access between the new trail and existing Soquel Drive (north) is proposed. A stair connection from the trail to Soquel Drive would begin on the south side of the trail west of the existing railroad bridge over Soquel Drive with a terminus at the Soquel Drive/Spreckels Drive signalized intersection. A new crosswalk would be provided at the Soquel Drive/Spreckels Drive signalized intersection. All trail users can access Soquel Drive via the at-grade trail crossing with Aptos Creek Road as an alternative to using the stairs. The alternative route would be identified with new signage. An at-grade trail connection from the new trail to the Aptos Village County Park between Aptos Creek and Aptos Creek Road would be constructed.

New at-grade trail crossings will be constructed at Aptos Creek Drive, Parade Street, and Trout Gulch Road in the approximate location of the existing railroad tracks.

Structures

- At the two locations where the existing railroad bridges cross over SR 1, the existing railroad bridges would be removed, and new single-span trail overcrossings would be constructed over SR 1 in the same general location as the existing railroad bridges. The bridge abutments constructed on either side of SR 1 would be constructed to freight railroad standards and be positioned and sized to account for the Ultimate Trail configuration.
- Where the trail crosses over Aptos Creek, Valencia Creek, and Soquel Drive (south), the existing bridge structures would remain, the railroad tracks removed, and new trail constructed along the existing rail centerline.
- The existing single-span railroad bridge superstructure over Soquel Drive (north) would be removed and replaced with a new trail deck and railing system.
- Slight modifications of the existing railroad bridge abutments are proposed to meet current seismic requirements.

Retaining Walls

Retaining walls would be constructed in the following locations:

- Just west of Soquel Drive - An approximate 5-ft high, 60-ft-long retaining wall on the south side of the trail.
- Just east of Aptos Creek —An approximate 18-ft high, 140-ft-long retaining wall on the south side of the trail and an approximate 6-ft high, 140-ft-long retaining wall on the inland side of the trail.

Fencing

The new trail overcrossings over SR 1 would include railings with fencing and the repurposed bridges over Aptos Creek, Valencia Creek, and Soquel Drive would have fencing added. No additional fencing is anticipated due to the railroad tracks being removed.

1.3.1.3.3 Removal of Optional First Phase for Coastal Rail Trail Segment 12

If all or a portion of the optional first phase of the trail is implemented, the trail along the existing railroad track alignment would need to be removed, a trail would be constructed adjacent to the tracks as described by the proposed Ultimate Trail project, and the railroad tracks re-installed in their approximate existing location. At-grade railroad crossings of Aptos Creek Drive, Parade Street, and Trout Gulch Road would need to be reconstructed.

Structures

- At the two locations where new trail overcrossings are constructed over SR 1 as part of the optional first phase improvements, the trail overcrossings would be relocated to be adjacent to the existing railroad alignment, and new railroad bridges would be constructed over SR 1 adjacent to the trail overcrossings, as described by the Ultimate Trail configuration. Construction of the new two-span railroad bridges over SR 1 would require the construction of support columns in the median of SR 1 to support the new railroad bridges.
- Repurpose bridges over Soquel Drive (south), Aptos Creek, and Valencia Creek from trail use to rail use by removing the trail deck and railing system and reconstructing railroad infrastructure.
- The trail deck and railing system over Soquel Drive (north) would be removed and replaced with a single-span railroad bridge with reconstructed railroad infrastructure.

Design Standards

Coastal Rail Trail Segment 12 would be designed as a multi-use paved path per the guidelines identified in Chapter 5 of the *Monterey Bay Sanctuary Scenic Trail (MBSST) Master Plan* (2014). The design standards used for this segment of the Coastal Rail Trail follow the MBSST guidelines and are listed under *Cross Section Standards*. The *MBSST Network Master Plan* incorporates and refers to design elements from the Class I Bikeways identified in Chapter 1000 of the *Highway Design Manual* (HDM) (Caltrans, 2020).

In areas where existing constraints limit the available width for the trail to be adjacent to the railroad tracks, other alternative design standards than those listed in the *MBSST Master Plan* may be utilized for design.

Cross Section Standards

- The paved traveled way of the Coastal Rail Trail would be a minimum of 12-ft-wide but may be reduced to 10 ft in areas with existing constrained conditions.
- Shoulders would be provided on each side of the traveled way and would be 2 ft in width where possible.
- For accessibility and drainage, the cross slope of the traveled way would be between 1% and 2%.

- The shoulder cross slope would be between 2% and 5% and would angle away from the surface of the traveled way.

Horizontal Design

- The design speed for the trail would be established at 20 miles per hour and correlates to a minimum stopping sight distance of 125 ft.
- To meet a minimum stopping sight distance of 125 ft, a radius of no less than 500 ft would be used for the Coastal Rail Trail alignment where possible.
- The minimum horizonal clearance between the railroad centerline and the edge of the Coastal Rail Trail, inclusive of shoulders, is 8 ft, 6 inches.
- Where roadways are adjacent to the trail, such as Soquel Drive through Aptos Village, a minimum horizonal separation of 12 ft on tangents and 10 ft on curves is recommended between edge of pavement of the roadway and edge of the trail. This standard would be modified at constrained locations along the corridor where necessary to maintain the absolute minimum horizontal separation. Such separation variances may include vertical separation, fence, or other barriers.

Vertical Design

- The vertical grade slope for the Coastal Rail Trail would be limited to no more than 5%.
- Vertical obstructions and signs would be 10 ft above the entire Coastal Rail Trail, except in limited situations where the vertical clearance may be reduced to 8 ft over the travel way and 7 ft over the shoulders.
- The Coastal Rail Trail would either be constructed following closely the existing grade or on widened segments and new bridges requiring new cuts/fills and retaining walls. Minor grading of the existing ground surface in segments on existing grade is anticipated and may involve excavation of approximately 1-ft in depth.

1.3.1.4 Vegetation Removal and Planting

Construction work for the Build Alternative would require removal of existing mature landscape plantings along SR 1 and along the Coastal Rail Trail Segment 12 route. Where proper setback requirements allow, plantings would be replaced as per Caltrans' policies, and include an automated irrigation system and a 3-year plant establishment period. The replacement planting effort would include vegetation impacted by the contractor's staging, storage, and construction activities. Vegetation needed for the optional first phase trail improvements is significantly less than for the Ultimate Trail improvements.

1.3.1.5 Construction Activities

Construction work for the Build Alternative would be done primarily during daylight hours from 7:00 a.m. to 6:00 p.m. However, night-time work and temporary closures of lanes and roadways may be necessary to avoid major disruption for tasks that could interfere with traffic or create safety hazards such as demolition of the existing railroad

bridges. Construction activities would include excavation, drilling, dewatering, pavement demolition, bridge demolition, mass grading, concrete form work, pavement installation, storm system installation, landscaping and irrigation, sign installation, striping operations, and traffic control. Such activities would require the use of the following types of equipment: drilling rig, forklift, scissor lift, backhoe, track excavator, compactor, concrete pump, crane, bulldozer, grader, front-end loader, dump trucks, jackhammer, and vibratory roller. These activities may require temporary freeway, ramp, and local street partial lane closures or full closures with possible detours.

A Transportation Management Plan (TMP) would be developed as part of the project construction planning phase. The TMP would address potential impacts to circulation of all modes of travel (i.e., transit, bicycles, pedestrians, and vehicles). Roadway and/or pedestrian access to all occupied businesses and respective parking lots would be maintained during Project construction. The TMP would include an evaluation of potential detour impacts and would also include measures to minimize, avoid, and/or mitigate impacts to alternate routes. The TMP would address coordination with local agencies for traffic through or near the construction zone. Staging areas would be located within the existing Caltrans' ROW and within the SCBRL's ROW along Coastal Rail Trail Segment 12.

Construction Schedule

Construction of the SR 1 and Coastal Rail Trail improvements including the auxiliary lanes and BOS features is anticipated to begin in 2025 subject to availability of funds for construction and is estimated to take approximately 3 years to complete.

Demolition

Demolition work would generally comprise removal of existing bridge structures, abutments, columns, overhead sign foundations, rails, and ties, clearing and grubbing, tree removal, pavement removal, and drainage system removal.

1.3.1.6 Stormwater Impacts

1.3.1.6.1 Permanent Stormwater Impacts

Permanent impacts from runoff from the increased impervious surface area could have the potential to increase in pollutants to the receiving water bodies. Erosion control measures such as hydroseeding and erosion control blankets will be applied on all disturbed soil areas to minimize post-construction erosion. Reducing pervious areas could also reduce the amount of rainfall that is able to percolate into the water table. Therefore, the Project will consider treatment best management practices and hydromodification measures to reduce these impacts.

1.3.1.6.2 Temporary Stormwater Impacts

During construction, the contractor would be required to develop and implement a Storm Water Pollution Prevention Plan (SWPPP) in compliance with the statewide Construction General Permit and consistent with the guidelines and procedures in Caltrans' Statewide

Storm Water Management Plan. The SWPPP will provide detailed, site-specific information regarding best management practices to avoid and minimize water quality impacts. The Project would be constructed to minimize erosion by disturbing slopes only when necessary, minimizing cut and fill areas to reduce slope lengths, providing cut and fill slopes flat enough to allow revegetation to limit erosion rates, and providing concentrated flow conveyance systems such as storm drains, ditches, and gutters.

1.3.1.7 Utilities

Existing utilities located in areas subject to construction that conflict with the proposed improvements would be relocated as needed. This is anticipated to include sanitary sewer and electric utility poles adjacent to Moosehead Drive and a gas line along the Coastal Rail Trail Segment 12 route for the Ultimate Trail improvements, and other utility appurtenances.

1.3.1.8 Property Acquisitions

The Build Alternative would require full or partial acquisitions for the construction of the SR 1 and Coastal Rail Trail Segment 12 Ultimate Trail improvements, as well as temporary easements for construction activities such as the construction of sound walls and retaining walls along SR 1 and the SCBRL.

Table 1 lists the full and partial property acquisitions that would occur under the Build Alternative. Along the SCBRL corridor, the acquisitions shown below would be needed for the construction of the proposed Ultimate Trail configuration of Coastal Rail Trail Segment 12. No new property acquisitions would be needed to construct the optional first phase of the Coastal Rail Trail Segment 12, however the STB would have to approve railbanking the corridor.

Table 1. Property Acquisitions

Assessor's Parcel Number	Street Address	Partial Acquisition (square ft)	Full Acquisition (square ft)
Coastal Rail Trail Segment 12 – Ultimate Trail Improvements			
039-232-03	7992 Soquel Drive	2,700	7,510[a]
039-232-02	7994 Soquel Drive	1,100	3,350[a]
039-232-01	7996 Soquel Drive	5,370	12,110[a]
041-561-11	8035 Soquel Drive 23	2,100	-
041-011-42	10 Parade St A	400	-
041-011-41	15 Parade St B	400	-
044-282-47	379 Sandalwood Drive	320	-
044-282-48	369 Sandalwood Drive	3,300	-
041-052-16	9006 Soquel Drive	520	-
041-052-17	Soquel Drive - Vacant	1,560	-
SR 1			
042-071-01, 042-071-02, 042-071-03, 042-067-18	345 Moosehead Drive	1,129	-
042-067-16	Moosehead Drive - Vacant	343	-
042-067-17	Moosehead Drive - Vacant	735	-

[a] During final design, partial acquisition of parcel numbers 039-232-01, 039-232-02, and 039-232-03 may be determined to be feasible, in which case, the respective amounts shown in the "Partial Acquisition" column of Table 1 would be acquired. In the event that it is determined during final design that partial acquisition is infeasible, the respective amounts shown in the "Full Acquisition" column of Table 1 would be acquired.

1.3.2 No-Build Alternative

Under the No-Build Alternative, there would be no construction of auxiliary lanes or BOS features on SR 1 within the Project area, and Coastal Rail Trail Segment 12 would not be constructed. The existing transportation facilities within the Project area would remain unchanged. The No-Build Alternative assumes the construction of other planned and programmed projects in the region, including other auxiliary lanes projects on SR 1 and other segments of the Coastal Rail Trail.

1.4 Reference Documents

1.4.1 As-built Record

The following Caltrans' reference documents and as-built plans within the Project limits were reviewed:

- EA 04-135334 (Caltrans, 2001)
- EA 4TC45 (Caltrans, 1947)

1.4.2 Santa Cruz County Records

The following County's reference documents and as-builts plans within the Project limits were reviewed:

- Santa Cruz Master Plan 2013
- Santa Cruz County Geographic information system (GIS) layers

1.4.3 Preliminary Layout and Design Files

Mark Thomas provided CAD and GAD files of the following within the Project extents (2022):

- Project's preliminary geometric exhibit drawings
- Existing and proposed layout geometry
- Existing utility locations
- Site topography from 3D Light Detection and Ranging (LiDAR) survey
- Existing and proposed Caltrans' and County' ROW
- Existing and proposed surface files

1.4.4 Geographical References

Mark Thomas directed the use of the survey data previously obtained by Kimley Horn (2021) for the existing condition within the Project area.

1.5 Existing Drainage and Drainage Design Issues

1.5.1 Caltrans' Existing Drainage and Drainage Design Issues

The existing drainage systems within Caltrans' ROW limits consist of waterway crossings, cross culverts, longitudinal systems, lateral systems, storm drain inlets, roadside asphalt concrete dikes, and the Valencia Creek culvert. Drainage pattern from State Park Drive to Rio del Mar Boulevard generally slope toward Valencia Creek and Aptos Creek, which eventually leads to Pacific Ocean. While east of Rio del Mar Boulevard to Freedom Boulevard slope towards Valencia Lagoon. The northern portion of the Coastal Rail Trail Segment 12 drains toward storm drains that outfall into Monterey Bay.

For the proposed build alternatives, the principal features that would impact existing drainage facilities are the increase of impervious surfaces, widening of the roadway and bridge, reconfiguration of railroad bridges, and the installation of innovative BOS, retaining walls, sound walls, new trail overcrossings, new decking and railing systems, and new crosswalks (see Appendix A). Potentially undersized culverts would have to be replaced with larger sizes and existing drainage systems at the edge of shoulders may need to be relocated. Additional inlets, new longitudinal systems and lateral systems may be designed to meet the current drainage design requirements and to capture the increased runoff.

The existing Aptos Creek Bridge (Bridge No. 36 0011) is a concrete T-Beam bridge built in 1948. The existing bridge will be widened on the south side of SR 1 only. The Valencia Creek Culvert is an arch culvert located at Station 277+50 of SR 1, under the east side of the bridge. The Valencia Creek Culvert will not be impacted during bridge widening construction. To accommodate the SR 1 ultimate improvements of six through-lanes plus an auxiliary lane in each direction, the SR 1 bridge over Aptos Creek and Spreckels Drive would be widened to the north (inland) side as part of a future project.

Based on as-built plans for EA 04-135334 (Caltrans, 2001) and EA 4TC45 (Caltrans, 1947) and the Storm Drain Facilities Master Plan (Santa Cruz County, 2013), existing cross-culverts at Project site have been identified in seven locations as shown in Table 2, the culverts may be impacted due to the proposed road widening and/or proposed retaining wall. The culverts will need to be extended and/or reconstructed to withstand the increase of flows. See Appendix B for cross-culverts locations and flow patterns.

Table 2. Existing Cross-Culvert within Caltrans' ROW

Resource	Existing Cross Culvert Station	Description
As-builts EA 04-135334 (Caltrans, 2001)	"SR1" 264+00	The existing cross-culvert (24" RCP) crosses SR 1 and outfall towards Valencia Creek.
	"SR1" 278+50	The existing arch culvert has an 11-ft-span and is approximately 11 ft in height. The culvert is approximately 169.3 ft long and carries the low flows of Valencia Creek.
	"SR1" 310+55	The existing cross-culvert (36" RCP) crosses SR 1 and outfall towards Pacific Ocean.
Storm Drain Facilities Master Plan (Santa Cruz County, 2013)	"SR1" 237+00	The existing culvert crosses SR 1 and outfalls towards Valencia Creek.
	"SR1" 268+90	The existing culvert crosses SR 1 and outfalls towards Valencia Creek.
Santa Cruz County GIS (2022)	"SR1" 206+95	The existing culvert crosses SR 1 and outfalls towards Valencia Lagoon.
	"SR1" 215+60	The existing culvert crosses SR 1 and outfalls towards Valencia Lagoon.
Note: Existing cross-culvert systems will be verified during PS&E drainage system survey.		

South of Valencia Creek and Soquel Drive, median drains connect to 18-inch diameter alternative pipe culvert that convey stormwater to the north to storm drains to Valencia Creek. The as-built plans referenced in Section 1.4.1 show the systems that were constructed in 1996.

South of Spreckels Drive and west of Coastal Rail Trail, median drains connect to existing 18-inch diameter reinforced concrete pipe that convey stormwater to the south towards Pacific Ocean. As-built plans referenced in Section 1.4.1 show the systems were constructed in 1996.

At the west end of the Project, near south of Soquel Drive and east of State Park Drive, the road runoff is conveyed through 12-inch diameter corrugated metal pipes to downstream, and then collected by dikes that convey flows to the surrounding storm drains towards Pacific Ocean.

In addition to the cross culverts that outfall to Valencia Creek, there are two existing cross culverts that outfall towards Valencia Lagoon.

1.5.2 Santa Cruz County and Unincorporated Cities Existing Drainage and Drainage Issues

The existing drainage systems within the County's ROW were identified with the County's GIS stormwater conduits and they consist of two waterway crossings, cross culverts, and longitudinal systems. These drainage systems will have to be verified with field investigation. The drainage pattern within the Coastal Rail Trail Segment 12 varies as some areas drain towards Aptos and Valencia and an existing storm drain near State Park Drive outfalls to the Pacific Ocean.

The Project's build alternative within the Coastal Rail Trail Segment 12 includes Interim and Ultimate options. Both options feature an increase of impervious surfaces and will not impact the existing cross culvert, which crosses the Coastal Rail Trail near Trout Gulch Road.

Ultimate Rail Trail also includes a new bridge construction which will accommodate a bike and pedestrian portion adjacent to the existing railroad bridges. An existing cross culvert located near the intersection of State Park Drive and the Coastal Rail Trail would be impacted and may have to be extended to accommodate the proposed work (Appendix A).

Table 3 shows the exiting cross culverts within the County's ROW. Due to limited as-built information within the Coastal Rail Trail Segment 12, a more detailed survey of drainage systems will be conducted in the Project's next phase to determine additional the drainage impacts.

Table 3. Existing Cross-Culvert within County's ROW

No.	*Existing Cross Culvert Station*	*Description*
1	"RT" Station 1026+60	The existing culvert crosses railroad and outfall towards Valencia Creek.

2	14.00' Rt "RT-U" Station 1061+50	The existing culvert crosses railroad and outfall towards Pacific Ocean.
Note: Existing cross-culvert systems will be verified during PS&E drainage system survey.		

1.6 Agencies Impacting Design

Work in environmentally sensitive areas will be minimized or avoided regulatory agency permit requirements are discussed in the Project's *Natural Environment Study* (SWCA Environmental Consultants, 2022).

The Project will trigger environmental permits from the following agencies:

- Local Coastal Program
- RWQCB
- California Department of Water Resources
- California Coastal Commission
- United States Army Corps of Engineers
- California Department of Fish and Wildlife
- National Marine Fisheries Service
- United States Fish and Wildlife Service

1.7 Drainage Design Criteria

The drainage design for the Project within Caltrans' ROW will comply with the Caltrans HDM (2020) and procedures presented in the *Hydraulic Engineering Circular Number 22* (2009), a publication for highway pavement drainage from the Federal Highway Administration (FHWA). Any drainage improvement proposed on local roads and any drainage systems within the County's ROW impacted by the Project will also conform first to the County's *Design Criteria Containing Standards for the Construction of Streets, Storm Drains, Sanitary Sewers, Water Systems, and Driveways within the Unincorporated Portion of Santa Cruz County* (Design Criteria) (Santa Cruz County, 2021). Town of Aptos is an unincorporated place under the jurisdiction of the Santa Cruz County.

1.7.1 Caltrans Drainage Design Criteria

Table 4 and Table 5 summarize some of the pertinent Caltrans drainage design criteria that will be used for the drainage design.

Table 4. Caltrans Drainage Hydraulics Design Criteria

Criteria Type	Design Flow	Design Criteria
Inlet Capacity	25-year	Flow width contained within the shoulder; flow depth less than the adjacent dike height
Crossover Flow	25-year	Less than or equal to 0.1 cubic feet per second (cfs)
On-Site Culvert Hydraulics	25-year	Hydraulic grade line (HGL) at least 0.75 ft below the top of grate or top of cover
	Half full	Pipe slope and roughness such that the flow velocity would equal or exceed 3 ft/s when flowing half full
Cross Culvert Hydraulics	100-year	HGL without rising above an elevation that would cause objectionable backwater depths or outlet velocities
	10-year	HGL without causing the headwater elevation to rise above the inlet top of the culvert

Source: Caltrans, 2020

Table 5. Caltrans Drainage Design Criteria

Criteria Type	Design Criteria	Caltrans HDM (Table & Index & Chapter)
Minimum Culvert Size	24".	Index 838.4
Minimum Cross Culvert Size	18". in diameter, unless they exceed 100 ft in length, the minimum diameter is 24".	Index 828.2
Manning's roughness coefficients	Manning's n values of 0.013 and 0.024 will be used in hydraulic calculations for existing concrete pipes and corrugated steel pipes respectively. Manning's n values for unlined and lined ditches	Table 851.2 Table 866.3 HEC 15 Table 2.1-2
Rational Method	• Small catchment (< 320 acres) • Concentration time < 1 hour • Storm duration >or = concentration time • Rainfall uniformly distributed in time and space • Runoff is primarily overland flow • Negligible channel storage	Table 819.5A
Time of Concentration (Tc)	The minimum time of concentration for all paved surfaces is 5 minutes.	Index 816.6
Maximum allowable flow spread width	Flow spread contained within shoulder width	Table 831.3
Freeboard Height of Ditches	Trapezoidal-shaped ditches with subcritical flow will be designed with a freeboard height equaling at least 0.2 times the energy head Rectangular-shaped ditches with subcritical flow will be designed with a freeboard height equaling at least 0.1 times the energy head.	Table 868.2
Runoff Coefficients (C)	Use Developed Areas Table for C. Multiply by frequency factor, C(f), for storms less frequent than 10-year frequency storms (not to exceed a C value of 1.0).	Table 819.2B Index 819.2
Highway Lined & Unlined drainage channels (ditches)	Ideal flow velocities	Table 865.2 Index 862.2
Rainfall Intensities	Use the NOAA Atlas 14 Precipitation Frequency Data Server web application	Index 814.2 Table 808.1

Source: Caltrans, 2020

1.7.2 Santa Cruz County Drainage Criteria

Table 6 summarizes the County's drainage design criteria.

Table 6. Santa Cruz County Design Criteria

Criteria Type	Design Criteria
Design Storm	10-year design storm for all peak flow and volume calculations.
Storm Runoff	Rational Method for basins less than <200 acres For larger areas: • Unit Hydrograph Method • Soil Conservation Service Methods • USGS Regional Regression Equations for the Central Coast Region (with a 25% safety factor) • Or other methodology approved in advance by the Director of Public Works may be required.
Storm Duration	For peak flow calculations, the storm duration shall be equal to time of concentration for the tributary drainage area for which the calculations are being performed. For runoff volume calculations, the storm duration shall be equal to 1 hour.
Rainfall Intensity	Rainfall intensity shall be determined by using the isopleths and the intensity and duration curves given by the Santa Cruz County Design Criteria (2021).
Time of Concentration	The minimum time of concentration used for intensity calculations shall be 10 minutes to the first inlet or culvert entrance, or less at the discretion of the Director of Santa Cruz County Public Works.
Safety Factor	A minimum factor of safety of 25% is required.
Minimum Roadway Culvert Size	Minimum pipe size is 18'' for roadway culverts.
Bridge Structure	The design flood (100-year) shall provide 1-ft of freeboard below the finished floor elevation of the existing and proposed structure.

Source: Santa Cruz County, 2021

1.8 Floodplain Information

The Project limits span several Flood Insurance Rate Maps (FIRM) (see Figure 8). Most of the Project site is located within unshaded Zone X regions. Zone X floodplain areas represents areas that have a moderate to minimal flood hazard. Unshaded Zone X represents areas that have a minimal flood hazard, which is above the 500-year flood level (see Appendix C).

The Aptos Creek crossing is in Special Flood Hazard Area (SFHA) Zone AE, which represents areas subject to flooding by the 100-year flood event determined by detailed methods where Base Flood Elevations (BFE) are shown. At the Project site, the 100-year flood elevation is approximately 27 ft North American Vertical Datum of 1988 (NAVD 88). According to the Flood Emergency Management Agency (FEMA) FIRM, residential properties are within the Aptos Creek floodplain downstream of the SR 1 bridge.

The Project site is also within a regulatory floodway. According to Title 44, Section 60.3(d)(3) of the Code of Federal Regulations (CFR), a community shall "prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge."

The SR 1 bridge over Aptos Creek is bound by FEMA cross sections F and G (Figure 9), which have BFEs of 24.9 ft and 27 ft respectively, as listed in the Floodway Data on Table 7. No increase of any amount in the BFE is allowed in the floodway.

The cross sections along Aptos Creek within the Project vicinity are presented in Table 7. SR 1 is located between FEMA cross sections F (downstream of SR 1) and G (upstream of SR 1), and the railroad is located between FEMA cross sections H, downstream of the railroad, and I, upstream of the railroad (FEMA, 2017b). Cross section E is at the downstream extent of the model and used at the boundary condition for the hydraulic analysis.

The flood hazards adjacent and within the Project limits that encompass Santa Cruz County are shown in Figure 8 and a closer view of the flood hazards that are associated with the Aptos Creek flooding source are shown on Figure 9.

The Project's *Floodplain Evaluation Report* (WRECO, 2022a) discuss more in detail the floodplain and impacts within the Project limits.

Table 7. FEMA BFE Along Aptos Creek

FEMA Cross Section	BFE (ft NAVD 88)
I	29.0
H	29.0
G	27.0
F	24.9
E	24.1

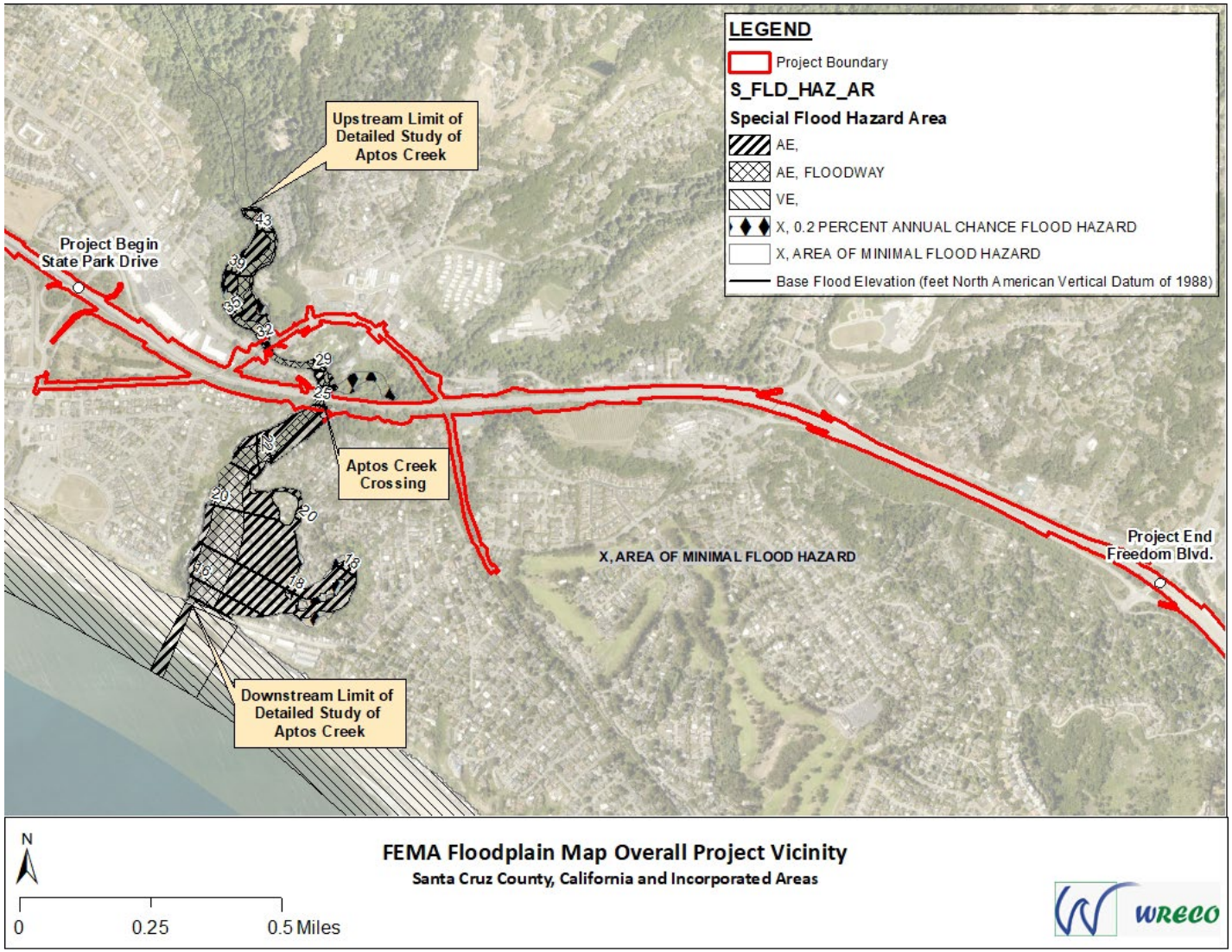

Figure 8. FEMA Floodplain Map - Overall Project Vicinity

Sources: FEMA, 2019a and ESRI

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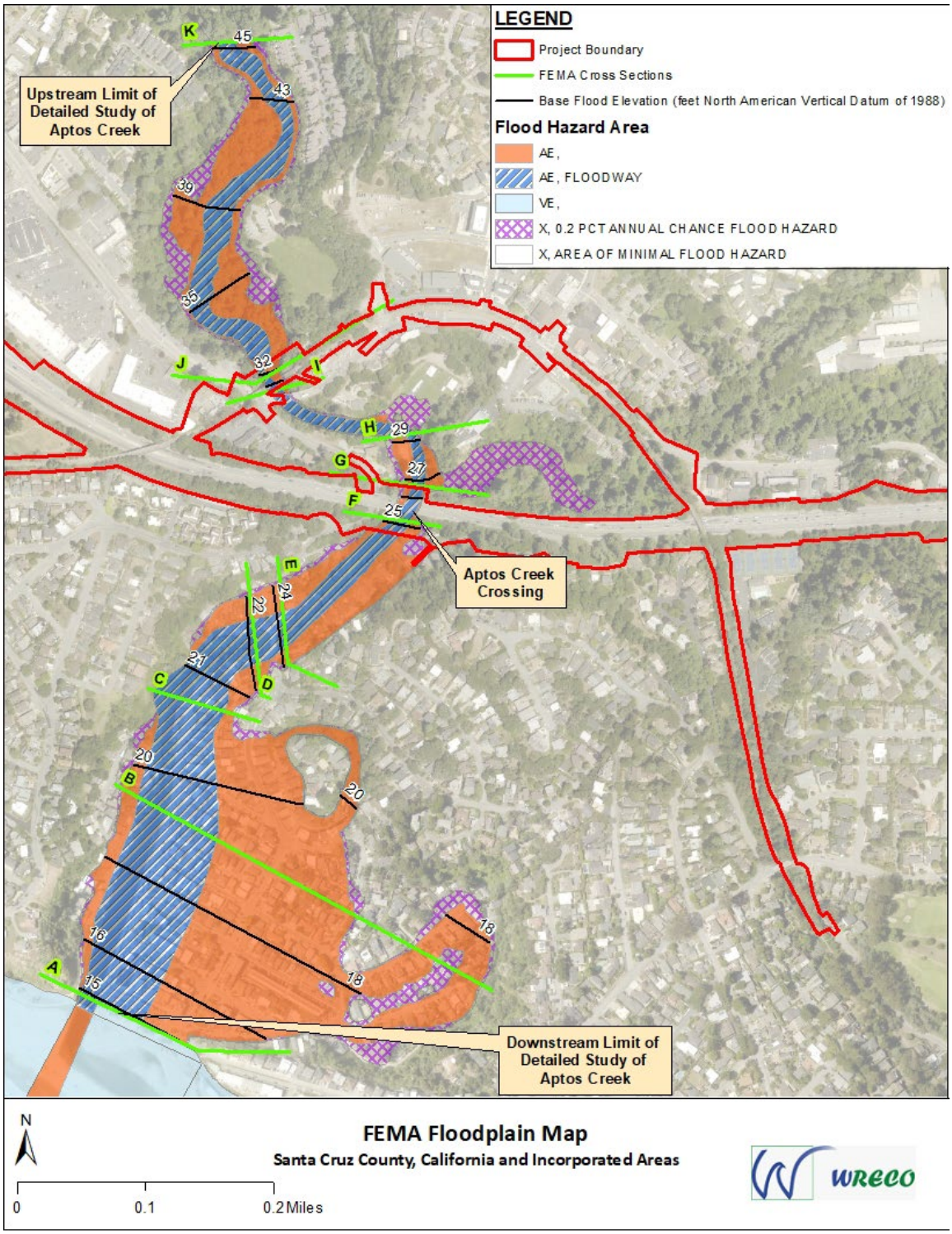

Figure 9. FEMA Floodplain Map - Aptos Creek

Sources: FEMA, 2017

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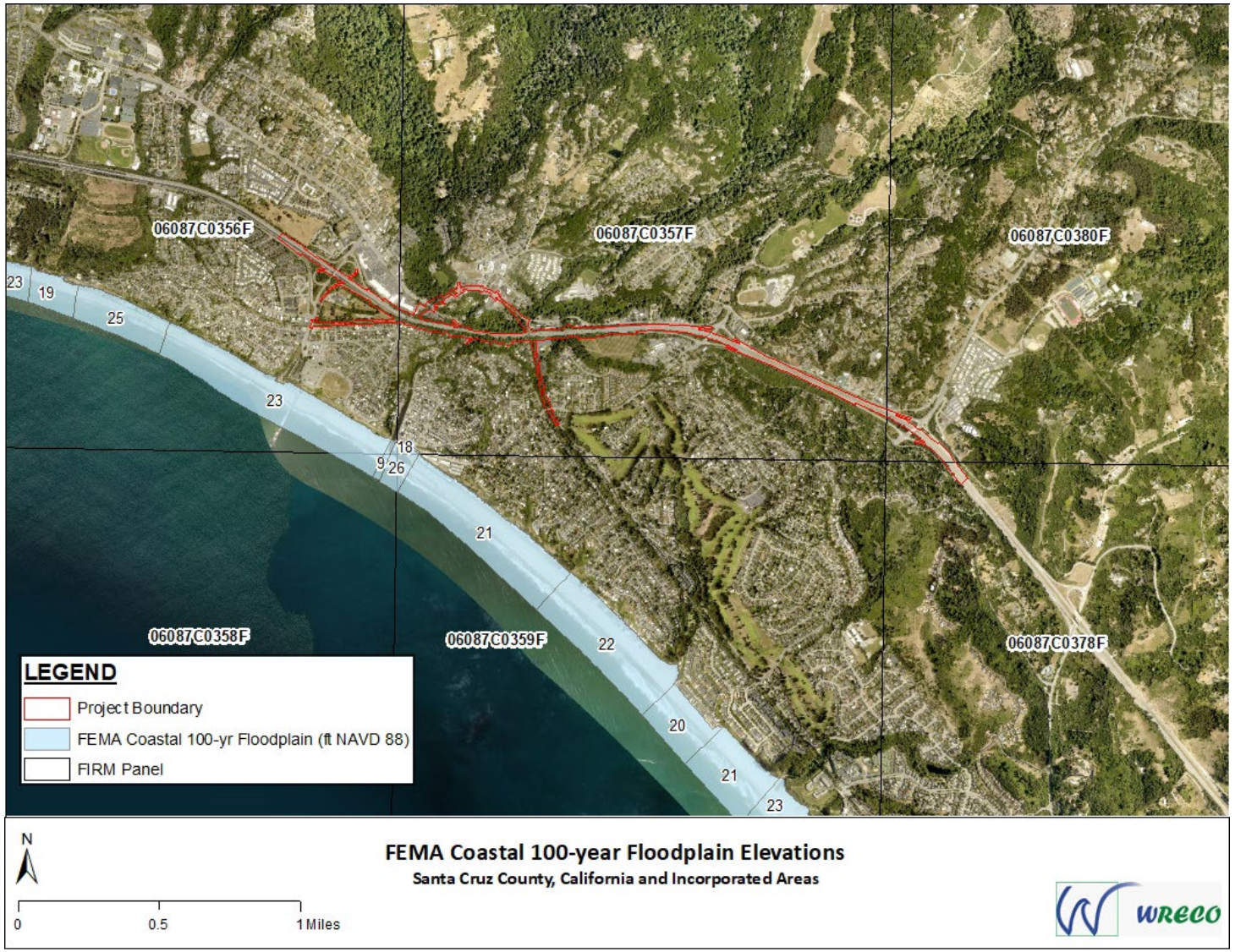

Figure 10. FEMA Floodplain Coastal Map

Sources: FEMA, 2019a and ESRI

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1.9 Sea Level Rise

Information regarding the sea-level rise (SLR) can be found in the Project's *Floodplain Evaluation Report* (WRECO, 2022a).

The Project's service life for the roadway is estimated to be 20 years according to the Project Team and based on the Caltrans' HDM (2020) Section 618. With this design life, the pavement would last through 2048 after the expected construction ends in 2028. Based on the Project design life and the medium-to-high-risk scenario, a SLR projection of 1.8 ft in the year 2048 for the Project's SLR impact evaluations was estimated by interpolating between the SLR projections between 2040 (1.2 ft) and 2050 (1.9 ft) for the medium-to-high risk scenario.

The Project's service life for the bridges is estimated to be 75 years according to the Caltrans' HDM (2020). With this design life, the Aptos Creek and Valencia Creek bridges would last through 2103 after the expected construction ends in 2028. Based on the Project design life and the medium-to-high-risk scenario, a SLR projection of 7.0 ft in the year 2103 for the Project's SLR impact evaluations was estimated by interpolating between the SLR projections between 2100 (6.9 ft) and 2110 (7.2 ft) for the medium-to-high risk scenario.

The SLR assessment was conducted following the methodologies outlined in the *State of California Sea-Level Rise Guidance, 2018 Update* (California Natural Resources Agency and California Ocean Protection Council, 2018) using, the medium-to-high risk scenario. However, it was found that the Project is not susceptible to SLR (see Figure 11).

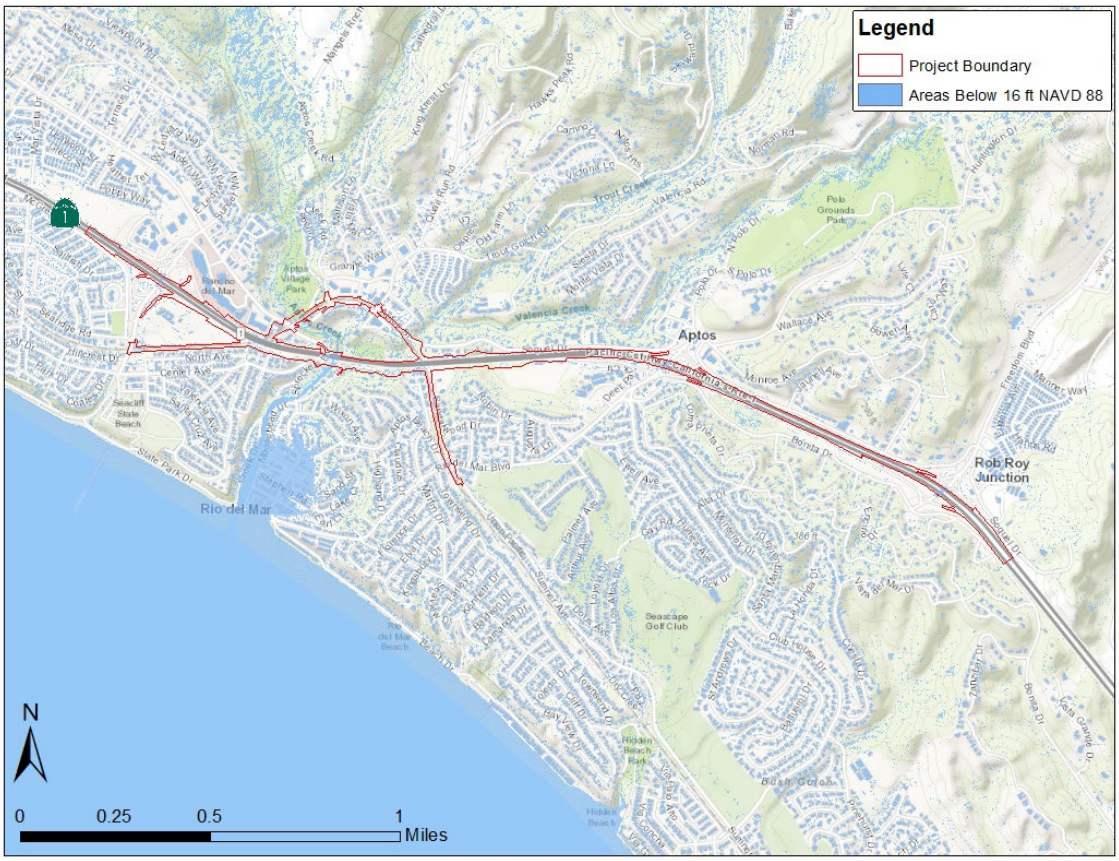

Figure 11. Extents of Future 100-year Coastal Elevation with SLR

Sources: ESRI and NOAA, 2021

2 HYDROLOGY

2.1 Climate and Precipitation

According to the Köppen climate classification system, the Project area has a Mediterranean climate, characterized by mild, moist winters and hot, dry summers (George, 2020). The Project generally experiences precipitation between October and April. A climate summary for the nearest National Oceanic and Atmospheric Administration weather station with similar elevation and topography to the Project reported the precipitation and temperature information for the Santa Cruz, California Station (047916). The average annual rainfall reported for the Santa Cruz, California Station is 29.33 inches. The maximum average temperature reported for the Project area is 76.1 °F in September and the minimum average temperature reported is 38.8 °F in January. The wettest month of the year is January with an average rainfall of 6.14 inches and the driest month is July with 0.06 inches (Western Regional Climate Center, 2016).

2.2 Topography

Santa Cruz County encompasses diverse topography, geologic features, and soils, including coastal terraces and alluvial valleys, steep foothills, and mountains, known and potential earthquake faults and seismic hazards, and a wide range of soil types with varying constraints (e.g., expansion, liquefaction) (WRECO, 2022b).

Based on California State Water Resources Control Board's (SWRCB) GeoTracker website, the average elevation of the Project area is 120 ft above mean sea level (WRECO, 2022b). Parikh Consultants, Inc., (Parikh) prepared the Project's *Preliminary Geotechnical Design Report* (Parikh, 2021). Based on Parikh's report, the subsurface soil conditions near the State Park Drive overcrossing consist of slightly compact to very dense silty sand/well graded sand and gravel/clayey sand. At the Freedom Boulevard interchange, the subsurface soil consists of very dense to fine coarse sand; and at the Rob Roy Junction, the subsurface consists of slightly compact fine to coarse sand (Parikh, 2021).

Per the Project's *Initial Site Assessment* (ISA) (WRECO, 2022b), subsurface conditions encountered near the Project limit, consists of various types of sand, silty sand, clayey silt with sand, sandy gravel, and sandy clay, to approximately 30 ft below ground surface.

Soils within the Project footprint fall under Hydrologic Soil Groups (HSG) A, C, and D, with the majority of the Project site under HSG C (NRCS, 2020). Soils classified as Group A typically have low runoff potential, with high infiltration rates and are located near Coastal Rail Trail Segment 12 and near Freedom Boulevard. Soils classified as HSG C typically have moderately high runoff potential, with low infiltration rates and are located throughout most of the Project site. Soils classified as HSG D typically have high runoff potential and very slow infiltration rates and are located near State Park Drive and Moosehead Drive.

As mentioned in the Project's ISA, Santa Cruz County encompasses diverse topography, geologic features, and soils, including coastal terraces and alluvial valleys, steep foothills, and mountains, known and potential earthquake faults and seismic hazards, and a wide range of soil types with varying constraints (e.g., expansion, liquefaction) (WRECO, 2022b).

2.3 Land Use

Based on the Project's ISA performed by WRECO (2022b), the Project limits are within Santa Cruz County and the Project extends through the unincorporated communities of Aptos, Rio Del Mar, Seacliff, and Aptos Hills- Larking Valley (Santa Cruz County GIS web tool, 2019).

The western end of the corridor along SR 1 begins at the intersection of State Park Drive at PM Santa Cruz (SCR) 10.60 and SR 1 and continues east for approximately 2.6 miles to Freedom Boulevard at PM R8.1. The immediate surroundings of SR 1 consist of vegetation along the shoulders of the roadway. Frontage roads are primarily parallel to the Project limits on both the north and south sides of SR 1, which are surrounded with residential and commercial properties. These properties are characterized by, but not limited to, gas stations, tire shops, auto repair shops, and shopping centers.

2.4 Creeks, Streams, and River Crossings

The Project's receiving waters are Aptos Creek, Valencia Creek, and Valencia Lagoon. The northern portion of the Coastal Rail Trail Segment 12 of the Project is in the Soquel Watershed and drains directly to the Pacific Ocean through a system of stormwater drains. Valencia Creek is a tributary to Aptos Creek, and Aptos Creek drains directly to the Pacific Ocean (see Figure 12) (Santa Cruz County Department of Environmental Health (SCCDEH), 2019).

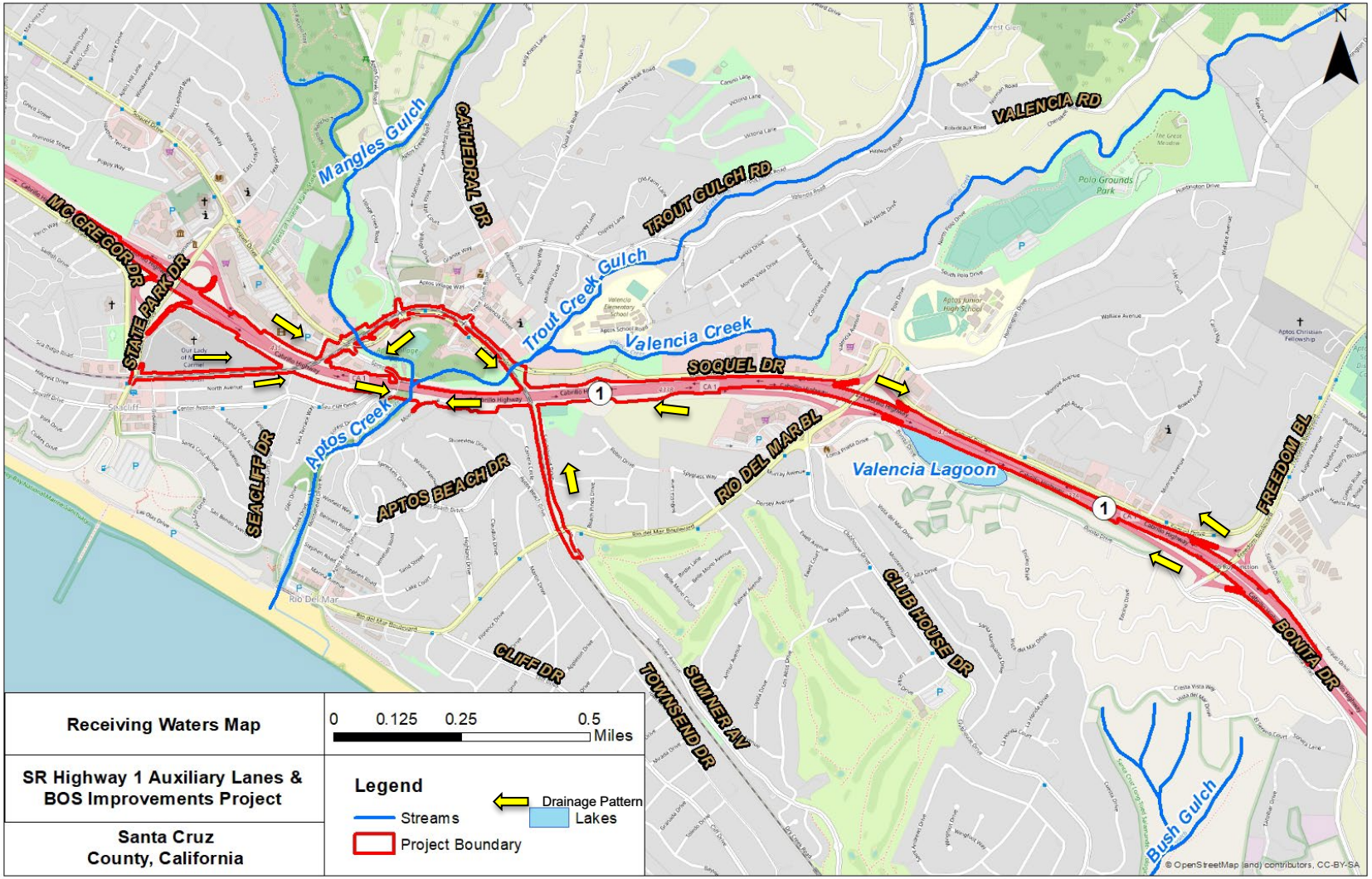

Figure 12. Receiving Waters Map

Source: ESRI and County of Santa Cruz, 2019

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Aptos Creek flows approximately from north to south as it crosses the Coastal Rail Segment 12 alignment and SR 1 bridge at Aptos Creek (Bridge No. 36-0011). The Caltrans Bridge Inspection Report (BIR) describes the channel as earth and gravel (2019). See Photo 1, which shows the Aptos Creek channel at SR 1. The existing railroad bridge at Aptos Creek spans over the creek (see Photo 2). The existing piers of the Railroad bridge are not within the floodplain WSE.

The SR 1 bridge at Aptos Creek (Bridge No. 36 0011) is a five-span bridge with four 56-ft-long spans and a 32-ft-long span at the west span. The total length of the bridge is 260 ft, and the width of the bridge is approximately 60.8 ft. East of the Aptos Creek bridge is an arch culvert that carries the low flows of Valencia Creek (see Photo 3). The arch culvert has an 11-ft-span and is approximately 11 ft in height. The culvert is approximately 169.3-ft-long (Caltrans, 1947). Aptos Creek bridge as-built is shown in Figure 13. Of the Project's receiving waters, Aptos Creek is associated with base floodplains, and is discussed in detail in this report.

Photo 1. Aptos Creek Looking South at the SR 1 Bridge

Source: WRECO, February 8, 2021

Photo 2. Aptos Creek Railroad Bridge

Source: WRECO, February 8, 2021

Photo 3. Valencia Creek SR 1 Culvert Entrance

Source: WRECO, February 8, 2021

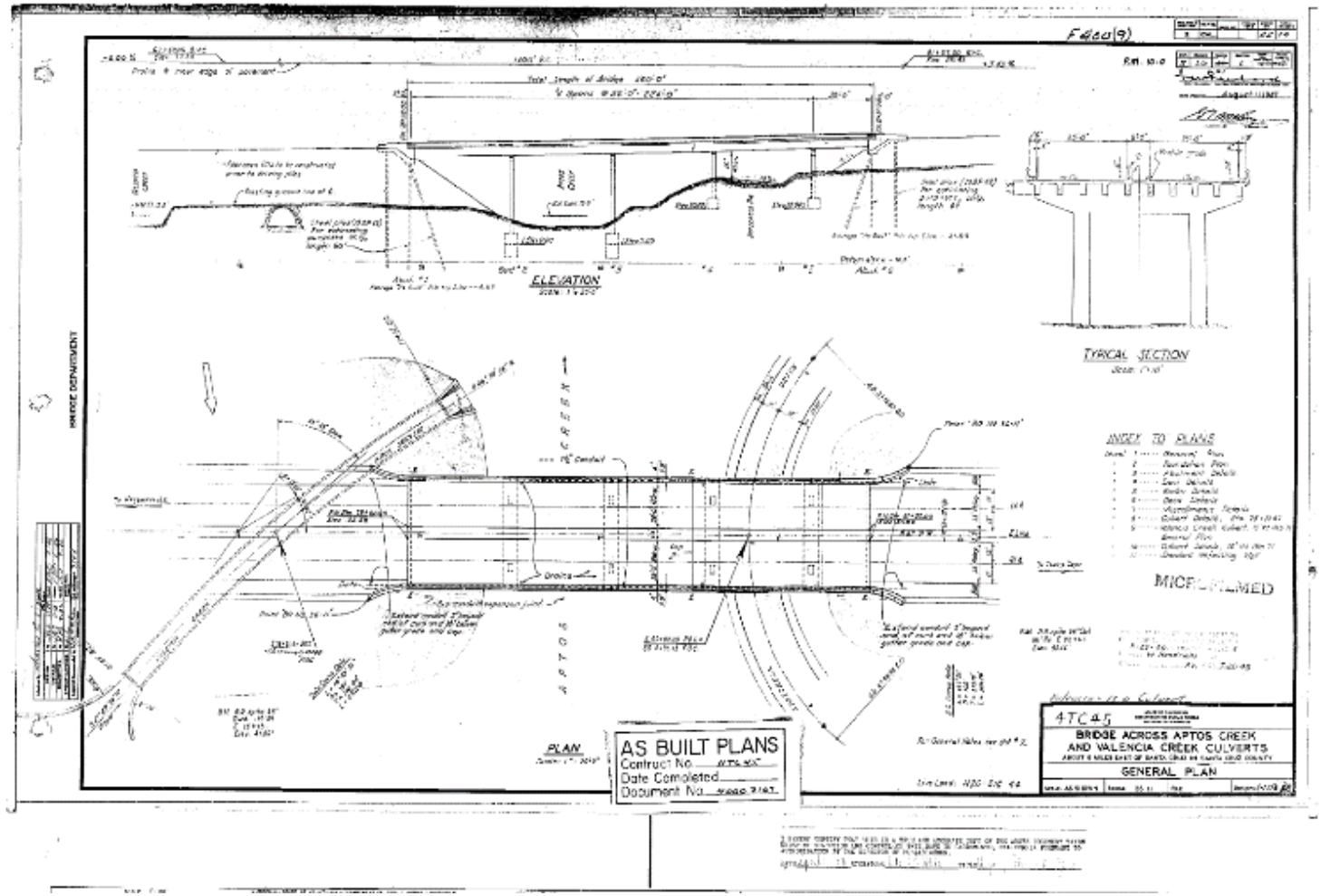

Figure 13. Aptos Creek Bridge and Culvert As-built

Source: Caltrans, 2016

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2.5 Water Quality

The RWQCB's *Water Quality Control Plan for the Central Coast Basin* (Basin Plan) (2019) lists beneficial uses for Aptos Creek, Valencia Creek, and Valencia Lagoon. A more detailed description of the Project water quality standards and objectives can be found in the *Water Quality Assessment Report* (WRECO, 2022c).

2.6 Watershed and Basin Characteristics

The Project limits are within Aptos Creek, San Andreas, and Soquel Creek watersheds.

The Aptos Creek watershed originates in the San Rosalia Mountains and flows predominantly from north to south. The watershed includes portions of the Forest of Nisene Marks State Park. One of the major tributaries that contributes to Aptos Creek is Mangels Gulch; its confluence with Aptos Creek is approximately 0.5 miles upstream of the SR 1 bridge crossing. Another major tributary to Aptos Creek is Valencia Creek. Valencia Creek originates along the northeastern boundary of the Aptos Creek watershed, and like Aptos Creek, it flows predominantly in a north to south direction. Trout Creek Gulch is a major tributary to Valencia Creek, and their confluence is approximately 0.3 miles upstream of the confluence of Valencia Creek with Aptos Creek. Upstream of the confluence to Aptos Creek, Valencia Creek flows east west along the north side of SR 1. At the confluence, the low flows of Valencia Creek are directed through an arch culvert that crosses under SR 1 and outfalls into Aptos Creek. An overflow channel just upstream (north) of the SR 1 crossing allows the Valencia Creek flows not conveyed through the culvert to overflow into Aptos Creek upstream of the SR 1 bridge crossing over Aptos Creek. The SR 1 crossing at Aptos Creek is a five-span bridge. Downstream (south) Aptos Creek continued to flow south to the Pacific Ocean.

Aptos Creek (upstream of its confluence with Valencia Creek) drains a watershed area of approximately 12.2 square mi, and StreamStats indicates that approximately 74 percent of the land is covered by forest (USGS, 2019). Valencia Creek (upstream of its confluence with Aptos Creek) drains a watershed area of approximately 12.1 square mi, and StreamStats indicates that approximately 53% of the land is covered by forest (USGS, 2019).

The 2017 effective Flood Insurance Study (FIS) for Santa Cruz County and Incorporated Areas, 06087CV001C (FEMA, 2017a), provides watershed areas for Aptos Creek at two locations: above the confluence with Valencia Creek and at the mouth of the Pacific Ocean. The watershed areas included in the FIS are comparable to the watershed areas delineated using StreamStats. According to the FIS, the watershed area of Aptos Creek above the confluence with Valencia Creek is 12.4 square miles, and the watershed area of Aptos Creek at the mouth of the Pacific Ocean is 24.5 square miles.

Aptos Creek and Valencia Creek are the principal tributaries in the watershed. Aptos Creek converges with Valencia Creek approximately 1 mile inland of Monterey Bay.

Bridge Creek and Mangels Gulch empty into the Aptos Creek portion of the watershed, and Trout Gulch empties into Valencia Creek (SCCDEH, 2021).

The northern Project limits of the SR 1 and the western limits of the Coastal Rail Trail Segment 12 are located within the Soquel Creek watershed and San Andreas watershed. The stormwater drains located within Soquel Creek watersheds drain through underground pipes to the Pacific Ocean. Soquel Creek watershed is one of the major watersheds in Santa Cruz County (SSCDEH, 2021)

A small portion of the southwestern Project limits within the Rail Trail Segment 12 is located within the San Andreas watershed. San Andreas watershed is bordered on the north and east by the Pajaro River watershed and to the west by the Aptos Creek watershed. San Andreas drains an area of approximately 15 square miles and is comprised of Bush Gulch and two unnamed streams. Land use is predominantly agriculture with some rural and urban residential areas (SCCDEH, 2021).

Figure 14 shows the various watersheds located within Santa Cruz County and Figure 15 shows the three watersheds within the Project limits. The Aptos Creek and Valencia Creek watersheds are shown Figure 16.

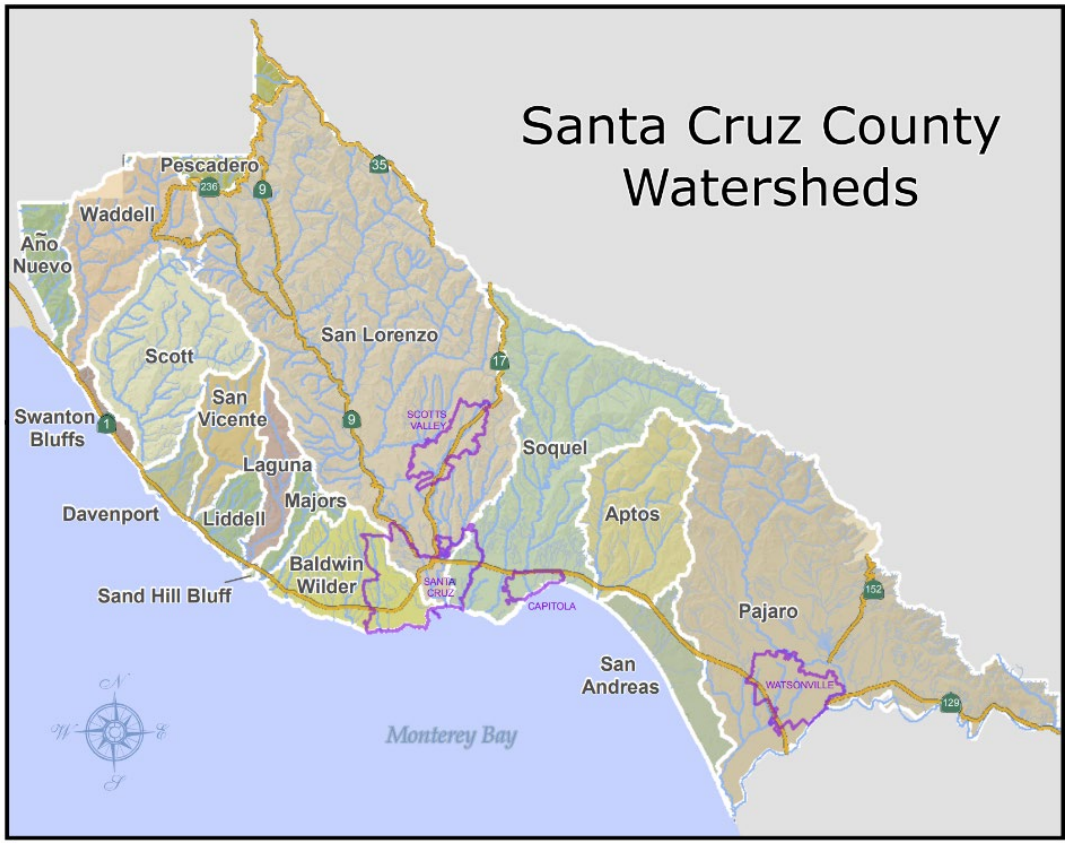

Figure 14. Santa Cruz County Watersheds

Source: Santa Cruz County, 2021

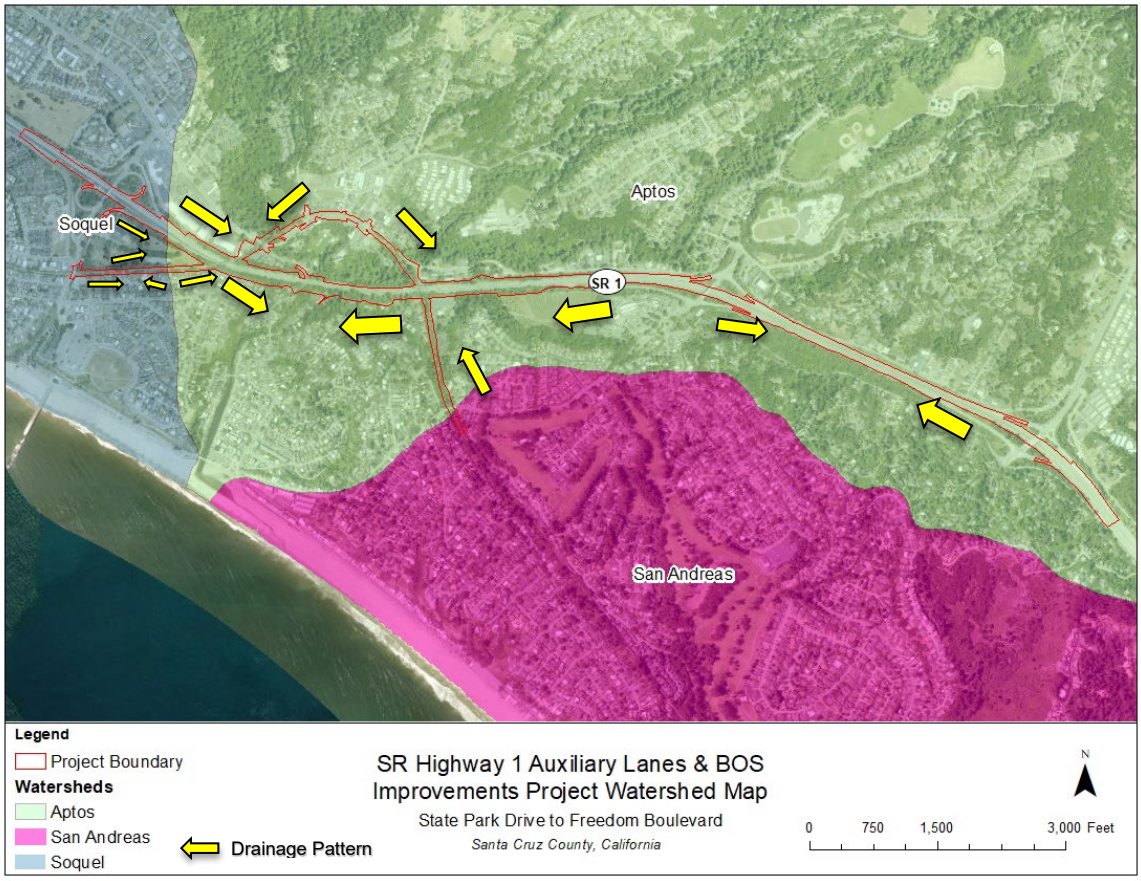

Figure 15. Watershed Map with Project Limits

Source: Santa Cruz County & ICF, 2022

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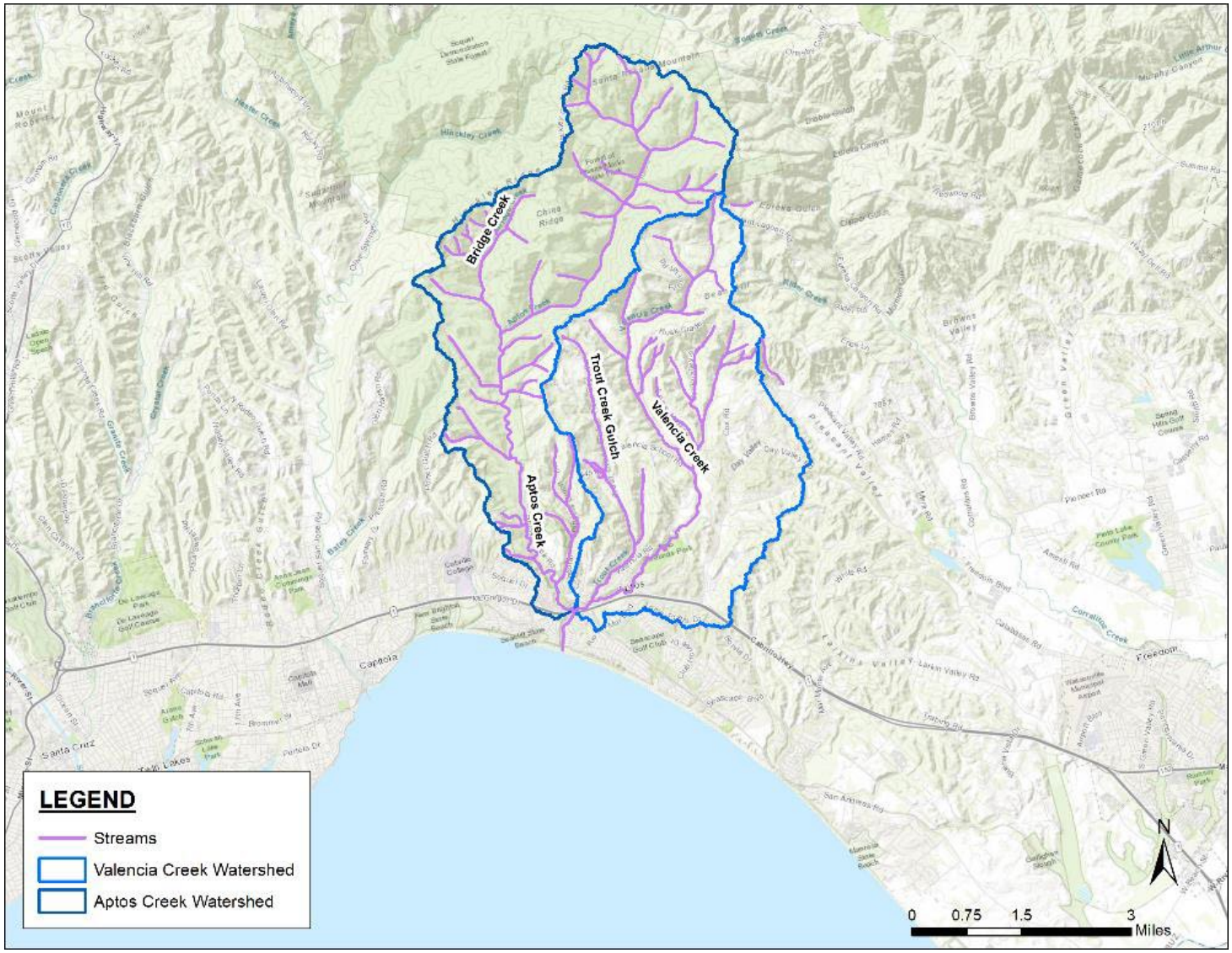

Figure 16. Aptos Creek and Valencia Creek Watersheds

Source: ESRI and USGS

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2.7 Rainfall Data and Intensities

2.7.1 Caltrans Rainfall Data and Intensities

Precipitation data were collected using National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 6, Version 2 Precipitation Frequency Data Server (PFDS) web application. The rainfall data generated from NOAA's PFDS website are summarized in Table 8 and the full data set can be found in Appendix D.

The minimum time of concentration of 5 minutes applies to all paved surfaces, slopes steeper than 10H:1V, or where there is limited opportunity for surface storage. Within Caltrans' ROW, the rainfall intensity for a 5-minute duration and 25-year roadway hydraulic design event, is 4.16 inches per hour.

Table 8. NOAA Atlas 14 Intensity-Duration Frequency Summary

Duration	Intensity (inches/hour)				
	2-year	5-year	10-year	25-year	100-year
5 minutes	2.47	3.04	3.50	4.16	5.22
15 minutes	1.43	1.76	2.03	2.41	3.02
30 minutes	0.988	1.22	1.40	1.67	2.09
1 hour	0.689	0.848	0.980	1.16	1.46
2 hours	0.506	0.620	0.716	0.850	1.07
24 hours	0.133	0.171	0.203	0.246	0.317

Source: NOAA, 2022

2.7.2 Santa Cruz County Rainfall Data and Intensities

Rainfall intensities within Santa Cruz County's ROW are determined through the use the Rainfall Intensity Isopleths and Rainfall Intensity Duration Curves found in the County's Design Criteria (Santa Cruz County, 2021).

Based on the County's P-60 Rainfall Intensity Isopleths, the P60 denotes the rainfall intensity in inches per hour for a 60-minute duration and a 100-year storm. The Project limits are within 1.4 inches per hour for a 60-minute duration and 100-year storm.

The County's Rainfall Intensity Duration Curves help determine the rainfall intensity within the desired storm duration period. Based on the County's criteria, a 10-minute, 10-year storms can be determined using the curves or the following formula:

$$Intensity = 1.0 \cdot \frac{(4.29112)(1.1952)}{Duration^{(0.60924)(0.78522)^{P60}}}$$

Where:

Intensity = Rainfall Intensity for a given storm event (inches/hour)
Duration = Duration of given storm event (minutes)

P60 = Rainfall intensity for a 60-minute duration and 100-year storm obtained from the isopleths for Santa Cruz County. (inches/hour)

This intensity equation is based on the 10-year equation given by the Design Criteria. It can be used to get the desired storm even if multiplied by the specified factor as detailed in the County's design manual.

Using the equation above the rainfall intensity within the Project is approximately 1.88 inches per hour for a 10-minute duration and 10-year storm.

2.8 Estimated Design Discharges

The design for discharge for the Project will comply with both Caltrans' Chapter 800 of the HDM (Caltrans, 2020) and the County's Design Criteria for their respective ROW.

2.8.1 Caltrans Drainage Design

2.8.1.1 On-site Drainage

Runoff estimates for roadway drainage are made by using Rational Method described under Index 819.2(1) of the HDM (Caltrans, 2020). The preliminary design discharge will be calculated using the equation below.

The equation for the Rational method is:

$$Q = C\ i\ A$$

Where:

- Q = design discharge (cubic feet per second)
- C = runoff coefficient for Rational Method including design storm frequency factor (1.0 for 10-year storm, 1.1 for 25-year storm, and 1.25 for 100-year storm)
- i = average rainfall intensity for the selected frequency and for a duration equal to the time of concentration (inches/hour)
- A = drainage area (acres)

The coefficient of runoff was determined using Figure 819.2A of the HDM (Caltrans, 2020). The average rainfall intensity was determined using precipitation data from NOAA Atlas 14, Volume 6, Version 2, as discussed in Section 2.7.1.

2.8.1.2 Off-site Drainage

2.8.1.2.1 Rational Method

Off-site watersheds below 320 acres will be calculated using the Rational Method as discussed in Section 2.8.1.1.

2.8.1.2.2 Technical Release 55 Peak Discharge

For off-site watersheds greater than 320 acres, the NRCS Technical Release 55 (TR-55) method will be used. The equation to determine the preliminary peak discharge using TR-55 is provided below:

$$q_p = q_u \cdot A_m \cdot Q \cdot F_p$$

Where:

q_p = peak discharge (cfs)
q_u = unit peak discharge (cubic feet per second per square mile)
A_m = drainage area (square miles)
Q = runoff (inches)
F_p = pond and swamp adjustments factor

The methodology within the TR-55 manual will be used to determine the preliminary peak discharges. The preliminary discharge for the individual watersheds will be determined during the Project's PS&E phase.

2.8.1.3 USGS Regional Regression Equations for the Central Coast Region

The regression equations developed for the Central Coast Region are for estimating the peak discharges having recurrence intervals that range from 2 to 100 years. The equations are outlined by USGS using topographic maps, the hydrologic regions map, the mean annual precipitation from *Rantz* (USGS, 1969).

2.8.2 Santa Cruz County Drainage Design

As noted in the County's Design Criteria (see Table 6), Rational Method may be used for basin less than 200 acres.

2.9 Culvert Design

2.9.1 Caltrans Culvert Design

Proposed storm drainage within Caltrans' ROW will conform to Chapter 838 of the HDM (2020). Storm drainage along ramps will be designed using a 25-year design storm. Additional design requirements are outlined in Table 4 and Table 5. Existing cross culverts will be evaluated and designed to ensure proper drainage throughout the Project to prevent ponding and other traffic hazards.

2.9.2 Santa Cruz County and Unincorporated Cities Culvert Design

Proposed storm drainage within County's ROW will conform to the Design Criteria (Santa Cruz County, 2021). Per the County's Design Criteria, cross culverts on publicly maintained roads should be designed to adhere to a flood overflow design return period of a 100-year storm. The minimum time of concentration used for intensity calculation

shall be 10 minutes to the first culvert or inlet entrance. The time of concentration can be less at the discretion of the Director of Public Works within the County.

Existing cross culverts within the County's ROW will be evaluated and designed to ensure proper drainage and prevent safety hazards.

2.10 Points of Concentration and Outfalls

The points of concentration and outfall for the Project are defined as the receiving waters where the runoff converges. The majority of the drainage is concentrated and discharged into Valencia Creek, Aptos Creek, and the Valencia Lagoon, which then leads to the Pacific Ocean.

3 HYDRAULICS

3.1 Recurrence Interval

3.1.1 Caltrans Recurrence Interval

Per Table 831.3 of the HDM, for the areas within Caltrans' ROW, roadway drainage system for through traffic lanes, branch connections, and other major ramp connections should be designed using the 4% (25-year) design storm with design water spread within shoulder or parking lane.

3.1.2 Santa Cruz County and Unincorporated Cities Recurrence Interval

As per Santa Cruz County's Design Criteria Manual, projects shall use the 10-year design storm for all peak flow and volume calculations. For peak flow calculations, the storm duration shall be equal to time of concentration for the tributary drainage area for which the calculations are being performed. For runoff volume calculations, the storm duration shall be equal to 1 hour (Santa Cruz County, 2021).

3.2 Grate Interception and Gutter Capacity

3.2.1 Caltrans Grate Interception and Gutter Capacity

Grate interception and gutter capacity should follow the criteria in Chapter 830 of the Caltrans HDM (2020). Gutters and drainage facilities are to be designed to keep flooding within the limits given in Table 831.3 of the HDM. Easy solutions to gutter flow problems can be obtained by using the charters contained in FHWA Hydraulic Engineering Circular No. 22, Urban Drainage Design Manual (2020).

Concentrations of sheet flow across roadways are to be avoided. As a general rule, no more than 0.10 cfs should be allowed to concentrate and flow across a roadway. Particular attention should be given to reversal points of superelevation where shoulder and gutter slopes may direct flows across the roadway and gore areas.

Calculations to determine grate interception and gutter capacity will be completed and discussed in the Project Plans, Specifications, and Estimate (PS&E) phase.

3.2.2 Santa Cruz County and Unincorporated Cities Grate Interception and Gutter Capacity

Grate interception and gutter design within the Town of Aptos and the County's ROW should comply with applicable requirements in the County's Design Manual. There are no specific flow requirements for sheet flow roadways in the manual.

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4 IMPACTED DRAINAGE SYSTEMS

4.1 Caltrans' Right-of-Way

4.1.1 On-site Drainage Caltrans - longitudinal

Based on preliminary review of as-builts and field visit, the majority of impacts to on-site drainage systems consist of widening the existing roadway, retaining walls, sound walls, new pavement, fencing, and accommodating the BOS operations. The widening and BOS will impact existing roadside ditches, asphalt concrete dikes, added impervious runoff and stormwater drains.

The proposed work on the median will impact the existing median drainage systems and proposed drainage system will have to be accommodated and verified based on the spread capacity and elevation grade modifications.

The proposed widening of Aptos Creek Bridge in the south side may require drainage systems to be extend and the relocation of inlets.

BOS innovative operations proposed within the SR 1 corridor does not currently have design criteria per Caltrans' standards and thus coordination with Caltrans Office of Hydraulics and Stormwater Design for allowable spread capacity will be required.

4.1.2 Off-site Drainage

The objective of the drainage design is to limit the design WSE and velocities to no greater than the existing conditions and to maintain the existing drainage pattern.

New cross drainage systems will be designed to convey the 100-year storm event without objectionable backwater and pass the 10-year storm within the culvert cross section, as required in the HDM (Caltrans, 2020). Existing cross culvert systems that are capable of passing the 10-year event and the 100-year event without objectionable backwater and in good condition would be extended to accommodate the proposed roadway widening.

Culverts that are undersized and/or in poor condition would be replaced with alternative pipe culverts as necessary. The cross-culvert drainage systems used for conveying off-site runoff will be studied to determine their capacity for the 10- and 100-year peak flows, pending additional survey information.

The preliminary impacted off-site drainage systems are listed in Table 9.

Table 9. Impacted Off-site Drainage Systems

Existing Culvert No.	Off-site Drainage System Station	Description
1	"SR1" 237+00	Roadway widening may impact the cross-culvert outfalls towards Valencia Creek.
2	"SR1" 264+00	Sound wall and roadway widening may impact the cross-culvert (24" RCP) outfall towards Valencia Creek.
3	"SR1" 268+90	Roadway widening on both sides may impact the cross-culvert outfall towards Valencia Creek.
4	"SR1" 310+55	Roadway widening may impact the cross-culvert (36" RCP) outfall towards Pacific Ocean.
Note: Impacted off-site drainage systems are based on As-builts EA 04-135334 (Caltrans, 2001), As-builts 4TC45 (Caltrans, 1947), *Storm Drain Facilities Master Plan* (Santa Cruz County, 2013), Santa Cruz County GIS (2022) and *Highway 1 Aux Lanes and Bus On Shoulder Freedom Boulevard to State Park Drive Geometric Approval Drawings* (10/2021). The off-site drainage systems may be verified during PS&E drainage system survey.		

4.2 County's Right-of-Way

4.2.1 Ultimate Trail Configuration

The existing drainage systems within the Coastal Rail Trail Segment 12 are expected to be impacted by retaining walls, the construction of a new trail and bridges. The Project, to the extent possible, aims to use of deck drains in areas such as the proposed pedestrian and bike bridge to capture and route runoff to adjacent bioswales. The impacted drainage systems are listed in Table 10.

Table 10. Impacted Drainage Systems – Ultimate Trail

Station	Description
14.00' Rt "RT-U" Station 1000+79.06 to 14.00' Rt "RT-U" Station 1006+50.00	Retaining walls and new trail will impact the longitudinal storm drain systems.
2.00' Lt "RT-U" Station 1000+79.06 to 2.00' Lt "RT-U" Station 1012+00.00	
14.00' Rt "RT-U" Station 1017+00.00 to 14.00' Rt "RT-U" Station 1016+14.56	
14.00' Rt "RT-U" Station 1022+22.17 to 14.00' Rt "RT-U" Station 1024+56.10	
14.00' Rt "RT-U" Station 1041+32.31 to 14.00' Rt "RT-U" Station 1044+36.21	
14.00' Rt "RT-U" Station 1056+00.00 to 14.00' Rt "RT-U" Station 1059+25.00	
14.00' Rt "RT-U" Station 1060+00.00 to 52.38' Rt "RT-U" Station 1062+77.83	
Rt "RT-U" Station 1061+50	The existing cross-culvert is expected to be extended.

4.2.2 Interim Trail Configuration

The existing drainage systems within the Coastal Rail Trail Segment 12 are expected to be impacted as there will be added impervious area. Per the proposed improvements under the Project, the existing culverts within Project limits will not be extended or replaced. The proposed pedestrian and bike bridge may allow for preliminary drainage design the use of feasible deck drains to route to adjacent bioswales. Preliminary locations are shown in Appendix B and will be further evaluated in the next phase.

The impact of drainage systems within the County's ROW were based on the review of the County's GIS, and the survey information made available by ICF. More design details will be verified during the PS&E and the future drainage system survey. Based on preliminary as-built review and field information, the impacted drainage systems within the Interim Trail configuration are listed in Table 11.

Table 11. Impacted Drainage Systems – Interim Trail

Station	Description
8.00' Lt "RT" Station 1040+67.64 to 8.00' Lt "RT-U" Station 1041+25.00	Proposed retaining walls will impact existing longitudinal storm systems. Evaluation of drainage runoff will be conducted in the Project's PS&E phase.

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5 HYDROMODIFICATION SUSCEPTIBILITY ASSESSMENT

The Project would result in net increase of impervious surface. The increase in impervious area could increase stormwater runoff due to the proposed widening. The additional stormwater runoff would cause a faster and larger peak in the Project's hydrograph, which could increase erosion of unlined channels downstream.

5.1 Regulations

5.1.1 Caltrans

The PID for this Project was signed in 2002 and therefore, the Project is grandfathered under the 1999 Caltrans Permit (Section E.2.d). This Project is subject to the treatment threshold requirements contained within the 1999 Caltrans Permit. Per the 1999 Caltrans Permit, the Project will treat the NNI to the maximum extent possible.

5.1.2 Santa Cruz County

The Project proposes 2.67 acres (Interim Trail) and 2.90 acres (Ultimate Trail) of NNI area within County's ROW.

Per the Phase II MS4 permit, sidewalks, bicycle lanes, and trails constructed with permeable surfaces, or sidewalks, bicycle lanes, and impervious trails built to direct stormwater to adjacent vegetated areas are excluded from the post-construction stormwater treatment control and hydromodification management requirements of this permit. Because all the Project's Coastal Rail Trail improvements within unincorporated Santa Cruz County's right-of-way fit the criteria of exclusion described above, these improvements would be exempt from implementing stormwater treatment and baseline hydromodification management.

For non-exempt portions of the Project within Santa Cruz County's right-of-way, the Project would have to comply with the hydromodification management requirements included under the Central Coast RWQCB Post-Construction Stormwater Requirements of the Phase II MS4 permit. The Project proposes to add or replace less than 15,000 square feet of non-exempt impervious areas within Santa Cruz County's right-of-way; therefore, the Project would not be subject to hydromodification requirements.

5.2 Recommendations

Based on the County's criteria and the Central Coast RWQCB requirement for WMZ to manage peak stormwater runoff, and the added and/or replaced impervious surface area, the Project is required to follow hydromodification requirements as outlined in the Central Coast RWQCB's Post Construction Stormwater Requirements (2013). Hydromodification mitigation measures will be considered during the Project's PS&E phase.

5.3 Stormwater Best Management Practices

The overall consideration process for the types of water quality measures applicable to this Project include permanent and temporary construction BMPs. These measures are discussed in detail in the Project's Stormwater Data Report (WRECO, 2022d).

6 COST

Table 12 summarizes the preliminary overall cost estimate for the Project and the Project's preliminary drainage costs as detailed in the Project Approval/Environmental Document Cost Estimate provided by ICF on December 2021 (Appendix E).

Table 12. Project's PA/ED Cost Estimates

Project Feature	Escalated Total Project Cost	Drainage Estimated Cost	Percent of Total Project Cost
SR 1	$84,660,000	$2,010,220	2.4%
Ultimate Trail	$49,337,000	$463,750	0.9%
Interim Trail	$19,944,000	$221,250	1.1%

Source: ICF, 2021

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7 REFERENCES

California Department of Transportation. 2020. Highway Design Manual.

California Department of Transportation. 2019. Bridge Inspection Report. Facility Carried: State Route 1. Bridge Number 36 0011. Structure Name: Aptos Creek.

California Department of Transportation. 1947. As Built Plans. Contract No. 4TC45. Document No. 40002167. Bridge Across Aptos Creek and Valencia Creek Culverts.

California Department of Transportation. 2001. As Built Plans. EA No. 04-135334.

California Department of Transportation. 2022. Water Quality Planning Tool. <http://svctenvims.dot.ca.gov/wqpt/wqpt.aspx>

California Department of Water Resources. 2004. Soquel Valley Groundwater Basin. Bulletin 118. <https://water.ca.gov/LegacyFiles/pubs/groundwater/bulletin_118/basindescriptions/3-1.pdf >

California Natural Resources Agency and California Ocean Protection Council. 2018. State of California Sea-Level Rise Guidance, 2018 Update.

Central Coast Regional Water Quality Control Board. 2013. Post-Construction Stormwater Management Requirements Development Projects in the Central Coast Region (Post-Construction Stormwater Requirements). <https://www.waterboards.ca.gov/centralcoast/water_issues/programs/stormwater/docs/lid/hydromod_lid_docs/2013_0032_attach1_post_construction_requirements.pdf>

Central Coast Regional Water Quality Control Board. 2013. Watershed Management Zones Map. <https://www.waterboards.ca.gov/centralcoast/water_issues/programs/stormwater/docs/lid/hydromod_lid_docs/attach_1b_attach_a_wmzs.pdf>

FEMA. 2019a. National Flood Hazard Layer for Santa Cruz County.

FEMA. 2017a. Flood Insurance Study, Santa Cruz County, California and Incorporated Areas. Flood Insurance Study Numbers 06087CV001C, 06087CV002C, and 06087CV003C.

FEMA. 2017b. Flood Insurance Rate Map, Santa Cruz County, California and Incorporated Areas. Map Numbers 06087C0356F, 06087C0357F, 06087C0380F, and 06087C0378F.

National Oceanic and Atmospheric Administration. Atlas 14 Precipitation Frequency Data Server (PFDS). < https://hdsc.nws.noaa.gov/hdsc/pfds/> (Last accessed: April 21, 2021)

Natural Resource Conservation District (NRCS). 2020. Custom Soil Resource Report for Santa Cruz County, California. <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>

Parikh Consultants, Inc (Parikh). 2021. *Preliminary Geotechnical Design Report.*

Regional Water Quality Control Board. 2013. Resolution No. R3-2013-0032 Approving Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast Region.

Santa Cruz County. 2021. Design Criteria Containing Standards for the Construction of Streets, Storm Drains, Sanitary Sewers, Water Systems, and Driveways within the Unincorporated Portion of Santa Cruz County.

Santa Cruz County. 2021. Santa Cruz County Geographical Information System (GIS) Map Tool. <https://gis.santacruzcounty.us/gisweb/> (Last accessed: April 6, 2021)

Santa Cruz County Department Environmental Health (SCCDEH). (2021). Santa Cruz County Watersheds <http://scceh.com/Home/Programs/WaterResources/WatershedandStreamHabitatProtection/SantaCruzCountyWatersheds.aspx> (Last accessed: March 31, 2021)

SWCA Environmental. (2022). *Draft Natural Environment Study.*

United States Census Bureau. 2022. QuickFacts. Santa Cruz County <https://www.census.gov/quickfacts/fact/table/santacruzcountycalifornia,US/PST045221> (Last Accessed: February 4, 2022)

United States Department of Agriculture. *(*2009). *Part 630 Hydrology National Engineering Handbook.* "Hydrologic Soil Group." <https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=22526.wba>

USGS. (2019). StreamStats. <https://streamstats.usgs.gov/ss> (Last accessed: January 20, 2022)

Western Regional Climate Center. 2016. Period of Record Monthly Climate Summary for Santa Cruz, California (047916). <https://wrcc.dri.edu/cgibin/cliMAIN.pl?ca7916t>

WRECO. (2022a). *Floodplain Evaluation Report*.

WRECO. (2022b). *Initial Site Assessment.*

WRECO. (2022c). *Water Quality Assessment Report.*

WRECO. (2022d). S*torm Water Data Report.*

Appendix A Project's Preliminary Geometry Exhibit Drawings

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LEGEND

- RETAINING WALL
- CONCRETE BARRIER
- SOUND WALL
- CALTRANS RIGHT OF WAY
- SLOPE LINE/TOE OF SLOPE
- SLOPE LINE/TOP OF CUT
- LINE DATA (SEE TABLE)
- CURVE DATA (SEE TABLE)
- BUS ON SHOULDER
- CONTRASTING SURFACE TREATMENT (GORE)
- NEW STRUCTURE
- NEW PAVEMENT
- NEW R/W TAKE

NOTES

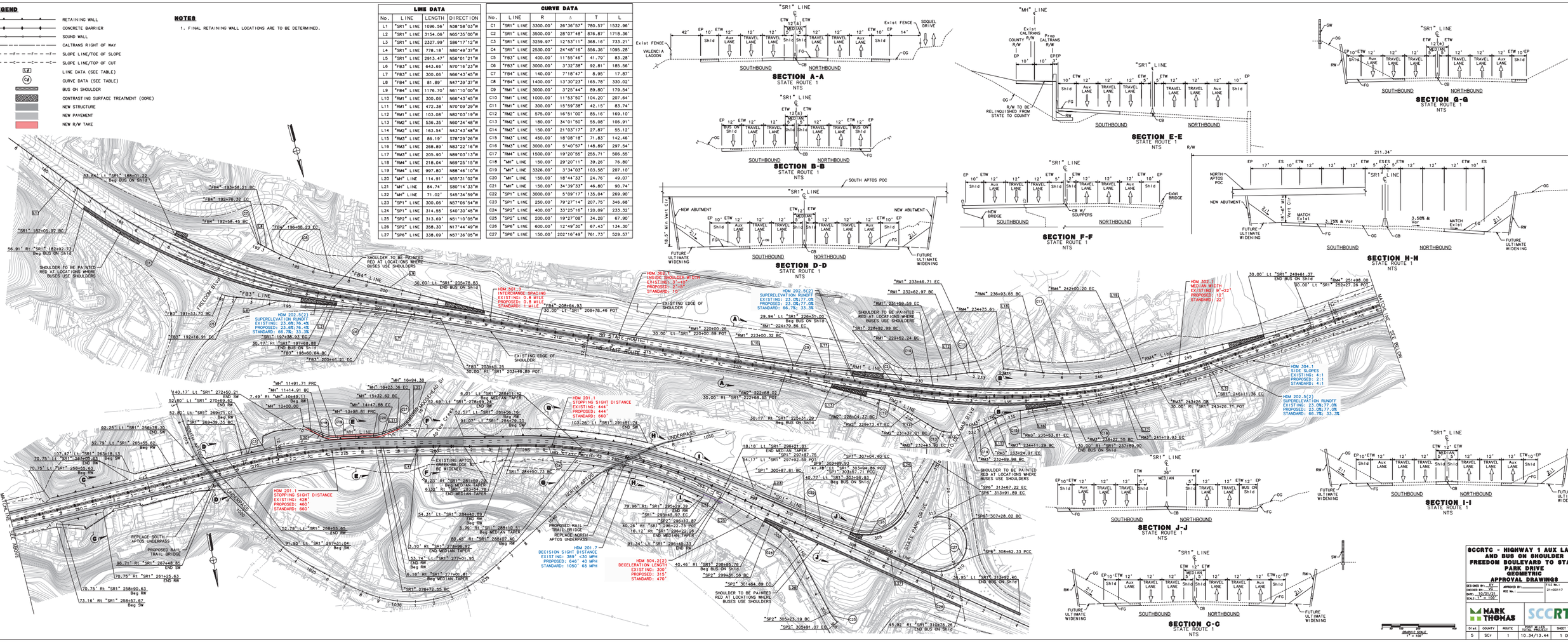
1. FINAL RETAINING WALL LOCATIONS ARE TO BE DETERMINED.

LINE DATA

No.	LINE	LENGTH	DIRECTION
L1	"SR1" LINE	1096.56'	N38°58'03"W
L2	"SR1" LINE	3154.06'	N65°35'00"W
L3	"SR1" LINE	2327.99'	S86°19'12"W
L4	"SR1" LINE	778.18'	N80°49'37"W
L5	"SR1" LINE	2913.47'	N56°01'21"W
L6	"FB3" LINE	643.66'	N70°16'23"W
L7	"FB3" LINE	300.06'	N66°43'45"W
L8	"FB4" LINE	81.89'	N47°30'37"W
L9	"FB4" LINE	1176.70'	N61°10'00"W
L10	"RM1" LINE	300.06'	N66°43'45"W
L11	"RM1" LINE	472.38'	N70°09'29"W
L12	"RM1" LINE	103.08'	N82°03'19"W
L13	"RM2" LINE	536.35'	N60°34'48"W
L14	"RM2" LINE	163.54'	N43°43'48"W
L15	"RM3" LINE	86.19'	S78°29'26"W
L16	"RM3" LINE	268.89'	N83°22'16"W
L17	"RM3" LINE	205.90'	N89°03'13"W
L18	"RM4" LINE	218.04'	N69°25'15"W
L19	"RM4" LINE	997.80'	N88°46'10"W
L20	"MH" LINE	114.91'	N55°31'02"W
L21	"MH" LINE	84.74'	S80°14'33"W
L22	"MH" LINE	71.02'	S45°34'59"W
L23	"SP1" LINE	300.06'	N57°06'54"W
L24	"SP1" LINE	314.55'	S40°30'45"W
L25	"SP2" LINE	313.69'	N51°10'05"W
L26	"SP2" LINE	358.30'	N17°44'49"W
L27	"SP6" LINE	338.09'	N57°36'05"W

CURVE DATA

No.	LINE	R	Δ	T	L
C1	"SR1" LINE	3300.00'	26°36'57"	780.57'	1532.96'
C2	"SR1" LINE	3500.00'	28°07'48"	876.87'	1718.36'
C3	"SR1" LINE	3259.97'	12°53'11"	368.16'	733.21'
C4	"SR1" LINE	2530.00'	24°48'16"	556.36'	1095.28'
C5	"FB3" LINE	400.00'	11°55'46"	41.79'	83.28'
C6	"FB3" LINE	3000.00'	3°32'38"	92.81'	185.56'
C7	"FB4" LINE	140.00'	7°18'47"	8.95'	17.87'
C8	"FB4" LINE	1400.00'	13°30'23"	165.78'	330.02'
C9	"RM1" LINE	3000.00'	3°25'44"	89.80'	179.54'
C10	"RM1" LINE	1000.00'	11°53'50"	104.20'	207.64'
C11	"RM1" LINE	300.00'	15°59'38"	42.15'	83.74'
C12	"RM2" LINE	575.00'	16°51'00"	85.16'	169.10'
C13	"RM2" LINE	180.00'	34°01'50"	55.08'	106.91'
C14	"RM3" LINE	150.00'	21°03'17"	27.87'	55.12'
C15	"RM3" LINE	450.00'	18°08'18"	71.83'	142.46'
C16	"RM3" LINE	3000.00'	5°40'53"	148.89'	297.54'
C17	"RM4" LINE	1500.00'	19°20'55"	255.71'	506.55'
C18	"MH" LINE	150.00'	29°20'11"	39.26'	76.80'
C19	"MH" LINE	3326.00'	3°34'03"	103.58'	207.10'
C20	"MH" LINE	150.00'	18°44'33"	24.76'	49.07'
C21	"MH" LINE	150.00'	34°39'33"	46.80'	90.74'
C22	"SP1" LINE	3000.00'	5°09'17"	135.04'	269.90'
C23	"SP1" LINE	250.00'	79°27'14"	207.75'	346.68'
C24	"SP2" LINE	400.00'	33°25'16"	120.09'	233.32'
C25	"SP2" LINE	200.00'	19°27'08"	34.28'	67.90'
C26	"SP6" LINE	600.00'	12°49'30"	67.43'	134.30'
C27	"SP6" LINE	150.00'	202°16'49"	761.73'	529.57'



SECTION A-A
STATE ROUTE 1
NTS

SECTION B-B
STATE ROUTE 1
NTS

SECTION D-D
STATE ROUTE 1
NTS

SECTION E-E
STATE ROUTE 1
NTS

SECTION F-F
STATE ROUTE 1
NTS

SECTION G-G
STATE ROUTE 1
NTS

SECTION H-H
STATE ROUTE 1
NTS

SECTION I-I
STATE ROUTE 1
NTS

SECTION J-J
STATE ROUTE 1
NTS

SECTION C-C
STATE ROUTE 1
NTS

JURISDIC SCALE
1" = 100'

SCCRTC - HIGHWAY 1 AUX LANES AND BUS ON SHOULDER FREEDOM BOULEVARD TO STATE PARK DRIVE GEOMETRIC APPROVAL DRAWINGS

DESIGNED BY: RY	APPROVED BY:
CHECKED BY: VG	RE No.:
DATE: 10/31/23	
SCALE: 1" = 100'	

FILE No.: 21-00117

MARK THOMAS

SCCRTC

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL
5	SCr	1	10.34/13.44	1 OF 2

LEGEND

- RETAINING WALL
- SLOPE LINE/TOE OF SLOPE
- SLOPE LINE/TOP OF CUT
- L1 — LINE DATA (SEE TABLE)
- C1 — CURVE DATA (SEE TABLE)
- ROW IMPACT
- PROPOSED BRIDGE
- PROPOSED BRIDGE DECK CONVERSION
- BUILDING DEMOLITION

NOTES

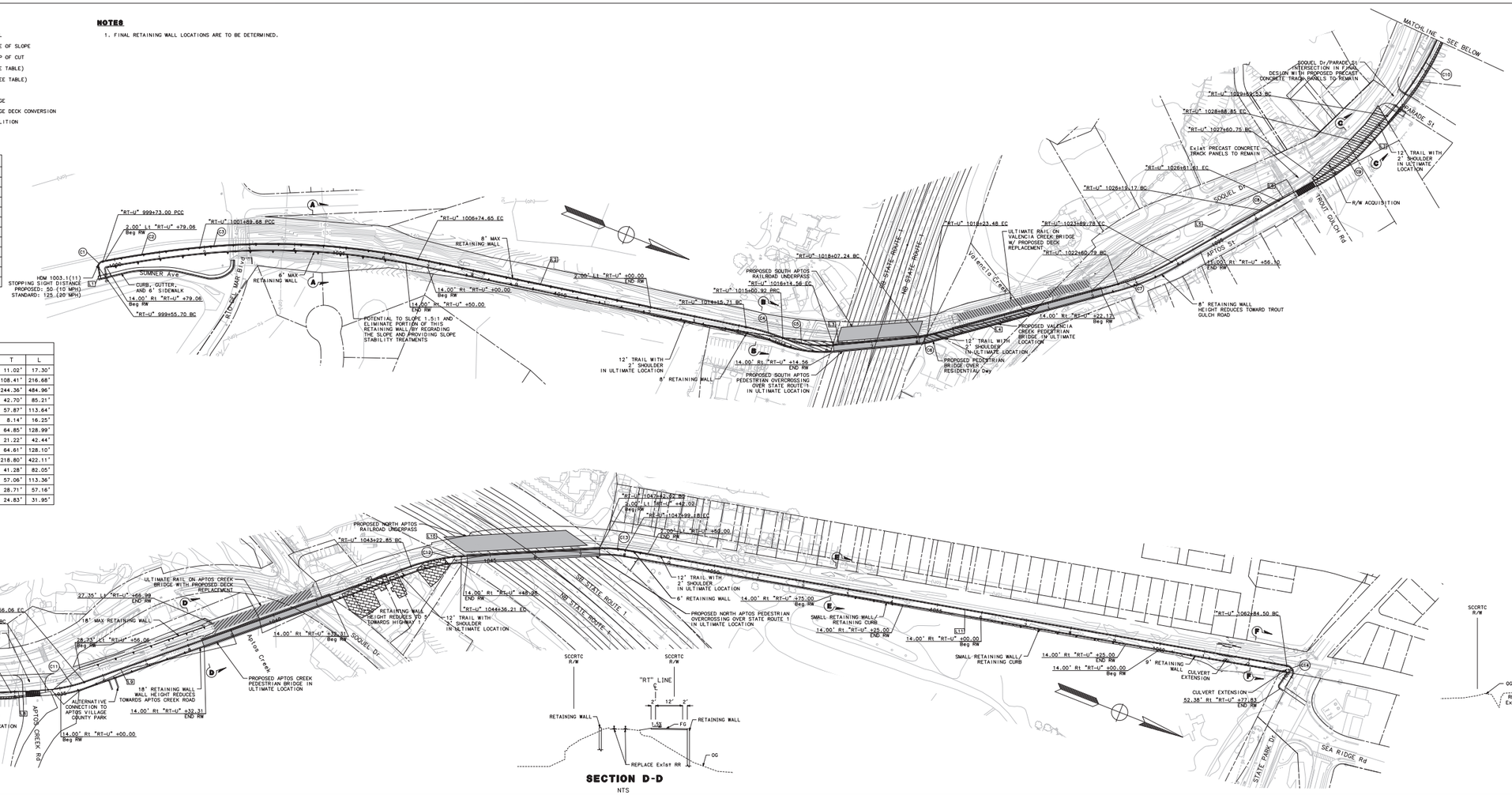
1. FINAL RETAINING WALL LOCATIONS ARE TO BE DETERMINED.

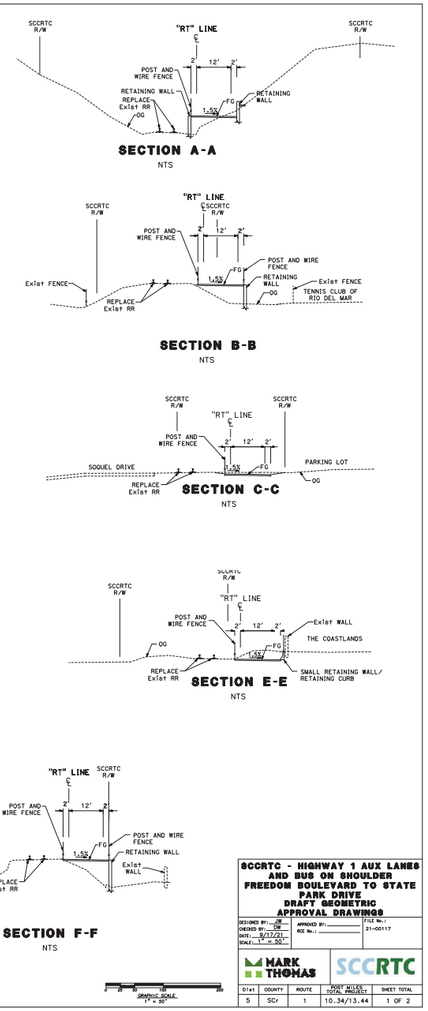
LINE DATA

No.	LINE	LENGTH	DIRECTION
L1	"RT-U" LINE	24.77'	S57°44'43"W
L2	"RT-U" LINE	741.07'	N9°48'26"W
L3	"RT-U" LINE	192.67'	N26°50'38"W
L4	"RT-U" LINE	437.31'	N36°36'29"W
L5	"RT-U" LINE	229.39'	N51°23'20"W
L6	"RT-U" LINE	99.14'	N50°54'10"W
L7	"RT-U" LINE	80.68'	N69°15'08"W
L8	"RT-U" LINE	82.37'	S73°32'23"W
L9	"RT-U" LINE	766.79'	S57°52'10"W
L10	"RT-U" LINE	305.81'	S74°08'33"W
L11	"RT-U" LINE	1485.32'	S87°14'37"W

CURVE DATA

No.	LINE	R	Δ	T	L
C1	"RT-U" LINE	11.00'	90°06'54"	11.02'	17.30'
C2	"RT-U" LINE	2500.00'	4°57'57"	108.41'	216.68'
C3	"RT-U" LINE	1600.00'	17°21'59"	244.36'	484.96'
C4	"RT-U" LINE	506.00'	9°38'54"	42.70'	85.21'
C5	"RT-U" LINE	244.00'	26°41'06"	57.87'	113.64'
C6	"RT-U" LINE	95.35'	9°45'51"	8.14'	16.25'
C7	"RT-U" LINE	500.00'	14°46'51"	64.85'	128.99'
C8	"RT-U" LINE	5000.00'	0°29'11"	21.22'	42.44'
C9	"RT-U" LINE	400.00'	18°20'58"	64.61'	128.10'
C10	"RT-U" LINE	650.00'	37°12'29"	218.80'	422.11'
C11	"RT-U" LINE	300.00'	15°40'14"	41.28'	82.05'
C12	"RT-U" LINE	399.13'	16°16'23"	57.06'	113.36'
C13	"RT-U" LINE	250.00'	13°06'04"	28.71'	57.16'
C14	"RT-U" LINE	16.00'	114°24'00"	24.83'	31.95'





SCCRTC - HIGHWAY 1 AUX LANES AND BUS ON SHOULDER FREEDOM BOULEVARD TO STATE PARK DRIVE
DRAFT GEOMETRIC APPROVAL DRAWINGS

DESIGNED BY: JB
CHECKED BY: TJM
DATE: 9/17/21
SCALE: 1" = 50'
APPROVED BY: _____
RE No.: _____
TITLE No.: 21-00117

MARK THOMAS | SCCRTC

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL
5	SCr	1	10.34/13.44	1 OF 2

LEGEND

- RETAINING WALL
- ULTIMATE TRAIL
- SLOPE LINE/TOE OF SLOPE
- SLOPE LINE/TOP OF CUT
- L1 — LINE DATA (SEE TABLE)
- C1 — CURVE DATA (SEE TABLE)
- ROW IMPACT
- PROPOSED BRIDGE
- PROPOSED BRIDGE DECK CONVERSION

NOTES

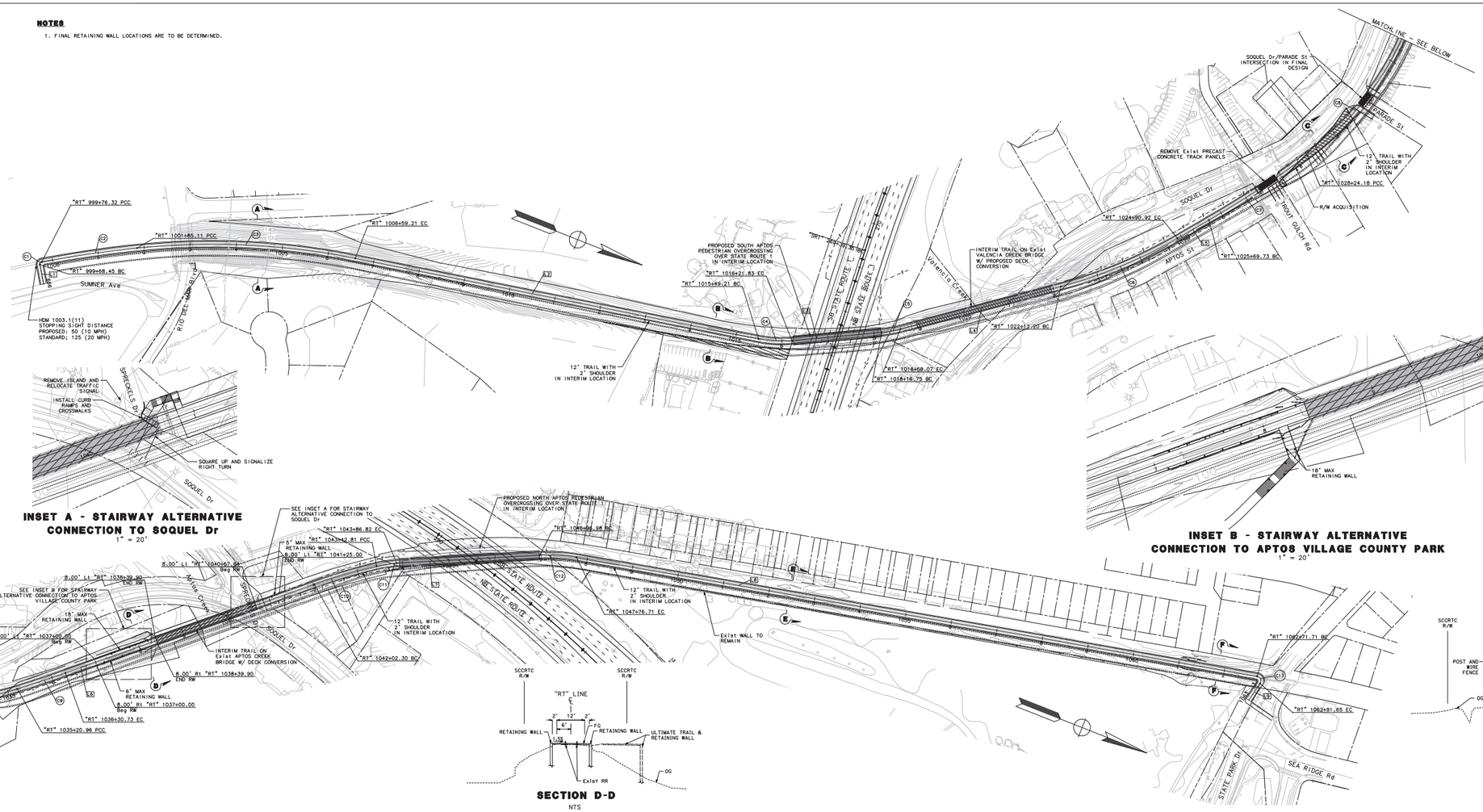
1. FINAL RETAINING WALL LOCATIONS ARE TO BE DETERMINED.

LINE DATA

No.	LINE	LENGTH	DIRECTION
L1	"RT" LINE	42.48'	S57°44'43"W
L2	"RT" LINE	890.00'	N10°11'59"W
L3	"RT" LINE	194.92'	N26°50'38"W
L4	"RT" LINE	359.14'	N36°18'43"W
L5	"RT" LINE	78.81'	N51°36'40"W
L6	"RT" LINE	571.58'	S57°45'32"W
L7	"RT" LINE	310.20'	S74°08'33"W
L8	"RT" LINE	1008.60'	S87°11'40"W
L9	"RT" LINE	43.54'	N21°38'36"E

CURVE DATA

No.	LINE	R	Δ	T	L
C1	"RT" LINE	5.00'	90°06'53"	5.01'	7.86'
C2	"RT" LINE	2512.00'	4°45'45"	104.46'	208.80'
C3	"RT" LINE	1575.00'	17°14'49"	238.85'	474.10'
C4	"RT" LINE	250.00'	16°38'40"	36.57'	72.62'
C5	"RT" LINE	250.00'	9°28'05"	20.70'	41.31'
C6	"RT" LINE	1025.00'	15°17'57"	137.67'	273.70'
C7	"RT" LINE	2300.00'	6°20'21"	127.36'	254.47'
C8	"RT" LINE	645.00'	61°53'42"	386.75'	696.77'
C9	"RT" LINE	2625.00'	2°23'46"	54.89'	109.77'
C10	"RT" LINE	1228.22'	6°33'15"	70.33'	140.50'
C11	"RT" LINE	250.00'	10°04'35"	22.04'	43.97'
C12	"RT" LINE	350.00'	13°03'07"	40.04'	79.73'
C13	"RT" LINE	10.00'	114°15'56"	15.48'	19.94'



SCCRTC - HIGHWAY 1 AUX LANES AND BUS ON SHOULDER FREEDOM BOULEVARD TO STATE PARK DRIVE
DRAFT GEOMETRIC APPROVAL DRAWINGS

DESIGNED BY: JB
CHECKED BY: TM
DATE: 9/17/21
SCALE: 1" = 50'
APPROVED BY:
RCE No.:
FILE No.: 21-00117

MARK THOMAS | SCCRTC

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL
5	SCr	1	10.34/13.44	1 OF 2

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Appendix B Project Existing Drainage Layout

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — No. — Exp. — CIVIL — STATE OF CALIFORNIA

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SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION
COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060

LEGEND:

FLOW DIRECTION

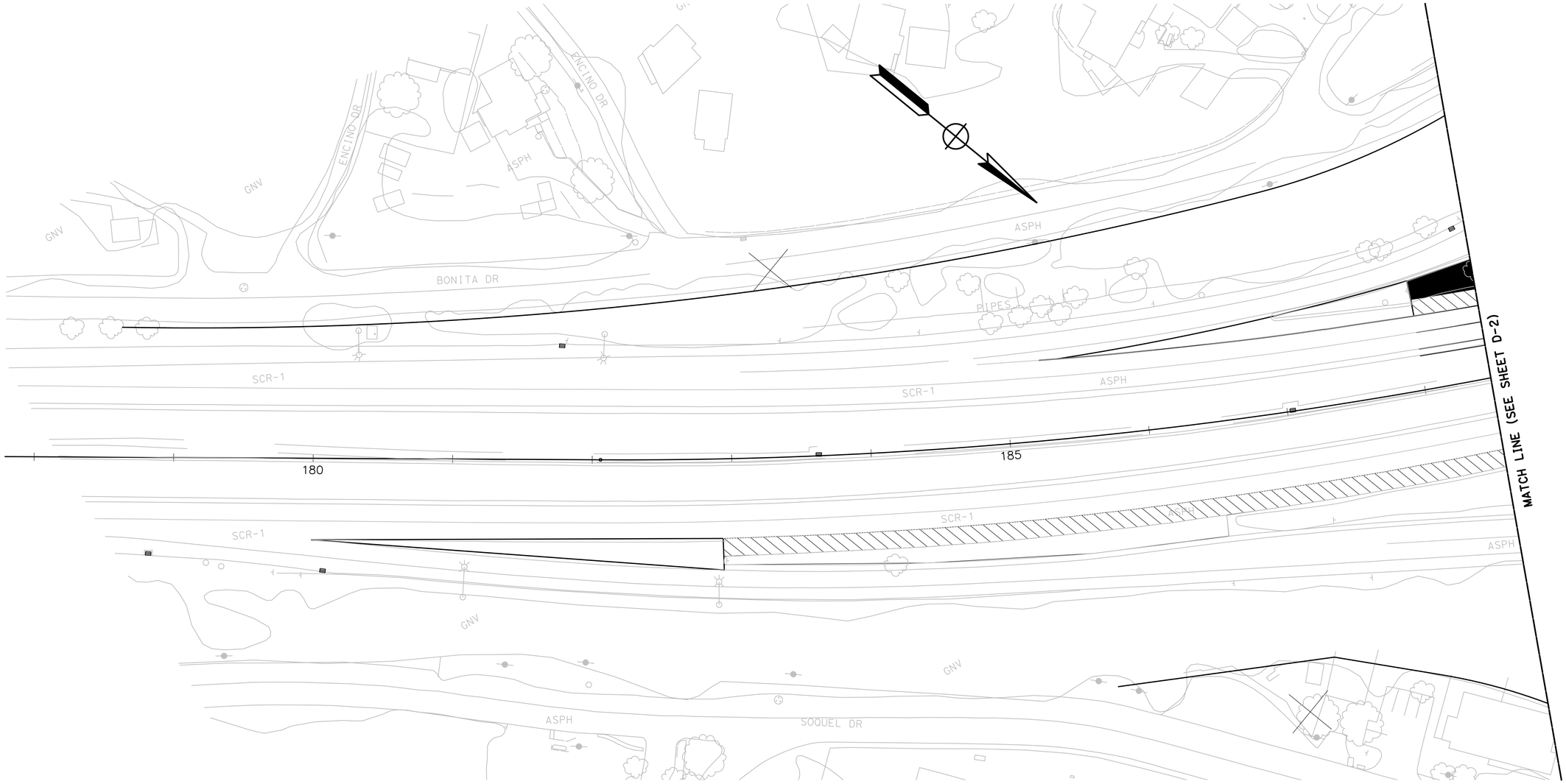
(#) OFF-SITE CROSS-CULVERTS

NOTE:

1. THE DRAINAGE FEATURES WERE DELINEATED BASED ON AS-BUILT EA 04-135334, AS-BUILT 4TC45, SANTA CRUZ COUNTY STORM DRAIN FACILITIES MASTER PLAN 2013, AND SANTA CRUZ COUNTY GIS.

2. CROSS-CULVERTS NO. 3, 4, 5, 7 WILL BE IMPACTED BY THE PROJECT IMPROVEMENTS AND NO. 1, 2, 6 WILL NOT BE IMPACTED.

3. THE DRAINAGE SYSTEMS WILL BE VERIFIED DURING PS&E DRAINAGE SYSTEM SURVEY.



EXISTING DRAINGE LAYOUT

SCALE: 1" = 40′ **PAGE 1 OF 15**

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SUPERVISOR | CONSULTANT FUNCTIONAL SUPERVISOR

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DGN FILE => wreco drainage.dwg

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

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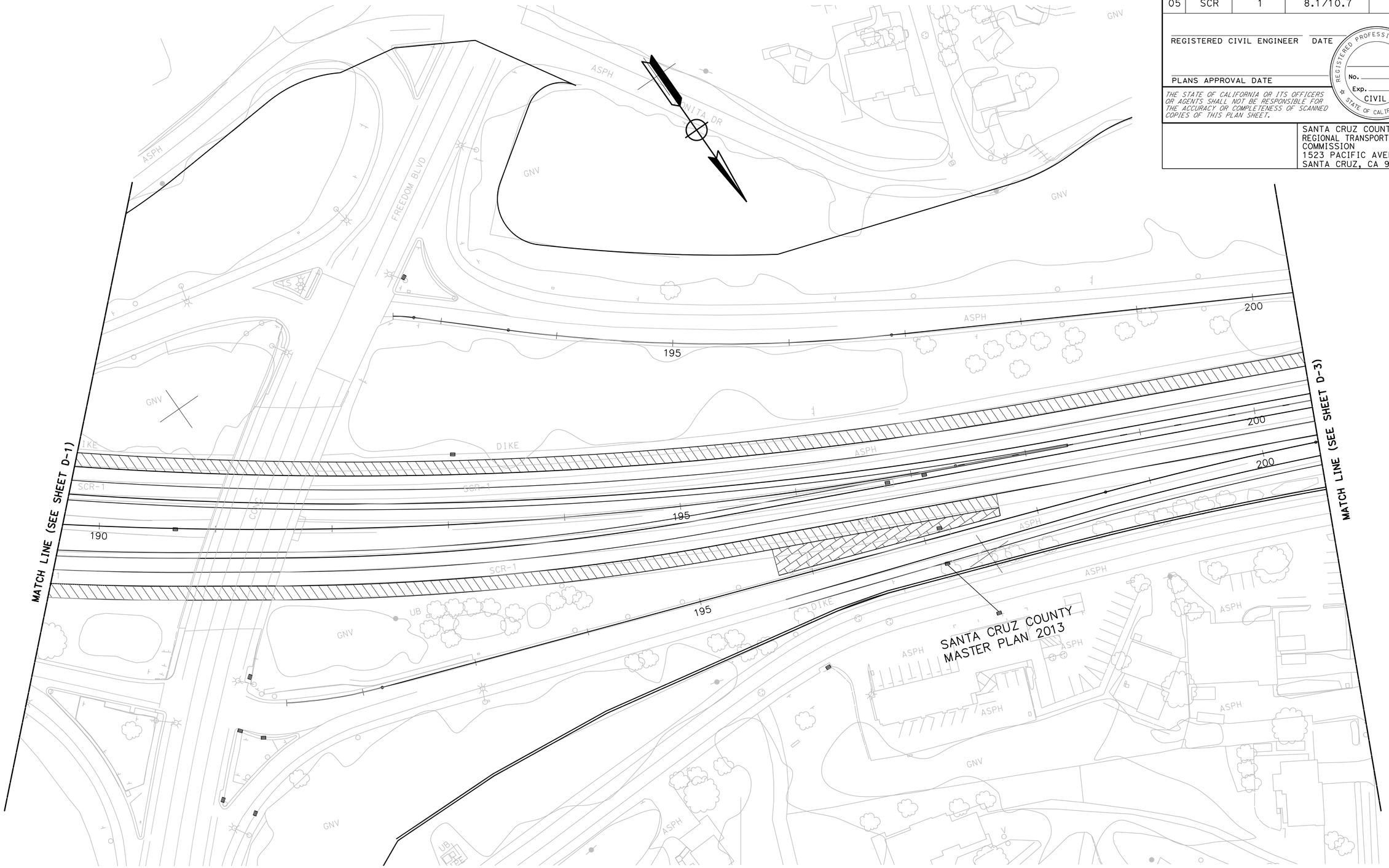
SANTA CRUZ, CA 95060



EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

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UNIT 0000

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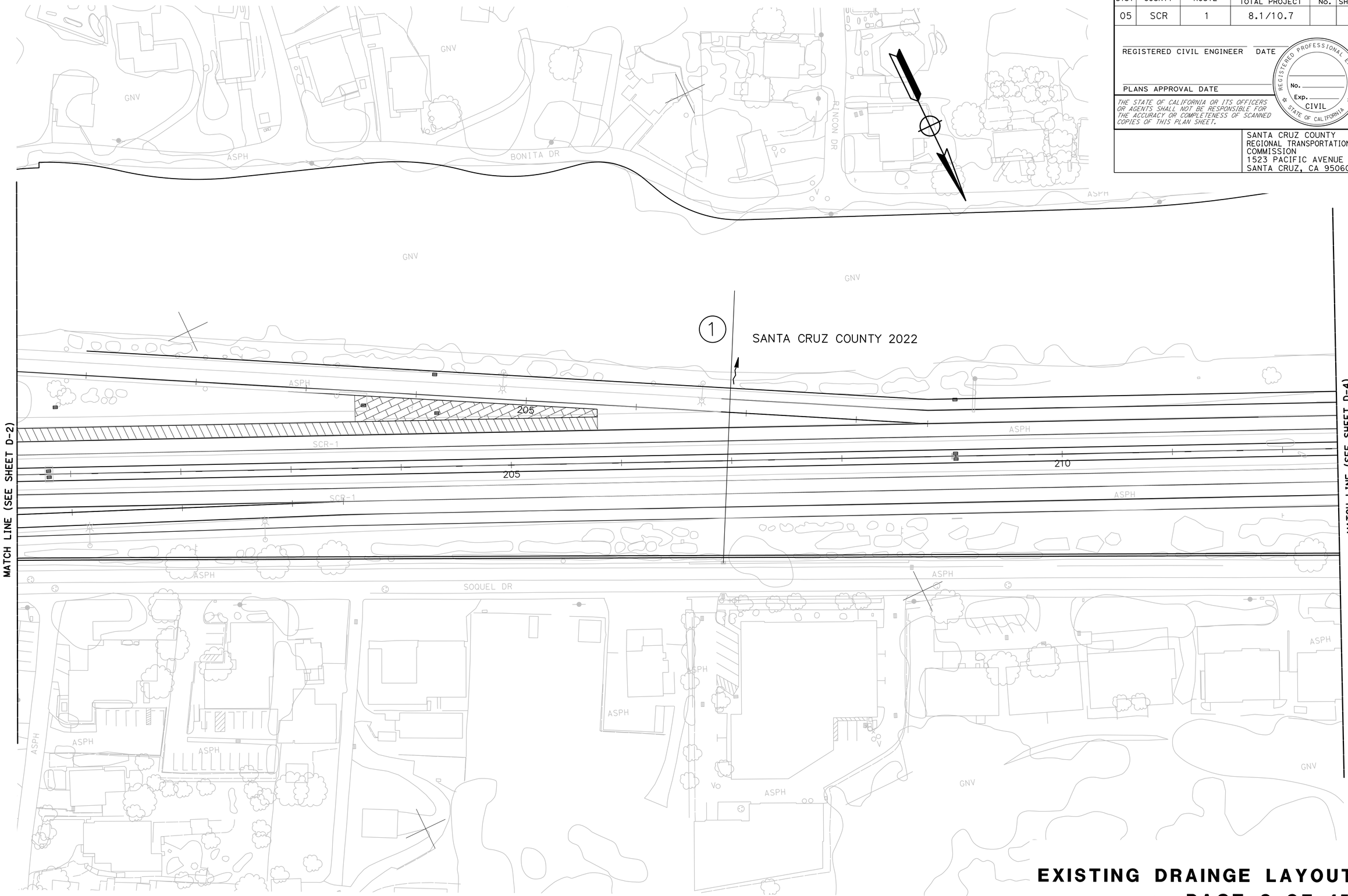
SANTA CRUZ, CA 95060



EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

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UNIT 0000

PROJECT NUMBER & PHASE 0000000000

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COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060

EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

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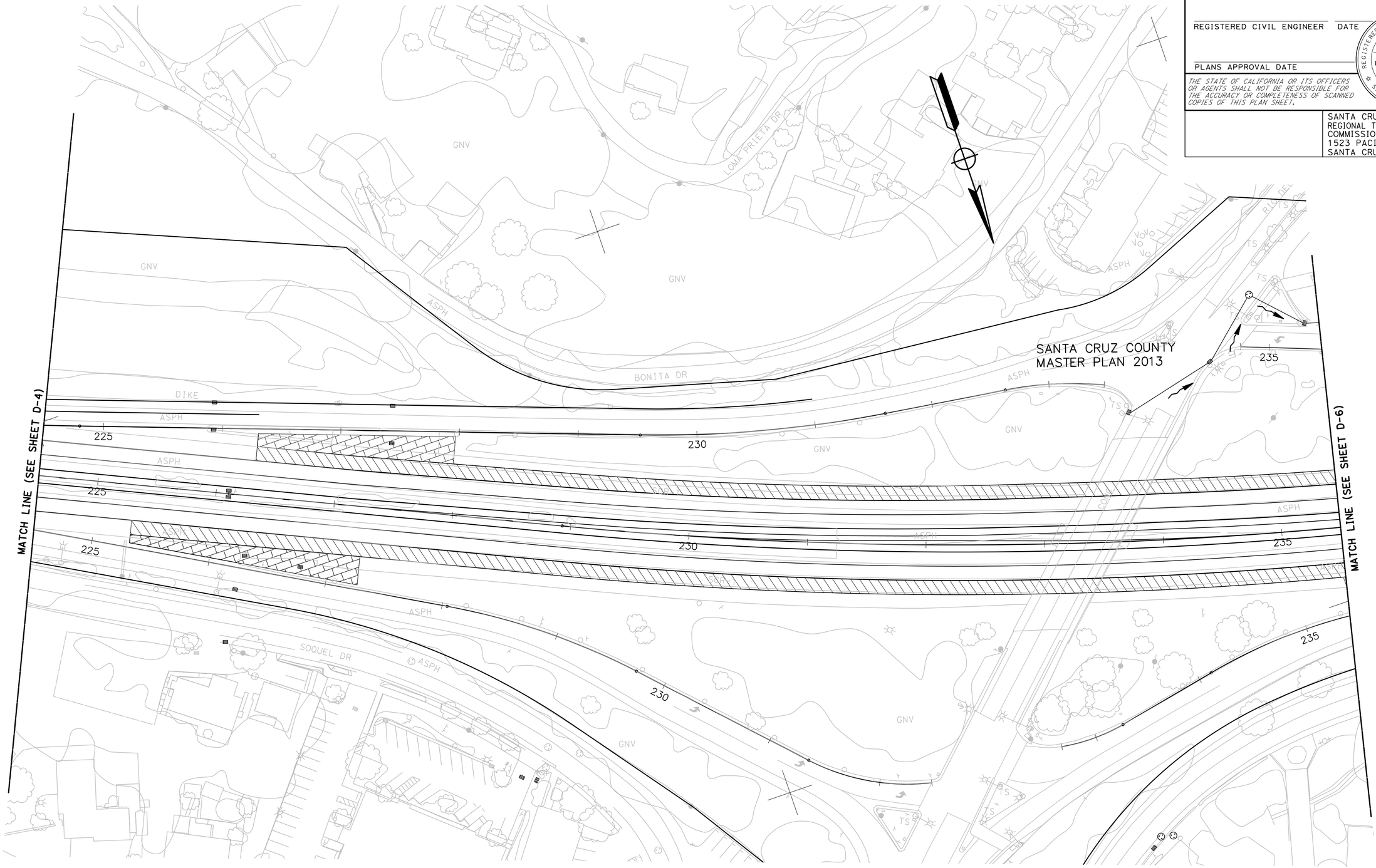

EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

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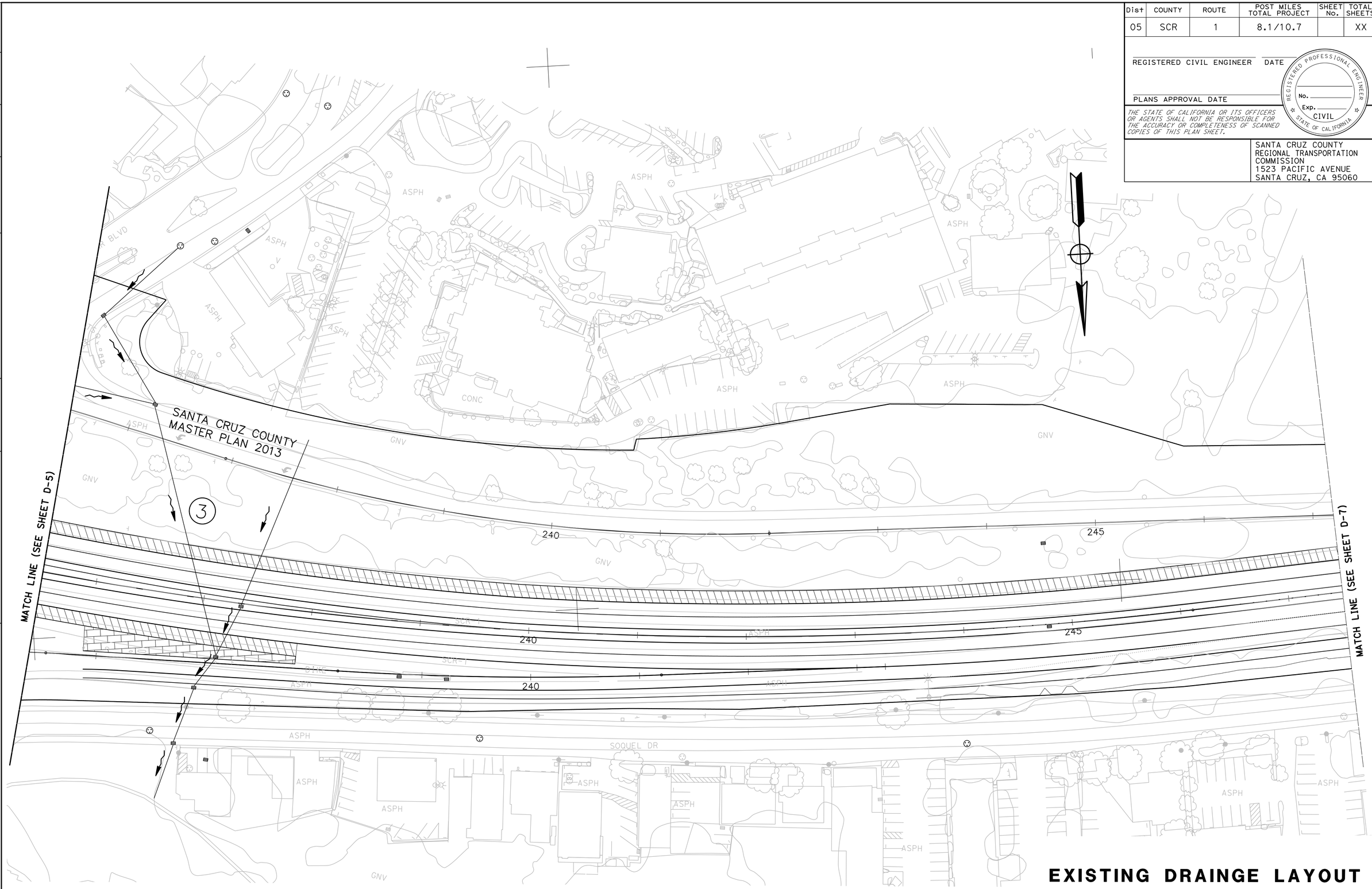

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SCALE: 1" = 40'

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PROJECT NUMBER & PHASE 0000000000

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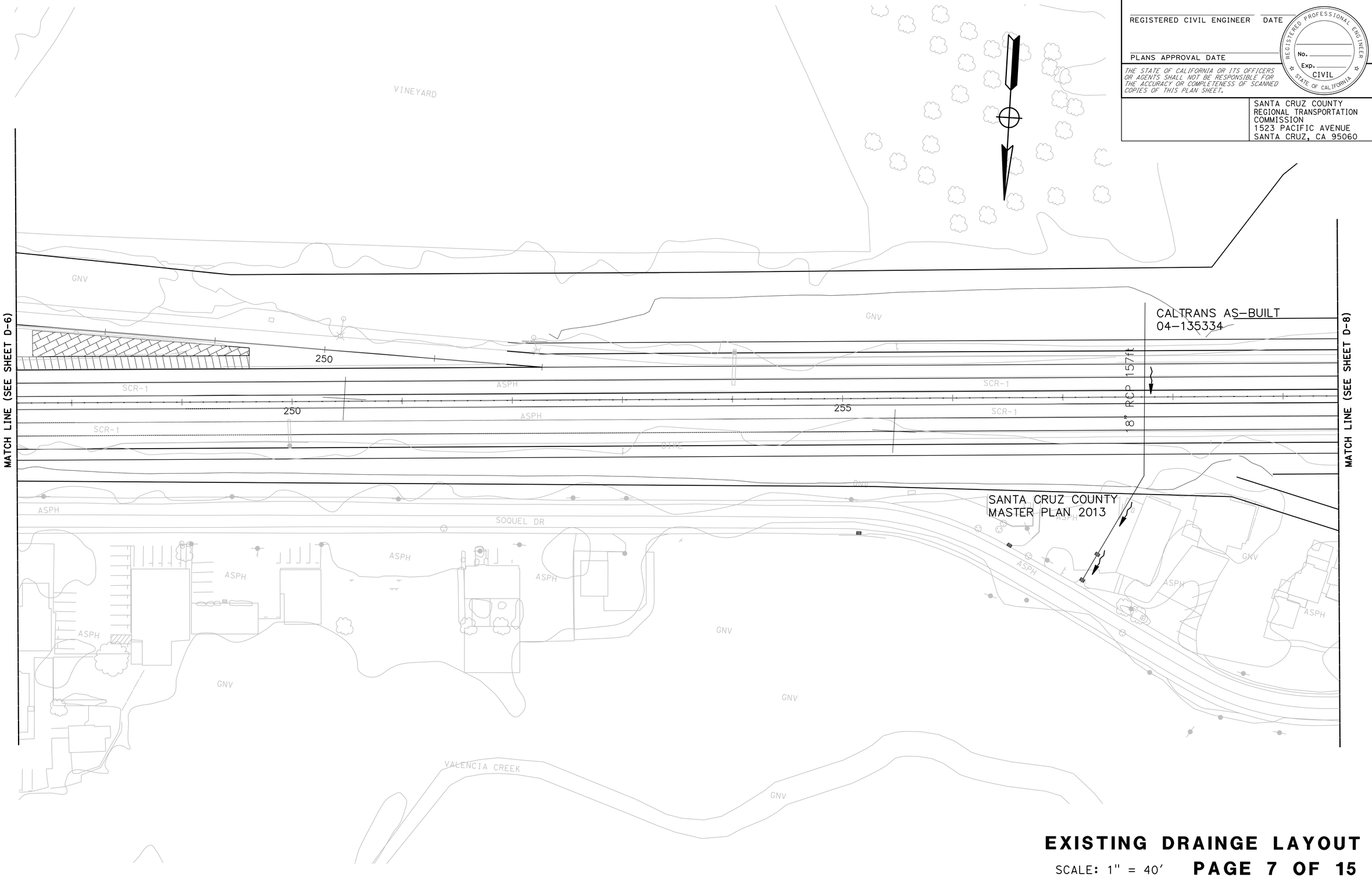

EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

PAGE 7 OF 15

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

CONSULTANT FUNCTIONAL SUPERVISOR

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UNIT 0000

PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
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REGIONAL TRANSPORTATION COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060

MATCH LINE (SEE SHEET D-9)

MATCH LINE (SEE SHEET D-7)

MATCH LINE (SEE SHEET D-10)

MATCH LINE (SEE SHEET D-11)

4

5

SANTA CRUZ COUNTY
MASTER PLAN 2013

24" RCP 150ft

CALTRANS AS-BUILT
04-135334

CALTRANS AS-BUILT
4TC45

10" VCP SS

"RT-U" 1015+00.92 PRC

"RT-U" 1016+14.56 EC

"RT-U" 1018+07.44 BC

"RT-U" 1018+21.44 EC

1015

1020

260

265

270

TENNIS COURTS

SOQUEL DR

VALENCIA CREEK

VALENCIA CR

ASPH

SCR-1

DIKE

GNV

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STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

LAST REVISION 00-00-00 | DATE PLOTTED =>4/29/2022 TIME PLOTTED =>10:23 AM

BORDER LAST REVISED 7/2/2010 | USERNAME => JFAN | DGN FILE => wreco_drainage.dwg | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0000 | PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

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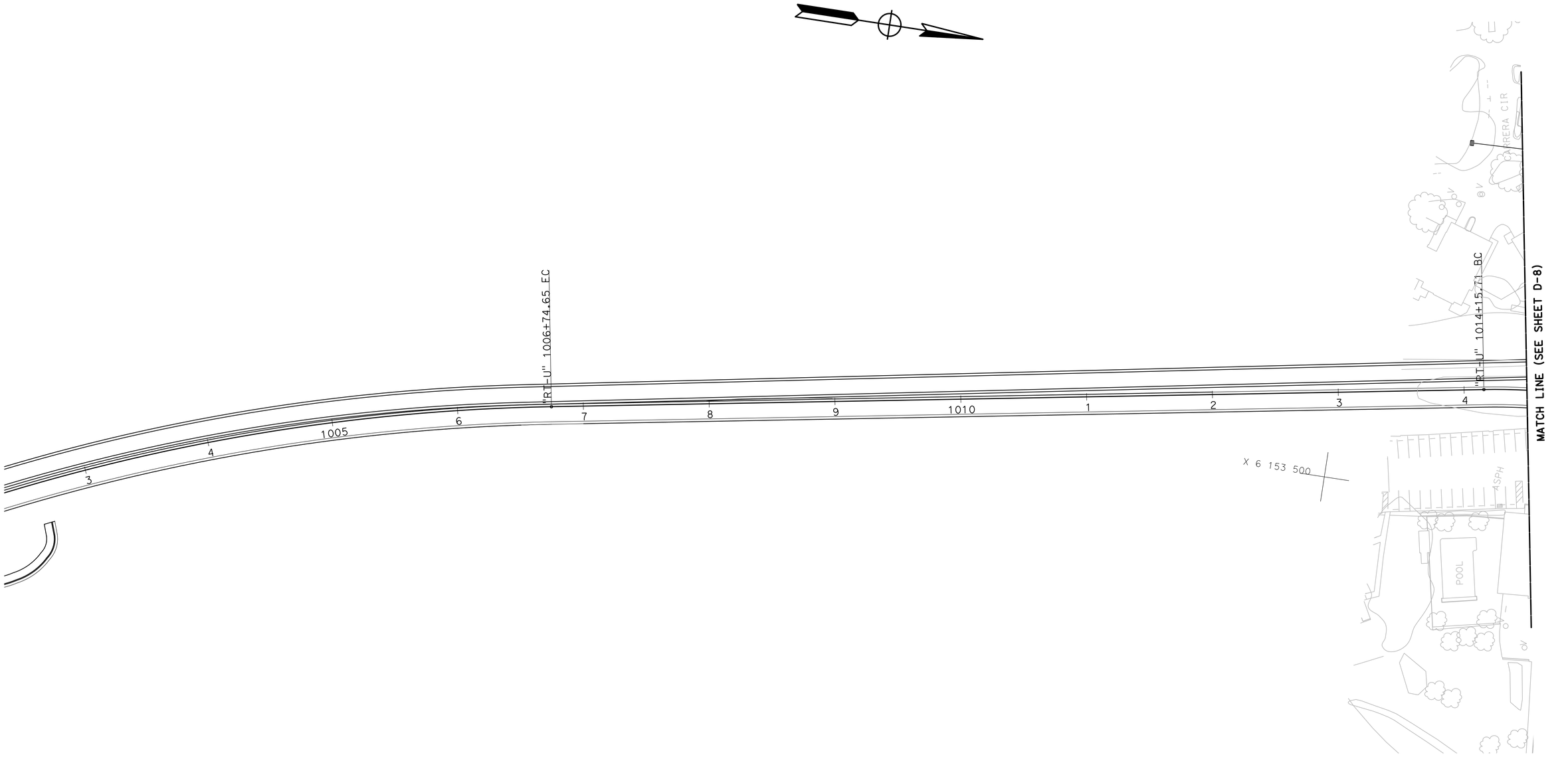

EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

PAGE 9 OF 15

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
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UNIT 0000

PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

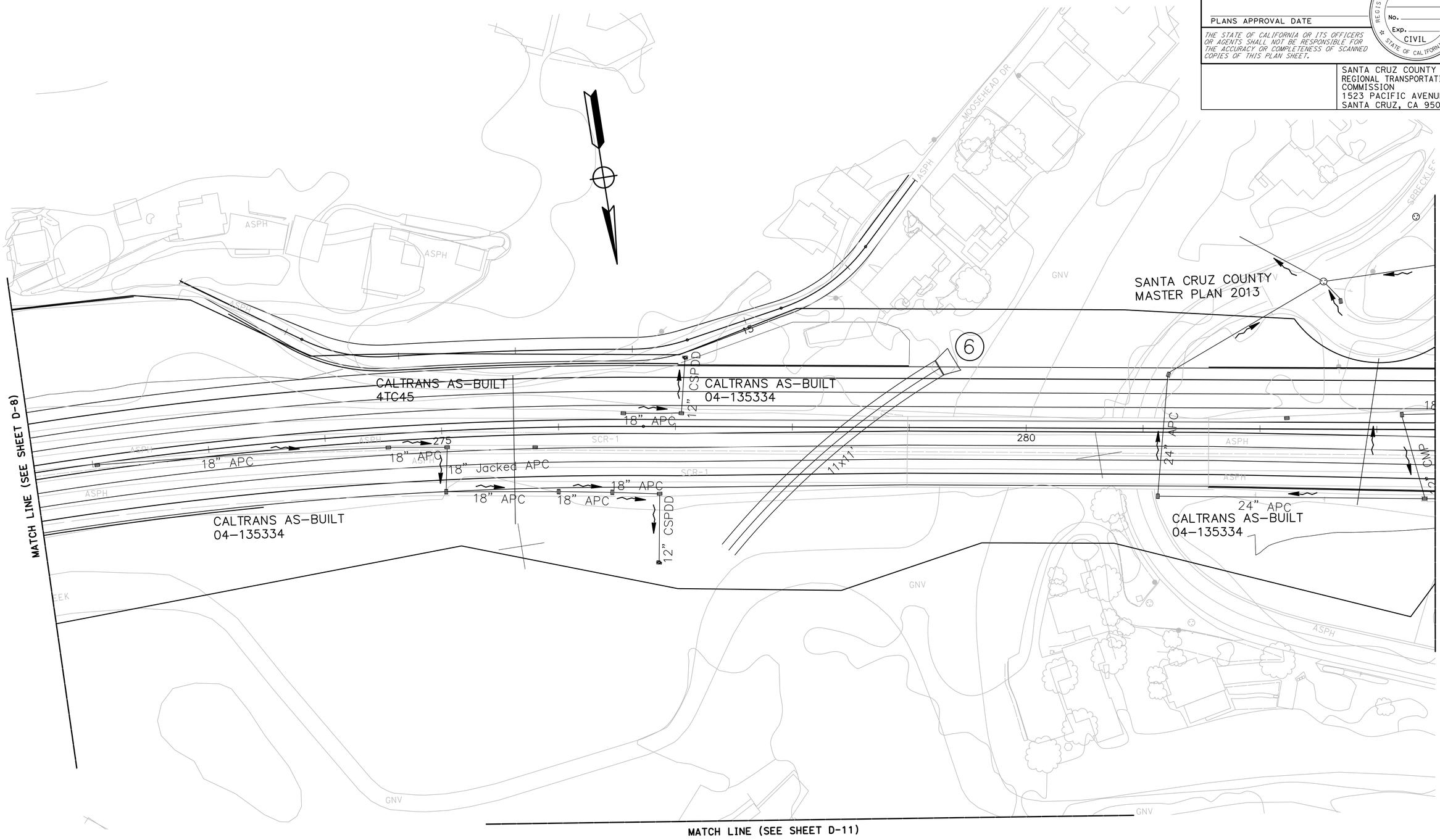
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. 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.

SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION
COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060



EXISTING DRAINGE LAYOUT

SCALE: 1" = 40' **PAGE 10 OF 15**

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION 00-00-00 | DATE PLOTTED =>4/29/2022 | TIME PLOTTED =>10:24 AM

BORDER LAST REVISED 7/2/2010

USERNAME => JFAN
DGN FILE => wreco drainage.dwg

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — No. — Exp. — CIVIL — STATE OF CALIFORNIA

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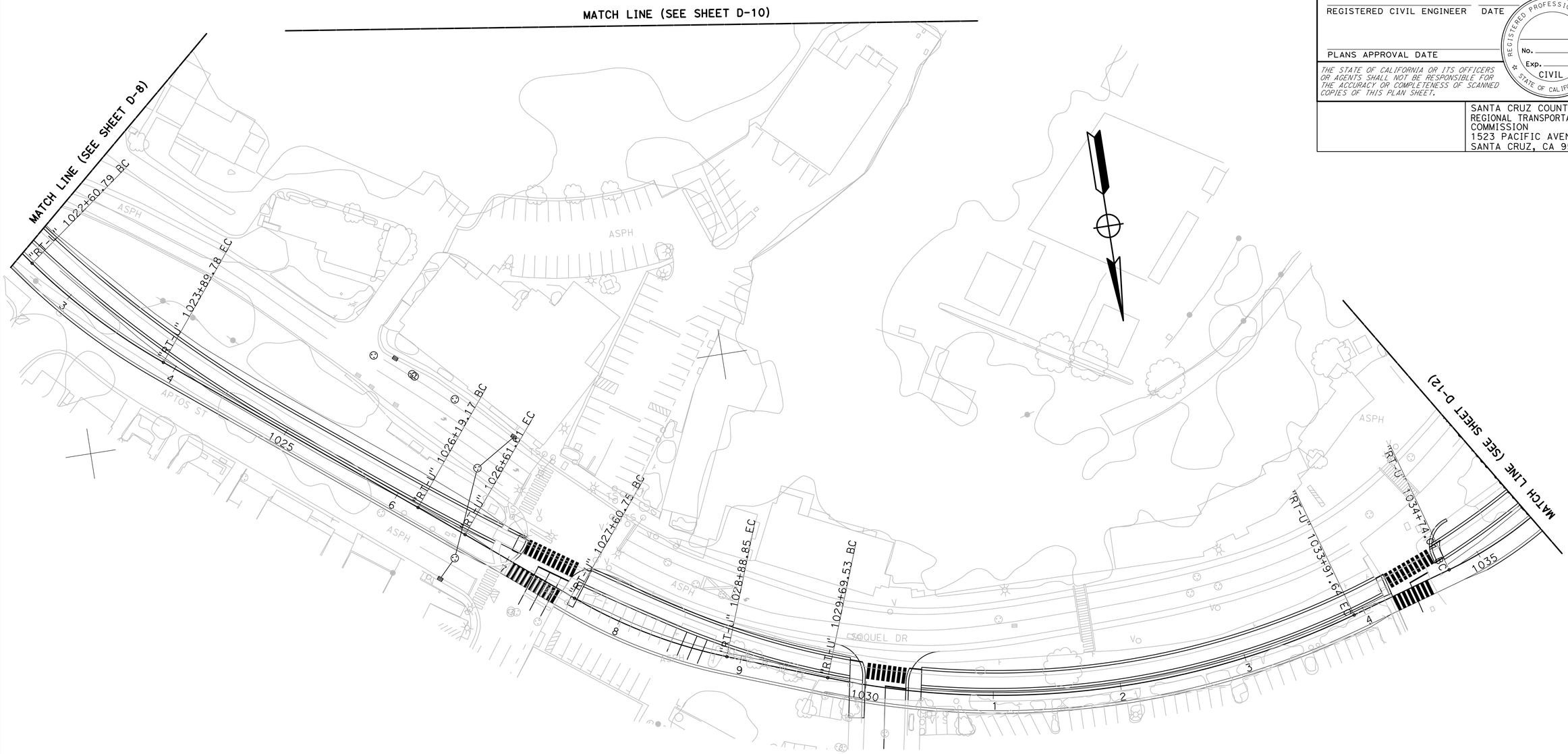
SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION
COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060



EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR

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DATE PLOTTED =>4/29/2022
TIME PLOTTED =>10:24 AM

BORDER LAST REVISED 7/2/2010

USERNAME => JFAN
DGN FILE => wreco_drainage.dwg

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION
COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060

MATCH LINE (SEE SHEET D-10)

MATCH LINE (SEE SHEET D-11)

MATCH LINE (SEE SHEET D-13)

SEACLIFF DR EAST

SEA TERRACE WAY

SPRECKLES DR

APTOS WHARF DR

APTOS CREEK

BIKE LANE

ASPH

GNV

OV

UB

TS

24" RCP

24" APC

285

18" APC

CALTRANS AS-BUILT
04-135334

24" APC

18" SCSP

"RT-1" 1043+22.85 BC

"RT-1" 1044+26.21 EC

290

1045

12"

18"

BC

1035+56.06 EC

1040

1

2

3

4

6

7

8

9

EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

CONSULTANT FUNCTIONAL SUPERVISOR

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

LAST REVISION 00-00-00

DATE PLOTTED =>4/29/2022

TIME PLOTTED =>10:24 AM

BORDER LAST REVISED 7/2/2010

USERNAME => JFAN

DGN FILE => wreco_drainage.dwg

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — No. Exp. CIVIL — STATE OF CALIFORNIA

SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION
COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060

MATCH LINE (SEE SHEET D-14)

MATCH LINE (SEE SHEET D-12)

MATCH LINE (SEE SHEET D-15)

"RT-U" 1047+99.18 EOL

"RT-U" 1047+42.04 BOL

1050

295

300

300

300

18" RCP

18" APC

12" CMPDD

CALTRANS AS-BUILT
04-135334

NORTH AVE

DEBRIS

ASPH

GNV

DIKE

SCR-1

CONC

DP

UB

UB LL

EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

REVISED BY | DATE REVISED

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STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

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USERNAME => JFAN
DGN FILE => wreco drainage.dwg

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

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SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION
COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060

X 6 150 000

X 6 149 500

MATCH LINE (SEE SHEET D-13)

SANTA CRUZ COUNTY 2022

EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR

CALCULATED-DESIGNED BY

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DATE REVISED	REVISED BY

LAST REVISION 00-00-00 DATE PLOTTED =>4/29/2022 TIME PLOTTED =>10:24 AM

BORDER LAST REVISED 7/2/2010

USERNAME => JFAN
DGN FILE => wreco drainage.dwg

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 0000000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SCR	1	8.1/10.7		XX

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — No. — Exp. — CIVIL — STATE OF CALIFORNIA

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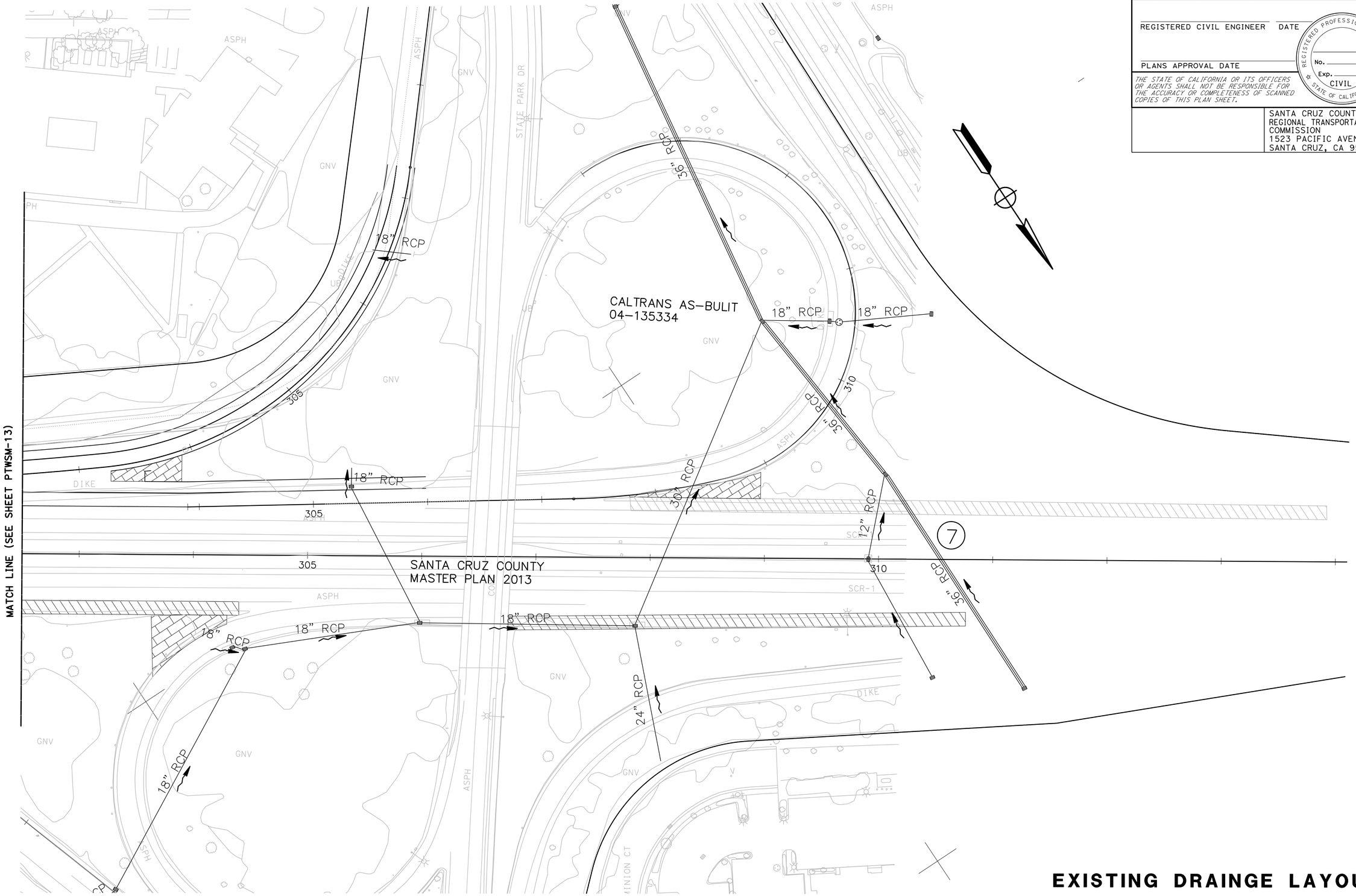
SANTA CRUZ COUNTY
REGIONAL TRANSPORTATION
COMMISSION
1523 PACIFIC AVENUE
SANTA CRUZ, CA 95060



EXISTING DRAINGE LAYOUT

SCALE: 1" = 40'

PAGE 15 OF 15

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BORDER LAST REVISED 7/2/2010

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RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 0000000000

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Appendix C Federal Emergency Management Agency Flood Insurance Rate Maps

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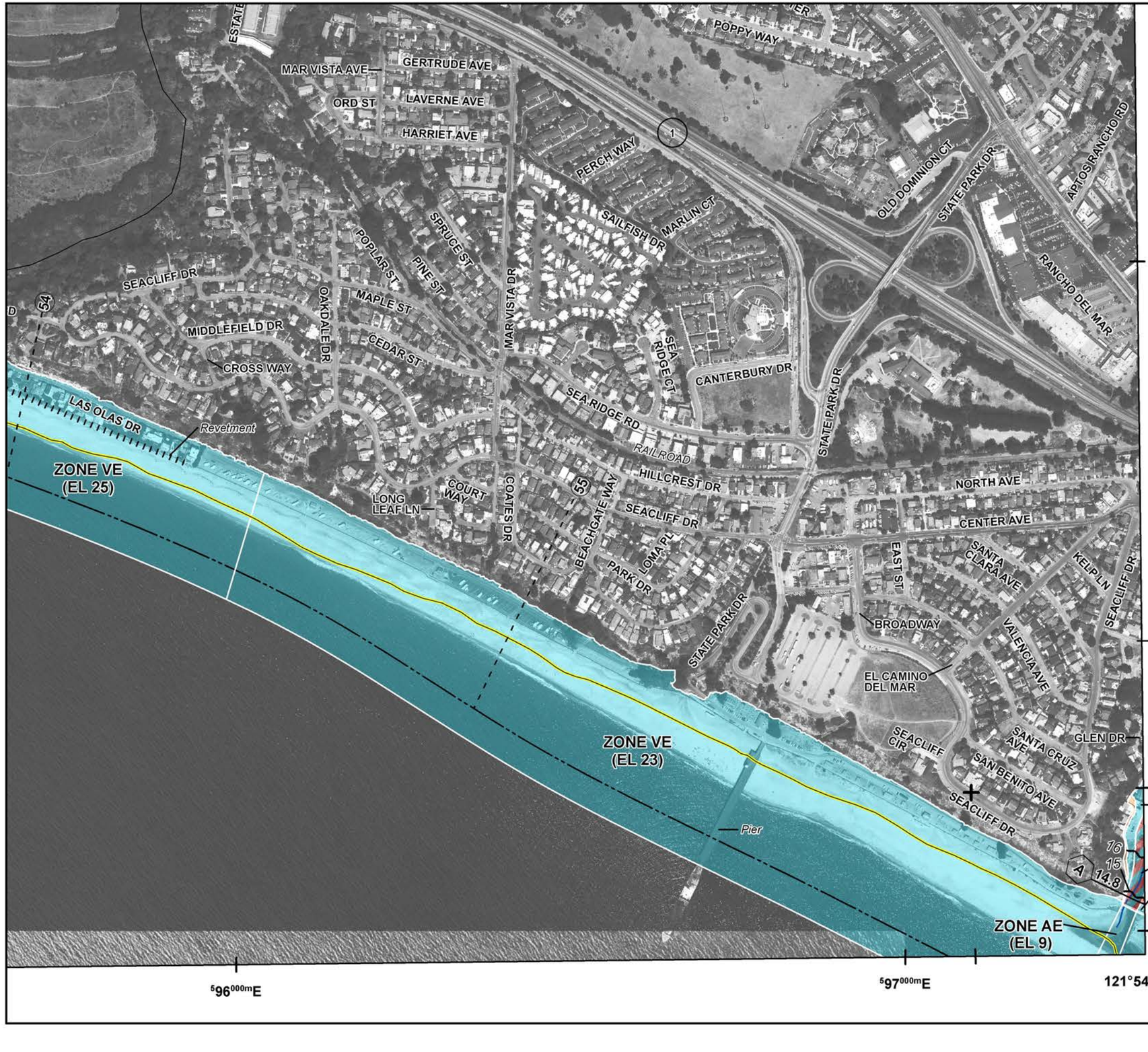

IONAL FLOOD INSURANCE PROGRAI

OD INSURANCE RATE MAP

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

SANTA CRUZ COUNTY, CALIFORNIA

and Incorporated Areas

PANEL 356 OF 470

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
CAPITOLA, CITY OF	060354	0356	F
SANTA CRUZ COUNTY	060353	0356	F

VERSION NUMBEF
2.3.2.(

MAP NUMBEF
06087C0356I

MAP REVISEI
SEPTEMBER 29, 201

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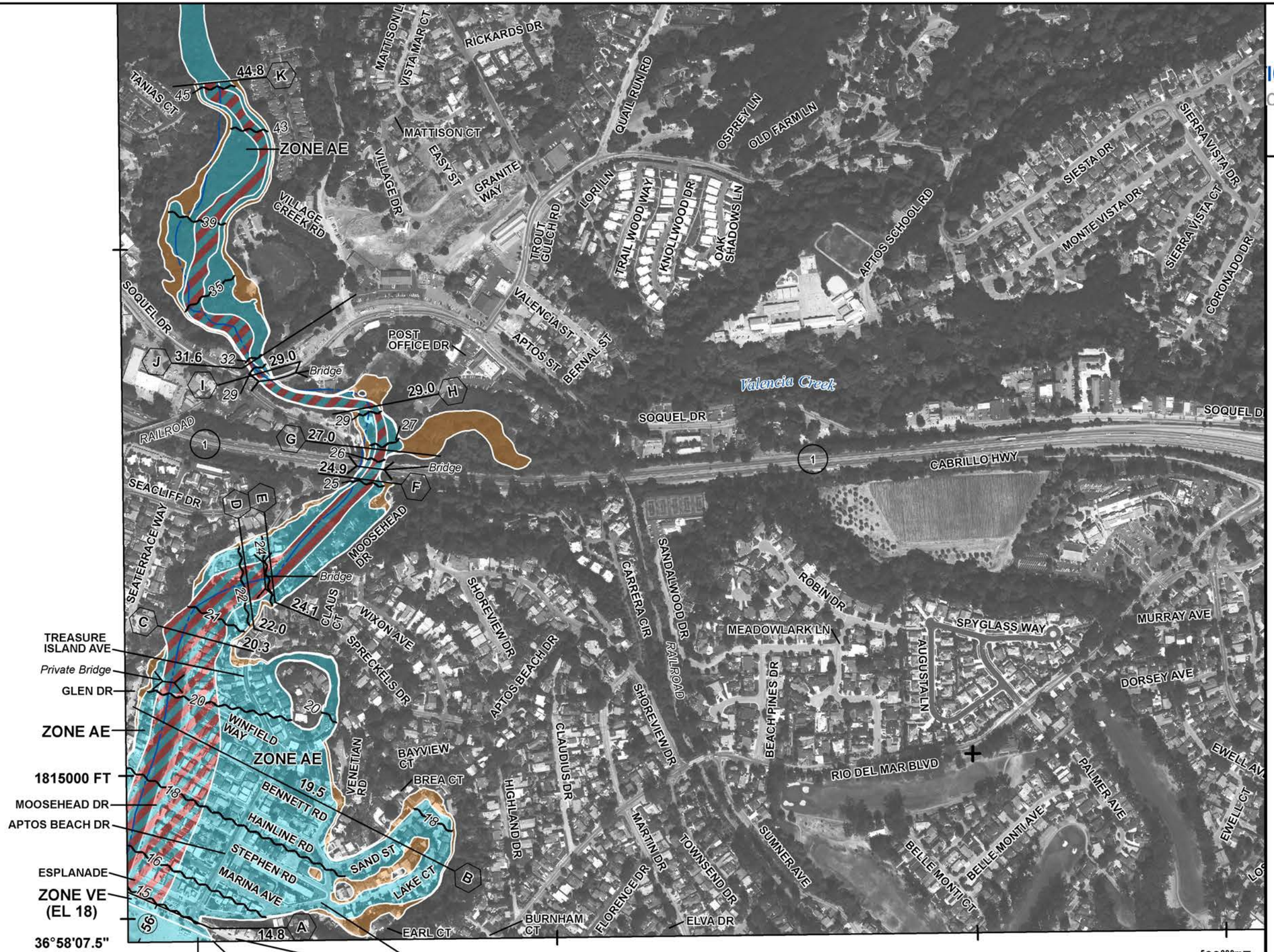
IONAL FLOOD INSURANCE PROGRAM

OD INSURANCE RATE MAP



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

SANTA CRUZ COUNTY, CALIFORNIA

and Incorporated Areas

PANEL 357 OF 470

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFD
SANTA CRUZ COUNTY	060353	0357	F

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Map Projection:
Universal Transverse Mercator Zone 10N; North Ame
Western Hemisphere; Vertical Datum: NAVD 88

N

1 inch = 500 feet

0 250 500 750 1,000

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

SANTA CRUZ COUNTY, CALIFORNIA

and Incorporated Areas

PANEL 378 OF 470

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
SANTA CRUZ COUNTY	060353	0378	F

VERSION NUMBER
2.3.2.0

MAP NUMBER
06087C0378F

MAP REVISED
SEPTEMBER 29, 2017

Map Projection:
Universal Transverse Mercator Zone 10N; North Amer
Western Hemisphere; Vertical Datum: NAVD 88

N

1 inch = 1,000 feet

0 1,000 2,000

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

SANTA CRUZ COUNTY, CALIFORNIA
and Incorporated Areas

PANEL 380 OF 470

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
SANTA CRUZ COUNTY	060353	0380	F

VERSION NUMBER
2.3.2.0

MAP NUMBER
06087C0380F

MAP REVISED
SEPTEMBER 29, 2017

SEE FLOOD INSURANCE RATE MAP FOR BASE FLOOD ELEVATIONS AND COASTAL TRANSECT DATA TABLE FOR STILLWATER ELEVATIONS

LIMIT OF DETAILED STUDY

SPRECKELS DRIVE

PRIVATE BRIDGE

ELEVATIONS DOWNSTREAM OF THIS POINT CONTROLLED BY PACIFIC OCEAN

A B C D E

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

ELEVATION IN FEET (NAVD)

30 25 20 15 10 5 0 −5 −10 −15

0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000 2,200 2,400 2,600

STREAM DISTANCE IN FEET ABOVE MOUTH AT PACIFIC OCEAN

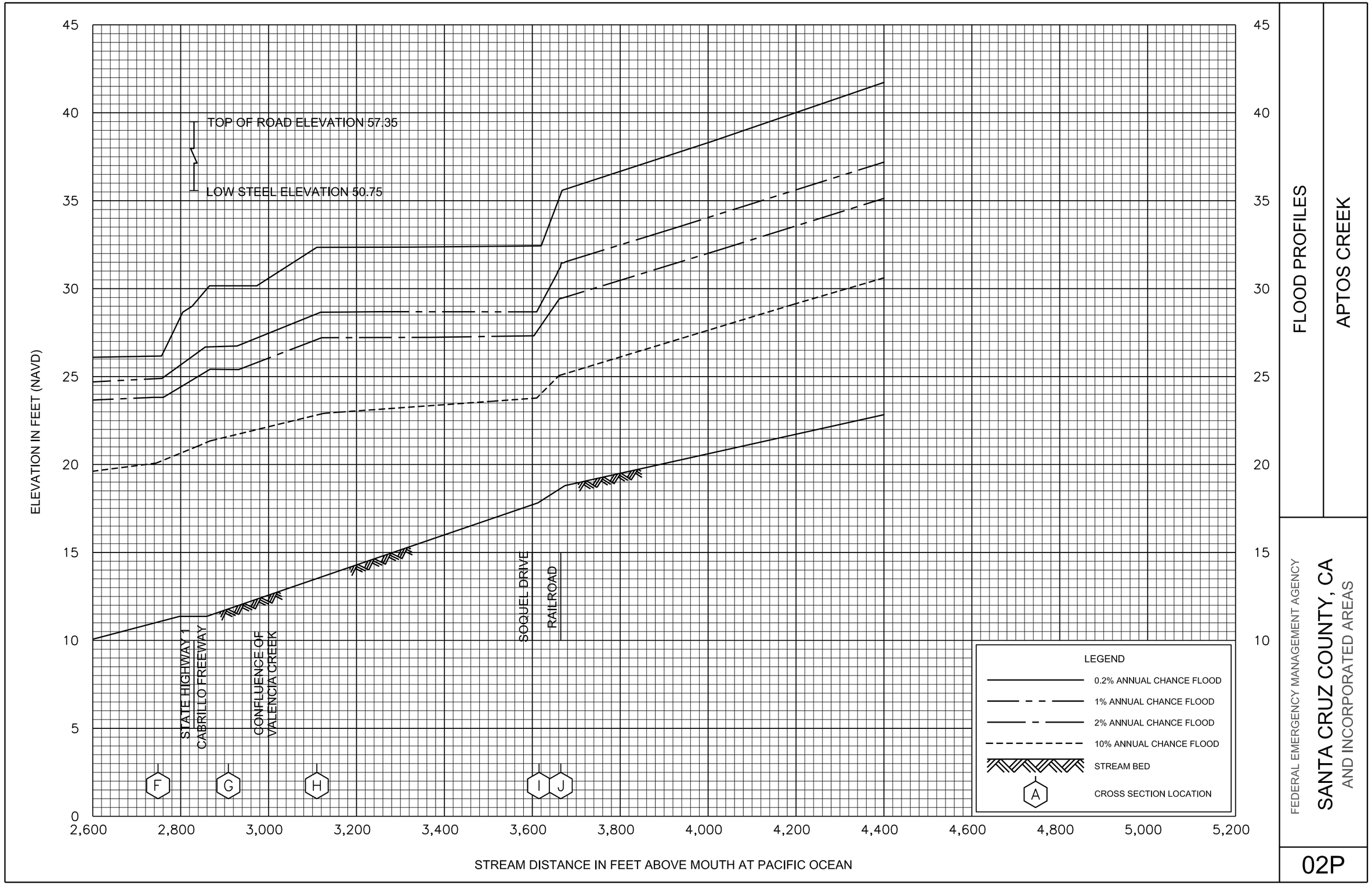
FLOOD PROFILES

APTOS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SANTA CRUZ COUNTY, CA
AND INCORPORATED AREAS

01P



FLOOD PROFILES

APTOS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SANTA CRUZ COUNTY, CA
AND INCORPORATED AREAS

02P

Appendix D NOAA Atlas 14 Rainfall Intensity

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NOAA Atlas 14, Volume 6, Version 2
Location name: Aptos, California, USA*
Latitude: 36.9752°, Longitude: -121.9019°
Elevation: 19.78 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.04 (1.78-2.38)	2.47 (2.14-2.87)	3.04 (2.63-3.55)	3.50 (3.00-4.14)	4.16 (3.42-5.14)	4.68 (3.74-5.93)	5.22 (4.04-6.80)	5.78 (4.32-7.81)	6.56 (4.67-9.34)	7.19 (4.90-10.7)
10-min	1.46 (1.27-1.70)	1.77 (1.54-2.06)	2.18 (1.88-2.54)	2.51 (2.15-2.97)	2.99 (2.45-3.68)	3.35 (2.68-4.24)	3.74 (2.90-4.88)	4.15 (3.10-5.60)	4.71 (3.34-6.70)	5.15 (3.51-7.64)
15-min	1.18 (1.02-1.37)	1.43 (1.24-1.66)	1.76 (1.52-2.05)	2.03 (1.74-2.39)	2.41 (1.97-2.96)	2.70 (2.16-3.42)	3.02 (2.34-3.93)	3.34 (2.50-4.51)	3.80 (2.70-5.40)	4.16 (2.83-6.16)
30-min	0.818 (0.710-0.950)	0.988 (0.856-1.15)	1.22 (1.05-1.42)	1.40 (1.20-1.66)	1.67 (1.37-2.05)	1.87 (1.50-2.37)	2.09 (1.62-2.72)	2.31 (1.73-3.13)	2.63 (1.87-3.74)	2.88 (1.96-4.27)
60-min	0.571 (0.496-0.664)	0.689 (0.598-0.803)	0.848 (0.733-0.991)	0.980 (0.839-1.16)	1.16 (0.954-1.43)	1.31 (1.04-1.65)	1.46 (1.13-1.90)	1.62 (1.21-2.18)	1.84 (1.30-2.61)	2.01 (1.37-2.98)
2-hr	0.422 (0.367-0.492)	0.506 (0.440-0.590)	0.620 (0.536-0.724)	0.716 (0.612-0.845)	0.850 (0.697-1.05)	0.956 (0.764-1.21)	1.07 (0.827-1.39)	1.19 (0.888-1.60)	1.35 (0.961-1.92)	1.49 (1.01-2.20)
3-hr	0.354 (0.308-0.412)	0.424 (0.368-0.494)	0.519 (0.449-0.607)	0.600 (0.513-0.708)	0.713 (0.585-0.878)	0.804 (0.642-1.02)	0.899 (0.696-1.17)	1.00 (0.748-1.35)	1.14 (0.812-1.62)	1.26 (0.856-1.87)
6-hr	0.247 (0.215-0.288)	0.298 (0.259-0.347)	0.367 (0.317-0.429)	0.426 (0.364-0.502)	0.508 (0.417-0.626)	0.574 (0.459-0.726)	0.644 (0.499-0.840)	0.718 (0.537-0.970)	0.823 (0.585-1.17)	0.908 (0.618-1.35)
12-hr	0.160 (0.139-0.186)	0.198 (0.171-0.230)	0.248 (0.215-0.290)	0.291 (0.249-0.344)	0.352 (0.289-0.434)	0.401 (0.320-0.507)	0.452 (0.350-0.589)	0.506 (0.379-0.684)	0.583 (0.414-0.829)	0.645 (0.439-0.957)
24-hr	0.105 (0.096-0.118)	0.133 (0.121-0.150)	0.171 (0.155-0.193)	0.203 (0.182-0.230)	0.246 (0.213-0.290)	0.281 (0.238-0.338)	0.317 (0.261-0.392)	0.354 (0.284-0.451)	0.407 (0.312-0.541)	0.448 (0.332-0.619)
2-day	0.067 (0.061-0.075)	0.085 (0.078-0.096)	0.110 (0.099-0.124)	0.129 (0.116-0.147)	0.156 (0.135-0.184)	0.177 (0.150-0.213)	0.198 (0.163-0.244)	0.219 (0.176-0.279)	0.248 (0.190-0.330)	0.271 (0.200-0.373)
3-day	0.051 (0.046-0.057)	0.065 (0.059-0.073)	0.084 (0.076-0.094)	0.098 (0.088-0.112)	0.118 (0.102-0.139)	0.133 (0.113-0.160)	0.148 (0.122-0.183)	0.163 (0.131-0.208)	0.184 (0.141-0.245)	0.200 (0.148-0.276)
4-day	0.043 (0.039-0.048)	0.054 (0.049-0.061)	0.070 (0.063-0.078)	0.082 (0.073-0.093)	0.098 (0.085-0.115)	0.110 (0.093-0.133)	0.122 (0.101-0.151)	0.135 (0.108-0.171)	0.151 (0.116-0.201)	0.164 (0.121-0.226)
7-day	0.030 (0.027-0.034)	0.038 (0.035-0.043)	0.049 (0.044-0.055)	0.057 (0.051-0.065)	0.068 (0.059-0.081)	0.077 (0.065-0.092)	0.085 (0.070-0.105)	0.093 (0.075-0.119)	0.104 (0.080-0.139)	0.113 (0.083-0.155)
10-day	0.024 (0.021-0.026)	0.030 (0.027-0.034)	0.038 (0.035-0.043)	0.045 (0.040-0.051)	0.053 (0.046-0.063)	0.060 (0.051-0.072)	0.066 (0.054-0.082)	0.072 (0.058-0.092)	0.081 (0.062-0.107)	0.087 (0.064-0.120)
20-day	0.015 (0.014-0.017)	0.020 (0.018-0.022)	0.025 (0.023-0.028)	0.029 (0.026-0.034)	0.035 (0.030-0.041)	0.039 (0.033-0.047)	0.043 (0.035-0.053)	0.047 (0.037-0.059)	0.052 (0.040-0.069)	0.055 (0.041-0.076)
30-day	0.012 (0.011-0.014)	0.016 (0.015-0.018)	0.021 (0.019-0.023)	0.024 (0.021-0.027)	0.028 (0.024-0.033)	0.031 (0.027-0.038)	0.034 (0.028-0.043)	0.037 (0.030-0.048)	0.041 (0.032-0.055)	0.044 (0.032-0.060)
45-day	0.010 (0.009-0.011)	0.013 (0.012-0.015)	0.017 (0.015-0.019)	0.019 (0.017-0.022)	0.023 (0.020-0.027)	0.025 (0.021-0.031)	0.028 (0.023-0.034)	0.030 (0.024-0.038)	0.033 (0.025-0.043)	0.035 (0.026-0.048)
60-day	0.009 (0.008-0.010)	0.012 (0.011-0.013)	0.015 (0.013-0.017)	0.017 (0.015-0.019)	0.020 (0.017-0.023)	0.022 (0.019-0.026)	0.024 (0.020-0.030)	0.026 (0.021-0.033)	0.028 (0.021-0.037)	0.030 (0.022-0.041)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

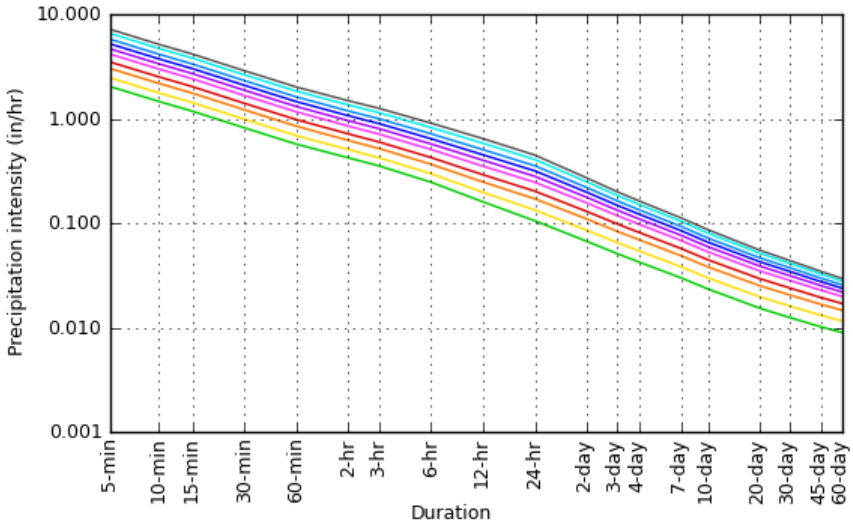
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

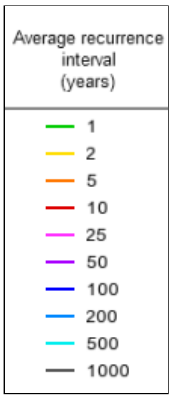
Please refer to NOAA Atlas 14 document for more information.

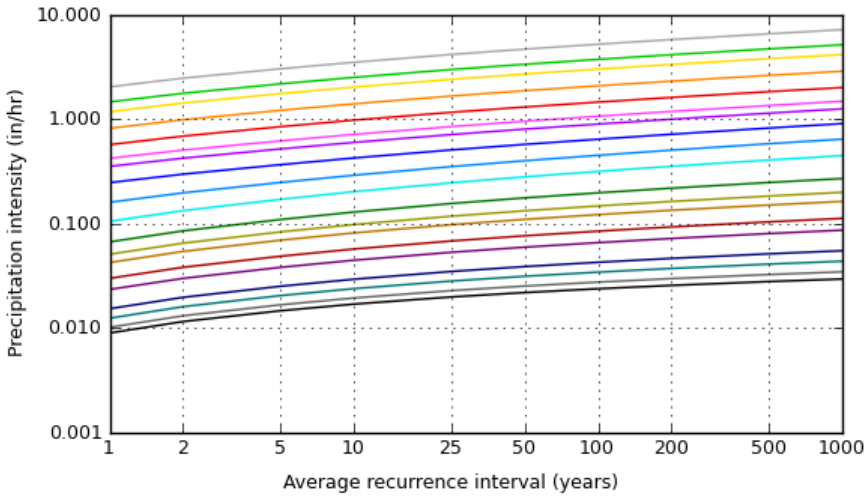
Back to Top

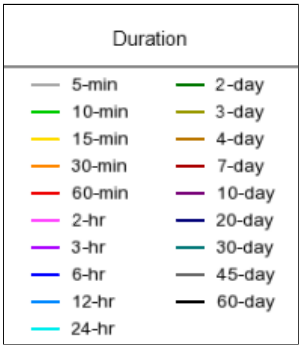
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 36.9752°, Longitude: -121.9019°









NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Fri Feb 4 23:59:57 2022

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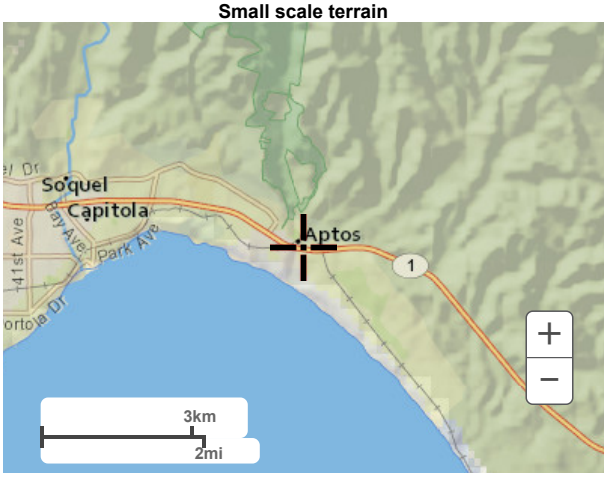
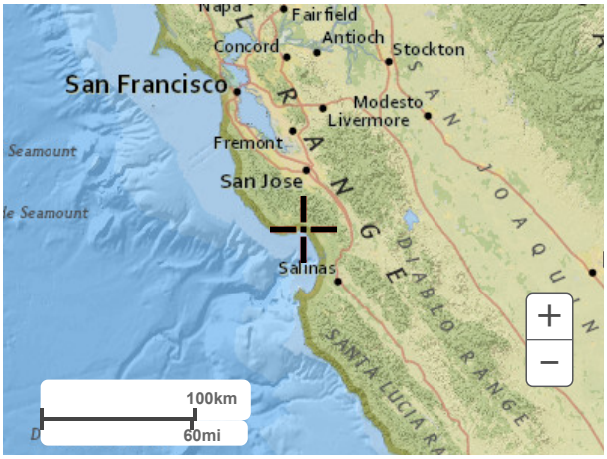
Maps & aerials

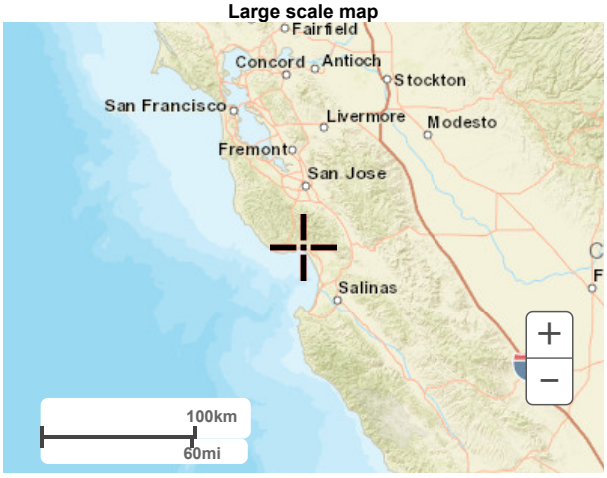
Small scale terrain



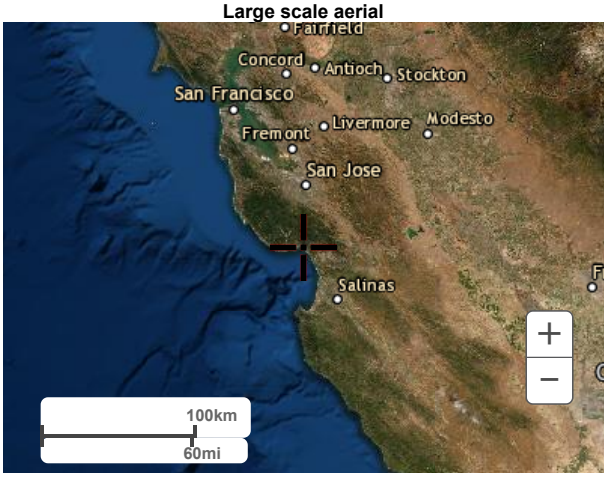
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

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Appendix E Project's Draft Preliminary Drainage Cost Estimate

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PROJECT

PROJECT PA/ED COST ESTIMATE

EA: 05-0C7340 PID: 05-1800-0116

EA: 05-0C7340

PID: 05-1800-0116

District-County-Route: 05-SCr-1

PM: 8.10-10.70

Type of Estimate : PA/ED

Program Code : 20.xx.075.600 STIP-RIP, 20.xx.400.100 Local, 20.30.010.810 RSTP

Project Limits : Along State Route 1 between the Freedom Boulevard interchange and Rio Del Mar interchange and State Park Drive interchange

Project Description: Freeway outside and median widening, widening of Aptos Creek bridge, replacemement of two rail bridges over highway 1, various sound and retaining walls.

Scope : Freeway Widening for Auxiliary Lanes, Bus on Shoulder Improvements

SUMMARY OF PROJECT COST ESTIMATE

	Current Year Cost	Escalated Cost
TOTAL ROADWAY COST	$ 53,520,000	$ 58,830,000
TOTAL STRUCTURES COST	$ 19,940,000	$ 21,920,000
SUBTOTAL CONSTRUCTION COST	$ 73,460,000	$ 80,750,000
TOTAL RIGHT OF WAY COST	$ 3,750,000	$ 3,910,000
TOTAL CAPITAL OUTLAY COSTS	$ 77,210,000	$ 84,660,000
PA/ED SUPPORT		
PS&E SUPPORT	$ 8,000,000	$ 8,000,000
RIGHT OF WAY SUPPORT	$ 375,000	$ 375,000
CONSTRUCTION SUPPORT	$ 7,346,000	$ 7,346,000
TOTAL SUPPORT COST	$ 15,721,000	$ 15,721,000
TOTAL PROJECT COST	$ 93,000,000	$ 101,000,000

Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2021
Estimated Construction Start (Month/Year)	3	/	2025
Number of Working Days =	500		
Estimated Mid-Point of Construction (Month/Year)	7	/	2026
Estimated Construction End (Month/Year)	3	/	2028
Number of Plant Establishment Days			

Estimated Project Schedule

PID Approval	
PA/ED Approval	Spring 2022
PS&E	Fall 2024
RTL	Winter 2024
Begin Construction	Spring 2025

Approved by Project Manager

David Williams, PE, Consultant Project Manager **Date** **Phone**

I. ROADWAY ITEMS SUMMARY

	Section		Cost
1	**Earthwork**	$	3,385,400
2	**Pavement Structural Section**	$	5,805,700
3	**Drainage**	$	2,010,220
4	**Specialty Items**	$	10,080,500
5	**Environmental**	$	5,575,600
6	**Traffic Items**	$	6,288,000
7	**Detours**	$	500,000
8	**Minor Items**	$	2,530,900
9	**Roadway Mobilization**	$	3,416,700
10	**Supplemental Work**	$	1,708,400
11	**State Furnished**	$	1,000,000
12	**Time-Related Overhead**	$	2,631,100
13	**Roadway Contingency**	$	8,584,500
	TOTAL ROADWAY ITEMS	**$**	**53,517,020**

Estimate Prepared By :

Name, Project Engineer Date Phone

Estimate Reviewed By :

Name, Project Manager Date Phone

By signing this estimate you are attesting that you have discussed your project with all functional units and have incorporated all their comments or have discussed with them why they will not be incorporated.

EA: 05-0C7340 PID: 05-1800-0116

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)			Cost
190101	Roadway Excavation	CY	65,230	x	45.00	=	$	2,935,350
170103	Clearing & Grubbing	LS	1	x	350,000.00	=	$	350,000
100100	Develop Water Supply	LS	1	x	100,000.00	=	$	100,000

TOTAL EARTHWORK SECTION ITEMS	$	3,385,400

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
390132	Hot Mix Asphalt (Type A)	TON	16,102	x	120.00	=	$	1,932,240
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON	8,051	x	170.00	=	$	1,368,670
260203	Class 2 Aggregate Base	CY	41,745	x	60.00	=	$	2,504,700

TOTAL PAVEMENT STRUCTURAL SECTION ITEMS	$	5,805,700

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150820	Modify Inlet	EA	43	x	4,000.00	=	$	172,000
XXXXXX	Additional Drainage (20% of Section 1 and 2)	LS	1	x	1,838,220.00	=	$	1,838,220

TOTAL DRAINAGE ITEMS	**$**	**2,010,220**

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
080050	Progress Schedule (Critical Path Method)	LS	1	x	15,000.00	=	$	15,000
582001	Sound Wall (Masonry Block)	SQFT	31,000	x	60.00	=	$	1,860,000
600017	Standard Retaining Wall (Fill)	SQFT	0	x	120.00	=	$	-
070030	Standard Retaining Wall (Cut)	SQFT	0	x	120.00	=	$	-
153221	Remove Concrete Barrier	LF	9,415	x	30.00	=	$	282,450
839752	Remove Guardrail	LF	2,705	x	25.00	=	$	67,625
832006	Midwest Guardrail System	LF	1,200	x	50.00	=	$	60,000
832011	Midwest Guardrail System (Special)	LF	300	x	300.00	=	$	90,000
839642	Concrete Barrier (60M)	LF	11,734	x	150.00	=	$	1,760,100
XXXXXX	Concrete Barrier (60MD)	LF	21,252	x	150.00	=	$	3,187,800

TOTAL SPECIALTY ITEMS	**$**	**10,080,500**

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost		
	Biological Mitigation	LS	1	x	1,000,000.00	=	$	1,000,000		
								Subtotal Environmental Mitigation	*$*	*1,000,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost		
20XXXX	Highway Planting	LS	1	x	650,000.00	=	$	650,000		
20XXXX	Irrigation System	LS	1	x	850,000.00	=	$	850,000		
								Subtotal Landscape and Irrigation	*$*	*1,500,000*

5C - EROSION CONTROL

Item code		Unit	Quantity		Unit Price ($)			Cost		
21XXXX	Erosion Control	LS	1	x	500,000.00	=	$	500,000		
21XXXX	Permanent Treatment BMPs	LS	1	x	250,000.00	=	$	250,000		
								Subtotal Erosion Control	*$*	*750,000*

5D - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost		
130300	Prepare SWPPP	LS	1	x	20,000.00	=	$	20,000		
130100	Job Site Management	LS	1	x	250,000.00	=	$	250,000		
130330	On-Site Stormwater Treatment BMP	LS	1	x	200,000.00	=	$	200,000		
130310	Off-Site Stormwater Treatment BMP	LS	1	x	250,000.00	=	$	250,000		
130520	Construction BMP (3% of Roadway Items)	LS	1	x	1,605,510.60	=	$	1,605,511		
								Subtotal NPDES	*$*	*2,325,511*

								TOTAL ENVIRONMENTAL	**$**	**5,575,600**

Supplemental Work for NPDES

066595	Water Pollution Control Maintenance Sharing*	LS		x		=	$	-		
066596	Additional Water Pollution Control**	LS		x		=	$	-		
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-		
XXXXXX	Some Item	LS		x		=	$	-		
								Subtotal Supplemental Work for NDPS	*$*	*-*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
15075X	Remove Sign Structure	LS	3	x	5,000.00	=	$	15,000
5602XX	Install Sign Structure	LS	3	x	300,000.00	=	$	900,000
XXXXX	Misc Electrical	LS	1	x	300,000.00	=	$	300,000

Subtotal Traffic Electrical $ *1,215,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
566011	Signing	LS	1	x	20,000.00	=	$	20,000
150742	Remove Roadside Sign	LS	1	x	3,000.00	=	$	3,000
120090	Construction Area Signs	LS	1	x	50,000.00	=	$	50,000
84XXXX	Pavement Marker (Reflective)	LS	1	x	500,000.00	=	$	500,000
84XXXX	Pavement Striping	LS	1	X	500,000.00	=	$	500,000

Subtotal Traffic Signing and Striping $ *1,073,000*

6C - Traffic Management Plan

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Traffic Management Plan	LS	1	x	$ 750,000	=	$	750,000

Subtotal Traffic Management Plan $ *750,000*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	1	x	1,500,000.00	=	$	1,500,000
129000	Temporary Railing (Type K)	LF	50,000	x	15.00	=	$	750,000
XXXXXX	Traffic Handling	LS	1	x	1,000,000.00	=	$	1,000,000

Subtotal Stage Construction and Traffic Handling $ *3,250,000*

TOTAL TRAFFIC ITEMS **$ 6,288,000**

SECTION 7: DETOURS

Includes constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
XXXXXX	Detour Items	LS	1	x	500,000	= $	500,000

* Includes constructing, maintaining, and removal

TOTAL DETOURS **$ 500,000**

SUBTOTAL SECTIONS 1 through 7 $ 31,635,200

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items							
	ADA Items				0.0%	$	-
8B - Bike Path Items							
	Bike Path Items				0.0%	$	-
8C - Other Minor Items							
	Other Minor Items				8.0%	$	2,530,816
	Total of Section 1-7	$	31,635,200	x	8.0%	= $	2,530,816

TOTAL MINOR ITEMS **$ 2,530,900**

SECTIONS 9: ROADWAY MOBILIZATION

Item code							
999990	Total Section 1-8	$	34,166,100	x	10%	= $	3,416,610

TOTAL ROADWAY MOBILIZATION **$ 3,416,700**

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
XXXXXX	Some Item	Unit		x		= $	-
	*Cost of **NPDES** Supplemental Work specified in Section 5D*					= $	-
	Total Section 1-8	$	34,166,100		5%	= $	1,708,305

TOTAL SUPPLEMENTAL WORK **$ 1,708,400**

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066105	Resident Engineers Office	LS	1	x	500,000.00	=	$500,000
066063	Traffic Management Plan - Public Information	LS	1	x	500,000.00	=	$500,000

TOTAL STATE FURNISHED **$1,000,000**

SECTION 12: TIME-RELATED OVERHEAD

Total of Roadway and Structures Contract Items excluding Mobilization $52,620,135 (used to calculate TRO)

Total Construction Cost (excluding TRO and Contingency) $60,221,558 (used to check if project is greater than $5 million excluding contingency)

Estimated Time-Related Overhead (TRO) Percentage (0% to 10%) = **5%**

Item code		Unit	Quantity		Unit Price ($)		Cost
090100	Time-Related Overhead	WD	500	X	$5,262	=	$2,631,100

TOTAL TIME-RELATED OVERHEAD **$2,631,100**

SECTION 13: ROADWAY CONTINGENCY

Total Section 1-12	$	42,922,300	x	**20%**	=	$8,584,460	

TOTAL CONTINGENCY **$8,584,500**

EA: 05-0C7340 PID: 05-1800-0116

II. STRUCTURE ITEMS

	Aptos Creek Br (Widen)	South Aptos UP (Remove)	North Aptos UP (Remove)
DATE OF ESTIMATE	10/27/2021	10/27/2021	10/27/2021
Bridge Name	Aptos Creek Bridge	South Aptos UP	North Aptos UP
Bridge Number	36-0011	36-0003	36-0012
Structure Type	CIP R/C Box Girder	Steel Girder	Steel Through Girder
Width (Feet) [out to out]	43.66 LF	23.00 LF	24.50 LF
Total Bridge Length (Feet)	260.00 LF	92.00 LF	137.25 LF
Total Area (Square Feet)	11352 SQFT	2116 SQFT	3363 SQFT
Structure Depth (Feet)	3.5 LF	5.50 LF	4.75 LF
Footing Type (pile or spread)	Pile	Pile	Spread
Cost Per Square Foot	$450.00	$140.00	$88.00
COST OF EACH	**$5,108,220**	**$296,240**	**$295,911**

	Walls 1, 2, 3 & 4	Walls 5, 6 & 7	Walls 8 & 9
DATE OF ESTIMATE	10/27/2021	10/27/2021	10/27/2021
Wall Name	RW No. 1, 2, 3 & 4	RW No. 5, 6 & 7	RW No. 8 & 9
Bridge Number	36E-XXXX	36E-XXXX	36E-XXXX
Structure Type	Subhorizontal Ground Anchor	Type 7 and MSE	Soil Nail
Width (Feet) [out to out]	N/A LF	N/A LF	N/A LF
Total Building Length (Feet)	1069 LF	857 LF	1471 LF
Total Area (Square Feet)	17475 SQFT	13839 SQFT	24770 SQFT
Structure Depth (Feet)	N/A LF	N/A LF	N/A LF
Footing Type (pile or spread)	N/A	N/A	N/A
Cost Per Square Foot	$182.00	$153.00	$152.00
COST OF EACH	**$3,180,450**	**$2,117,367**	**$3,765,040**

TOTAL COST OF BRIDGES		**$5,700,371**
TOTAL COST OF WALLS		**$9,062,857**
STRUCTURES MOBILIZATION	10%	**$1,476,323**

Recommended Contingency: (Pre-PSR 30%-50%, PSR 25%, Draft PR 20%, PR 15%, after PR approval 10%, Final PS&E 5%)
Total recommended percentages includes any quantified risk based contingency from the risk register.

STRUCTURES CONTINGENCY	25%	**$3,690,807**
TOTAL COST OF STRUCTURES		**$19,930,358**

Estimate Prepared By: _____ _____

XXXXXXXXXXXXXXXX ------ Division of Structures | Date

EA: 05-0C7340 PID: 05-1800-0116

III. RIGHT OF WAY

Fill in all of the available information from the Right of Way Data Sheet.

A)	A1)	Acquisition, including Excess Land Purchases, Damages & Goodwill, Fees	$	0
	A2)	SB-1210	$	0
	A3)	TCEs	$	1,500,000
B)		Acquisition of Offsite Mitigation	$	1,000,000
C)	C1)	Utility Relocation (State Share)	$	1,000,000
	C2)	Potholing (Design Phase)	$	250,000
D)		Railroad Acquisition	$	0
E)		Clearance / Demolition	$	0
F)		Relocation Assistance (RAP and/or Last Resort Housing Costs)	$	0
G)		Title and Escrow	$	0
H)		Environmental Review	$	0
I)		Condemnation Settlements 0%	$	0
J)		Design Appreciation Factor 0%	$	0
K)		Utility Relocation (Construction Cost)	$	0

L)	**TOTAL RIGHT OF WAY ESTIMATE**	**$3,750,000**
M)	**TOTAL R/W ESTIMATE: Escalated**	**$3,907,500**
N)	**RIGHT OF WAY SUPPORT**	**$375,000**

Support Cost Estimate Prepared By _____ Project Coordinator[1] Phone

Utility Estimate Prepared By _____ Utility Coordinator[2] Phone

R/W Acquisition Estimate Prepared By _____ Right of Way Estimator[3] Phone

Note: Items G & H applied to items A + B

[1] When estimate has Support Costs only [2] When estimate has Utility Relocation [3] When R/W Acquisition is required

DO NOT PRINT THIS SHEET AS PART OF COST ESTIMATE ATTACHMENT TO PROJECT INITIATION OR APPROVAL DOCUMENTS.

EA: 05-0C7340 PID: 05-1800-0116

IV. SUPPORT COST ESTIMATE SUMMARY

Run a Support Cost Estimate Summary report (D11 Project Management Support onramp) for component data.

		Unescalated-Risk Loaded					Escalated (3.2% per year for ETC, effective 1/2/2018)				
Total by FY		PA&ED	PS&E	RW	CON	Total $	PA&ED	PS&E	RW	CON	Total $
<2016	Expended										
	ETC										
2017	Expended										
	ETC										
2018	Expended										
	ETC										
2019	Expended										
	ETC										
2020	Expended										
	ETC										
2021	Expended										
	ETC		$8,000,000	375000		$8,375,000		$8,256,000	$387,000		$8,643,000
2022	Expended										
	ETC										
2023	Expended										
	ETC										
2024	Expended										
	ETC							$0	$0		
2025	Expended										
	ETC										
2026	Expended										
	ETC				$7,346,000	$7,346,000				$7,823,666	$7,823,666
2027	Expended										
	ETC										
2028	Expended										
	ETC										
2029	Expended										
	ETC										
>2030	Expended										
	ETC										
EAC (Expended + ETC)		$0	$8,000,000	$375,000	$7,346,000	$15,721,000	$0	$8,256,000	$387,000	$7,823,666	$16,466,666
Risk Amount from Risk Register		$0	$0	$0	$0	Escalated Risk Amount	$0	$0	$0	$0	$0
Support Escalation Rate		0.0%	0.0%	0.0%	0.0%						
Duration to mid-point component		0.00	0.00	0.00	0.00						
Total including Risk Amount		$0	$8,000,000	$375,000	$7,346,000	Total Esc. Support Cost	$0	$8,256,000	$387,000	$7,823,666	$16,466,666
Approved Budget (PRSM)											
Difference (Budget - EAC)		$0	-$8,000,000	-$375,000	-$7,346,000	-$15,721,000	$0	-$8,256,000	-$387,000	-$7,823,666	-$16,466,666
Support Ratio (EAC / Cap Cost)		0.0%	9.4%	0.4%	8.7%	18.6%	0.0%	9.8%	0.5%	9.2%	19.5%

Note: If you have alr

Total Capital Cost:	$84,660,000
Total Capital Outlay Support Cost:	$16,466,666
Overall Percent Support Cost:	19.45%

PRSM workplan hours/costs verified against approved MWA:

Office Chief - Date

Approved by:

Project Control - Date

PROJECT

PROJECT PA/ED COST ESTIMATE

EA: 05-0C7340

EA: 05-0C7340 PID: 05-1800-0116

PID: 05-1800-0116

District-County-Route: 05-SCr-1

PM: 8.10-10.70

Type of Estimate : PA/ED

Program Code : 20.xx.075.600 STIP-RIP, 20.xx.400.100 Local, 20.30.010.810 RSTP

Project Limits : Coastal Rail Trail Segment 12

Project Description: Interim Rail Trail

Scope : Coastal Rail Trail Segment 12

SUMMARY OF PROJECT COST ESTIMATE

	Current Year Cost	Escalated Cost
TOTAL ROADWAY COST	$ 7,910,000	$ 8,693,919
TOTAL STRUCTURES COST	$ 10,140,000	$ 11,144,922
SUBTOTAL CONSTRUCTION COST	$ 18,050,000	$ 19,838,841
TOTAL RIGHT OF WAY COST	$ 100,000	$ 104,200
TOTAL CAPITAL OUTLAY COSTS	$ 18,150,000	$ 19,944,000
PA/ED SUPPORT		
PS&E SUPPORT	$ 791,000	$ 791,000
RIGHT OF WAY SUPPORT	$ 10,000 0	$ 10,000
CONSTRUCTION SUPPORT	$ 1,805,000	$ 1,805,000
TOTAL SUPPORT COST	$ 2,606,000	$ 2,606,000
TOTAL PROJECT COST	$ 20,800,000	$ 22,550,000

Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2021
Estimated Construction Start (Month/Year)	3	/	2025
Number of Working Days =	250		
Estimated Mid-Point of Construction (Month/Year)	3	/	2026
Estimated Construction End (Month/Year)	3	/	2027

Number of Plant Establishment Days

Estimated Project Schedule

PA/ED Approval	Spring 2022
PS&E	Fall 2024
RTL	Winter 2024
Begin Construction	Spring 2025

Approved by Project Manager

David Williams, PE, Consultant Project Manager **Date** **Phone**

I. ROADWAY ITEMS SUMMARY

	Section		Cost
1	**Earthwork**	$	141,300
2	**Pavement Structural Section**	$	644,700
3	**Drainage**	$	221,250
4	**Specialty Items**	$	1,504,900
5	**Environmental**	$	1,317,200
6	**Traffic Items**	$	817,000
7	**Detours**	$	-
8	**Minor Items**	$	354,100
9	**Roadway Mobilization**	$	478,000
10	**Supplemental Work**	$	439,000
11	**State Furnished**	$	-
12	**Time-Related Overhead**	$	708,200
13	**Roadway Contingency**	$	1,280,900
	TOTAL ROADWAY ITEMS	**$**	**7,906,550**

Estimate Prepared By :

Name, Project Engineer | Date | Phone

Estimate Reviewed By :

Name, Project Manager | Date | Phone

By signing this estimate you are attesting that you have discussed your project with all functional units and have incorporated all their comments or have discussed with them why they will not be incorporated.

EA: 05-0C7340 PID: 05-1800-0116

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)			Cost
190101	Roadway Excavation	CY	1,193	x	90.00	=	$	107,370
198010	Imported Borrow	CY	48	x	80.00	=	$	3,840
170103	Clearing & Grubbing	LS	1	x	30,000.00	=	$	30,000

TOTAL EARTHWORK SECTION ITEMS	**$**	**141,300**

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
390132	Hot Mix Asphalt (Type A)	TON	2,633	x	170.00	=	$	447,610
260203	Class 2 Aggregate Base	CY	1,970	x	100.00	=	$	197,000

TOTAL PAVEMENT STRUCTURAL SECTION ITEMS	**$**	**644,700**

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
15080X	Culvert	LF	43	x	500.00	=	$	21,250
XXXXXX	Additional Drainage	LS	1	x	200,000.00	=	$	200,000

TOTAL DRAINAGE ITEMS	$	221,250

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
080050	Progress Schedule (Critical Path Method)	LS	1	x	5,000.00	=	$	5,000
XXXXXX	Standard Retaining Wall (Fill)	SQFT	2,000	x	100.00	=	$	200,000
XXXXXX	Post and Wire Fence	LF	13,328	x	30.00	=	$	399,840
XXXXXX	Remove Railroad Track and Ties	LS	1	x	900,000	=	$	900,000

TOTAL SPECIALTY ITEMS	$	1,504,900

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost		
	Biological Mitigation	LS	1	x	250,000.00	=	$	250,000		
								Subtotal Environmental Mitigation	*$*	*250,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost		
20XXXX	Planting	LS	1	x	100,000.00	=	$	100,000		
20XXXX	Irrigation System	LS	1	x	150,000.00	=	$	150,000		
								Subtotal Landscape and Irrigation	*$*	*250,000*

5C - EROSION CONTROL

Item code		Unit	Quantity		Unit Price ($)			Cost		
XXXXX	Erosion Control (Includes slope stabilization)	LS	1	x	250,000.00	=	$	250,000		
XXXXX	Permanent Erosion Control Measures	LS	1	x	250,000.00	=	$	250,000		
								Subtotal Erosion Control	*$*	*500,000*

5D - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost		
130300	Prepare SWPPP	LS	1	x	15,000.00	=	$	15,000		
130100	Job Site Management	LS	1	x	50,000.00	=	$	50,000		
130310	Rain Event Action Plan (REAP)	EA	1	x	15,000.00	=	$	15,000		
130730	Construction BMP's (3% of Roadway Items)	LS	1	x	237,196.50	=	$	237,197		
								Subtotal NPDES	*$*	*317,197*
								TOTAL ENVIRONMENTAL	**$**	**1,317,200**

Supplemental Work for NPDES

XXXXXX	Supplemental for Environment Items	LS	1	x	100,000.00	=	$	100,000		
								Subtotal Supplemental Work for NDPS	*$*	*100,000*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
860460	Lighting and Sign Illumination	LS	1	x	250,000.00	=	$	250,000
XXXXX	Misc electrical (Work at Crossings)	LS	1	x	250,000.00	=	$	250,000

Subtotal Traffic Electrical *$* *500,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
820840	Roadside Sign - One Post	EA	20	x	350.00	=	$	7,000
120090	Construction Area Signs	LS	1	x	10,000.00	=	$	10,000
84XXXX	Permanent Pavement Delineation	LS	1	x	25,000.00	=	$	25,000

Subtotal Traffic Signing and Striping *$* *42,000*

6C - Traffic Management Plan

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Traffic Management Plan (For crossings and intersections)	LS	1	x	$ 25,000	=	$	25,000

Subtotal Traffic Management Plan *$* *25,000*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Traffic Handling	LS	1	x	250,000.00	=	$	250,000

Subtotal Stage Construction and Traffic Handling *$* *250,000*

TOTAL TRAFFIC ITEMS **$** **817,000**

SECTION 7: DETOURS

Includes constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
XXXXXX	Detour Items	LS		x		=	$ -

* Includes constructing, maintaining, and removal

TOTAL DETOURS **$ -**

SUBTOTAL SECTIONS 1 through 7 $ 4,425,100

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items							
	ADA Items				3.0%	$	132,753
8B - Bike Path Items							
	Bike Path Items				3.0%	$	132,753
8C - Other Minor Items							
	Other Minor Items				2.0%	$	88,502
	Total of Section 1-7	$	4,425,100	x	8.0%	$	354,008

TOTAL MINOR ITEMS **$ 354,100**

SECTIONS 9: ROADWAY MOBILIZATION

Item code							
999990	Total Section 1-8	$	4,779,200	x	10%	$	477,920

TOTAL ROADWAY MOBILIZATION **$ 478,000**

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
XXXXXX	Some Item	Unit	1	x	100,000.00	=	$ 100,000
	*Cost of **NPDES** Supplemental Work specified in Section 5D*					=	$ 100,000
	Total Section 1-8	$	4,779,200		5%	=	$ 238,960

TOTAL SUPPLEMENTAL WORK **$ 439,000**

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
XXXXXX	Some Item	Unit		x		=	$0
	Total Section 1-8	$	4,779,200		0%	= $	-

TOTAL STATE FURNISHED **$0**

SECTION 12: TIME-RELATED OVERHEAD

Total of Roadway and Structures Contract Items excluding Mobilization $14,162,471 (used to calculate TRO)

Total Construction Cost (excluding TRO and Contingency) $15,830,132 (used to check if project is greater than $5 million excluding contingency)

Estimated Time-Related Overhead (TRO) Percentage (0% to 10%) = **5%**

Item code		Unit	Quantity		Unit Price ($)		Cost
090100	Time-Related Overhead	WD	250	X	$2,833	=	$708,200

TOTAL TIME-RELATED OVERHEAD **$708,200**

SECTION 13: ROADWAY CONTINGENCY

Total Section 1-12	$	6,404,400	x	**20%**	=	$1,280,880

TOTAL CONTINGENCY **$1,280,900**

II. STRUCTURE ITEMS

	South Aptos POC	North Aptos POC	Aptos Crk Deck Conv
DATE OF ESTIMATE	10/27/2021	10/27/2021	11/9/2021
Bridge Name	South Aptos POC	North Aptos POC	Aptos Creek UPRR Bridge
Bridge Number	36-XXXX	36-XXXX	36C-0077
Structure Type	Steel Truss	Steel Arch Truss	Steel Plate Girder
Width (Feet) [out to out]	18.66 LF	19.08 LF	18.00 LF
Total Bridge Length (Feet)	190.00 LF	290.00 LF	233.50 LF
Total Area (Square Feet)	3545 SQFT	5533 SQFT	4203 SQFT
Structure Depth (Feet)	2.0 LF	2.33 LF	12.25 LF
Footing Type (pile or spread)	Pile	Pile	Spread
Cost Per Square Foot	$378.00	$521.00	$265.00
COST OF EACH	**$1,340,161**	**$2,882,797**	**$1,113,795**

	Valencia Crk Deck Conv	RW 101	RW 102
DATE OF ESTIMATE	11/9/2021	11/9/2021	11/9/2021
Bridge Name	Valencia Creek UPRR Bridge	RW No. 101	RW No. 102
Bridge Number	36C-0069	36E-XXXX	36E-XXXX
Structure Type	Steel Plate Girder	Soldier Pile	Type 5
Width (Feet) [out to out]	18.00 LF	N/A LF	N/A LF
Total Bridge Length (Feet)	298.50 LF	314.50 LF	139.83 LF
Total Area (Square Feet)	5373 SQFT	3300 SQFT	800 SQFT
Structure Depth (Feet)	12.25 LF	N/A LF	N/A LF
Footing Type (pile or spread)	Spread	N/A	N/A
Cost Per Square Foot	$231.00	$255.00	$109.00
COST OF EACH	**$1,241,163**	**$841,500**	**$87,200**

TOTAL COST OF BRIDGES		**$6,577,916**
TOTAL COST OF WALLS		**$928,700**
STRUCTURES MOBILIZATION	10%	**$750,662**

Recommended Contingency: (Pre-PSR 30%-50%, PSR 25%, Draft PR 20%, PR 15%, after PR approval 10%, Final PS&E 5%)

Total recommended percentages includes any quantified risk based contingency from the risk register.

STRUCTURES CONTINGENCY	25%	**$1,876,654**
TOTAL COST OF STRUCTURES		**$10,133,932**

Estimate Prepared By: _____ _____

XXXXXXXXXXXXXXXX ------ Division of Structures Date

EA: 05-0C7340 PID: 05-1800-0116

III. RIGHT OF WAY

Fill in all of the available information from the Right of Way Data Sheet.

A)	A1)	Acquisition, including Excess Land Purchases, Damages & Goodwill, Fees	$	0
	A2)	SB-1210	$	0
B)		Acquisition of Offsite Mitigation	$	0
C)	C1)	Utility Relocation (State Share)	$	
	C2)	Potholing (Design Phase)	$	0
D)		Railroad Acquisition	$	0
E)		Clearance / Demolition	$	0
F)		Relocation Assistance (RAP and/or Last Resort Housing Costs)	$	0
G)		Title and Escrow	$	0
H)		Environmental Review	$	0
I)		Condemnation Settlements 0%	$	0
J)		Design Appreciation Factor 0%	$	0
K)		Utility Relocation (Construction Cost)	$	100,000

L)	**TOTAL RIGHT OF WAY ESTIMATE**	**$100,000**
M)	**TOTAL R/W ESTIMATE: Escalated**	**$104,200**
N)	**RIGHT OF WAY SUPPORT**	**$10,420**

Support Cost Estimate Prepared By _____
Project Coordinator[1] Phone

Utility Estimate Prepared By _____
Utility Coordinator[2] Phone

R/W Acquisition Estimate Prepared By _____
Right of Way Estimator[3] Phone

Note: Items G & H applied to items A + B

[1] When estimate has Support Costs only [2] When estimate has Utility Relocation [3] When R/W Acquisition is required

DO NOT PRINT THIS SHEET AS PART OF COST ESTIMATE ATTACHMENT TO PROJECT INITIATION OR APPROVAL DOCUMENTS.

EA: 05-0C7340 PID: 05-1800-0116

IV. SUPPORT COST ESTIMATE SUMMARY

Run a Support Cost Estimate Summary report (D11 Project Management Support onramp) for component data.

		Unescalated-Risk Loaded					Escalated (3.2% per year for ETC, effective 1/2/2018)				
Total by FY		PA&ED	PS&E	RW	CON	Total $	PA&ED	PS&E	RW	CON	Total $
<2016	Expended										
	ETC										
2017	Expended										
	ETC										
2018	Expended										
	ETC										
2019	Expended										
	ETC										
2020	Expended										
	ETC										
2021	Expended										
	ETC		791000	10000		$801,000		$816,312	$10,320		$826,632
2022	Expended										
	ETC										
2023	Expended										
	ETC										
2024	Expended										
	ETC										
2025	Expended										
	ETC										
2026	Expended										
	ETC				$1,805,000	$1,805,000				$1,922,368	$1,922,368
2027	Expended										
	ETC										
2028	Expended										
	ETC										
2029	Expended										
	ETC										
>2030	Expended										
	ETC										
EAC (Expended + ETC)		$0	$791,000	$10,000	$1,805,000	$2,606,000	$0	$816,312	$10,320	$1,922,368	$2,749,000
Risk Amount from Risk Register		$0	$0	$0	$0	Escalated Risk Amount	$0	$0	$0	$0	$0
Support Escalation Rate		0.0%	0.0%	0.0%	0.0%						
Duration to mid-point component		0.00	0.00	0.00	0.00						
Total including Risk Amount		$0	$791,000	$10,000	$1,805,000	Total Esc. Support Cost	$0	$816,312	$10,320	$1,922,368	$2,749,000
Approved Budget (PRSM)											
Difference (Budget - EAC)		$0	-$791,000	-$10,000	-$1,805,000	-$2,606,000	$0	-$816,312	-$10,320	-$1,922,368	-$2,749,000
Support Ratio (EAC / Cap Cost)		0.0%	4.0%	0.1%	9.1%	13.1%	0.0%	4.1%	0.1%	9.6%	13.8%

Note: If you have alr

Total Capital Cost:	$19,944,000
Total Capital Outlay Support Cost:	$2,749,000
Overall Percent Support Cost:	13.78%

PRSM workplan hours/costs verified against approved MWA:

Office Chief - Date

Approved by:

Project Control - Date

PROJECT

PROJECT PA/ED COST ESTIMATE

EA: 05-0C7340 PID: 05-1800-0116

EA: 05-0C7340

PID: 05-1800-0116

District-County-Route: 05-SCr-1

PM: 8.10-10.70

Type of Estimate : PA/ED

Program Code : 20.xx.075.600 STIP-RIP, 20.xx.400.100 Local, 20.30.010.810 RSTP

Project Limits : Coastal Rail Trail Segment 12

Project Description: Ultimate Rail Trail

Scope : Coastal Rail Trail Segment 12

SUMMARY OF PROJECT COST ESTIMATE

	Current Year Cost	Escalated Cost
TOTAL ROADWAY COST	$ 12,990,000	$ 14,277,371
TOTAL STRUCTURES COST	$ 23,860,000	$ 26,224,640
SUBTOTAL CONSTRUCTION COST	$ 36,850,000	$ 40,502,011
TOTAL RIGHT OF WAY COST	$ 8,480,000	$ 8,834,076
TOTAL CAPITAL OUTLAY COSTS	$ 45,330,000	$ 49,337,000
PA/ED SUPPORT		
PS&E SUPPORT	$ 1,298,915	$ 1,298,915
RIGHT OF WAY SUPPORT	$ 848,000	$ 848,000
CONSTRUCTION SUPPORT	$ 3,685,000	$ 3,685,000
TOTAL SUPPORT COST	$ 5,832,000	$ 5,832,000
TOTAL PROJECT COST *	$ 51,200,000	$ 55,200,000

Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2021
Estimated Construction Start (Month/Year)	3	/	2025
Number of Working Days =	500		
Estimated Mid-Point of Construction (Month/Year)	3	/	2026
Estimated Construction End (Month/Year)	3	/	2027
Number of Plant Establishment Days			

Estimated Project Schedule

PID Approval	
PA/ED Approval	Spring 2022
PS&E	Fall 2024
RTL	Winter 2024
Begin Construction	Spring 2025

*Costs to remove the rails and ties are not in this estimate

Approved by Project Manager

David Williams, PE, Consultant Project Manager **Date** **Phone**

I. ROADWAY ITEMS SUMMARY

	Section		Cost
1	**Earthwork**	$	363,500
2	**Pavement Structural Section**	$	630,200
3	**Drainage**	$	463,750
4	**Specialty Items**	$	2,965,000
5	**Environmental**	$	2,523,700
6	**Traffic Items**	$	1,417,000
7	**Detours**	$	-
8	**Minor Items**	$	632,000
9	**Roadway Mobilization**	$	853,200
10	**Supplemental Work**	$	626,600
11	**State Furnished**	$	-
12	**Time-Related Overhead**	$	426,600
13	**Roadway Contingency**	$	2,087,600
	TOTAL ROADWAY ITEMS	**$**	**12,989,150**

Estimate Prepared By :

Name, Project Engineer | Date | Phone

Estimate Reviewed By :

Name, Project Manager | Date | Phone

By signing this estimate you are attesting that you have discussed your project with all functional units and have incorporated all their comments or have discussed with them why they will not be incorporated.

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)			Cost
190101	Roadway Excavation	CY	3,578	x	90.00	=	$	322,020
19801X	Imported Borrow	CY	143	x	80.00	=	$	11,440
170103	Clearing & Grubbing	LS	1	x	30,000.00	=	$	30,000

TOTAL EARTHWORK SECTION ITEMS	**$**	**363,500**

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
390132	Hot Mix Asphalt (Type A)	TON	2,574	x	170.00	=	$	437,580
260203	Class 2 Aggregate Base	CY	1,926	x	100.00	=	$	192,600

TOTAL PAVEMENT STRUCTURAL SECTION ITEMS	**$**	**630,200**

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
15080X	Culvert	LF	128	x	500.00	=	$	63,750
XXXXXX	Drainage	LS	1	x	400,000.00	=	$	400,000

TOTAL DRAINAGE ITEMS $ 463,750

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
080050	Progress Schedule (Critical Path Method)	LS	1	x	15,000.00	=	$	15,000
510530	Standard Retaining Wall (Fill)	SQFT	24,000	x	100.00	=	$	2,400,000
600017	Standard Retaining Wall (Cut)	SQFT	1,600	x	100.00	=	$	160,000
XXXXXX	Post and Wire Fence	LF	12,998	x	30.00	=	$	389,940

TOTAL SPECIALTY ITEMS $ 2,965,000

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost		
	Biological Mitigation	LS	1	x	500,000.00	=	$	500,000		
								Subtotal Environmental Mitigation	*$*	*500,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost		
20XXXX	Planting	LS	1	x	100,000.00	=	$	100,000		
20XXXX	Irrigation System	LS	1	x	150,000.00	=	$	150,000		
								Subtotal Landscape and Irrigation	*$*	*250,000*

5C - EROSION CONTROL

Item code		Unit	Quantity		Unit Price ($)			Cost		
21XXXX	Temporary Erosion Control	LS	1	x	750,000.00	=	$	750,000		
21XXXX	Permanent Erosion Control Measures	LS	1	x	400,000.00	=	$	400,000		
								Subtotal Erosion Control	*$*	*1,150,000*

5D - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost		
130300	Prepare SWPPP	LS	1	x	15,000.00	=	$	15,000		
130100	Job Site Management	LS	1	x	50,000.00	=	$	50,000		
130310	Rain Event Action Plan (REAP)	EA	1	x	15,000.00	=	$	15,000		
130505	Move-In/Move-Out (Temporary Erosion Control)	EA	1	x	150,000.00	=	$	150,000		
130730	Construction BMP's (3% of Roadway Items)	LS	1	x	389,700.00	=	$	389,700		
								Subtotal NPDES	*$*	*623,700*
								TOTAL ENVIRONMENTAL	**$**	**2,523,700**

Supplemental Work for NPDES

XXXXXX	Supplemental for Environment Items	LS	1	x	100,000.00	=	$	100,000		
								Subtotal Supplemental Work for NDPS	*$*	*100,000*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
860460	Lighting and Sign Illumination	LS	1	x	500,000.00	=	$	500,000
XXXXX	Misc electrical (Work at Crossings)	LS	1	x	250,000.00	=	$	250,000

Subtotal Traffic Electrical $ *750,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
820840	Roadside Sign - One Post	EA	20	x	350.00	=	$	7,000
120090	Construction Area Signs	LS	1	x	10,000.00	=	$	10,000
84XXXX	Permanent Pavement Delineation	LS	1	x	100,000.00	=	$	100,000

Subtotal Traffic Signing and Striping $ *117,000*

6C - Traffic Management Plan

Item code		Unit	Quantity		Unit Price ($)			Cost
128652	Traffic Management Plan (For crossing and intersections)	LS	1	x	$ 50,000	=	$	50,000

Subtotal Traffic Management Plan $ *50,000*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Traffic Handling	LS	1	x	500,000.00	=	$	500,000

Subtotal Stage Construction and Traffic Handling $ *500,000*

TOTAL TRAFFIC ITEMS **$ 1,417,000**

SECTION 7: DETOURS

Includes constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
XXXXXX	Detour Items	LS		x		=	$ -

* Includes constructing, maintaining, and removal

TOTAL DETOURS **$ -**

SUBTOTAL SECTIONS 1 through 7 $ 7,899,400

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items							
	ADA Items				3.0%	$	236,982
8B - Bike Path Items							
	Bike Path Items				3.0%	$	236,982
8C - Other Minor Items							
	Other Minor Items				2.0%	$	157,988
	Total of Section 1-7	$	7,899,400	x	8.0%	$	631,952

TOTAL MINOR ITEMS **$ 632,000**

SECTIONS 9: ROADWAY MOBILIZATION

Item code							
999990	Total Section 1-8	$	8,531,400	x	10%	$	853,140

TOTAL ROADWAY MOBILIZATION **$ 853,200**

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
XXXXXX	SW	Unit	1	x	100,000.00	$	100,000
	*Cost of **NPDES** Supplemental Work specified in Section 5D*					$	100,000
	Total Section 1-8	$	8,531,400		5%	$	426,570

TOTAL SUPPLEMENTAL WORK **$ 626,600**

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
XXXXXX	Some Item	Unit		x		=	$0
	Total Section 1-8	$	8,531,400		0%	= $	-

TOTAL STATE FURNISHED **$0**

SECTION 12: TIME-RELATED OVERHEAD

Total of Roadway and Structures Contract Items excluding Mobilization $8,531,400 (used to calculate TRO)

Total Construction Cost (excluding TRO and Contingency) $10,011,200 (used to check if project is greater than $5 million excluding contingency)

Estimated Time-Related Overhead (TRO) Percentage (0% to 10%) = **5%**

Item code		Unit	Quantity		Unit Price ($)		Cost
090100	Time-Related Overhead	WD	500	X	$853	=	$426,600

TOTAL TIME-RELATED OVERHEAD **$426,600**

SECTION 13: ROADWAY CONTINGENCY

Total Section 1-12	$	10,437,800	x	**20%**	=	$2,087,560	

TOTAL CONTINGENCY **$2,087,600**

II. STRUCTURE ITEMS

	South Aptos UP	North Aptos UP	Aptos Creek Ped Bridge
DATE OF ESTIMATE	10/27/2021	10/27/2021	11/9/2021
Bridge Name	South Aptos UP	North Aptos UP	Aptos Creek Ped Bridge
Bridge Number	36-XXXX	36-XXXX	36C-XXXX
Structure Type	Steel Through Girder	Steel Through Girder	Steel Truss
Width (Feet) [out to out]	26.50 LF	35.00 LF	16.00 LF
Total Bridge Length (Feet)	180.00 LF	270.00 LF	300.00 LF
Total Area (Square Feet)	4680 SQFT	9450 SQFT	4800 SQFT
Structure Depth (Feet)	3.66 LF	3.66 LF	8.50 LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$945.00	$891.00	$364.00
COST OF EACH	**$4,422,600**	**$8,419,950**	**$1,747,200**

	Valencia Creek Ped Br	Trail Bridge over Driveway	RW 102U
DATE OF ESTIMATE	11/9/2021	11/9/2021	11/9/2021
Bridge Name	Valencia Creek Ped Bridge	Trail Bridge over Driveway	RW No. 102U
Bridge Number	36C-XXXX	36C-XXXX	36E-XXXX
Structure Type	Steel Truss	CIP R/C Slab	MSE
Width (Feet) [out to out]	16.00 LF	18.00 LF	N/A LF
Total Building Length (Feet)	300.00 LF	78.00 LF	335 LF
Total Area (Square Feet)	4800 SQFT	1404 SQFT	4800 SQFT
Structure Depth (Feet)	8.50 LF	1.50 LF	N/A LF
Footing Type (pile or spread)	Pile	Pile	N/A
Cost Per Square Foot	$364.00	$145.00	$109.00
COST OF EACH	**$1,747,200**	**$203,580**	**$523,200**

SUBTOTAL COST OF BRIDGES	**$16,540,530**
SUBTOTAL COST OF WALLS	**$523,200**

Estimate Prepared By: _____ _____

XXXXXXXXXXXXXXXX ------ Division of Structures | Date

EA: 05-0C7340 PID: 05-1800-0116

II. STRUCTURE ITEMS

	South Aptos POC (move)	North Aptos POC (move)	Aptos Crk Deck Rplc
DATE OF ESTIMATE	12/13/2021	12/13/2021	12/13/2021
Bridge Name	South Aptos POC	North Aptos POC	Aptos Creek UPRR Bridge
Bridge Number	36-XXXX	36-XXXX	36C-0077
Structure Type	Steel Truss	Steel Truss	Steel Plate Girder
Width (Feet) [out to out]	18.66 LF	19.08 LF	18.00 LF
Total Bridge Length (Feet)	190.00 LF	290.00 LF	233.50 LF
Total Area (Square Feet)	3545 SQFT	5533 SQFT	4203 SQFT
Structure Depth (Feet)	2.00 LF	2.33 LF	12.25 LF
Footing Type (pile or spread)	Pile	Pile	Spread
Cost Per Square Foot	$42.00	$26.00	$20.00
COST OF EACH	**$148,907**	**$143,863**	**$84,060**

	Valencia Creek Deck Rplc	Soil Nail Wall	
DATE OF ESTIMATE	12/13/2021	12/13/2021	
Bridge Name	Valencia Creek UPRR Bridge	Soil Nail Wall	
Bridge Number	36C-0069	36E-XXXX	
Structure Type	Steel Plate Girder	Soil Nail	
Width (Feet) [out to out]	18.00 LF	N/A LF	LF
Total Building Length (Feet)	298.50 LF	671.00 LF	LF
Total Area (Square Feet)	5373 SQFT	5368 SQFT	SQFT
Structure Depth (Feet)	12.25 LF	N/A LF	LF
Footing Type (pile or spread)	Spread	N/A	
Cost Per Square Foot	$20.00	$150.00	
COST OF EACH	**$107,460**	**$805,200**	**$0**

TOTAL COST OF BRIDGES		**$17,024,820**
TOTAL COST OF WALLS		**$1,328,400**
STRUCTURES MOBILIZATION	10%	**$1,835,322**

Recommended Contingency: (Pre-PSR 30%-50%, PSR 25%, Draft PR 20%, PR 15%, after PR approval 10%, Final PS&E 5%)
Total recommended percentages includes any quantified risk based contingency from the risk register.

STRUCTURES CONTINGENCY	20%	**$3,670,644**
TOTAL COST OF STRUCTURES		**$23,859,186**

Estimate Prepared By: _____ _____

XXXXXXXXXXXXXXXX ------ Division of Structures — Date

EA: 05-0C7340 PID: 05-1800-0116

III. RIGHT OF WAY

Fill in all of the available information from the Right of Way Data Sheet.

A)	A1)	Acquisition, including Excess Land Purchases, Damages & Goodwill, Fees	$	7,380,000
	A2)	SB-1210	$	0
B)		Acquisition of Offsite Mitigation	$	0
C)	C1)	Utility Relocation (State Share)	$	50,000
	C2)	Potholing (Design Phase)	$	0
D)		Railroad Acquisition	$	0
E)		Clearance / Demolition	$	200,000
F)		Relocation Assistance (RAP and/or Last Resort Housing Costs)	$	320,000
G)		Title and Escrow	$	28,000
H)		Environmental Review	$	0
I)		Condemnation Settlements 0%	$	0
J)		Design Appreciation Factor 0%	$	0
K)		Utility Relocation (Construction Cost)	$	500,000

L)	**TOTAL RIGHT OF WAY ESTIMATE**	**$8,478,000**
M)	**TOTAL R/W ESTIMATE: Escalated**	**$8,834,076**
N)	**RIGHT OF WAY SUPPORT**	**$847,800**

Support Cost Estimate Prepared By _____ Project Coordinator[1] _____ Phone

Utility Estimate Prepared By _____ Utility Coordinator[2] _____ Phone

R/W Acquisition Estimate Prepared By _____ Right of Way Estimator[3] _____ Phone

Note: Items G & H applied to items A + B

[1] When estimate has Support Costs only [2] When estimate has Utility Relocation [3] When R/W Acquisition is required

DO NOT PRINT THIS SHEET AS PART OF COST ESTIMATE ATTACHMENT TO PROJECT INITIATION OR APPROVAL DOCUMENTS.

EA: 05-0C7340 PID: 05-1800-0116

IV. SUPPORT COST ESTIMATE SUMMARY

Run a Support Cost Estimate Summary report (D11 Project Management Support onramp) for component data.

		Unescalated-Risk Loaded					Escalated (3.2% per year for ETC, effective 1/2/2018)				
Total by FY		**PA&ED**	**PS&E**	**RW**	**CON**	**Total $**	**PA&ED**	**PS&E**	**RW**	**CON**	**Total $**
<2016	Expended										
	ETC										
2017	Expended										
	ETC										
2018	Expended										
	ETC										
2019	Expended										
	ETC										
2020	Expended										
	ETC										
2021	Expended										
	ETC		1298915	84800		**$1,383,715**		$1,340,480	$87,514		**$1,427,994**
2022	Expended										
	ETC										
2023	Expended										
	ETC										
2024	Expended										
	ETC										
2025	Expended										
	ETC										
2026	Expended										
	ETC				$3,685,000	**$3,685,000**				$3,924,613	**$3,924,613**
2027	Expended										
	ETC										
2028	Expended										
	ETC										
2029	Expended										
	ETC										
>2030	Expended										
	ETC										
EAC (Expended + ETC)		**$0**	**$1,298,915**	**$84,800**	**$3,685,000**	**$5,068,715**	**$0**	**$1,340,480**	**$87,514**	**$3,924,613**	**$5,352,607**
Risk Amount from Risk Register		**$0**	**$0**	**$0**	**$0**	**Escalated Risk Amount**	**$0**	**$0**	**$0**	**$0**	**$0**
Support Escalation Rate		**0.0%**	**0.0%**	**0.0%**	**0.0%**						
Duration to mid-point component		**0.00**	**0.00**	**0.00**	**0.00**						
Total including Risk Amount		**$0**	**$1,298,915**	**$84,800**	**$3,685,000**	**Total Esc. Support Cost**	**$0**	**$1,340,480**	**$87,514**	**$3,924,613**	**$5,352,607**
Approved Budget (PRSM)											
Difference (Budget - EAC)		**$0**	**-$1,298,915**	**-$84,800**	**-$3,685,000**	**-$5,068,715**	**$0**	**-$1,340,480**	**-$87,514**	**-$3,924,613**	**-$5,352,607**
Support Ratio (EAC / Cap Cost)		**0.0%**	**2.6%**	**0.2%**	**7.5%**	**10.3%**	**0.0%**	**2.7%**	**0.2%**	**8.0%**	**10.8%**

Note: If you have alr

Total Capital Cost:	**$49,337,000**
Total Capital Outlay Support Cost:	**$5,352,607**
Overall Percent Support Cost:	**10.85%**

PRSM workplan hours/costs verified against approved MWA:

Office Chief - Date

Approved by:

Project Control - Date